

Economic Structural Change Overtime in Iran

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ABSTRACT

Since the 1979 Islamic revolution, profound changes have been taken place in the Iranian economy as a result of a combination of external and internal factors. The revolution itself, the trade sanctions and the freezing of Iranian assets that followed, the costly eight-year war, 1980-1988, with Iraq, political problems and economic isolation from the west, and the vagaries of the oil market all have made their mark on the economy and brought about profound changes in the Iranian economy. Two years after the war ended, and in a confused economic situation, regarding uncontrolled inflation and rising unemployment, the government asked an IMF mission to visit Tehran in 1990, so that a loan could be negotiated. Both government and IMF group had an agreement that the government had to follow a broadly-based macroeconomic policy introducing a cut back in the government's role and giving priority to the private sector. Nevertheless the government decided to take heed of some of the IMF structural adjustment policies. So there was a general agreement not only from the outside but also inside Iran that the economy is seriously in need of reconstruction.

The First Socio-Economic and Cultural Development Five-Year Plan (1990-94) was presented by the government and was approved by *Majlis* (The Consultant Assembly of the Islamic Republic) in 1990. This plan provided an important framework within which the government embarked on a programme of structural reform and economic liberalization. The Second Plan, 1995-1999, had stressed privatization of the economy, exchange rate unification, gradual omission of tax exemptions and tried to make the state economic organizations as small as possible. The Third Five Year Plan 2000-2004 emphasized administrative reform and reorganization of the state-owned enterprises to

utilize their resources and potentials effectively, and privatization. As a result since 1979 large changes could have been taken in the economy and may have some effect on the structure of the economy.

The main aim of this paper is to measure the change of the economic structure has been taken since Islamic Revolution in Iran. In this study the changes in the structure will be examined by the input-output techniques, key sectors and the rowscaler-cum-columnscaler indices using different input-output tables to measure the structural changes and to identify the sources of those changes. For this purpose four input-output tables 1969, 1986, 1991 and 2000 will be employed. To identify the key sectors Leontief inverse coefficients of these matrices will be calculated whereas for rowscaler-cum-columnscaler indices the changes in the intermediate transaction, final demand, and value added matrices will be investigated.

1. INTRODUCTION

Iran today has many of the characteristics of a developing country with medium human development index¹, even though its GNP per capita is now above 5800\$². As a consequence of its high oil exports, Iran's GNP reached over 108.6 \$ billion in 1997 and rose on average by 1.2 percent per annum during the period 1975-1995³. Nevertheless the general standard of living still has plenty of scope for improvement with life expectancy 70 years⁴. Among its population of over 65 million, the literacy rate is as low as 73.3%⁵. Although the population growth rate has already decelerated during the last two decades,

¹ United Nations Development Programme 1999, Human Development Report.

² Ibid. p. 135.

³ Ibid. p. 181.

⁴ Ibid. p. 140.

⁵ Ibid. p. 177.

growth has still imposed an additional burden upon the country's development efforts. The population below the income poverty line is 15%⁶. Exports are predominantly of primary products and the country's imports consist of capital goods, semi-manufactured goods, and foodstuffs.

Since the 1979 Islamic revolution, profound changes have been taken place in the Iranian economy as a result of a combination of external and internal factors. The revolution itself, the taking of US hostages in November 1979, the trade sanctions and the freezing of Iranian assets that followed, the costly eight-year war, 1980-1988, with Iraq, political problems and economic isolation from the west, and the vagaries of the oil market all have made their mark on the economy and brought about profound changes in the Iranian economy. Of course, the changes to a large extent have been conditioned by the pre-revolution structure of the Iranian economy as well as the policy responses of the post-revolutionary government. Over the first decade of the post-revolution period, the Iranian economy gradually disintegrated. The nationalised sectors failed to grow, with the exception of the war industries, internal production and productivity declined and the rate of growth in GDP, industrial production, and capital investment showed down. At the same time inflation was running at a rate of up to 28.9% in 1988 (the highest rate in this period)⁷. The successful investment was likely to be in trade, retailing and services. Money was made by deals. And a product could be sold several times over in a day, which in turn caused further inflation and liquidity problems. The liquidity levels had increased twenty-three times in the period 1974-1990. Foreign exchange earnings had

⁶ Ibid. p. 146.

⁷ Monthly Trade Reports, No.3, Summer 1991.

fallen. The government had resorted to printing money and was then faced with an ever-accelerating increase in money supply and liquidity. Eventually, two years after the war ended, and in a confused economic situation, regarding uncontrolled inflation and rising unemployment, the government asked an IMF mission to visit Tehran in 1990, so that a loan could be negotiated. Both government and IMF group had an agreement that the government had to follow a broadly-based macroeconomic policy introducing a cut back in the government's role and giving priority to the private sector. Nevertheless the government decided to take heed of some of the IMF structural adjustment policies and removed some of subsidies and decided to float the rial (Iranian currency) which in fact meant that there was a severe devaluation of the currency in 1993. Within months of this government decision Iran received a loan from the World Bank, and the other suggested policy followed by reducing the size of the public sector and other essential reform. So there was a general agreement not only from the outside but also inside Iran that the economy is seriously in need of reconstruction. The First Socio-Economic and Cultural Development Five-Year Plan (1990-94) was presented by the government and approved by *Majlis* (The Consultant Assembly of the Islamic Republic) in 1990. This plan provided an important framework within which the government embarked on a programme of structural reform and economic liberalization. This Plan was relatively successful. Of course we should not forget the fact that after the war between Iran and Iraq (1980-1988) there were a lot of economic opportunities and rise in oil prices helped increase in the economic indicators. When the cost of creation of new economic opportunities became higher and there was a drop in crude oil prices, that period came to an end and the country entered a recession. During the final year of the First Plan, the

economic growth rate decreased. Nevertheless, an economic growth rate of 7.3 percent per annum was considered an achievement. The Second Plan started in 1995 with a delay of one whole year. The Second Plan, 1995-1999, had stressed privatization of the economy, exchange rate unification, gradual omission of tax exemptions and tried to make the state economic organizations as small as possible. However, what actually took place was a move toward a more controlled economy. Third Plan started in 2000, with one whole year delay. The Third Five Year Plan (2000-2004) emphasized administrative reform and reorganization of the state-owned enterprises to utilize their resources and potentials effectively, and privatization, which was started in the Second Plan. The government is authorized to take appropriate measures to privatize the provision of postal and telecommunication services, and transportation. Since 1979 major structural changes took place in the Iranian economy.

The main aim of this paper is to investigate the changes in the structure of the Iranian economy. This structure included not only the traditional index of production sectors in the input-output framework but also the pattern of consumption and the distribution of income. In addition, the interconnections between changes in production, consumption and value added in the input-output pattern will be explored.

2. ANALYTICAL TECHNIQUES

In recent years, there has been a great deal of renewed interest in extending the input-output framework to accommodate some of the concerns in the structural change area. The structural change can be included changes in production, consumption and

income distribution. The links between income distribution and production have been explored in models of the kind developed by Miyazawa (1976); these models are still linear in variable and assume a fixed price environment. The social accounting structure (SAM) provides for a more complex set of interrelationships, involving production, institution and factor accounts. The SAM model provides a convenient framework for establishing the impacts of production changes on income distribution and back to production through changes in consumption patterns. So, the symbolic nature of changes in an economy can be captured within the SAM framework. Moreover, the spirit of the Walrasian general equilibrium framework has been captured in the set of models now referred to generically as computable general equilibrium models (CGE). Which can provide the conditions in which the analyse the movement towards a flexible-price model is possible. However none of these models is without problem. The main problems are related to data and analytical issues. In the case of less developed countries if the analytical issue is possible to borrow from other countries' experiences but severity of data problems will be remained. To investigate the macroeconomic structural changes is required to have access to many IOs or SAMs for different periods of time which most of the times have not been prepared already and may push analyst to use whatever exist.

3. METHODOLOGY

When we review the literature in the input-output on the structural changes, is noticed that input-output analysis provides a framework to examine the structure and functioning of an economy. In this area the major concern arose about the degree to which some sectors created a greater than average impact upon an economy. In the

framework of input- output production each sector has two types of economic effects on other sectors: demand-side effect which measure by backward linkage and the other is supply-side effect called supply side⁸.

Backward linkage is used to indicate to interconnection between a particular sector to those from which it purchases inputs and in the simplest form is computed by the sum of the elements in the j th column of the direct-input coefficients matrix A namely $\sum_{i=1}^n a_{ij}$. Since the coefficients in A matrix are measures of direct effects only, this is usually known as the direct backward linkage. Thus

$$LBD_j = \sum_{i=1}^n a_{ij}$$

This is the column sums of the A matrix. The elements of Leontief inverse incorporate both direct and indirect connection between sectors. It seems to be more useful and comprehensive measure of the backward linkage of each sector. By this view backward linkage each sector would be given by the sum of the elements of the corresponding sector in the column of the direct and indirect coefficients matrix $(I-A)^{-1}$, whose elements we can denoted as b_{ij} . Thus the total (direct and indirect) backward linkage⁹ for sector j is,

$$LB(D+I)_j = \sum_{i=1}^n b_{ij}$$

⁸The initial conceptual developments may be traced to the work of Rasmussen (1952) and Hirschman (1958). Rasmussen introduced two types of indices the *power of dispersion* and the *sensitivity of dispersion* later called backward and forward linkages.

⁹ This is Rasmussen (1958) index and called power of dispersion

Other effects is derived from supply-side of input-output model and called forward linkage. Forward linkage measures from direct coefficient matrix \bar{A} and $(I-\bar{A})^{-1}$ which is parallel to direct backward linkage, is defined as the sum of the row of elements \bar{A} .i.e.,

$$LFD_i = \sum_{j=1}^n \bar{a}_{ij}$$

Similarly, the measure of the direct and indirect forward linkage of sector¹⁰ i is given by the sum of the elements in the i th row of $(I-\bar{A})^{-1}$, whose elements denoted by \bar{b}_{ij} ,

$$LF(D+I)_i = \sum_{j=1}^n \bar{b}_{ij}$$

Direct an indirect forward and backward linkage is an index for introducing key sector in an economy. Key sector is the sector with the highest forward and backward linkage. From the policy perspective, if a sector is key can generate high activity in the economy and a change in the final demand in all sectors will generate an above average increase in the output. These indices are used to make comparison of the structure of production and in inter-industry relations between periods of time. In addition to the changes in structure of production, the configuration of final demand and primary inputs is other index for investigation. In this view structural change between any two periods is revealed by the difference in technical coefficients, final demand and primary inputs. To investigate the changes in inter-industry relationship, expenditure patterns and output composition the rowscaler-cum-columnscaler indices is introduced by Wang (1997). The rowscaler index is connected to the demand-driven IO model while the columnscaler

¹⁰ This is also Rasmussen (1958) index and called sensitivity of dispersion

index is with the supply-constrained IO model. These two indices are used for the better and deeper understanding of the sources and pattern of structural change in the economy.

If we express the demand-driven IO system Leontief in matrix notation as follows:

$$X = AX + KF$$

Where

X = a $n \times 1$ vector of total gross outputs, $X_i, (i=1,2,\dots,n)$

A = a $n \times n$ square matrix of technical coefficients, with elements $a_{ij} = \frac{x_{ij}}{X_j} (j=1,2,\dots,n)$

F = a $m \times 1$ vector of final demands, $F_k, (k=1,2,\dots,m)$

λ = a $n \times m$ matrix of bridge coefficients, with elements of $\lambda_{ik} = \frac{f_{ik}}{F_k}, (k=1,2,\dots,m)$.

In this system, A and k matrices play important role to determine the extend to which change in total output can be attributed to change in final demand. A is technical coefficients and k is a matrix of bridge coefficients.

Generally, interindustry coefficients in A matrix change overtime when new techniques are brought on line, as cheaper inputs are substituted for more expensive ones, as the product composition of individual sectors changes and even as the level of capacity utilization in a sector varies, and so on. Changes in bridge coefficients in λ matrix reflect changes in consumer spending patterns, changes in types of capital goods, changes in relative importance of inventory accumulation, changes in the composition of government purchases, and changes in trade composition.

For supply-driven Ghosh models matrix form can be written as follows:

$$X' = i'(X)\bar{A} + V'C$$

Where

X' = a $1 \times n$ vector of total gross outputs, $X_i, (1, 2, \dots, n)$

i' = a $1 \times n$ unit vector

\bar{A} = a $n \times n$ square matrix of direct output coefficients, with elements

$$\bar{a}_{ij} = \frac{x_{ij}}{X_j} (j = 1, 2, \dots, n)$$

V' = a $1 \times l$ vector of primary inputs or value added, $V_l, (l = 1, 2, \dots, h)$

C = a $l \times n$ matrix of value added coefficients with elements of $c_{lj} = \frac{v_{lj}}{V_l}$.

In the Ghoshian model (Ghosh 1958) matrix C includes employee compensation, capital depreciation, and operating surplus, etc. serves as a critical point. By focusing on the C and V' in this model we can investigate the changes in industrial structure that might be due to changes in resources.

By using both models it is possible to draw the source of structural change in economy. We first apply the rowscaler index to identify the structural change from the demand side of an economy this is the method which set out by Carter (1980), Feldman and McClain and Modified by Wang (1996,97). This method is very simple and defined as the ratio of actual output level in current year to a generated output level which would have been produced when the actual output and final demand were associated with the base year input-output structure. It provides a measure of average change in all coefficients in a row of the interindustry matrix A and of bridge coefficients matrix λ

since the base year. Illustrating the method to put on view the change on structure, we begin with the Standard input-output equation:

$$X_{it} = \sum_j a_{ijt} X_{jt} + \sum_k \lambda_{ikt} F_{kt}$$

Where the subscript t denotes a specific time for example 2001. Measuring the coefficients change between base year and year of t , we compute a generated output value for year t by using base year coefficients and actual output and demand values, as follows:

$$\hat{X}_{it} = \sum_j a_{ij(0)} X_{jt} + \sum_k \lambda_{ik(0)} F_{kt} \quad (1)$$

Where the subscript (0) denotes base period coefficients. The total rowscaler (RS^T) for sector i in year t is defined as:

$$RS_{it}^T = \frac{X_{it}}{\hat{X}_{it}}$$

The RS_{it}^T ratio lets us to analyse the structural change for any two years rather than just for two years in which the full input-output data are available. If this ratio is greater than one (i.e. $RS_{it}^T > 1$) means the actual output is greater than the generated output. Normally we expect that the coefficients must have increased since the base year. Otherwise, for the ratio smaller than one the coefficients must have decreased.

Changes in the coefficients can be decomposed into the interindustry and final demand components. If for the purpose is to measure the technical change then we can denote it X_{it}^a which defined similarly to X_{it} with $a_{ij(0)}$ would be replaced by a_{ijt} in the equation number (1). Then the rowscaler of technical change is $RS_{it}^a = \frac{X_{it}^a}{\hat{X}_{it}}$ which allows

for changing technical coefficients. If the concern is with final demand coefficients we denote it as X_{it}^b and the rowscaler of final demand change is $RS_{it}^b = \frac{X_{it}^b}{\hat{X}_{it}}$ which allows for changing final demand coefficients. The relation between total changes and technical and final demand coefficients changes can be seen as follow;

$$RS_{it}^t = RS_{it}^a + RS_{it}^b - 1 \quad (2)$$

These two coefficients tell us nothing about which individual coefficients changes nor by how much. Many coefficients may change as a result of changes in input prices. Parallel to the rowscaler index in the demand-driven model, we refer to the columnscaler index in the supply-driven model. The generated output for sector j can be written as follow:

$$\hat{X}_{jt} = \sum_i X_{it} \bar{a}_{ij(0)} + \sum_i V_{it} C_{lj0}$$

and the total columnscaler CS for sector j in year t is then defined as follows:

$$CS_{jt} = \frac{X_{jt}}{\hat{X}_{jt}}$$

Where X_{jt} is the actual output of sector j . If CS_{jt} is bigger than one, then the coefficients have been increased. Otherwise, $CS_{jt} < 1$ the coefficients decreased. For measuring thee interindustry relationship it is required to replace \bar{a}_{ij0} by \bar{a}_{ijt} and define X_{jt}^a . The columnscaler of allocation change can be written as $CS_{jt}^a = \frac{X_{jt}^a}{\hat{X}_{jt}}$. If focus of attention is on the primary input or value added coefficients then it is required to replace C_{lj0} by C_{ljt} and define a new output vector of X_{jt}^c for this purpose and write out the

columnscaler of value-added change as $CS_{jt}^c = \frac{X_{jt}^c}{\hat{X}_{jt}}$. A relation parallel to that of equation

(2) also holds for the columnscaler.

4. APPLICATION OF THE IRANIAN ECONOMY

The history of IO frameworks revealed that the idea of compiling an IO table for Iran is one of the reasons to survey and manage data and information and finally calculate the national income since the first table was prepared. This history also shows that Iran is one of the countries with a relatively large body of experience in compiling IO tables. The first experience dates back to 1969 when help was obtained from American experts. This help continued in the compilation of the 1973 national IO table and in preparing regional tables. Thereafter tables were prepared at approximately five-year intervals by Iranian experts without any international help. Preparation of IO tables has been a statutory function of the Bureau of Statistics, in the Ministry of Economic. However, the Central Bank of Islamic Republic of Iran (CBI)¹¹ and the Statistical Centre of Iran (SCI) have also prepared separate IO tables. The results of their efforts over almost five decades are nine national which have been compiled, provided or estimated by different official organizations.

For the purpose of this paper we selected four IO tables out of nine IO tables.

- Input-output table 1969 (CBI 1976), 25 by 25 sectors,
- Input-output table 1985 (SCI 1995), 78 by 78 sectors,
- Input-output table 1991 (SCI 1997), 78 by 78 sectors,

¹¹ Central Bank of Iran before 1979 (Islamic Revolution era)

- Input-output table 2000 (no date), 45 by 45 sectors.

These tables have many common characteristic features, such as uniform conceptual definitions especially for tables which have been compiled by SCI. However, methods of valuation of all these tables are at current prices. These tables are prepared for 1969, 1986, 1991, and 2000 at national level. The big gap between 1969 and 1989 relates to the period of Islamic Revolution and eight-year war with Iraq that Iranian Government could not prepare any other tables. Initially all the tables have been aggregated into 20 sectors. Sectors are: 1) Agriculture, 2) oil and gas, 3) Mining, 4) Food, 5) Paper, 6) Wood, 7) Non-metal products, 8) Textiles, 9) Chemicals, 10) Metal products, 11) Non-electrical equipment, 12) Electrical equipments, 13) Transport equipment, 14) Other industrial products, 15) Public utility, 16) Construction, 17) Trade, 18) Transport, 19) Banking, and 20) Other services. Two methods of structural change have been applied for four periods in this paper which, were presented at section three: one method of backward and forward linkages and another column scaler and row scaler indices.

The results of first method are shown on Table 1-4. Tables of 1 and 2 provide the calculation of direct backward and forward linkages. Table 1 reveals that direct backward linkage for almost all manufacturing sub-sectors (with 4-15 cod number), agriculture (cod 1), mining (cod 3) and other services have been increased overtime since 1969. While for oil and gas (cod 2), banking (cod 19) and transport (cod 18) have been decreased. This index shows the direct input for one Rial¹² of output in each year. So, the higher coefficients indicate that those sectors pay more for intermediate inputs may due to using new techniques, or relatively more expensive inputs or the product composition of those sectors has been increased.

¹² Iranian currency

Table 1- Direct Backward Linkage

Sector with cod number	1969	1986	1991	2000
1. Agriculture	0.279	0.398	0.342	0.389
2. Oil and gas	0.235	0.077	0.032	0.022
3. Mining	0.127	0.239	0.193	0.291
4. Food	0.710	0.715	0.796	0.751
5. Paper	0.388	0.534	0.496	0.628
6. Wood	0.535	0.434	0.549	0.579
7. Non-metal products	0.155	0.335	0.445	0.507
8. Textiles	0.508	0.500	0.543	0.580
9. Chemicals	0.357	0.464	0.518	0.521
10. Metal products	0.434	0.492	0.608	0.599
11. Non-electrical equipment	0.271	0.474	0.579	0.631
12. Electrical equipments	0.399	0.379	0.491	0.648
13. Transport equipment	0.354	0.386	0.289	0.699
14. Other industrial products	0.489	0.559	0.538	0.649
15. Public utility	0.367	0.355	0.364	0.448
16. Construction	0.734	0.490	0.494	0.573
17. Trade	0.440	0.057	0.062	0.202
18. Transport	0.387	0.285	0.300	0.337
19. Banking	0.359	0.255	0.293	0.159
20. Other services	0.097	0.275	0.257	0.189

Table 2- Direct Forward Linkage

Sector with cod number	1969	1986	1991	2000
1. Agriculture	0.703	0.701	0.651	0.513
2. oil and gas	0.242	0.048	0.025	0.076
3. Mining	0.910	0.981	0.846	0.745
4. Food	0.153	0.160	0.192	0.191
5. Paper	0.517	0.696	0.826	0.965
6. Wood	0.652	0.746	0.665	0.796
7. Non-metal products	0.864	0.823	0.852	0.438
8. Textiles	0.278	0.321	0.618	0.324
9. Chemicals	0.506	0.661	0.411	0.394
10. Metal products	0.553	0.972	0.805	0.643
11. Non-electrical equipment	0.095	0.560	0.076	0.095
12. Electrical equipments	0.658	0.223	0.313	0.485
13. Transport equipment	0.261	0.182	0.098	0.135
14. Other industrial products	0.694	0.273	0.722	0.547
15. Public utility	0.382	0.486	0.635	0.710
16. Construction	0.000	0.016	0.085	0.086
17. Trade	1.000	0.221	0.196	0.578
18. Transport	0.442	0.396	0.477	0.475
19. Banking	0.509	0.643	0.682	0.759
20. Other services	0.005	0.049	0.043	0.092

Table 2 shows that the direct forward linkage of all sectors has been decreased with exception of sector 17, 18, 19 and 20. Which means that the share of final demand (consumption) from output of those sectors has been increased and the share of output in the production process decreased.

While tables 3-6 provide indices of direct and indirect backward and forward linkages with their normalized for Iranian economy over a period of 40 years. According to these results each period has their own specifications. For example, in 1969 four sectors (paper, electrical equipments, other industrial products, and trade) had high backward and forward linkages with both power of dispersion and sensitivity of dispersion greater than 1, they are called key sectors. Such results are consistent with the policy of industrialization before revolution.

In addition, 6 key sectors in 1986 are known: agriculture, paper, wood, chemical, metal products and non-electrical equipments. Although some of the manufacturing subsectors have high linkages, in this period key sectors have been shifted to agriculture and agro-based industry which may due to the impact of revolution itself and nationalize industry, the trade sanction and the costly eight-year war with Iraq which had heavily impacts on the depended manufacturing sectors to outside Iran and depend to export oil which was damaged in this period.

This analysis is also true for the next period 1991 in which the key sectors those are recognized: paper, wood, non-metal, textile, metal products, and other industrial products. Finally, in 2000 the key sectors are agriculture, wood, paper, metal products, other industrial products, and public utility (water, gas, and electricity). In this period for one of the service sectors have high backward and forward linkages. It seems there is a

Table 3- Direct and Indirect Backward Linkage

Sector with cod number	1969	1986	1991	2000
1. Agriculture	1.404	1.663	1.559	1.621
2. oil and gas	1.319	1.123	1.054	1.038
3. Mining	1.200	1.375	1.308	1.511
4. Food	2.066	2.224	2.293	2.281
5. Paper	1.634	1.865	1.791	2.213
6. Wood	1.795	1.719	1.910	1.955
7. Non-metal products	1.242	1.509	1.703	1.886
8. Textiles	1.831	1.873	1.960	2.056
9. Chemicals	1.555	1.745	1.835	1.767
10. Metal products	1.744	1.798	2.089	2.067
11. Non-electrical equipment	1.441	1.841	2.099	2.169
12. Electrical equipments	1.670	1.615	1.864	2.181
13. Transport equipment	1.563	1.643	1.448	2.299
14. Other industrial products	1.812	1.982	1.981	2.218
15. Public utility	1.625	1.561	1.594	1.759
16. Construction	2.206	1.799	1.916	1.929
17. Trade	1.778	1.089	1.102	1.288
18. Transport	1.646	1.450	1.492	1.506
19. Banking	1.622	1.362	1.475	1.218
20. Other services	1.170	1.503	1.471	1.323

Table 4- Direct and Indirect Forward Linkage

Sector with cod number	1969	1986	1991	2000
1. Agriculture	2.098	2.128	2.016	1.783
2. oil and gas	1.342	1.110	1.044	1.124
3. Mining	1.990	2.990	2.596	2.285
4. Food	1.187	1.257	1.267	1.247
5. Paper	2.136	2.402	2.546	2.701
6. Wood	1.672	2.032	1.855	2.103
7. Non-metal products	1.917	2.051	2.047	1.528
8. Textiles	1.600	1.523	2.335	1.464
9. Chemicals	1.803	2.240	1.699	1.614
10. Metal products	1.711	2.416	2.192	1.930
11. Non-electrical equipment	1.106	2.077	1.120	1.140
12. Electrical equipments	1.880	1.358	1.511	1.631
13. Transport equipment	1.353	1.304	1.116	1.196
14. Other industrial products	2.768	1.420	1.943	1.736
15. Public utility	1.552	1.975	2.139	2.327
16. Construction	1.000	1.030	1.102	1.122
17. Trade	2.818	1.383	1.335	1.853
18. Transport	1.577	1.663	1.747	1.698
19. Banking	1.686	2.201	2.085	2.278
20. Other services	1.007	0.087	1.073	1.141

Table 5- Power of Dispersion

Sector with cod number	1969	1986	1991	2000
1. Agriculture	1.227	1.229	1.160	1.052
2. oil and gas	0.785	0.641	0.601	0.663
3. Mining	1.164	1.726	1.493	1.348
4. Food	0.694	0.726	0.729	0.736
5. Paper	1.249	1.387	1.465	1.593
6. Wood	0.978	1.173	1.067	1.241
7. Non-metal products	1.121	1.184	1.178	0.902
8. Textiles	0.935	0.879	1.343	0.864
9. Chemicals	1.054	1.293	0.977	0.952
10. Metal products	1.000	1.395	1.261	1.139
11. Non-electrical equipment	0.647	1.199	0.644	0.673
12. Electrical equipments	1.099	0.784	0.869	0.962
13. Transport equipment	0.791	0.753	0.642	0.706
14. Other industrial products	1.619	0.820	1.118	1.024
15. Public utility	0.907	1.140	1.230	1.373
16. Construction	0.585	0.595	0.634	0.662
17. Trade	1.648	0.798	0.768	1.093
18. Transport	0.922	0.960	1.005	1.002
19. Banking	0.986	1.270	1.199	1.344
20. Other services	0.589	0.050	0.617	0.673

Table 6- Sensitivity of Dispersion

Sector with cod number	1969	1986	1991	2000
1. Agriculture	0.868	1.016	0.919	1.037
2. oil and gas	0.816	0.686	0.621	0.664
3. Mining	0.743	0.840	0.770	0.967
4. Food	1.278	1.359	1.351	1.460
5. Paper	1.011	1.140	1.055	1.416
6. Wood	1.111	1.050	1.125	1.251
7. Non-metal products	0.768	0.922	1.003	1.207
8. Textiles	1.133	1.144	1.155	1.316
9. Chemicals	0.962	1.066	1.081	1.131
10. Metal products	1.079	1.098	1.231	1.323
11. Non-electrical equipment	0.892	1.125	1.237	1.388
12. Electrical equipments	1.033	0.986	1.098	1.395
13. Transport equipment	0.967	1.004	0.853	1.471
14. Other industrial products	1.121	1.211	1.167	1.419
15. Public utility	1.005	0.954	0.939	1.125
16. Construction	1.365	1.099	1.129	1.234
17. Trade	1.100	0.665	0.649	0.824
18. Transport	1.018	0.886	0.879	0.964
19. Banking	1.004	0.832	0.869	0.779
20. Other services	0.724	0.918	0.867	0.847

uniform shift of the sector in the national economy since 1969, started with industrialization and with the a gap of 20 years for uncertainty in the economy cause by the revolution and war we reach to the step that one of the services sector have characteristic of the key sector at the national level.

In order to have confirmation about the above results, we are also applied columnscaler and rowscaler indices to the case of Iran those four sets of IO tables, which discussed in section 3 of this paper. For assessment the fixed-based scenario uses the matrix of 1969 IO table as shifting based period for calculation. Table 7 provides the total rowscaler (RS) with their ranking. RS index indicates combine the technical coefficients with final demand coefficients between each set of periods to assess the extend of structural change over the 30 years. A general picture of economy according to the result of table 7 shows outputs of all sectors have been increasing after revolution 1979 but with a slow process for manufacturing sectors and agriculture and agro-based industries have play important role in the economy yet.

More details explanation about the result can be drawn. Textile, transportation, construction, and other industry have the three highest RS values across three periods. The interpretation is that actual outputs were significantly greater than the generated output that would have been produced had the input coefficients remain unchanged between 1969 and 2000. These sectors must have experienced considerable increases in growth outputs, intermediate requirements and/or final demand since 1948. These changes reflect the rapid growth on production of these sector after revolution in 1979.

In addition for six sectors: agriculture, food industry, and wood no essential changes have been noticed in RS or ranking. Such stability reflects that agriculture and

agro-based industry for all periods have same importance in an economy. In the more than thirty years, although for mining sector its relative position deteriorated. An emphasis always have been existed to protect these sectors which produce the necessary goods and help to be independent from foreign countries. This is one of the main strategy of Iranian Government and do not move to manufacturing nor services sectors.

While a substance of economic growth and shift can be seen in particular with the RS values for oil and gas, non-metal, metal, electrical equipments, and non-electrical equipments. Oil and gas sector in this economy play essential role which, dependent to the oil export and import primary import for improve economy.

On the contrary banking sector and non-metal industry, its relative position and RS has not been deteriorated. They have an RS value that is well below unity and was ranked at or near the bottom across the three sub-periods.

Table 7- Total Rowscaler for Various Periods

Sector with cod number	RS 1986	RS 1991	RS 2000
1. Agriculture	0.680	0.932	0.895
2. oil and gas	0.281	0.405	0.575
3. Mining	0.703	0.825	1.517
4. Food	0.768	0.966	0.722
8. Textiles	3.140	3.206	3.591
6. Wood	0.794	0.908	0.990
5. Paper	0.129	0.234	1.851
9. Chemicals	1.156	1.277	1.118
7. Non-metal products	0.265	0.302	0.132
10. Metal products	0.283	0.585	0.678
11. Non-electrical equipment	0.052	0.089	0.607
12. Electrical equipments	0.053	0.154	0.384
13. Transport equipment	0.174	0.599	1.104
14. Other industrial products	4.747	5.580	3.931
16. Construction	0.777	0.885	0.449
15. Public utility	0.660	0.934	1.089
18. Transport	2.346	2.845	3.226
19. Banking	0.270	0.291	0.447
17. Trade	0.664	0.847	0.891
20. Other services	0.973	1.118	1.116

Table 8- Columscaler for Various Periods

Sector with cod number	CS 1986	CS 1991	CS 2000
1. Agriculture	3.542	2.477	2.462
2. oil and gas	0.961	1.577	2.728
3. Mining	4.189	3.667	3.644
4. Food	3.268	1.418	1.211
8. Textiles	3.011	1.885	1.937
6. Wood	4.118	2.177	1.929
5. Paper	2.264	1.907	7.274
9. Chemicals	4.856	2.966	1.955
7. Non-metal products	9.388	5.724	1.590
10. Metal products	3.438	3.136	2.795
11. Non-electrical equipment	1.878	1.250	5.397
12. Electrical equipments	0.779	1.047	1.617
13. Transport equipment	2.281	2.507	3.115
14. Other industrial products	22.337	13.277	8.802
16. Construction	1.891	1.242	0.353
15. Public utility	2.452	1.670	9.681
18. Transport	3.753	2.974	0.758
19. Banking	2.016	0.989	7.065
17. Trade	1.809	1.527	1.133
20. Other services	7.113	3.978	3.473

Table 8 shows the total columnscaler *CS* results, again using 1969 as the base year. For any sector with $CS > 1$ an interpretation is that actual output is greater than output that would have occurred had the output allocation pattern and primary input ratio remained unchanged. As with the rowscalers, the sectors with the highest *CS* values are other industrial products, mining, and other services, these findings indicate that the coefficient changes in these sectors have indeed been significant in both production and allocation sides. On the contrary the sectors with the smallest *CS* value are again found in electrical equipments and trade. Again agriculture and agro-based sectors have not had high changes in their structure since 1969.

5- CONCLUSION REMARKS

Finding better understanding of the pattern of the structural changes in industries enable policy makers to manage and anticipate the future of the economy in the right direction. To reach the detailed structural change this paper applied a simple method of examining structural changes in the input-output framework in Iran for the period of 1969-2000. In this paper we tested not only traditional technique of investigating the key sectors but also exploring the changes in the structure from both demand and supply sides of the coefficient changes. It does so through the use of rowscaler-cum-columnscaler method between the years in which the input-output tables are available.

From the both indices, the results pointed out to the shifting them from one period to another. If we divide the length of study to two main periods: first before revolution (1969 this study), the second after revolution (1986, 1991, and 2000 this study) it would be much reasonable analysis. Before revolution Iran started to industrialize economy especially assembling manufacturing sectors such as food and electronic and etc. industries. Before to achieve to industrialization, revolution occurred and changed the direction. But this short period(1969-79) of industrization policy had some effects on the economy and mostly agro-based sectors had been increased their impacts on the economy and they characterized as key sectors and the second indices.

While after revolution period that includes two steps: the first includes 10 years after revolution in which the economy faced with big changes from inside as a result of revolution and eight-year war followed from outside and economic sanction. The second, the period after war finished. In the first step of the period after revolution (1986 in this study) as a result of revolution itself and war, many industries had been destroyed heavily

and decreased deeply the oil export and could not continue industrialization. So, we again noticed that agriculture and agro-based industry which are more independent from oil export had high backward and forward first decade after revolution. In the second step after revolution (1991 and 2001), when war finished economy went on reconstruction which accompanied with some economic reforms such privatization. The impacts of such policies was on the efficiency and output multipliers which they have been increased.

Although three macroeconomic plans have been carried out since war finished and These plans provided an important framework within which the government embarked on a programme of structural reform, economic liberalization, privatization of the economy, exchange rate unification, gradual omission of tax exemptions and tried to make the state economic organizations as small as possible, we wish to be able to comprise the impact of recent government policies in our findings. We have not observed any signal of specific and stable policy industrialization since 1969 according to the indices relate to the input-output analysis. So, according to the results we can not state explicit what the policy of the government has been and when it changed and in which direction. It may relate to the economy under uncertainty which is satisfied to this economy.

One of the reasons of above discussion may relate to this point that IO tables are used to analysis the structural changes are provided at current price not in fixed price. To provide IO table in fixed price require the data on output, producer price indices which had not been prepared already. This issue can be a subject for further or future research.

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