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Identifying the Key Sector and Analyzing the Sector Linkages with Special Reference to Crude Oil, Natural Gas and their related Industries- A Study in the Input-Output Framework

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Abstract

The present study is an attempt to describe the role of Oil industry on the process of industrial growth. The study focuses on the impact of oil and oil's income on the trend of structural changes and linkages of this sector with rest of the economy. The main purpose of this research is to conduct a unified and comprehensive study on oil and the income which is generated from oil export on the cycle of production or in other words' on the manufacturing sector. We employed Input- Output modeling because it is one of the most accepted means for estimating economic impact. This is because it provides a concise and accurate means for articulating the interrelationships among industries. Dependency of Iranian economy on oil revenue persuaded me to study the place and importance of crude oil and natural gas with related industries in Iranian economy and analyze its linkages with other sectors of economy by using **Hypothetical Extraction Method** framework. The result of our research revealed that, five sectors out of 36 sectors of Iranian economy could be considered as key sectors, as follow: (1) Agriculture (2) Construction (3) Whole sale & Retail sales (4) Transportation services (5) Other services. We have used Hypothetical Extraction Method in our fourth chapter. The original idea of the **(HEM)** tries to extract a sector hypothetically from an economic system and examine the influence of this extraction on other sectors in the economy. The output differences before and after the hypothetical extractions reflect the linkage of a sector. Linkage measures based on the (HEM) are becoming increasingly influential. So we could find out the importance of any sector in production cycle and indentifying key sector in Iran economy.

The main purpose of this thesis is to present the real picture of **Oil and Gas sector (with related industries)** in the critical language. The role of Oil and Gas sector (with related industries) and its incomes on the process of industrial growth in the Iranian economy has been assessed from different point of views.

This thesis endeavor to present the real picture of oil income as main source of government incomes. We study the linkage (**forward linkage-FL, backward linkage-BL**) among the sectors to see the importance of each sector separately in the Iranian economy. We have a different ideas under our research, first, the negative role of

oil income on the industrial growth and second that this sector is not a key sector and finally to prove the weak and negative role of this sector on the production chain. Using the input-output model helps us to study the interaction between sectors. The structural decomposition model helps us to analyze the change in output induce by change in domestic demand, export, import, intermediate input use, and input output coefficients. This model analyzes a major shift within the economy by means of comparative static examination of key parameters. While hypothetical extraction method tries to extract a sector **hypothetically** from an economy system and examine the influence of this extraction in the sector in the economy.

The result of our research revealed that, five sectors out of 36 sectors of Iranian economy could be considered as key sectors, as follow: (1) Agriculture (2) Construction (3) Whole sales & Retail sales (4) Transportation services (5) Other services. We used the input-output table of 99 sectors in 2001 year, the analysis of these results helped us to determine and identify the key sector in Iranian economy with special reference to crude oil and natural gas sector with related industries. We measured a correlation between (**BL&FDs- the share of final demand of each sector**) (see table 6), and (**BL&WDs- the share of intermediate demand of each sector**) (see table 7) to show the feature of each sector and their impact separately in the cycle of economic production. As we mentioned before sector with high value in both forward and backward linkages is called a key sector. So, high value in both forward and backward linkages is required for identifying a sector as a key sector. The value of backward linkage indicator of these sectors (**oil & gas sectors with related industries**) is at low value because this sector plays a fundamental connecting role in the value chain, whereas if the value of forward linkage indicator of this sector are at high value, it shows the weak sectoral independence and strong push of these sector, If we take a look at table 7, the correlation between **(FL & VAs- the share of Value added of each sector**) and (**FL &CWs- the share of Intermediate cost of each sector**) it's clear that only 2.6 percent of these sector's output related to intermediate demand **(intersection demand**) and hence 97.4 percent related to value-add share of these sector's output. So, these sectors are not considered as a key sector in Iranian economy because these sectors have major role in creating demand and attracting buyer to distribution system.

Out of the 22 industries in the industry sector, except manufactures of Food and Beverage and manufactures of motor vehicles & other transport equipment with high value in backward linkages and manufactures of other non-metallic & mineral products, manufactures of basic iron and steel with relative high value in forward linkages, the rest of the industries can be considered as non-key sectors, because they don't have considerable value either in backward linkage nor in forward linkage. This means industry sector in Iranian economy has not developed properly in a way like other developing countries such as South Korea, Brazil, and Malaysia. Manufacture sector play important and vital in the process of industrial growth of any economy therefore, lack of a developed industry sector in the economy of a country could cause a chronic and cyclical problem which could lead the economy to permanent crises. Most of the key sectors in Iranian economy except Construction and Agriculture are in this section (service sector); Wholesale & retail sale, Transportation services and other services. Service sector play important role in the Iranian economy, so that in the recent years the value-added of service sector accounted for more than 50 percent of gross domestic output.

The backward linkage of these sectors, food and beverage, construction, other services, agriculture, motor vehicle and other transport equipment, transportation service, public services, are more than average of economy's backward linkage. This is obvious which three sector out of seven sector are belongs to service sector, and two sector are belongs to industry sector. Sectors which have backward linkage larger than 1 are the sectors that have more dependency to the other sectors, so far this issue shows that these sectors act as an intermediate buyers than as an intermediate sellers.

We find out that, the crude oil and natural gas sector with related industries as a supplier plays a service delivery role in the value chain of other sector. These sectors have fairly, considerable high forward linkage, which means according to this approach it should has a relative high performance in Iranian economy, but with a little attention it's clear that only 2.6 percent of this sector's output related to intermediate demand (**intermediate intersection**) and hence 97.4 percent related to value-added share of this sectors output (see table 5). Due to these sectors's low value in backward linkage, this sector has not considered as a key sector in Iranian economy. This result is quit

compatible with our last hypothesis that Oil and Gas sector (with related industries) is not a key sector and these sectors can't push the economy and play important role in production chain.

In response to many constraints and problems that Iranian economy faced regarding to expansion of non-oil exports and exit from mono-economy to poly-economy, numbers of remedial measures and policy recommendation have been identified that we mention some of them as follow:

Fiscal policy:

Government revenues in Iran economy are highly dependent on the prices of the commodities they export. Those prices are both highly volatile and hard to predict.in the short run, government of Iran need to promote macroeconomic stability by decoupling current spending from volatile government revenues. In the long run, Iran need to establish medium-term spending plans to ensure intergenerational equity. Sustainable management of revenues derived from the exploitation of exhaustible natural resources can be achieved either through the accumulation of savings in Oil Stabilization of Funds or trough public investment in future growth outside the natural-resource sector (Das et al.2009).

Monetary policy:

Iranian economy frequently faces large and volatile capital flows which complicated the conduct of monetary and exchange rate policy. Stabilizing exchange rate by limiting flexible exchange rate and inflation target regime in order to sheltering the economy from external shocks could be useful and successful in Iran case. A properly managed counter-cyclical fiscal policy will provide a degree of automatic sterilization by increasing the unity and integration between fiscal authorizes and central bank of Iran.

Economic diversification:

Experiences with industrial policy around the world suggest that it is not straightforward to design an appropriate incentive structure that would help lay the ground for economic diversification in resource-rich countries. Old-style industrial policies where government is directly involved in the production process need to be avoided. Indeed, those policies have in many cases been captured by local elites, opening the door to corruption and undermining the broader institutional framework.

New industrial policies have focused on designing incentive-compatible rules aiming to achieve a private sector-led economic diversification. Success stories that have yielded economic diversification suggest that low, predictable and non-distorting taxes on entrepreneurial activity can help foster diversification. Also, the use of commodity proceeds to establish a supportive physical and social infrastructure can raise returns and encourage private investment in other sectors. The financial sector can also play an important role in fostering economic diversification. In particular, effort to deepen and broaden financial systems in resource-based economies would help achieve that goal.

Institutions

Perhaps the biggest challenge facing resource-rich countries and of course Iran results from rent-seeking behavior that undermines their existing institutions, including political diversification and democracy.in countries with weak institutions, talent tends to shift out of private entrepreneurial activity into more lucrative rent-seeking activates, with detrimental implications for efficiency and sustainable economic growth. In Iran institutions need to be designed to guard against such developments. The strong and reliable property rights can foster financial-sector development, allowing the financial system to play a more active and significant role in intermediating resources to help build small and medium-sized enterprises in the non-resource rich sectors of the economy. Generally, more effective checks and balances and more transparency in the management of natural-resource revenues can help counteract the misallocation of talent into socially unproductive activities in Iranian economy.

1. Introduction

Oil and gas revenues play a strategic role in the structure of the Iranian economy. Holding 10 percent of the world's proven oil reserves as the second largest producer (after Saudi Arabia) within the Organization of Petroleum Exporting Countries (sees OPEC, 2005), Iran significantly affects, and is affected by, the international oil market. Iran's economy relies heavily on crude oil export revenues representing about 90 percent of total export earnings and on average 60 percent of government revenues in annual budgets (The Central Bank of Iran, 2008). The share of oil value-added in the GDP of Iran averaged about 20 percent between 1970 and 2006. The unique role of oil revenues in the structure of government budget and social security programs distinguish the Iranian economy from other oil-dependent countries. Despite higher oil prices and revenues in recent years, the Iranian government's budget deficits are still a challenging issue, in part due to the large scale of state subsidies on energy and comestible goods. Possible sources of financing the annual budget deficits include issuing state bonds, foreign borrowing, privatization and withdrawals from the Oil Stabilization Fund (OSF); more than 90 percent of annual budget deficits in Iran are financed through withdrawals from OSF. This is like spending oil revenues directly and has strong inflationary effects through increasing money supply in the economy. Considering the high rigidity of current government expenditures in Iran, any significant negative oil price shocks will worsen the budget deficit of the government and create inflationary pressures for the whole economy. This research aims to identify the key sectors and explore the linkages (forward & backward) between economic sectors of Iran. Because of the high level of dependency of Iranian economy on oil revenues, it is crucial to study a relative position of crude oil and natural gas industries within the Iranian economy, and to analyze their linkages with other sectors by using the Hypothetical Extraction Method (HEM) in the input-output framework.

Conceptually, a sector's relationships with the rest of the economy through its direct and indirect intermediate purchases and sales are described as the sector's linkages, which are considered to be one of the most important factors for gaining competitive advantage. The direction and level of such linkages define the potential capacity of each

sector to stimulate other sectors. The sectors with strong linkages should be capable of stimulating a rapid growth of production, income and employment, compared to alternative allocations of resources. For example, a strong linkage between a supplier and a buyer may guarantee on-time delivery of high quality intermediate inputs. Information on these linkages is essential to understand the structure of an economy, which is in turn important in formulating industrial policies and business strategies. What is more, the linkages are important for innovative activities because there is a positive relation between the diversity of local industrial structure and the number of innovations achieved by these industries.

The study aims to examine the role and position of oil and gas sector within the Iranian economy and their impact on national income in the process of industrial growth. This research presents a real picture of oil revenues as a main source of government incomes, and examines the linkages (forward linkage, backward linkage) among the sectors in order to see the importance of each sector separately in the Iranian economy. The study takes different approaches to the research questions. First, the negative role of oil income on the industrial growth is considered; second, whether oil and gas sectors are key sectors of the economy is discussed; and finally advantages and disadvantages of these sectors in the production chains are identified. The research use Hypothetical Extraction Model in input-output frameworks. Using the HEM based on an input-output model helps us to understand the interaction between industries and to examine the relative importance of the target sectors in the economy.

2. Methodology

2.1. Hypothetical extraction method

The original idea of the (HEM) developed by stassert (1968) which was to extract a sector hypothetically from an economic system and examine the influence of this extraction on other sector in the economy. Mathematically, the idea was to quantify how much an economy's total output would decrease if the sector were extracted. Thus, by comparing the output levels for each of the remaining sectors before and after the hypothetical extraction, the impact of the extracted sector can be assist. The difference between the output in the reduced case and in the original situation reflects the linkages between the extracted sector and all other sectors in the economy. In the light of the

basic ideal of (HEM), it is assumed that the n-sector input-output technical coefficient A has been partitioned into two groups: group one (b_1) is a sector that are to be extracted from the economy and group two (b_2, $b_1 + b_2 = n$) consists of all the remaining sectors of the economy. Now, the b_1 has been extracted hypothetically from the economy, using the same final demand vector the Leontief model can be rewritten as $X' = (I - A)^{-1}Y$, where X' is the output after extraction and A' is a reduced technical coefficients matrix $\{(n-1)^*(n-1)\}$. The reduction in output can be expressed as X – X', which reflects the linkage between b_1 and b_2 given the technical production process held constant. The linkage can be decomposed into backward and forward linkage according to different transformations.

In the literature, backward and forward linkages are widely accepted concepts for describing inter-sectoral relationship, yet how to measure those remains controversial even though much research. Cella (1984) defined "total linkage", which was decomposed into total backward and forward linkages. Cella argued that his method built up an appropriate measure of "the quantities of n goods directly and indirectly stimulated by the intermediate functions". However, Cella's definitions received a lot of criticism, which mainly focused on the decomposition of linkages and the choice of the Leontief quantity model and Ghosh price model. Following these arguments, a series of methods (transformations) where proposed, such as net linkage, absolute linkage, pure linkage and so on. Miller and Lahr (2001) reviewed all these transformations in light of the influence on output by using seven hypothetical extractions from the Leontief and Ghosh models and concluded that the total linkage derived from the (HEM) is an appropriate measure of an extracted sector's importance. Additionally, they suggested using the Leontief model to explore the backward linkage and the Ghosh model to measure the forward linkage. Their suggestions have been approved widely in the literature.

3. Analysis and Ranking of Sectors in Modern Approach:

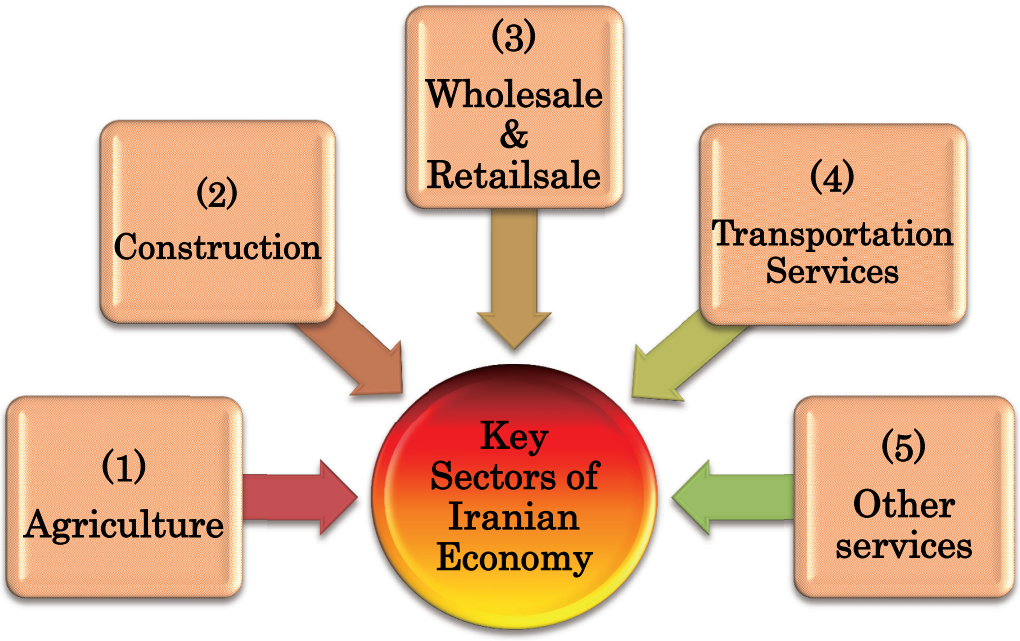
Table (1) shows the results of indentation the key sectors with modern approach from Leontief demand side. According to amount of effect due to extract of each sector in reduction of output in the economy from maximum reduction to minimum reduction,

sectors are ranked from 1 up to 36. In the other word, the sector with maximum importance in the economy is in the first rank in this table and sector with minimum importance in the economy is in the 36 rank in this table. For example: Food and beverage industries, construction sector, other services, agriculture sector, motor vehicle and other transport equipment have maximum backward linkage in Iranian economy; hence they allocated 1 up to 5 ranks to themselves in order. (Figure 2)

Table (2) shows the result of identification the key sector with modern approach from Ghosh supply side. Same as Leontief pattern sector with maximum importance in the economy is in the 1 rank and sector with minimum importance in the economy is in the 36 rank in this table. (Figure 3) For example: Wholesale and retail sale sector, agriculture sector, transportation services, other services, crude oil and natural gas sector in order have maximum forward linkage in Iranian economy and hence they allocated 1 up to 5 ranks to themselves.

The result of our research shows that in this approach, five sectors out of 36 sectors of Iranian economy could be considered as key sectors, as follow: (1) Agriculture (2) Construction (3) Whole sells & Retail sells (4) Transportation services (5) Other services. (Figure 1)

Figure No 1:
Key Sector of Iranian Economy



Source: Authour

To have a more comprehensive analysis we divided economic activities into six groups as follow: (1) Agriculture (2) Crude oil and natural gas sector with related industries (3) Other mining (4) Industry (5) Construction, Water, Electricity, Natural Gas (6) Services.

3.1 Backward linkage indicators of the Iranian economics sector:

Assuming that all the local products inputs of the sector are extracted and all inputs will depend on imports (the forward and internal effects will remain), the backward linkage of sector reflects this sector's dependence on local inputs that are produced within the production process of the economy.

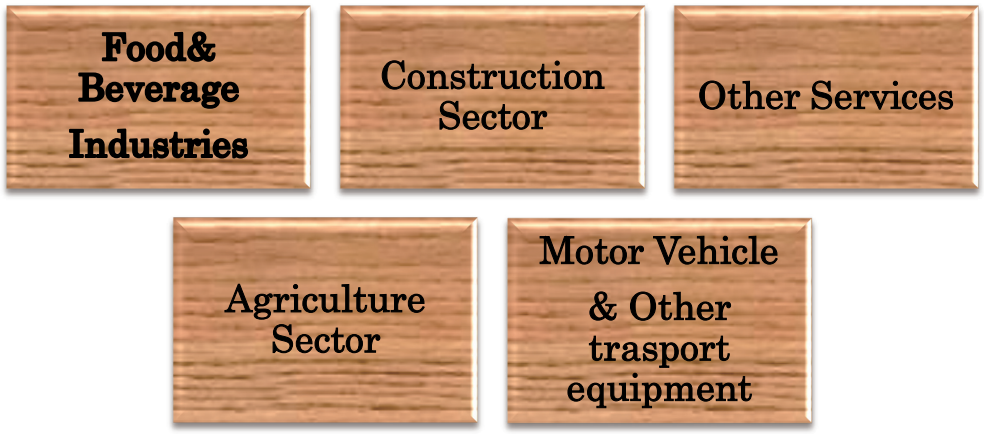
The backward linkage of these sectors: food and beverage, construction, other services, agriculture, motor vehicle and other transport equipment, transportation service, public services, are more than average of economics backward linkage. This is obvious which three sector out of seven sector are belongs to service sector, and two sector are belongs to industry sector.

The sectors with relative high value in backward linkage represent a weak sectoral independence. On the other hand, a higher value of backward linkage represents a

strong economic pull of these sectors to the remaining sectors. The backward linkage induces growth through the process of derived demand because the remaining sectors would have to face the losses without the purchase of these sectors. More importantly, the backward linkage indicator is a measure of degree of the industrialization of these sectors production process and the national technology difference in terms of intermediate and value-added inputs composition, because it is generally agreed that input-output tables reflect a general equilibrium model of the economy where inputs are allocated according to technological availability. With a lower relative backward linkage indicator, the sector represents low industrialization and technology levels.

Sectors which have backward linkage larger than 1 are the sectors that have more dependency to the other sectors, so far this issue shows that these sectors act as an intermediate buyers than as an intermediated sellers. Rasmussen suggests the Direct Indirect Backward Linkage (DIBL) as a total linkage which generally known as a demand multiplier which represent the increase of total output per increase of 1 unit in final demand.

Figure No 2: Key sector with modern approach from Leontief Demand side Figure



Source : Author

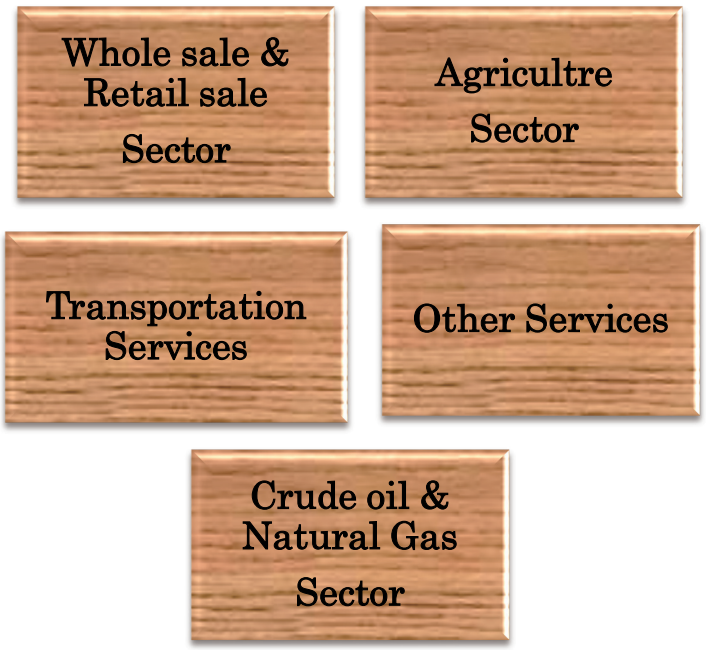
3.2 Forward linkage indicators of Iranian economics sector:

The forward linkage of a sector reflects the dependence of the remaining sectors in the economy on sectors supplies that are produced within the production process. Assuming that extracted sector just sells for export, except for deliveries to itself, the difference between the outputs in the reduced case and in the original situation reflects the economic losses of the remaining sectors of the economy without the supply of the local sector.

The forward linkage of these sectors, whole sales and retail sales, agriculture, transportation services, other services, crude oil and natural gas, water/electricity/natural gas, are more than the average of economics forward linkage, hence other sectors of economy have more dependency to these sectors. It means these sectors should be close to primary commodities, in sectors like: crude oil and natural gas, non-metallic mineral products, basic metal products, chemical products, this issue obviously could be observed.

A strong forward linkage shows a week sectoral independence and a strong push of the sector. Moreover, the value of the indicator reflects that the proportion of final demand of the sector is larger than its intermediate demand in the country. The main reason seems to be that these sectors has a major role in creating demand and attracting the buyer to the distribution system. The lower relative forward linkage indicator shows the strong sectoral independence and weak economic push of these sectors.

Figure No 3: Key sector with modern approach from Gosh Supply side



Source : Author

3.3 Importance of Agriculture sector in Iranian economy:

The relative linkage indicates the percentage decrease in economy-wide outputs caused by the extraction of agriculture sector. The relative backward linkage indicators of agriculture sector is at a high value 3.10 percent which it allocated the 4th ranks in backward linkage point of view among the 36 sector of Iranian economy as it shown in table 3.

A higher backward linkage suggests a weak sectoral independence on the other hand; a higher value represents a strong weak economic pull of Agriculture to the remaining sectors. The backward linkage induces growth through the process of derived demand because the remaining sectors would have to face the losses without the purchase of agriculture sector.

3.3.1 Forward Linkage of agriculture sector:

The value of relative Forward linkage indicators are at a higher value 5.49 percent at compare to the value of relative backward linkage, which is allocated 2th ranks in forward linkage point of view among the 36 sector as it shown in table 4.

A strong forward linkage shows a weak sectoral independence and strong economic push of the agriculture sector. Comparing with the backward linkage indicators, forward linkage indicators has higher value which shows a higher forward linkage effect on the sectoral output.

3.4 Importance of Mining sector in Iranian Economy:

The backward linkage of Mining sector is at a low value 0.41 percent which is smaller than 1 and it allocated 16^{th} ranks in backward point of view among 36 sectors. (As it shown in table 3)

Such a low value of backward linkage shows a very strong sectoral independence on the other hand, a lower value represents a weak economic pull of mining sector to the remaining sectors.

3.4.1 The forward linkage of mining sector:

The value of relative forward linkage indicators are at a higher value 1.12 percent which is bigger than 1 and it allocated 11^{th} ranks in forward linkage point of view among the 36 sector.(as it shown in table 4). A strong forward linkage shows a weak sectoral independence and strong economic push of the remaining sector. Compared with the backward linkage indicators, the forward linkage indicators have a higher value, which shows a higher forward effect on the sectoral output.

3.5 Importance of Crude oil and Natural gas sector with related industries in Iranian Economy:

The relative linkage indicates the percentage decrease in economy-wide outputs caused by the extraction of crude oil and natural gas sector with related industries. The value of the backward linkage indicator is at a low value because this sector plays a fundamental connecting role in the value chain, which suggests a strong sectoral independence and weak economic pull of this sector to the remaining sectors. Whereas the value of forward linkage indicator are at high value, which shows the weak sectoral independence and strong push of this sector because this sector has a major role in

creating demand and attracting buyer to the distribution system.

The crude oil and natural gas sector with related industries as a supplier plays a service delivery role in the value chain of other sector. These sectors have fairly, considerable high forward linkage, which means according to this approach it should has a relative high performance in Iranian economy, but with a little attention it's clear that only 2.6 percent of this sector's output related to intermediate demand (intermediate intersection) and hence 97.4 percent related to value-added share of this sectors output (see table 5). From this point of view, value-added is an effective factor in calculating of forward linkage, therefore one of the important factors of high forward linkage is related to high value-added of it. The higher rankings of forward linkage reflect the strength of the push to economic growth is larger than that of the pull in these sectors. Due to these sectors low value in backward linkage, this sector has not considered as a key sector in Iranian economy.

3.6 Importance of Industry sector in Iranian Economy:

Out of the 22 industries in the industry sector, except manufactures of Food and Beverage and manufactures of motor vehicles & other transport equipment with high value in backward linkages and manufactures of other non-metallic & mineral products, manufactures of basic iron and steel with relative high value in forward linkages, the rest industries considers as non-key sectors, because they don't have considerable value either in backward linkage nor in forward linkage.

The backward linkage indicators of Food and Beverage manufactures are at very high value 7.84 percent and it allocated the 1th ranks in backward linkage point of view among the 36 sectors(as it shown in table 3). Motor vehicles & other transport equipment manufacturers have high relative value in backward linkages too, 2.60 percent and it allocated 5^{th} ranks among 36 sectors.

The two other sectors have relative high value in forward linkage indictors, the manufactures of other non-metallic &mineral products have relative high value in forward linkage 1.28 percent and it allocated 9^{th} ranks among 36 sectors, and the manufactures of basic iron & steel have relative high value in forward linkage indicators too with 1.52 percent and it allocated the 10^{th} ranks among the 36 sectors, whereas they have got a very low value in backward linkage.

In the industry sector, there is not a key sector except these four sectors which they have got relative high value in backward & forward linkages separately, that means they have not been consider as key sector too because they don't have relative high value in both backward and forward linkages, and the rest industries considered as a non-key sector.

The higher relative forward linkage of Food and Beverage manufactures & Motor vehicles & other transport equipment manufactures represents the high industrialization and technology levels. The higher ranks of backward linkage in these industries as compare to low ranks of forward linkage reflect the strength of the pull to economic growth is larger than that of the push in these industries. It demonstrated that developing these industries through promoting the national economy is not as effective as developing a national economy by promoting these industries.

The higher relative value of Forward linkage indicator in manufactures of other non-metallic &mineral products and manufactures of basic iron & steel represents strong forward linkages that show a weak sectoral independence and a strong economic push of these industries. The high ranking in forward linkage compared with backward linkage reflect the strength of the push to economic growth is larger than that of the pull in these industries. It also demonstrated that developing a national economy by promoting these industries is not effective as developing these industries through promoting the national economy.

3.7 Importance of Construction, Electricity, Water supply and Gas sectors in the Iranian economy:

If the value of both the backward linkage and forward linkage indicators of a sector are above the corresponding average, the sector is called a 'key' sector. Construction sector considered as a key sector in Iranian economy, because it has a relative high linkage in backward linkage as well as forward linkage, so we can consider this sector as a key sector. Construction sector has relative high backward linkage indicator, it means the backward linkage of this sector is larger than one, 6.83 percent and it allocated 2th ranks among the 36 sector from backward linkage point of view.

The forward linkage indicator of construction sector is larger than one, 1.52 percent which means this sector has relative high backward linkage indicator, and it allocated 8^{th} ranks among the 36 sectors as it shown in the table 4.

The amount of backward linkage indicator of construction sector 6.83 percent is five times larger than the amount of forward linkage indicator 1.52 percent.

Such a strong backward linkage means a strong sectoral independence, or in the other word, a higher value represents a strong economic pull of construction sector to the remaining sectors. The backward linkage induces growth through the process of derived demand because the remaining sectors would have to face losses without purchase of the construction sector. The high backward linkage indicator of construction sector shows a high degree of the industrialization of this sector production's process and the national technology difference in the terms of intermediate and value-added inputs composition. The high value of backward linkage indicators means that construction sector's ability to pull the rest of the economy is high.

3.7.1 Forward linkage indicators of construction sector:

The relative forward linkage indicators of the construction sector is above the corresponding average which means it is larger than one, 1.52 percent but as I mentioned above that a strong forward linkage shows a weak sectoral independence ,and a strong economic push of construction sector. Moreover the value of the relative high forward linkage indicators reflects that the proportion of final demand of construction sector is larger than its intermediate demand.

The main reason seems to be that construction sector has major role in creating demand and attracting the buyer to the distribution systems. Compared with forward linkage indicators, the backward linkage indicator has a higher value, which is show a higher backward linkage effect on the sectoral output. The higher rankings reflect the strength of the pull to economic growth is larger than that of the push in the construction sector.

So, because of the higher value in both backward linkage and forward linkage indicators of construction sector, this sector consider as key sector in the Iranian economy.

3.8 Electricity, Water supply and Gas:

The Backward linkage indicators of these sectors are at very low value 0.23 percent and it allocated the 20^{th} ranks among the 36 sectors (it shown in able 3). A weak backward linkage suggests a strong independence. On the other hand, such a low value represents a weak economic pull of the (Electricity, Water supply and Gas) sectors. The low backward linkage indicator of these sectors represents low industrialization and

technology levels. The backward indicators are a measure of the degree of industrialization of a sector's production process and the national technology difference in the terms of intermediate and value-added inputs composition. The relative low value is reasonable for (Electricity, Water supply and Gas) sectors because this sector plays a fundamental connecting role in the value chain.

3.8.1 Forward linkage indicator of (Electricity, Water supply and Gas) sectors:

Assuming that the (Electricity, Water supply and Gas) sectors only sells for export, except for deliveries to itself, the difference between the output in the reduced case and in the original situation reflects the economic losses of the remaining sectors of the economy without supply of the local (Electricity, Water supply and Gas) sectors.

The forward linkage of a (Electricity, Water supply and Gas) sectors reflects the dependence of the remaining sectors in the economy on these sectors supplies, which are produced within the production process. The value of the forward linkage indicators is at a higher value compared with the backward linkage. Moreover, the value the indicator reflects that proportion of final demand of (Electricity, Water supply and Gas) sectors is larger that it's intermediate demand. The main reason seems to be that (Electricity, Water supply and Gas) sectors have major role in creating demand and attracting the buyer to the distribution system.

3.9 Importance of service sector in the Iranians economy:

This sector including the (wholesales& retail sales, transportation services, public services, education services, medical services and other services) which we aggregated into one sector called services sector.

The maximum key sectors of Iranian economy are in this section as follow: wholesales& retail sales, transportation services and other services. So out of six sectors, three sectors are considered as key sectors. As I explained before, if the values of both the backward linkage and forward linkage indicators of sector are above the corresponding averages the sector is called a' key' sector. The backward linkage of other services is 3.60 percent, wholesales& retail sales is relatively high 1.95 percent and transportation services is 1.36 percent which reflects these sector's dependence on local inputs that are produced within the production process of the economy. A strong backward linkage suggests a strong economic pull of these sectors to the rest of

economy.

The other sectors in this section like, public services and medical services have relative high backward linkage indicators but are not considered as key sector because they have got high value in backward linkage only.

The public sector has relative high value of backward linkage 1.71 percent and medical services has approximate high value in backward linkage 0.99 percent, which represents the high industrialization and technology levels of these sector and it shows the strong economic pull and sectoral independence of these two sectors.

The education services consider as a non-key sector because the value of both backward linkage and forward linkage indicators are not above the corresponding average, so this sector is called a non-key sector. The backward linkage indicator of education services is 0.70 percent which allocated the 12^{th} ranks among the 36 sectors to itself in backward linkage point of view.

3.9.1 Forward linkage indicator of Service sector:

As wholesales& retail sale, transportation services and other services are the key sector, therefore they have got relative high forward linkage indicators. The forward linkage of wholesales& retail sale is 6.73 percent which allocated 1th ranks and the value of forward linkage transportation services is 4.23 percent which allocated 3th ranks and other services forward linkage indicator is 3.39 percent that allocated 4^{th} ranks among the 36 sector.

The high value of forward linkage indicators of these sectors show the strong economic push of these sectors which mean these sectors push strength to economic growth. The value of the indicator shows these sectors have weak sectoral independence too.

The forward linkage of medical services and public service are at a very low value which means strong sectoral independence and weak economic push of these sectors and represents that these sectors' push strength to economic growth is relatively low.

The forward linkage of education services is at very low value 0.12 percent, which is one more reason to consider this sector as a non-key sector.

4. Conclusion:

Since the first oil shock in 1973, almost the economic performance of Iran has been related to its natural resource wealth. The economy has experienced relatively lower per

capita GDP growth, higher income inequality, lower rate of industrial production and lower rate of non-oil production export. This may support this hypothesis that natural resources seem to have been more of curse than a blessing for Iran. Numerous researchers have supported the view that resource poor countries often outperform resource rich countries (Sacha and Warner, 1995). The sharp swing in its economic performance and oil prices in the recent decades make Iran a natural laboratory for investigating the relationship among oil abundance and macroeconomic variable such as economic growth, manufacturing growth and etc…natural resource such as oil may be regarded as gift from the god, because in theory it can be taxed away by governments without impairing incentives to produce. A high ratio of natural resource over GDP can facilitate economic development if the rent uses to boost levels of investment and foreign exchange from resource exports is deployed to enhance the capacity to import the capital goods required to build a modern economy.

Since 1970s, changes in the price of oil have been important source of economic fluctuations, as well as a paradigm of global shock, likely to affect many macroeconomics indicators in Iran. More specially, this process has resulted in lower productivity, lower industrial growth, higher income inequality, higher unemployment and higher inflation characterized every resource based economy after the mid-1970s. Effects of oil production exports can inhibit growth in manufacturing, a sector whose expansion is commonly believed to generate positive productivity externalities, giving rise to increasing returns. Slower growth in manufacturing would reduce the economy's potential for dynamic growth.

In the case of oil production export, large scale revenue inflows from exports put upward pressure on the exchange rate. They also lead to a significant expansion in domestic demand relative to the country's ability to supply that demand. The demand expansion comes from the budget and public sector and where the revenues get into the domestic banking sector, from credit expansion. The demand expansion in turn increases the prices of non-traded goods, causing a further appreciation of the real exchange rate. The combination of these impacts results in an often dramatic decline in the competitiveness of non-oil exports, a shift in domestic resources away from those

sectors to non-traded goods sector and erosion of diversity and balance in the domestic economy. All these evidence has been identified in almost all countries where potential exports play a major role in their economy. Oil-reliance economies like Iran benefit less from the technology spillovers that are typical in manufacturing industries because the exports of these industries are harmed by an appreciation of local currency.

The transformations of structure of economy happen in that manner the relative importance of agriculture sector decrease and importance of other sectors particularly industry increase. But in Iran there has been always a shortcut in this trend about importance of industry sector and its maturity. It means that as importance of agriculture sector decreased the importance of industry sector has not increased up to the maturity level and to allocate the noticeable part of GDP to itself. And we could practically claim that industry sector in Iranians economy has not developed like other developing country such as, South Korea, Brazil, India & Malaysia. Therefore, we have made a shortcut from agriculture to service sector.

We used Hypothetical Extraction Method in input-output framework in forth chapter of this thesis, which could present the importance of sector in Iranian economy. Dependency of Iranian economy to oil revenue pursues us to study the place and importance of crude oil and natural gas with related industries in Iranian economy and analyze its linkages (forward & backward) with other sector of economy by using Hypothetical Extraction Method frameworks. Theoretically, a sector's relationships with the rest of the economy through its direct and indirect intermediate purchases and sales are described as the sector's linkages. Linkage is one of the most important factors for gaining competitive advantage. The direction and level of such linkages present the potential capacity of each sector to stimulate other sectors. The sectors with the highest linkages should be possible to stimulate a more rapid growth of production, income and employment then with alternative allocations of resources.

We used the input-output table of 99 sectors in 2001 year, the analysis of these results helped us to determine and identify the key sector in Iranian economy with special reference to crude oil and natural gas sector with related industries. In order to bring our empirical results in a manageable proportion, we have aggregated the above 99

sectors to 36 sector. We presented our result in two tables according to sectors rank & status in backward and forward linkages. We measured a correlation between (BL&FDs) and (BL&WDs) to show the accurate feature of each sector and their impact separately in the cycle of economic production. As we mentioned before sector with high value in both forward and backward linkages is called a key sector. So, high value in both forward and backward linkages is required to identifying a sector as a key sector. The value of backward linkage indicator of these sectors is at low value because this sector play fundamental connecting role in the value chain, whereas the value of forward linkage indicator of this sector are at high value, which shows the weak sectoral independence and strong push of these sector, b If we take a look to table 5, the correlation between (FL & VAs) and (FL &CWs) it's clear that only 2.6 percent of these sector's output related to intermediate demand (intersection demand) and hence 97.4 percent related to value-add share of these sector's output So, these sectors are not considered as a key sector in Iranian economy because these sectors have major role in creating demand and attracting buyer to distribution system.

Out of the 22 industries in the industry sector, except manufactures of Food and Beverage and manufactures of motor vehicles & other transport equipment with high value in backward linkages and manufactures of other non-metallic & mineral products, manufactures of basic iron and steel with relative high value in forward linkages, the rest industries considers as non-key sectors, because they don't have considerable value either in backward linkage nor in forward linkage. This means industry sector in Iranian economy has not developed properly in a way like other developing countries such as South Korea, Brazil, and Malaysia. Manufacture sector play important and vital in the process of industrial growth of any economy therefore, lack of a developed industry sector in the economy of a country could cause a chronic and cyclical problem which could lead the economy to permanent crises. Most of the key sectors in Iranian economy except Construction and Agriculture are in this section (service sector); Wholesale & retail sale, Transportation services and other services. Service sector play important role in the Iranian economy, so that in the recent years the value-added of service sector allocated more than 50 percent of gross domestic output to itself.

5. Policy recommendation

In response to many constraints and problems that Iranian economy faced regarding to expansion of non-oil exports and exit from mono-economy to poly-economy, numbers of remedial measures and policy recommendation have been identified as follow:

5.1 Fiscal policy:

Government revenues in Iran economy are highly dependent on the prices of the commodities they export. Those prices are both highly volatile and hard to predict.in the short run, government of Iran need to promote macroeconomic stability by decoupling current spending from volatile government revenues. In the long run, Iran need to establish medium-term spending plans to ensure intergenerational equity. Sustainable management of revenues derived from the exploitation of exhaustible natural resources can be achieved either through the accumulation of savings in Oil Stabilization of Funds or trough public investment in future growth outside the natural-resource sector (Das et al.2009).

5.2 Monetary policy:

Iranian economy frequently faces large and volatile capital flows which complicated the conduct of monetary and exchange rate policy. Stabilizing exchange rate by limiting flexible exchange rate and inflation target regime in order to sheltering the economy from external shocks could be useful and successful in Iran case. A properly managed counter-cyclical fiscal policy will provide a degree of automatic sterilization by increasing the unity and integration between fiscal authorizes and central bank of Iran.

5.3 Economic diversification:

Experiences with industrial policy around the world suggest that it is not straightforward to design an appropriate incentive structure that would help lay the ground for economic diversification in resource-rich countries. Old-style industrial policies where governmet is directly involved in the production process need to be avoided. Indeed, those policies have in many cases been captured by local elites, opening the door to corruption and undermining the broader institutional framework. New industrial policies have focused on designing incentive-compatible rules aiming to achieve a private sector-led economic diversification. Success stories that have yielded economic diversification suggest that low, predictable and non-distorting taxes on

entrepreneurial activity can help foster diversification. Also, the use of commodity proceeds to establish a supportive physical and social infrastructure can raise returns and encourage private investment in other sectors. The financial sector can also play an important role in fostering economic diversification. In particular, effort to deepen and broaden financial systems in resource-based economies would help achieve that goal.

5.4 Institutions

Perhaps the biggest challenge facing resource-rich countries and of course Iran results from rent-seeking behavior that undermines their existing institutions, including political diversification and democracy.in countries with weak institutions, talent tends to shift out of private entrepreneurial activity into more lucrative rent-seeking activates, with detrimental implications for efficiency and sustainable economic growth. In Iran institutions need to be designed to guard against such developments. The strong and reliable property rights can foster financial-sector development, allowing the financial system to play a more active and significant role in intermediating resources to help build small and medium-sized enterprises in the non-resource rich sectors of the economy. Generally, more effective checks and balances and more transparency in the management of natural-resource revenues can help counteract the misallocation of talent into socially unproductive activities in Iranian economy.

Figure No 4:
Policy recommendation

	Promoting macroeconomic stability by decoupling current spending from volatile government revenues
Fiscal policy	**Establish medium-term spending plans in long run to ensure intergenerational equity**
	Sustainable management of revenues through the OSF
	Stabilizing exchange rate by inflation-targeting regime and limiting flexible exchange rates
Monetary policy & Exchange Rates	
	Managed cyclical fiscal, policy to stabilize of exchange rates
	New industrial policies focused on designing incentive-compatible rules aiming to achieve a private sector-led economic diversification
Economic diversification	**Predictable and non-distorting taxes on entrepreneurial**
	Pursuing fiscal sector to play more comprehensive role in fostering economic diversification
	Underscore the existing institutions, including political diversification and democracy
Institutions	
	Carful approach to institution building

Source : Author

In this thesis we employed input-output model to analyzing our data and explaining the issues on our topic, here we proceed to some strengths and limitations point of our research & models that we have done. It's been a new idea to study the oil and gas sector (with related industries) and the income generate from this sector on the process of industrial growth and focus upon the linkages of this sector with production technology by using input-output models in Iranian economy. Input- Output modeling is one of the most accepted means for estimating economic impacts. This is because it provides a concise and accurate means for articulating the interrelationships among industries. We employed Hypothetical Extraction Model as well as it helped us to analyze the result from Leontief demand-side and Ghosh supply-side as well, which helped us to identifying sector from different aspects by using different multiplier.

The limitations of input-output modeling should also be recognized. The approach makes several key assumptions. First, the input-output model approach assumes that there are no economies of scale to production in an industry; that is, the proportion of inputs used in an industry's production process does not change regardless of the level of production. This assumption will not work if the technology matrix depicts an economy of a recessional economy (e.g., 1982) and the analyst is attempting to model activity in a peak economic year (e.g.1989).A less-restrictive assumption of the input-output approach is that technology is not permitted to change over time.

We would advise future researcher to improving the analysis technique at the possible level. Future researcher could add more multiplier to increase the model abilities for better analyzing.

(Table No 1 :Forward linkage indicators of Iranian economic sector)

Number	The Sector of Iranian Economy	FL	FLn	Rank	Statues
1	Agriculture	44690680	5.4938723	2	KS
2	Crude Oil & Natural Gas	19301692	2.3727773	5	FL
3	Other Mining except crude oil and natural gas	9163487	1.1224306	11	FL
4	Food and Beverages	4082043	0.5018089	15	BL
5	Manufacture of Tobacco products	2495	0.0003667	36	NKS
6	Manufacture of Textile	1865396	0.2293151	20	NKS
7	Manufacture of Wearing apparel; dressing & dyeing of fur	287932.9	0.0353959	31	NKS
8	Tanning & Fabricating of Leather; manufacture of luggage, handbags, saddler, harness & footwear.	159213	0.0195019	35	NKS
9	Manufacture of Wood& product of Wood & Cork	1196315	0.146536	24	NKS
10	Manufacture of Paper & Paper products	2000000	0.2458621	18	NKS
11	Publishing, Printing &Reproduction of recorded media	1034644	0.1271899	23	NKS
12	Manufacture of Coke, refined petroleum products& Nuclear fuel	5107205	0.6146553	13	NKS
13	Manufacture of Chemical & Chemical products	12646897	1.5546964	7	FL
14	Manufacture of Rubber & Plastics products	3575036	0.4394829	16	NKS
15	Manufacture of Glass & Glass products	612604	0.0753081	27	NKS
16	Manufacture of other non-metallic mineral products	10455695	1.2807124	9	FL

17	Manufacture of basic Iron& Steel	12477570	1.5283708	10	FL
18	Manufacture of fabricated metal products except machinery & equipment	4165659	0.5120888	14	NKS
19	Manufacture of general-purpose machinery	3181918	0.3911565	17	NKS
20	Manufacture of domestic appliance	299943.6	0.0368793	30	NKS
21	Manufacture of office ,accounting & computing machinery	20206	0.0024839	34	NKS
22	Manufacture of electrical machinery & apparatus n.e.c	1097852	0.1229311	25	NKS
23	Manufacture of medical &surgical instruments	94117	0.0115699	32	NKS
24	Manufacture of optical instrument &photographic equipment & watches & clock	63992.242	0.0078666	33	NKS
25	Manufacture of motor vehicles & other transport equipment	24273583	0.2458621	19	BL
26	Manufacture of furniture	404070	0.0496728	29	NKS
27	Manufacturing of n.e.c & recycling	458908	0.056414	28	NKS
28	Water, Electricity & Gas	17160415	2.1095479	6	FL
29	Construction	12443201	1.5296558	8	KS
30	Wholesale & retail trade	54768378	6.7327344	1	KS
31	Hotel & Restaurant	1325811	0.1629833	21	NKS
32	Transportation services	34437866	4.2334831	3	KS
33	Public services	6612220	0.8128472	12	BL
34	Education services	1038430	0.1276553	22	NKS
35	Medical services	643578	0.0791157	26	BL
36	Other services	27622210	3.3956274	4	KS

Source: Authour

(Table No 2 :Backward linkage indicators of Iranian economic sector)

Number	The Sector of Iranian Economy	BL	BLn	Rank	Statues
1	Agriculture	28982523	3.1056784	4	KS
2	Crude Oil & Natural Gas	3903136.9	0.4182482	15	FL
3	Other Mining except crude oil and natural gas	74720.8	0.00245	16	FL
4	Food and Beverages	73199041	7.8437851	1	BL
5	Manufacture of Tobacco products	900336.69	0.0964773	26	NKS
6	Manufacture of Textile	8393627.5	0.8994354	10	NKS
7	Manufacture of Wearing apparel; dressing & dyeing of fur	2922626	0.3131797	19	NKS
8	Tanning & Fabricating of Leather; manufacture of luggage, handbags, saddler, harness & footwear.	1920641.8	0.2058101	22	NKS
9	Manufacture of Wood& product of Wood & Cork	471437	0.0505177	29	NKS
10	Manufacture of Paper & Paper products	306152.48	0.0328064	32	NKS
11	Publishing, Printing &Reproduction of recorded media	177836	0.0190564	34	NKS
12	Manufacture of Coke, refined petroleum products& Nuclear fuel	4692867.1	0.457845	16	NKS
13	Manufacture of Chemical & Chemical products	4428946.8	0.4745924	14	FL
14	Manufacture of Rubber & Plastics products	1521201.1	0.1630073	24	NKS
15	Manufacture of Glass & Glass products	570090.4	0.0610891	28	NKS
16	Manufacture of other non-metallic mineral products	2016920.4	0.216127	21	FL
17	Manufacture of basic Iron& Steel	3122959.7	0.3346468	18	FL

18	Manufacture of fabricated metal products except machinery & equipment	7609947.4	0.8154587	11	NKS
19	Manufacture of general-purpose machinery	85009.096	0.0091093	35	NKS
20	Manufacture of domestic appliance	3405156	0.3648861	17	NKS
21	Manufacture of office ,accounting & computing machinery	218655.65	0.0234305	33	NKS
22	Manufacture of electrical machinery & apparatus n.e.c	5951629.9	0.6377584	13	NKS
23	Manufacture of medical &surgical instruments	459469.63	0.0492354	30	NKS
24	Manufacture of optical instrument &photographic equipment & watches & clock	454758	0.0487305	31	NKS
25	Manufacture of motor vehicles & other transport equipment	24273583	2.6010829	5	BL
25	Manufacture of motor vehicles & other transport equipment	24273583	2.6010829	5	BL
26	Manufacture of furniture	1902185.8	0.2038324	23	NKS
27	Manufacturing of n.e.c & recycling	1138881	0.122039	25	NKS
28	Water, Electricity & Gas	2160240.5	0.2314848	20	FL
29	Construction	63795911	6.8361745	2	KS
30	Wholesale & retail trade	20485789	1.9566405	27	KS
31	Hotel & Restaurant	8695358.4	0.931768	9	NKS
32	Transportation services	12701267	1.3610289	7	KS
33	Public services	15984719	1.7128736	6	BL
34	Education services	6602620.4	0.7075166	12	NKS
35	Medical services	9297687.4	0.9963117	8	BL
36	Other services	33633737	3.604088	3	KS

Source: Authour

(Table No 3 :Proportion of value added from total output of Iranian economic sector)

	VA/X	VAs	FL	CWs
Agricultre	0.635	0.106	5.494	0.123
Crude oil and natural gas	0.974	0.130	2.6	0.007
Other Minging except crude oil and natural gas	0.754	0.006	1.122	0.004
Food and Bevages	0.264	0.027	0.502	0.154
Manufacture of tobacco products	0.777	0.002	0.000	0.001
Manufacture of textiles	0.464	0.013	0.229	0.029
Manufacture of wearing apparel; dressing & dyeing of fur	0.747	0.007	0.035	0.005
Tanning & fabricating of leather; manufacture of luggage, handbags, saddlery, harness & footwear	0.653	0.004	0.020	0.004
Manufacture of wood & products' of wood & cork	0.468	0.002	0.147	0.004
Manufacture of paper & paper products	0.584	0.003	0.246	0.005
Publishing, printing & reproduction of recorded media	0.615	0.002	0.127	0.002
Manufacture of coke, refined petroleum products & nuclear fuel	0.512	0.012	0.615	0.023
Manufacture of chemicals & chemical products	0.693	0.031	1.555	0.028
Manufacture of rubber & plastics products	0.470	0.005	0.439	0.012
Manufacture of glass & glass products	0.559	0.001	0.075	0.002

Manufacture of other non-metallic mineral products	0.520	0.012	1.281	0.022
Manufacture of basic iron & steel	0.505	0.022	1.528	0.043
Manufacture of fabricated metal products except machinery & equipment	0.553	0.012	0.512	0.020
Manufacture of general-purpose machinery	0.791	0.031	0.391	0.017
Manufacture of domestic appliances	0.453	0.003	0.037	0.006
Manufacture of office, accounting & computing machinery	0.840	0.001	0.002	0.000
Manufacture of electrical machinery & apparatus n. e. c	0.650	0.015	0.123	0.017
Manufacture of medical & surgical instruments	0.775	0.002	0.012	0.001
Manufacture of optical instrument & photographic equipment & watches & clock	0.893	0.003	0.008	0.001
Manufacture of motor vehicles & other transport equipment	0.493	0.032	0.246	0.066
Manufacture of furniture	0.497	0.002	0.050	0.003
Manufacturing n. e. c. & recycling	0.413	0.001	0.056	0.003
electricity&gas&aterw	0.531	0.017	2.110	0.031
construction	0.454	0.053	1.530	0.130
Wholesale & retail trade	0.820	0.116	6.733	0.051
hotel & Resturant	0.554	0.008	0.163	0.012
Transportation services	0.728	0.068	4.233	0.052
public services	0.794	0.061	0.813	0.032

education services	0.876	0.035	0.128	0.010
medical services	0.777	0.026	0.079	0.015
other services	0.801	0.128	3.396	0.064
COR(VA,FL)=	0.8177			
COR(CW,FL)=	0.4902			

Source: Authour

BL: The backward linkages of each sector

WDs: The share of intermediate demand of each sector

FDs: The share of final demand of each sector

FD/X: The proportion of final demand from total output of each sector

(Table No 4 :Proportion of final demand from total output of Iranian economic sector)

	Fd/X	FDs	WDs	BL
Agricultre	0.504	0.085	0.167	3.106
Crude oil and natural gas	0.913	0.124	0.024	0.418
Other Minging except crude oil and natural gas	0.027	0.000	0.016	0.002
Food and Bevages	0.750	0.079	0.052	7.844

Manufacture of tobacco products	0.997	0.003	0.000	0.096
Manufacture of textiles	0.614	0.017	0.021	0.899
Manufacture of wearing apparel; dressing & dyeing of fur	0.857	0.008	0.003	0.313
Tanning & fabricating of leather; manufacture of luggage, handbags, saddlery, harness & footwear	0.829	0.005	0.002	0.206
Manufacture of wood & products' of wood & cork	0.226	0.001	0.006	0.051
Manufacture of paper & paper products	0.129	0.001	0.010	0.033
Publishing, printing & reproduction of recorded media	0.139	0.000	0.005	0.019
Manufacture of coke, refined petroleum products & nuclear fuel	0.445	0.011	0.026	0.458
Manufacture of chemicals & chemical products	0.382	0.018	0.057	0.475
Manufacture of rubber & plastics products	0.206	0.002	0.017	0.163
Manufacture of glass & glass products	0.439	0.001	0.003	0.061
Manufacture of other non-metallic mineral products	0.152	0.003	0.039	0.216
Manufacture of basic iron & steel	0.145	0.006	0.074	0.335

Manufacture of fabricated metal products except machinery & equipment	0.558	0.013	0.020	0.815
Manufacture of general-purpose machinery	0.677	0.027	0.026	0.009
Manufacture of domestic appliances	0.852	0.005	0.002	0.365
Manufacture of office, accounting & computing machinery	0.909	0.001	0.000	0.023
Manufacture of electrical machinery & apparatus n. e. c	0.724	0.017	0.013	0.638
Manufacture of medical & surgical instruments	0.740	0.002	0.001	0.049
Manufacture of optical instrument & photographic equipment & watches & clock	0.914	0.003	0.001	0.049
Manufacture of motor vehicles & other transport equipment	0.749	0.049	0.033	2.601
Manufacture of furniture	0.815	0.003	0.001	0.204
Manufacturing n. e. c. & recycling	0.582	0.002	0.002	0.122
Electricity&gas&aterw	0.219	0.007	0.051	0.231
Construction	0.763	0.079	0.049	6.836
Wholesale & retail trade	0.644	0.092	0.102	1.957

Hotel & Resturant	**0.866**	**0.012**	**0.004**	**0.932**
Transportation services	**0.500**	**0.048**	**0.095**	**1.361**
Public services	**0.892**	**0.070**	**0.017**	**1.713**
Education services	**0.977**	**0.040**	**0.002**	**0.708**
Medical services	**0.973**	**0.033**	**0.002**	**0.996**
Other services	**0.821**	**0.133**	**0.058**	**3.604**
COR(FD,BL)=	**0.65997**			
COR(FW,BL)=	**0.44713**			

Source: Authour

BL: The backward linkages of each sector

WDs: The share of intermediate demand of each sector

FDs: The share of final demand of each sector

FD/X: The proportion of final demand from total output of each sector

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