Recognition any Backward – Forward Effects of Transportation in Iran Economy

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Abstract

It is evident to everybody that transportation is one of the infrastructure and fundamental sections and a connective ring of different industries as well. This is because all activities are under the effects of this part and it is an important part of production-consumption cycle in each economy. Transportation is necessary to provide suitable facilities for industries and development of most economic plans. In this research we intend to study and calculate any preceding and latest coefficients of transportation and dispersion / sensitivity power indexes by integration of Input -Output table and 30-parts table. According to the results, it is obvious that transportation has high level of preceding and latest effects in state's economy with the most preceding connections with industry and fuels and also highest rate of latest connection with industry and building sector.

Keywords*: Transportation, Economy, Input -Output table, Iran.*

1. Introduction

It is evident to everybody that transportation is one of the infrastructure and fundamental sections and a connective ring of different industries as well. This is because all activities are under the effects of this part and it is an important part of production-consumption cycle in each economy. Transportation is necessary to provide suitable facilities for industries and development of most economic plans. With such an effect on space structure of country, transportation could promote communication network and facilitating of production and distribution of produced products and also great effect on major indexes such as occupation, production and investment (Mahmoudi, 1997). In national accounts system, transportation is located in services section with three sub-divisions as: Air transportation, Marine transportation and Land transportation (Road and Railway).

Economists will explain development mainly as increase in production and standard of living. Since 1970s by reducing transportation costs and increasing the quality of connective ways and different technologies, transportation caused a considerable increase of trade and also due to the great investments in infrastructures and success in transportation technology after World War II there was integration inside and outside of countries. But the governments had no chance to accept the responsibility of these costs due to the great costs in transportation infrastructures and any investment in transportation belong to governments as a natural inclusivity. Therefore developing countries had unsuccessful experiences in this part due to the non-developed properties of governments and weakness of market in this part. It needs to be studied and programmed more seriously later on (World Bank 2009). Like industry and agriculture, transportation as one of the important economic parts of the countries may not only provides

more services directly in production and economic growth, but also is effective on other economic parts with indirect effects through various services for other parts and any demands for other producing goods and services. The major goal of this research is to introduce transportation as a key part and its relation with other economic parts through the calculation of any latest and preceding connections and special framework. Transportation may have a growth or development and/or with a further relation with development of other sectors and any effects on other economic parts in order to be more efficient and effective with regard to above-mentioned items and any governmental investment in transportation in private sector.

Regarding the importance of transportation as one of the major factors in Iranian economy and more investment in this part for further growth and fixed development, we intend to find a reply for the following basic questions in this research.

A- Whether transportation section has high latest and preceding effects in Iranian economy?

B- Whether the latest effects of transportation are more than the preceding ones?

2. Research literature

There is a thesis at the Master of Science level for specifying the major role of transportation in Iranian Economy and further analysis of Input -Output written by Maboudi by the use of table 1991 supplied and published by Iranian Statistic Center. It has calculated both the preceding and latest connections and Leontief matrix of technical/converse coefficients. Finally it is about preceding connections of transportation, other buildings, residential buildings, general services, defense, wholesale/retail with 6^{th} grade among 19 sectors and from the viewpoint of latest connections of agriculture, industry and trade with 4^{th} grade and from general connection in which 9 economic primary sector are named as key sectors accordingly.

Esfandyari (1998), Recognition of key industries based upon the preceding and latest connections in Iranian economy and by the use of Input –Output table of 1986. In this research he has managed to calculate the preceding and latest connections and also the distribution of power index and the sensitivity index by using Input -Output table of 1986. Finally he could confirm that different sectors including industry vegetables, animal husbandry (except birds), sugar, edible oils, other food stuffs, textiles, plastic products, other chemicals and basic products have high preceding-latest connections in state's economy and would be included in key industries as well.

Bakhshi (1999) Evaluation of agriculture position among key sectors of Iranian economy by using Input–Output table of 1999. All key economic sectors have been determined from the viewpoint of output by using the Input-Output table of 1999, accompanied by the calculation of preceding-latest connections and their distribution rate. According to the obtained results and by the use of various indexes, it was revealed that all key sectors of production system belong to the industry and none of them are sub-sectors of agriculture and sub-services of key sectors in the mentioned year. Some of the most important key sectors of production system at mentioned sector are leather and leather products industries, clothes (textile?) industries and other industrial products as well.

Gheibi Boldaji et al (2001), Evaluation of the position of sub-sectors of agriculture among other economic sectors of Isfahan province with regard to Input -Output table for 2001.

3. Research Methodology

Documentary or library method has been applied in this research in order to collect required information through internet sites and different information banks including Statistics Center and

Central Bank of Iran. In this research we used Input-output table to find relations among different variables. Input – Output table shows an image of any relations and mutual contacts among economic activities in a special framework. In fact it is a clear explanation of quantitative specifications of different parts and real parts of an economic system. It is a detailed picture of economic structure at a special period of time which is usually a 1-year program for all transactions.

Input – Output table in this research is one updated by specialists of Central Bank of Islamic Republic of Iran for 2005 and out of published information in 1999. This is a net table and like other Input -Output tables has four parts. The first part is about intermediate consumptions and the second part is related to final consumptions and the third part is about value added consumptions and fourth part is about white tables. In the first part of this table, we have intermediate consumptions with buyer's price and with separation of fields of activities in rows and type of products in columns. Total column of this table will show total intermediate consumptions of different fields of activities with buyer's price. In second part, we have final consumption costs including private sector consumption, Non-beneficiary institutes servicing to families, consuming expenses of government, gross fixed capital, export of goods and services and any changes in stock with buyer's price. The buyer's price for final items of final consumption is the observing market price and also FOB price for export equal to buyer's price as well.

The third part, shows the producer's costs except for intermediate consumptions. In other words, it may show relevant costs of value added items. The major consumptions of value added are as follows:

Compensation of personnel services, Tax minus production subside and import including tax minus subside of products and other taxes minus production subside (as mentioned with producer's price in relevant table), gross operational abundance.

The above-mentioned table is a 38-parts one with following dimensions. The original form of this table is presented in enclosure No. (1).

Followings are relevant dimensions of above-mentioned table:

1	Agricultural and Garden products
2	Animal products
3	Forest products
4	Fishery products
5	Crude oil and Natural gas
6	Other mineral products
7	Foodstuffs and Beverages
8	Products out of tobacco
9	Textile, clothing and leather
10	Wooden products
11	Paper and Paper products
12	Benzene
13	Kerosene
14	Gasoline
15	Fuel oil
16	Other oil products
17	Other chemicals and plastic

18	Nonferrous mineral products
19	Basic metals
20	Made metallic products
21	Types of machinery and equipment
22	Other non-classified products
23	Electricity
24	Refined and Distributed gas
25	Water
26	Building
27	Commerce and Different types of repairing services
28	Hotel and Restaurant
29	Rail transportation
30	Road transportation
31	Marine transportation
32	Air transportation
33	Supportive and Auxiliary services
34	Post and Telecommunication services
35	Financial intermediate services
36	Properties services
37	Other business services
38	Other services

Since some of the rows of this table are in lack of efficiency for further analysis and could not provide an exact analysis, therefore we have aggregated them in different parts of table dimensions. Then we aggregated agricultural, garden, animal and jungle products in a separate section under the title of Agricultural and Jungle products. Wooden and paper products have also aggregated in another section. Benzene, kerosene, gasoline, fuel oil and other oil products in another separated part under the title of fuel materials. Other business services and other services have aggregated in a separate part and finally it was changed into a 30-parts table with following table of content. The origin form of which has been presented in enclosure No. (2).

Considering a 30-parts table, we will first obtain technical coefficients matrix (A) and then Leontief matrix (I-A) and also Leontief inverse matrix (inv I-A) as enclosed. Then we will calculate any direct backward connections through column adding of technical coefficients matrix and direct/indirect backward connections and through column adding of Leontif converse matrix and finally indirect backward connections from these two deductions and calculation of power distribution index. Then we will calculate production coefficient matrixes or obtained coefficient matrix (B), production converse matrix (inv I-B) (Enclosed) and finally we could obtain sensitivity index through their forward direct connections and total lines matrix elements of production coefficients and also forward direct/indirect connections through linear adding of elements of production converse matrix as well.

1	Agricultural and Jungle products
2	Fishery products
3	Crude oil and Natural gas
4	Other mineral products
5	Foodstuffs and Drinkable products
6	Products out of tobacco
7	Textile, clothing and leather
8	Wooden and Paper products
9	Fuel products
10	Other chemicals and plastic
11	Nonferrous mineral products
12	Basic metals
13	Made metallic products
14	Types of machinery and equipment
15	Other non-classified products
16	Electricity
17	Refined and Distributed gas
18	Water
19	Building
20	Commerce and Different types of repairing services
21	Hotel and Restaurant
22	Rail transportation
23	Road transportation
24	Marine transportation
25	Air transportation
26	Supportive and Auxiliary services
27	Post and Telecommunication services
28	Financial intermediate services
29	Properties services
30	Other services

4. Findings

Calculations of backward and forward coefficients

A) Backward correlation coefficients

Backward direct correlation coefficients show any direct effects of final demands on producing system of different sections. It is a linear vector (l x n) obtained from column total of technical coefficients matrix elements (A).

$$B^d = i'.A \qquad (1)$$

Where:
i': unique linear vector

A: Technical Coefficient Matrix or Input Coefficient Matrix , square matrix (nxn) with relevant elements obtained through dividing of relevant factors of area 1 in common Input –Output tabl (x_{ij}) on total output (x_j)

$$a_{ij} = \frac{x_{ij}}{X_j} \qquad (2)$$

Therefore, we will have:

$$B^{(d)} = \sum_{i=1}^{n}\left(\frac{x_{ij}}{X_j}\right) = \sum_{i=1}^{n} a_{ij} \qquad (3)$$

Also, backward direct and indirect correlation coefficients may show direct/indirect effectiveness of changes in final demand (final family consumption, final governmental consumption, capital, export and changing of warehouse stock) on producing structure of different sectors of economy. It is a linear vector (l x n) obtained from column total of Leontif inverse matrix elements (A).

$$B^{(d+i)} = i'.(I - A)^{-1} \qquad (4)$$

Where:
i': unique linear vector
I: Unique matrix, it is a square matrixes (nxn) in which any elements on its diameter are 1 and other elements are zero.
$(I- A)^{-1}$:Leontif inverse matrix

Indirect backward correlation coefficient is a linear vector (l x n) obtained from deducting $B^{(d+i)}$ and B^d and shows the effects of indirect changes of final demand on producing structure of different economic parts.

$$B^i = B^{(d+i)} - B^d \qquad (5)$$

Direct correlation coefficient shows any direct effects of final demand on producing system of sections; while direct / indirect correlation coefficient may show direct/ indirect effectiveness of changes in final demand (final family consumption, final governmental consumption, capital, export and changing of warehouse stock) on producing structure of different sectors of economy. It is possible to introduce relevant sections with backward direct correlation coefficient more than 0.55 as the sections with powerful backward relations.

There are correlation coefficients higher than average total as mentioned in table (1) for total transportation backward correlation and by sub-section separation (Rail, Road, Air, Marine, Supportive and Auxiliary services). Table (2) shows the backward correlation coefficients in which there is a general transportation form.

As it is obvious in relevant tables, the mentioned coefficients of total transportation sub-sections are more than the general average of total country. The highest coefficient of them is related to Air transportation and the lowest is related to road one. From the viewpoint of direct/indirect correlation, it is obvious that rail transportation, marine transportation and Air transportation have different correlations more than general average of total country. Therefore supportive and auxiliary services of road transportation have a lower coefficient than the average rate of country.

Table No. 1-: Backward Correlation coefficients according to the Backward-Forward table 2005

No.	Section	Indirect backward correlation	Direct and Indirect backward correlation	Direct backward correlation
1	Agricultural and Jungle products	1.1887	1.4638	0.275
2	Fishery products	1.3611	1.8180	0.457
3	Crude oil and Natural gas	1.0181	1.0431	0.025
4	Other mineral products	1.2038	1.4710	0.267
5	Foodstuffs and Drinkable products	1.5919	2.3187	0.727
6	Products out of tobacco	1.3094	1.8039	0.494
7	Textile, clothing and leather	1.4013	2.0060	0.605
8	Wooden and Paper products	1.4255	1.9512	0.526
9	Fuel products	1.1001	1.4637	0.364
10	Other chemicals and plastic	1.3244	1.7910	0.467
11	Nonferrous mineral products	1.3440	1.8151	0.471
12	Basic metals	1.5561	2.1883	0.632
13	Made metallic products	1.5644	2.1257	0.561
14	Types of machinery and equipment	1.8148	2.5374	0.723
15	Other non-classified products	1.2945	1.6750	0.380
16	Electricity	1.5792	2.2838	0.705
17	Refined and Distributed gas	1.1178	1.4514	0.334
18	Water	1.3681	1.7889	0.421
19	Building	1.6572	2.3911	0.734
20	Commerce and Different types of repairing services	1.1596	1.3726	0.213
21	Hotel and Restaurant	1.5220	1.8180	0.296
22	Rail transportation	1.2440	1.8180	0.574
23	Road transportation	1.3668	1.8180	0.451
24	Marine transportation	1.1210	1.8180	0.697
25	Air transportation	1.1083	1.8180	0.710
26	Supportive and Auxiliary services	1.3476	1.8180	0.470
27	Post and Telecommunication services	1.5704	1.8180	0.248
28	Financial intermediate services	1.4655	1.8180	0.352
29	Properties services	1.7721	1.8180	0.046
30	Other services	1.5651	1.8180	0.253
Total average of state		1.3479	1.7971	0.449

Resources: Results of the research

Table No. 2-: Backward Correlation coefficients according to the Backward-Forward table 2005

No.	Section	Indirect backward correlation	Direct and Indirect backward correlation	Direct backward correlation
1	Agricultural and Jungle products	1.1956	1.4708	0.275
2	Fishery products	1.3541	1.8110	0.457
3	Crude oil and Natural gas	1.0169	1.0419	0.025
4	Other mineral products	1.1919	1.4590	0.267
5	Foodstuffs and Drinkable products	1.5916	2.3184	0.727
6	Products out of tobacco	1.3074	1.8019	0.494
7	Textile, clothing and leather	1.4028	2.0074	0.605
8	Wooden and Paper products	1.4198	1.9455	0.526
9	Fuel products	1.0985	1.4621	0.364
10	Other chemicals and plastic	1.3264	1.7930	0.467
11	Nonferrous mineral products	1.3325	1.8036	0.471
12	Basic metals	1.5411	2.1574	0.614
13	Types of machinery and equipment	1.7836	2.4965	0.713
14	Electricity, Natural Gas and Water	1.3894	1.9298	0.540
15	Building	1.6467	2.3807	0.734
16	Commerce, Hotel and Restaurant	1.1697	1.3897	0.220
17	Transportation	1.3173	1.7950	0.478
18	Post and Telecommunication services	1.1578	1.4053	0.248
19	Financial intermediate services	1.2376	1.5901	0.352
20	Properties services and Other services	1.1315	1.3075	0.176
Total average of state		1.3549	1.7924	0.438

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Therefore, in table (4-1) in which backward direct and indirect coefficients have been introduced in a 30-parts form, we have building, foodstuffs, machinery and equipment, air transportation, electricity and marine transportation with highest backward direct connections. Upon a study of direct and indirect connections we may recognize that the location of transportation sections is between levels 9 to 14 out of 30 parts.

B) Dispersion power index

This index which is normalized form of $B^{(d+1)}$ index, is a linear vector (l x n) out of multiplying of the number of sectors (n) in total column of Leontief inverse matrix and divided on grand total of Leontief inverse matrix as well.

$$P = \frac{ni'.(I-A)^{-1}}{i'.(I-A)^{-1}.i} \qquad (6)$$

It is obtainable from backward direct /indirect relation of different sections. If $P \phi 1$, therefore the mentioned sector has a serious need to intermediate data of other sections and create more demands against economic average. If $P \pi 1$, then there is a weak motivation for economy. The average of this coefficient is 1 for all sectors. It means that total of this coefficient for a 15-parts table is 15. In other words, according to this index, any parts with an index more than 1, have greater average amount. Therefore these sectors are in serious need to intermediate data of other sections and higher motivation from an average in economy. Those parts with Dispersion power index lower than 1, have a lower motivation than average amount. As it is obvious in table (3), we have rail transportation sections (1.169), Marine transportation (1.204), air transportation (1.236) and supportive and auxiliary services of transportation (1.00) with higher Dispersion power index than 1. Furthermore, table (4-4) shows that total transportation has a distribution power index of 1.015. These sectors with a coefficient higher than 1 may create a motivation higher than average in aerial economy.

Table No. 3-: Backward Correlation coefficients according to the Backward-Forward table 2005

No.	Section	Indirect backward correlation
1	Agricultural and Jungle products	0.815
2	Fishery products	1.012
3	Crude oil and Natural gas	0.580
4	Other mineral products	0.819
5	Foodstuffs and Drinkable products	1.290
6	Products out of tobacco	1.004
7	Textile, clothing and leather	1.116
8	Wooden and Paper products	1.086
9	Fuel products	0.814
10	Other chemicals and plastic	0.997
11	Nonferrous mineral products	1.010
12	Basic metals	1.218
13	Made metallic products	1.183
14	Types of machinery and equipment	1.412
15	Other non-classified products	0.932
16	Electricity	1.271
17	Refined and Distributed gas	0.808
18	Water	0.995
19	Building	1.331
20	Commerce and Different types of repairing services	0.764
21	Hotel and Restaurant	0.876
22	Rail transportation	1.169
23	Road transportation	0.972
24	Marine transportation	1.204
25	Air transportation	1.236
26	Supportive and Auxiliary services	1.000
27	Post and Telecommunication services	0.789
28	Financial intermediate services	0.893
29	Properties services	0.604
30	Other services	0.802
Total average of state		1

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Table No. 4-: The index of economy distribution power according to the Backward-Forward table 2005

No.	Section	Indirect backward correlation
1	Agricultural and Jungle products	0.832
2	Fishery products	1.024
3	Crude oil and Natural gas	0.589
4	Other mineral products	0.825
5	Foodstuffs and Drinkable products	1.311
6	Products out of tobacco	1.019

7	Textile, clothing and leather	1.135
8	Wooden and Paper products	1.100
9	Fuel products	0.827
10	Other chemicals and plastic	1.014
11	Nonferrous mineral products	1.020
12	Basic metals	1.219
13	Types of machinery and equipment	1.412
14	Electricity, Natural Gas and Water	1.091
15	Building	1.346
16	Commerce, Hotel and Restaurant	0.786
17	Transportation	1.015
18	Post and Telecommunication services	0.795
19	Financial intermediate services	0.899
20	Properties services and Other services	0.739
Total average of state		1.0

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In other words, relevant sections with Dispersion power index greater than unit, have priority than other sections due to their backward direct/indirect correlation coefficient.

C) Preceding correlation coefficients

Generally these coefficients show any relation among primary factors with producing system and will be divided into three groups of forward direct correlation coefficients, direct/indirect coefficients and indirect coefficients.

Forward direct correlation coefficients are applied for calculation and recognition of key factors by forward connections method. In fact, they will specify direct effects of potential changes on producing system as the first factors. The mentioned coefficients which are linear vectors (n x 1), are obtainable from linear combination of matrix elements of production coefficients:

$$F^{(d)} = B.i \qquad (7)$$

Where:

i': unique linear vector

B: Production coefficients matrix or forward coefficients is a square matrix (n x n). The relevant elements of b_{ij} are obtainable from dividing all elements of district 1 of Input – Output table of total X_i:

$$bij = \frac{x_{ij}}{X_j} \qquad (8)$$

Therefore, we will have:

$$F^{d} = \sum_{j=1}^{n}\left(\frac{x_{ij}}{X_i}\right) = \sum_{j=1}^{n} bij \qquad (9)$$

Upon calculation of production coefficient matrixes in enclosure No. 5, we may add its elements in order to find direct preceding correlation as mentioned in table (5).
Preceding direct/indirect correlation coefficient which may specify any direct and indirect effects of potential changes of primary factors on different parts of production are column vectors obtainable from linear total of output inverse matrix:

$$F^{(d+i)} = (I - B)^{-1}.i \qquad (10)$$

Then :
$(I- B)^{-1}$: Output inverse matrix
i: unique column vector
Upon the calculation of (I-B) as mentioned in enclosure 6, we could find production converse matrix with regard to table 30 as well (Enclosure 7) then we add its elements up to finding direct / indirect correlation coefficients.
Preceding indirect correlation coefficient is a column vector (n x 1) from deduction of $F^{(d=i)}$ vectors and F^{d} for specifying any indirect effects of potential changes of primary factors on producing system.

$$F^{i} = F^{(d+i)} - F^{d} \qquad (11)$$

As it is obvious in table (5) as well.
Table (6) shows the preceding correlation coefficients of total transportation.
As it is obvious in table (5), forward direct/indirect correlation coefficient of other mineral products, supportive and auxiliary services of transportation and intermediate services have more powerful forward relations.

Table No. 5-: Backward Correlation coefficients according to the Backward-Forward table 2005

No.	Section	Indirect backward correlation	Direct and Indirect backward correlation	Direct backward correlation
1	Agricultural and Jungle products	1.2293	1.582	0.353
2	Fishery products	1.0876	1.326	0.238
3	Crude oil and Natural gas	1.0417	1.110	0.068
4	Other mineral products	1.8335	2.628	0.795
5	Foodstuffs and Drinkable products	1.1341	1.414	0.280
6	Products out of tobacco	1.0002	1.008	0.008
7	Textile, clothing and leather	1.1335	1.368	0.235
8	Wooden and Paper products	1.5713	2.350	0.779
9	Fuel products	1.2218	1.556	0.334
10	Other chemicals and plastic	1.5190	2.051	0.534
11	Nonferrous mineral products	1.1835	2.035	0.852
12	Basic metals	1.3800	2.167	0.787
13	Made metallic products	1.2949	1.898	0.603
14	Types of machinery and equipment	1.1301	1.414	0.284
15	Other non-classified products	1.0687	1.156	0.087
16	Electricity	1.5947	2.285	0.690
17	Refined and Distributed gas	1.2416	1.496	0.254

18	Water	1.8729	2.052	0.180
19	Building	1.0424	1.114	0.072
20	Commerce and Different types of repairing services	1.2305	1.666	0.436
21	Hotel and Restaurant	1.0889	1.315	0.227
22	Rail transportation	1.3190	1.868	0.549
23	Road transportation	1.2293	1.654	0.425
24	Marine transportation	1.1913	1.577	0.385
25	Air transportation	1.2171	1.639	0.422
26	Supportive and Auxiliary services	1.6485	2.556	0.907
27	Post and Telecommunication services	1.2330	1.533	0.300
28	Financial intermediate services	1.6599	2.540	0.880
29	Properties services	1.0548	1.149	0.094
30	Other services	1.0922	1.200	0.107
Total average of state		1.2848	1.690	0.405

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Table No. 6-: The index of economy distribution power according to the Backward-Forward table 2005

No.	Section	Indirect backward correlation	Direct and Indirect backward correlation	Direct backward correlation
1	Agricultural and Jungle products	1.2296	1.583	0.353
2	Fishery products	1.0909	1.329	0.238
3	Crude oil and Natural gas	1.0453	1.114	0.068
4	Other mineral products	1.8119	2.607	0.795
5	Foodstuffs and Drinkable products	1.1364	1.416	0.280
6	Products out of tobacco	1.0002	1.008	0.008
7	Textile, clothing and leather	1.1299	1.365	0.235
8	Wooden and Paper products	1.5705	2.349	0.779
9	Fuel products	1.2271	1.561	0.334
10	Other chemicals and plastic	1.5207	2.053	0.534
11	Nonferrous mineral products	1.1778	2.029	0.852
12	Basic metals	1.3625	2.113	0.751
13	Types of machinery and equipment	1.1234	1.402	0.279
14	Electricity, Natural Gas and Water	1.5644	2.008	0.443
15	Building	1.0414	1.113	0.072
16	Commerce, Hotel and Restaurant	1.2164	1.634	0.417
17	Transportation	1.2734	1.754	0.480
18	Post and Telecommunication services	1.2220	1.522	0.300
19	Financial intermediate services	1.6489	2.529	0.880
20	Properties services and Other services	1.0723	1.175	0.102
Total average of state		1.2733	1.683	1.410

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D) Sensitivity index

This index which is normalized form of $F^{(d=i)}$ index, is a column vector (n x1) obtained from multiplying of the number of sections (n) in total rows of production inverse matrix coefficients and dividing on total production inverse matrix as follows:

$$Q = \frac{n(I-B)^{-1}.i}{i'(I-B)^{-1}.i} \qquad (12)$$

It is obtainable from forward direct /indirect relation of different sections. If this index is greater than $(q \phi 1)$, therefore the mentioned sector has a key role in internalization of production process and economy integration with further great activities and secondary effects as well. If this index is smaller than $q \pi 1$, then obtained effects in economy is minor which may cause a motivation for final demand on import and no more reflection in distribution of additional incomes by start up and development of activities.

This index is the normalized form of forward direct and indirect correlation coefficients. The average of this coefficient for all sections is 1. According to tables (7) and (8), we have other sections of mineral products, supportive and auxiliary transportation services, financial intermediate services, electricity, fundamental metals, wooden and paper products, other chemicals, plastic, non-metallic mineral products, water, rail transportation and metallic products with a sensitive index greater than 1. It means that all mentioned sections have a key role in economic integration of the area.

Tables (9) and (10) show the total correlation backward/forward coefficients and /or the same total correlation for tables 20 and30.

Table No. 7-: Backward Correlation coefficients according to the Backward-Forward table 2005

No.	Section	Sensitivity index
1	Agricultural and Jungle products	0.9362
2	Fishery products	0.7842
3	Crude oil and Natural gas	0.6567
4	Other mineral products	1.5550
5	Foodstuffs and Drinkable products	0.8365
6	Products out of tobacco	0.5964
7	Textile, clothing and leather	0.8095
8	Wooden and Paper products	1.3902
9	Fuel products	0.9206
10	Other chemicals and plastic	1.2136
11	Nonferrous mineral products	1.2041
12	Basic metals	1.2818
13	Made metallic products	1.1230
14	Types of machinery and equipment	0.8365

15	Other non-classified products	0.6840
16	Electricity	1.3519
17	Refined and Distributed gas	0.8849
18	Water	1.2143
19	Building	0.6592
20	Commerce and Different types of repairing services	0.9858
21	Hotel and Restaurant	0.7783
22	Rail transportation	1.1053
23	Road transportation	0.9787
24	Marine transportation	0.9328
25	Air transportation	0.9698
26	Supportive and Auxiliary services	1.5121
27	Post and Telecommunication services	0.9069
28	Financial intermediate services	1.5027
29	Properties services	0.6796
30	Other services	0.7097
Total average of state		1

Resources: Results of the research

Table No. 8-: Backward Correlation coefficients according to the Backward-Forward table 2005

No.	Section	Sensitivity index
1	Agricultural and Jungle products	1.4106
2	Fishery products	0.7895
3	Crude oil and Natural gas	0.6616
4	Other mineral products	1.5488
5	Foodstuffs and Drinkable products	0.8414
6	Products out of tobacco	0.5989
7	Textile, clothing and leather	0.8108
8	Wooden and Paper products	1.3957
9	Fuel products	0.9276
10	Other chemicals and plastic	1.2197
11	Nonferrous mineral products	1.2058
12	Basic metals	1.2555
13	Types of machinery and equipment	0.8330
14	Electricity, Natural Gas and Water	1.1928
15	Building	0.6614
16	Commerce, Hotel and Restaurant	0.9706
17	Transportation	1.0419
18	Post and Telecommunication services	0.9042
19	Financial intermediate services	1.5026
20	Properties services and Other services	0.6979
Total average of state		1

Resources: Results of the research

Table No. 9-: Backward Correlation coefficients according to the Backward-Forward table 2005

No.	Section	Indirect correlation	Direct and Indirect correlation	Direct correlation
1	Agricultural and Jungle products	2.4180	3.0463	0.628
2	Fishery products	2.4487	3.1435	0.695
3	Crude oil and Natural gas	2.0598	2.1530	0.093
4	Other mineral products	3.0373	4.0993	1.062
5	Foodstuffs and Drinkable products	2.7260	3.7326	1.007
6	Products out of tobacco	2.3097	2.8119	0.502
7	Textile, clothing and leather	2.5348	3.3742	0.839
8	Wooden and Paper products	2.9968	4.3011	1.304
9	Fuel products	2.3218	3.0197	0.698
10	Other chemicals and plastic	2.8434	3.8422	0.999
11	Nonferrous mineral products	2.5275	3.8504	1.323
12	Basic metals	2.9361	4.3549	1.419
13	Made metallic products	2.8593	4.0238	1.164
14	Types of machinery and equipment	2.9449	3.9513	1.006
15	Other non-classified products	2.3632	2.8311	0.468
16	Electricity	3.1739	4.5688	1.395
17	Refined and Distributed gas	2.3594	2.9471	0.588
18	Water	3.2408	3.8413	0.601
19	Building	2.6996	3.5054	0.806
20	Commerce and Different types of repairing services	2.3901	3.0388	0.649
21	Hotel and Restaurant	2.3673	2.8899	0.523
22	Rail transportation	2.8454	3.9687	1.123
23	Road transportation	2.5252	3.4013	0.876
24	Marine transportation	2.6588	3.7412	1.082
25	Air transportation	2.7285	3.8604	1.132
26	Supportive and Auxiliary services	2.9749	4.3527	1.378
27	Post and Telecommunication services	2.4029	2.9502	0.547
28	Financial intermediate services	2.9116	4.1441	1.233
29	Properties services	2.0950	2.2347	0.140
30	Other services	2.2809	2.6411	0.360
Total average of state		3.6327	3.4871	0.855

Resources: Results of the research

Table No. 10-: Backward Correlation coefficients according to the Backward-Forward table 2005

No.	Section	Indirect correlation	Direct and Indirect correlation	Direct correlation
1	Agricultural and Jungle products	2.4253	3.0535	0.628
2	Fishery products	2.4450	3.1399	0.695
3	Crude oil and Natural gas	2.0622	2.1555	0.093
4	Other mineral products	3.0038	4.0658	1.062
5	Foodstuffs and Drinkable products	2.7280	3.7346	1.007
6	Products out of tobacco	2.3077	2.8099	0.502
7	Textile, clothing and leather	2.5327	3.3721	0.839
8	Wooden and Paper products	2.9903	4.2946	1.304
9	Fuel products	2.3255	3.0234	0.698
10	Other chemicals and plastic	2.8472	3.8460	0.999
11	Nonferrous mineral products	2.5103	3.8331	1.323
12	Basic metals	2.9036	4.2678	1.364
13	Types of machinery and equipment	2.9071	3.8985	0.991
14	Electricity, Natural Gas and Water	2.9539	3.9373	0.983
15	Building	2.6881	3.4939	0.806
16	Commerce, Hotel and Restaurant	2.3861	3.0233	0.637
17	Transportation	2.5907	3.5486	0.958
18	Post and Telecommunication services	2.3797	2.9271	0.547
19	Financial intermediate services	2.8865	4.1191	1.233
20	Properties services and Other services	2.2038	2.4822	0.278
Total average of state		2.6281	3.4755	0.847

Resources: Results of the research

5. Discussion

Latest correlation: Upon consideration of calculated coefficients and indexes and with regard to table (1), for finding any direct backward activities at transportation section, it is revealed that rail transportation (0.57), road transportation (0.45), marine transportation (0.69) and supporting /auxiliary services of transportation (0.47) have direct correlation more than total average of (0.44). This means that even by assuming that rail transportation will pay Rls. 57 out of its Rls.100 as obtained amount to other economic sectors as the supplier of production data and also those sectors with obtaining rates more than %50 of total amount have powerful backward index and also we have direct/indirect correlation coefficients in which rail transportation has a coefficient equal to (2.10), road transportation (1.74), marine transportation (2.16), air transportation (2.22) and supportive/auxiliary services of transportation (1.796) while total average rate of state is 1.797 it is a sign of higher backward rate that average rate of state. Also we have Air transportation has the fifth grade with a forward direct/ indirect correlation coefficient after machinery and equipment (2.53), building (2.39), foodstuffs and beverages (2.31) and electricity (2.28) with a direct/indirect backward correlation of 2.22. On the other

hand, we have marine transportation with 7th grade with backward direct/indirect correlation coefficient of 2.16 after basic metals (2.18).

Also regarding the mentioned data in table (2), total transportation with direct / indirect correlation coefficient of 1.7950 has the 9th grade. This means that by assuming one unit of its obtained rate equal to 1.79 of transportation section will motivate other economic sections directly and/or indirectly or in other words higher rate of mentioned index is a sign of higher direct /indirect correlation with other economic sectors as mentioned in table 1. Marine transportation has a backward correlation of 0.697 and air transportation with 0.710 more than 0.55 have the powerful backward relations.

Distribution power index: Also with regard to table (3), all types of transportation such as rail transportation (1.16), marine transportation (1.20), supportive and auxiliary services (1) and air transportation (1.23) have higher distribution index than 1 (P>1). This is obtained from direct and indirect backward relation of sectors and shows that all above-mentioned sections are in serious need to intermediate data of other sectors and create higher economic average rate.
Then different sectors with distribution power index lower than 1 may create further motivations lower than average in economy like rail transportation (0.97), Crude oil and natural gas (0.58), fuel (0.81), water (0.99), treated and distributed gas (0.80), post and telecommunication services (0.78) and …
Table (4) shows that total transportation with Dispersion power index 1.015 may create more motivation than economic average which is a sign of the key role of transportation in Iranian economy.

Preceding correlation: Regarding table 5, about direct preceding correlation coefficients, as it is mentioned in relevant table, rail transportation has a preceding direct correlation of (0.549), road transportation (0.425), marine transportation (0.385), air transportation (0.422) and supportive and auxiliary transportation services has a preceding direct correlation of 0.907 which except for marine, the remained are higher than total average of country (0.405). This means that rail transportation will give its products to other sectors against a sum of Rls. 549 out of Rls.1000 in order to use it in their production process. From the viewpoint of direct and indirect preceding correlation, it is obvious that rail transportation has a correlation of 1.86 and supportive/auxiliary services (2.55) which are more than the total average of the country (1.69). But road/marine and air transportation have lower preceding direct/indirect correlation respectively as 1.65 and 1.57 and 1.63 lower than the total average of the country. In other words those activities with higher coefficients than total average rate will sell their products directly and indirectly more than other sectors in comparison with other economic sectors. In contrast, we have supportive and auxiliary transportation services with preceding direct/indirect correlation (2.55) after other mineral products (2.62) and as the second grade among all economic activities. Then we have rail transportation (1.86) at 11th grade and road transportation (1.65) at 13th grade, air transportation (1.63) at 14th grade and marine transportation (1.57) at 16th grade. According to table (6), total transportation with preceding direct and indirect correlation coefficient (1.75) at 8th grade among other activities.

Sensitivity index: Table (7) shows the economic sensitivity index at different sectors. This is extracted out of preceding direct and indirect relations among other sectors. If it is greater than

unit (q>1) then it has a key role in internalization of production process and integration of economy with further great activities and secondary effects. As it is mentioned for supportive and auxiliary services with sensitivity index of (1.51) with second grade in 30 sectors and also rail transportation with 1.10 and road transportation of 0.97 and air transportation (0.96) and marine transportation of (0.93) close to one. Also with regard to table No. (8), we have sensitivity index 1.04 as total transportation and the transportation as a key factor in total production process and also economy integration with wide range of secondary effects. Furthermore with regard to tables (9) and (10), we have transportation with direct and indirect correlation higher than the general average rate which is again a point out to the importance of this sector.

With regard to all above-mentioned items, after building and industry, transportation has the most powerful preceding connection and highest rate of latest relation after Electricity, water and gas industries. Also regarding any comparison of preceding / latest effects and as it is obvious in relevant tables, total transportation has a preceding correlation of 1.754 and latest correlation of 1.795. Therefore preceding effects have very small differences with latest ones. This is obvious with regard to the average distribution indexes (1.116) and sensitivity of 1.099.

6. Conclusion

Upon considering the results of analytical tables of previous section and mentioned results out of calculated indexes in previous part, it is possible to conclude following results:

- Any calculation of backward direct coefficients show that industry, building and transportation sectors have the greatest coefficients and then we have post and telecommunications, commerce and hotel and restaurant, crude oil/ natural gas and other services with lowest amount of backward connections. In other words, these coefficients show that industry, building and transportation will pay respectively 75, 73 and 47 Rls. to other economic sections as suppliers of production data and by assuming about Rls. 100 as their output amount while the similar rate for crude oil and natural gas is 2 Rials.
  Also it is revealed that rail transportation has the highest direct preceding correlation with machinery and equipment section (0.104), road transportation with fuels (0.167) and air transportation with fuels (0.292).

- According to the results of backward direct/ indirect coefficients for different sectors of industry, building and transportation have more powerful backward connections than other economic sectors. In other words, industry, building and transportation may create more motivations in country's economy. Then rail transportation has the highest direct/indirect correlation with different machinery and equipment (0.184), road transportation with fuels (0.186), marine transportation with other services (0.293) and air transportation with fuels (0.322).
- Any calculation of Dispersion power index based upon latest coefficients information, will show that which one of the mentioned activities are in need to intermediate data of other sections and will create more motivations in other activities of aerial economy. Those sectors with Dispersion power index lower than 1, may have lower motivation than average rate. Any calculation of Dispersion power shows that industry, building, supplying of electricity, water, gas and transportation sectors have a Dispersion power index more than 1. Therefore since these sections have Dispersion power index greater

than unit, they have more priorities than other sectors due to their preceding direct / indirect correlation coefficient.

- Latest direct/ indirect relations index make it clear that any effects of potential increase in value added (compensation of services, operational addition) on production increase and its supply to other economic sectors. Greater index means supplying of products and services for other economic sectors by mentioned sectors on direct and indirect methods. As a result they are considered as key sectors due to have forward direct and indirect connections. According to the results of calculated tables in previous chapter, industry and transportation have more powerful forward relations in country's economy and all sectors of transportation have highest preceding correlation (direct, direct/indirect) with building and industry sector.
- The priority of calculating the sensitivity index in specifying and recognition of key sectors in comparison with forward connections index is that these indexes may reveal the average forward direct/ indirect connections of each part with average indirect/ direct relations of total economy. Therefore, any sector (s) with greater sensitivity index show that all mentioned sections may have more production ability against total economy. Then they may have more supply possibilities than other sectors. According to the results of tables in previous chapter, we have industry, supplying of electricity, gas and water, agriculture and forestry and then transportation with sensitivity index greater than 1. This means that all these parts will play a key role in aggregation of country's economy with great activities and wide secondary effects.
- Any calculation of preceding and latest correlation in transportation will specify that transportation is a random sector with equal and high level of preceding and latest correlations in state's economy.

- Therefore, as it is obvious in mentioned tables, from among four effective indexes in making decision and policy making we have the greatest abundance respectively for industry, transportation and building. But all of them may have more priorities in investment and focus of attention according to the priorities of different areas of country.

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