***Structural Changes, Mismatching in the Labor Market and Jobless Growth in Iran***

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***Abstract:***

In recent years, jobless growth has posed a major problem in many countries. Since 1990s, several economists have suggested structural factors may underlie this phenomenon. Looking at economic statistics of Iran shows that during 2006-2011 the employment rate is significantly reduced however the average annual economic growth rate is not significantly different from the previous, which shows the evidence of jobless growth. The main aim of this paper is to answer these questions: do structural changes explain jobless growth in Iran? And if the answer is yes, what explains structural changes in this economy? For answering first question, we use input-output decomposition approach. Our finding shows that technology and labor productivity change components especially in manufacturing, transportation and communication and other service sectors are the main reasons of occurring jobless growth in this period. There are two important candidates for explaining why structural changes happened in this period: Huge increasing of oil exports and skill mismatch in labor market. Some existing evidences show that both could guide the economy toward more capital-intensive activities. Increase in capital formation can increase the share of capital in production which means need less labor for a specific production level.

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Keyword: Input-output Table, Jobless Growth, Labor Market, Structural Change, labor skill mismatch.

***Introduction***

Labor market is a dynamic market with a number of workforces entering and exiting it at any given time. Some labor force who have found their desired position may enter the labor market, whereas others who have either lost their jobs or hope to find better positions may leave this market. Since workforce demand is a function derived from the level of production and services, the flourishing or downturn in the goods market or any other business cycle in general has definite and significant effects on the labor market. Theoretically, the unemployment variable is expected to change counter cyclically. In other words, cyclical unemployment occurs during a recession and is accompanied by dramatic reductions in real wages. During a cyclical recession, workforce demand simultaneously declines across many economic sectors, without real wages decreasing at a similar rate to balance out the labor market (Rissman, 1997). However, cyclical unemployment disappears during economic expansion and prosperity periods. Therefore, cyclical unemployment is classified as “suspended unemployment” where the workers are called back to work upon the end of recession, or are given similar jobs as those they had before. For this reason, we can argue that an increase in employment or real wages alongside increased gross national product (GNP) is another sign of exit from recession. However, experience obtained in both developed and developing countries during the past three decade shows divergence relationship between the labor and goods markets. In other words, during an economic boom, there is a steady growth in output, whereas recovery in employment is associated with a more pronounced delay as compared with the previous cycle. This is obviously in contrast with the traditional Okun’s law regarding the negative relationship between output and unemployment. Okun’s law has been empirically proved on numerous occasions, suggesting that the negative correlation between the two mentioned factors still persists. This relation has been further confirmed by Noutek (2007) who, by estimating the coefficient between growth of output and unemployment, concluded that unemployment growth in recent decades (from mid 1980s onward) exhibited a weaker response to output variations as compared with the previous decades (between 1960 and 1980). These results can be adapted to those obtained from Okun’s law[[4]](#footnote-4) only if we assume the relationship between the mentioned factors has changed with time (Mate, 2010).

“Jobless recovery” or “jobless growth” is an economic phenomenon where macroeconomic experiences growth with employment remaining at its previous level or decreasing. Two definitions have been proposed for “jobless growth.” The first is presented in the Human Development Report (1993) of United Nations Development Program (UNDP) (one of the first sources to use the term “jobless growth”) as: “a delayed increase in employment after an increase in production.” According to this definition, jobless growth occurs where a relatively great number of the existing workforce lose their jobs and the employment rate is not sufficient to compensate for the unemployment or limited employment, or to attract fresh workforce to the labor market. The second definition for “jobless growth”, presented in the 1996 UNDP report, is: “a situation where employment growth is lower than production level growth.” The International Report on Employment (2004-2005) and International Labor Organization report also refer to jobless growth as a condition where production level growth far exceeds employment growth (khoshkalam, 2015)

In recent years, jobless growth has posed a major problem in many countries (developed countries included). It is unclear when and how this term entered the growth and development literature. Apparently, the term was first used by New York Times in 1935 to describe the economic recession in the United States during the 1990s (Islam, 2010). According to the estimated models based on the data obtained from the previous business cycles, the increase in output in the first years of the economic boom (after the end of recession in the 1990’s) was expected to be accompanied by a corresponding increase in employment rate (Schreft et.al, 2005). However, the reality proved to be different from the previous predictions. In reality, about 8.9 million Americans lost their jobs during the 1990s economic recession. However, upon the end of the recession and beginning of economic prosperity, employment rate continued to decline, with the number of created jobs reaching a minimum and then a maximum 14 and 23 months later respectively (compared to the corresponding figures before the recession). The employment growth was even more disappointing since, 24 months after the start of economic flourishing. Employment rate was up only by 1.8 percent as compared with that in the 1980s recession (Aaronson.et.al, 2004).

The same phenomenon has apparently also occurred in other developed countries and even in developing countries. According to the statistics presented in the 1993 Human Development Report, the rate of unemployment in the Organization for Economic Cooperation and Development (OECD) member countries throughout the 1980s was more than 6 percent and reached a maximum (6.9%) in 1991. This is equivalent to an unemployed population of more than 30 million. In the meantime, a threefold increase was reported in unemployment rate in the OECD European members, from 3% in mid 1970s to 10% in 1992. The situation in the developing countries was much worse than that of the industrial countries. For example, in Sub-Saharan Africa, no single country had unemployment rate lower than 10%. In Latin America, urban unemployment alone was about 8%. According to the same report, unemployment rate in Asian countries such as India and Pakistan was 15% in spite of the fact that they enjoyed an acceptable annual growth rate (more than 6%) (Datt, 1994).

Study over employment and economic growth shows that there are evidences of jobless growth in Iran. Table (1) shows economic and employment growth including five variables as follows: economic growth rate, number of employment, net change in employment, growth rate of employment and proportion of employment to economic growth. Table (2) also shows the same variables except the number of employment.

Table 1- economic and employment growth in 1991-2011 periods

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Economic Growth | Employment Population- Thousand people | Net Employment Change- Thousand people | Employment Growth | Average net job creation per 1 percent of economic growth (Column 1 to Column3), Thousands people |
|  | (1) | (2) | (3) | (4) | (5) |
| **1991** | 12.3% | 1397 | 549.7 | 4.4% | 44.7 |
| **1992** | 3.1% | 13262 | 165.3 | 1.3% | 53.9 |
| **1993** | 1.4% | 13408 | 146.6 | 1.1% | 108.2 |
| **1994** | -0.9% | 13688 | 279.8 | 2.1% | 279.8(1) |
| **1995** | 2.7% | 14061 | 372.4 | 2.7% | 138.7 |
| **1996** | 5.4% | 14572 | 98.8 | 3.6% | 17.6 |
| **1997** | 0.8% | 14962 | 471.8 | 2.7% | 570.5 |
| **1998** | 2.2% | 15368 | 184.8 | 2.7% | 84.1 |
| **1999** | 1.7% | 15974 | 357.2 | 3.9% | 210.4 |
| **2000** | 5.7% | 16657 | 120.4 | 4.3% | 21.2 |
| **2001** | 2.1% | 17112 | 221.8 | 2.7% | 108.1 |
| **2002** | 8.1% | 17882 | 94.7 | 4.5% | 11.7 |
| **2003** | 8.4% | 18401 | 61.7 | 2.9% | 7.3 |
| **2004** | 4.6% | 19091 | 148.6 | 3.7% | 32.0 |
| **2005** | 6.3% | 19696 | 95.8 | 3.2% | 15.2 |
| **2006** | 6.1% | 20476 | 128.6 | 4.0% | 21.2 |
| **2007** | 7.7% | 29492 | 2.1 | 0.1% | 0.3 |
| **2008** | 0.6% | 20495 | 4.5 | 0.0% | 6.9 |
| **2009** | 1.3% | 20501 | 4.4 | 0.0% | 3.5 |
| **2010** | 6.5% | 20520 | 2.9 | 0.1% | 0.4 |
| **2011** | 4.3% | 20547 | 6.3 | 0.1% | 1.5 |

Source: National accounts of Iran’s central bank and macroeconomic office of management and planning organization

(1)Although in 1994 economic growth rate was negative, the employment growth rate was positive. Ignoring opposite sign of these two variables in calculation will be misleading. So for this year, in calculating the employment rate for each percent of growth, the growth rate for 1994 has been considered 0.01 percent (almost zero).

Table 2- economic and employment growth (5-year period)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Economic Growth | Net Employment Change- Thousand | Employment Growth | Average net job creation per 1 percent of economic growth (Column 1 to Column 3), Thousands people |
| 1991-1995 | 3.7% | 303 | 2.3% | 125 |
| 1996-2000 | 3.2% | 246 | 3.4% | 181 |
| 2001-2006 (1) | 6.7% | 106 | 3.7% | 17 |
| 2007-2011 | 4.1% | 4 | 0.1% | 3 |

Source: National accounts of Iran’s central bank and macroeconomic office of management and planning organization

(1)This period consists of 6 years as we want to use input-output tables to explain the condition of these years. The input-output tables which we used in this paper belong to 2001, 2006 and 2011 which form an 11-years period.

The employment growth rate during 2007-2011 has significantly reduced compared to the earlier periods. However, the average annual economic growth rate in this period was not significantly different from the previous and even higher than 1991-1995 and 1996-2000 (Table 2 and Figure 1). In this period, employment growth rate reduced from 3.7 to 0.1 percent in 2001-2007 periods. The average net job creation for each 1 percent of economic growth has reduced from 17 thousand to 3 thousand. The overall net employment for each percent of economic growth in 2001-2006 periods is too low compared to the period before (Table 2 and Figure 2).

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In addition total unemployment rate during 2007-2011 increased from 11.3% in 2007 to 12.3% in 2011. Graduated unemployment rate increased from 15% to 19.5% which means that in this period graduated unemployment is higher than total unemployment. The rate of vacancies relative to unemployment (even if it is few and decreasing) and graduated unemployment suggest that the employers are facing more difficulties uncovering applicants with the skills they need. In other word, if growth of educated supply outstrips demand, this may be reflected in a surplus of skilled workers in terms of unemployment, but also in workers who are overeducated for the jobs they perform. This type of skills mismatch is called overqualified mismatch.

The patterns of job destruction and job creation interacted with or accelerated longer term structural trends. At the supply side, such trends include increasing level of educational attainment of workers, while major factors at the demand side include technological change, globalization and trade.

Figure 1- economic and employment growth

Source: National accounts of Iran’s central bank and macroeconomic office of management and planning organization

Figure 2- The average net job creation for 1 percent of economic growth (1991-2011) - Thousand

Source: National accounts of Iran’s central bank and macroeconomic office of management and planning organization

The main idea of this paper is to show that jobless growth phenomena has occurred during 2001-2011 period in Iran’s economy and the main reason of occurring this phenomenon is structural change (especially in 5 years period ended in 2011). For studying this issue, input-output decomposition approach has been used.

The present paper is arranged in four sections. The first section explains the reasons for the occurrence of the jobless growth phenomenon and the experiences gained in this respect in different countries. Section 2 is allocated to the methodology and basic statistics used in this regard. Analysis of the results and conclusion are presented in Sections 3 and 4, respectively.

***1. Background literature: Structural change, Sectoral reallocation, Mismatching in the labor market and Jobless Growth***

In the period before the global economic and financial crisis, particularly from the early 2000s, many economies achieved high growth rates. However, the response of employment to growth (what economists call the employment elasticity of growth) has been low. The employment-to-population ratio stagnated around 60% when the world economy was growing steadily. While it may mask regional and country level successes, at the global level, there is little evidence to suggest employment is responsive to growth. One reason why growth fails to generate significant employment can be explained by the structural changes that the global economy is undergoing.

Structural change in overall meaning refers to a long-term shift in the fundamental structure of an economy, which is often linked to growth and economic development. For example, a subsistence economy may be transformed into a manufacturing economy. But structural change in the labor market is said to occur when there are changes in the composition of aggregated demand for goods and services, or when there are changes in productivity of labor, that results in an industrial shift in labor demand. Technical progress is seen as crucial in the process of structural change as it involves the obsolescence of skills, vacations, and permanent changes in spending and production resulting in structural unemployment. In other words, when the labor market is undergoing structural change, workers may lose jobs because their current skills are no longer in demand. Hence, if an economic growth is accompanied by structural change, there is a potential for this growth to be jobless (Haider, 2010).

Apart from the number of job or vacancy creation in economic prosperity what is needed for employment numbers to rise is an adequate supply of workers that the firm views as good productive matches for the job created. According to widely recognized definition, skills mismatch is the discrepancy between the qualifications and skills that individuals possess and those needed by the labor market. Skill mismatch is produced by different factors, such as technological progress (for instance, digital development), economic developments (for example, industrial restructuring), or social changes (for example, demographic phenomena) (EPRS, 2016).

However, in short run, reallocation is costly. Workers displaced from contracting sectors of the economy need to spend time searching for new jobs. This can take substantial time and resources, especially if workers’ old skills do not match those demanded by firms in expanding sectors. (Aaronson.et al, 2004). This misallocation leaves vacant position open longer and forces job seekers to search longer to find work. This results in higher unemployment because it is harder for employers to find suitable work. It also results in weak hiring because it is harder for employers to find qualified applicants (Feberman et.al, 2012). Thus, an increased need for sectoral reallocation may temporarily increase the economy’s natural rate of unemployment and lower its rate of employment growth.

In the event of structural changes, job opportunities with higher productivity will replace traditional jobs. Thus, because of technological changes, new jobs with new characteristics will be emerged and workforce will move among different economic sectors. There are several reasons for this movement such as changes in the business patterns, changes in product demands, productivity growth, and the other reason may be structural change in supply side of labor market and credit market. Movement of workforce among different economic sectors (e.g. job relocation) is one of the attributes of a dynamic economy in which some of the companies do job adjustments or they go bankrupt while some of the other companies start their activity or some of the others expand their businesses. In long term, these structural changes will cause constant labor relocation from the industries that experience negative growth to the industries that experience high growth rates. Groshen and Potter (2003) show that share of total employment in the industries of U.S. that have faced structural changes, has increased during the time. For example, during 1970s and 1980s share of total employment for the mentioned industries in U.S. was 51, while this share increased to 57 percent in 1990 and it reached to 79 percent in 2001.

This possible explanation of jobless growth was first suggested by Aghion and Howitt (1994) and then later empirically studied by Rissman (1997), Groshen and Potter (2003) and Aaronson, et al. (2004). They claimed that a substantial percentage of a dismissal of employees can be recognized to permanent rather than short-term. Permanent dismissals are a feature of structural unemployment as industries fade away.

Aghion and Howitt (1994), analysis the effects of growth on long-run unemployment using a search model of equilibrium unemployment where growth arises explicitly from the introduction of new technologies that require labor reallocation for their implication.

The analysis uncovers and compares between two competing effects of growth on unemployment. The first is the capitalization effect, whereby an increase in growth raises the rate at which the returns from creating a firm will grow, and hence increases capitalized value of those returns. The capitalization effect encourages more firms to enter. This raises the number of job openings in the steady-state equilibrium, as in Pissarides's analysis, thereby reducing the equilibrium rate of unemployment by increasing the job-finding rate. The second effect is the creative destruction effect, according to which an increase in growth may reduce the duration of a job match, which in turn raises the equilibrium level of unemployment both directly, by raising the job-separation rate, and indirectly, by discouraging the creation of job vacancies and hence reducing the job-finding rate.

If the changes in the labor demand side because of d creative destruction (or any other reason such as changes in foreign trade pattern, aggregate demand pattern or technological improvement) occurs at the same time with structural changes in labor supply side (as a reason of social changes like population, sex, region and etc.), then it can increase mismatch between new jobs and existing labor forces and increase the natural and structural unemployment rate.

Rissman (1997), measured economic turbulence using data on employment shares across broad industry categories. The procedure he proposed differs substantially from what has been proposed previously in the literature, an alternative approach to measuring the intensity of sectoral shifts. By applying the Kalman filter to a simple model of net industry employment growth, he measured the dispersion that is purged of cyclical effects. The analysis suggest several implications for policymakers, he emphasized that an appropriate role for policy in reducing structural unemployment may be to aid in reducing the cost of acquiring new skills or to provide job search assistance.

Groshen and Potter (2003), tried to explore the reason why the recovery from 2001 recession has brought no growth in jobs. They advanced the hypothesis that structural changes have contributed significantly to the sluggishness in the job market. They found evidence of structural change in two features of the 2001 recession: the predominance of permanent job losses over temporary layoffs and the relocation of jobs from one industry to another. In addition, most of the jobs added during the recovery have been new positions in different firms and industries, not rehired. They finally suggested that a return to job growth may require a mix of two ingredients: improved financing options for riskier ventures and resolution of uncertainties, including time for the dust to settle from all the structural changes.

Aaronson et.al (2004), use the data of U.S to reconsider the case of sectoral reallocation’s role in the jobless recovery during last two recessions. They review previous work on measures of sectoral reallocation. This includes evidence on the extent of worker displacement, reasons for unemployment, and job creation and job destruction, as well as statistical models of reallocation based on readily available industry-level employment data. They concluded that there is a little evidence of an increase in sectoral reallocation. In addition, they found that other traditional measures of sectoral reallocation (rather than the methodology of Erica Groshen and Simon Potter (2003)) based on changes in industry employment shares actually rose less during the most recent recessions than in previous recessions. Finally, they offer new evidence of the extent of sectoral reallocation based on the methodology of Rissman (1997).

Some other studies have also examined the relationship between sectoral reallocation and jobless recovery, for example:

Aaronson et.al (2004), in their paper discussed about several explanations about the causes of jobless recovery and offer some thoughts on strengths and weaknesses of them. They believed that sectoral labor reallocation can be necessitated by changes in trade patterns, shifts in product demand, productivity growth, and other factors. Such movement is a feature of a dynamic economy and is an important source of overall productivity gains in the economy. They concluded that employment shares by industry are relatively stable in U.S. labor market and some shifts that happened were because of the overall weakness of labor market conditions. Thus, they do not think that the need to reallocate workers across industries is a likely explanation of the jobless recovery.

Khemray et.al. (2006), they summarized the thinking that jobless growth in the US reflects a structural change independent of business cycle. This paper attempts to relate the recent discussion on jobless recovery, observed in the US economy since the 1990s, to the empirical studies on Okun’s law, which postulates a specific empirical relationship between economic growth and the change in the rate of unemployment. Their general hypothesis is that if the Okun coefficient for the economy has weakened, it explains the jobless recovery. Their results indeed show a decline in the time-varying Okun coefficient for the US since the early 1990s, which coincides with the weak job recovery starting from the 1991 trough. By contrast, in many other countries, Okun’s coefficient is rising.

Haider (2010), in his paper discussed about the nature of structural change that took place in Pakistan economy over 1967-2008. He said to analyses four commonly used measure of sectoral reallocation proposed by Lilien (1982), Groshen and Potter (2003), Rissman (1997), and Aaronson, Rissman and Sullivan (2004). He found that the economy of Pakistan underwent structural change during period of recession and recovery. However, it does appear that structural changes were more pronounced at the time of 1969 recession than that of 1991 recession. A plausible explanation for this result might be significant shift in employment from agriculture towards services sectors. He concludes that sectoral reallocation is one of the major causes of jobless growth in Pakistan.

Labor mismatch, also known as structural imbalance, can be defined as a poor match between the characteristics of unemployed workers and those required for vacant jobs. In the wake of the jobless recovery from the Great Recession, economists have sought to explain the coexistence of a high unemployment rate and increasing job openings as a mismatch phenomenon. Some papers examined this phenomena:

Manacorda et.al. (1998), the main concern of their paper was to assess the role played by the imbalance between the demand and supply of skills in shaping the evolution of labor market performances across OECD countries. The analysis is guided by a simple theoretical framework where aggregate technology is characterized by a Cobb–Douglas production function involving two inputs (skilled and unskilled labor), and wage-setting is governed by a double log wage function. The empirical analysis shows that there has been some increase in skill mismatch in a few OECD countries, but this has not been a generalized phenomenon. Moreover, the rise in mismatch cannot explain much of the rise in unemployment in continental Europe, while it does explain a significant proportion of the increase in the rate of joblessness in Britain.

Thisse and Zenou (2000), they propose to model the matching between a population of workers (who are heterogeneous in the type of work they are best suited for) and firms (that are heterogeneous in their job requirements) by using a monopolistic competitive market. The main result of their paper is that unemployment can be attributed to imbalance in demand and supply of skills. To obtain this conclusion, they have assumed that the labor market is imperfectly competitive because both firms and workers are heterogeneous. They also concluded that unemployment may also arise in equilibrium because of job mismatch and firms’ market power.

Faberman et.al. (2012), in their paper reviewed the concept of skills mismatch in labor market and examined its role in explaining ongoing low levels of hiring and high level of unemployment during the 2009 economic recovery in US. They perform their analysis of mismatch by examining the supply and demand of workers across occupations of varying skill requirements. They find that workers in occupations that require a moderate amount of skills have not experienced employment gains. If there is a skills mismatch in the US labor, it may be most significant for this group.

***2. Data Base and Methodology***

As it was discussed in the previous section, structural change has been mentioned as an important cause of jobless growth in the literature. Changes in the sectoral share of employment is the main subject in the structural change literature, too, which itself can be related to changes in productivity, final demand, trade model and etc. By using input-output approach, we can decompose sectoral changes of employment into three factors: technology change, productivity change and employment change. Comparing different periods of job creation can help to explain jobless growth in the economy of Iran. In this section, we tried to explain the methodology of structural decomposition of sectoral employment by using input-output model.

When there are two or more sets of input-output data for an economy, analysts are often interested in trying to disaggregate the total amount of change in some aspect of that economy into contributions made by its various components. For example, the total change in Leontief inverse matrix could be disaggregated into a part that is associated with changes in technology within each sector. And there are numerous additional options such as changes in employment, value added, energy use, etc. (Miller and Blair, 2009).

A perspective on changing source of employment demand comes from the use of decomposition approach. The decomposition approach explains the change in employment by sector through the use of three type of data (1) vectors of employment per Billion Rials of output (2) Leontief inverse matrices for particular years, and (3) vector of final demand.

Where: is a vector of employment by sector, is a vector of employment per Billion Rails of output, L is a Leontief inverse and F is a vector of final demand

Superscript 0 refers to initial year (first time period) and 1 refers to target year (second time period).

Decomposition into contribution by three elements now follows the standard pattern. These equations are as follows (Miller and Blair, 2009, P.606):

1. Labor input coefficient change:
2. Technology change:
3. Final-demand change:

Thus, ∆ = (1) + (2) + (3)

In order to answer the main question of this article, we have used three input-output tables of years 2001, 2006 and 2011. A survey-based input-output table of 2001 is derived on the basis of make and use tables of Statistical Center of Iran, a symmetric industry-by-industry with industry assumption at current price. The 2006 and 2011 tables are updated tables of initial year 2001, a symmetric industry-by-industry with industry assumption at current price which are published at Islamic Parliament Research Center of Iran. The tables were updated using modified RAS method. Then for calculating structural changes between these years, tables were transformed into constant prices using RAS methodology[[5]](#footnote-5). After that each table were decomposed to total and domestic[[6]](#footnote-6) tables. In this paper, we have used domestic input-output tables for the analysis purpose. For compatibility and consistency of the table of the year 2011 with the table of year 2001, the above tables were aggregated in 8 sectors. The 8-sector table includes sectors of “agriculture”, “oil”, “manufacturing”, “mining”, “transportation and communication”, “provision of water, electricity and gas”, “construction” and “services”.

With the above method, the structural changes will be decomposed into three factors and their relationship with production and employment in Iran will be discussed. However, this approach does not convey any special implications about the reason of these changes and their impacts of jobless growth in the mentioned period. The main focus of this paper is not on this issue. However, we try to present the most important factors and some existing evidences which may be related based on existing literature. In this context, the role of changes in the trade pattern that has influence on production and labor demand and structural changes in the labor supply side (like social changes) and their impact on increasing of job mismatch in Iran is very important. As discussed in previous section, changes in labor demand side as a result of changes in foreign trade pattern, changes in demand pattern or technological improvement can lead to more job mismatch and if these changes occur at the same time with structural change in the labor supply side (e.g. as a reason of social changes like population, sex, region and etc.) it can increase the mismatch between new jobs and existing labor forces. This would increase natural and structural unemployment.

***3. Empirical Results***

According to the input-output methodology, change in the sectors’ employment can be decomposed to “Final demand change”, “Labor productivity change or Labor input coefficient change” and “Technology change”. Indeed, the last component is the change in Leontief coefficient that shows direct and indirect dependency of producing a unit in each sector to products of other sectors. Table 3 shows the relationships among these three factors and economic growth and employment growth in the whole economy.

Table 3.State of economic and employment growth as a result of positive change in labor productivity, technology and final demand

|  |  |  |  |
| --- | --- | --- | --- |
| Final demand change | Technology change | Labor productivity change |  |
| + | + | + | Economic Growth |
| +/- | +/- | - | Employment Growth |

An increase in labor productivity is a result of an increase in share of capital in production which means more production and fewer jobs at the same time. So the labor productivity change can play an important role in explaining jobless growth.

An increase in final demand of each sector leads to production growth and more employment in that sector. In whole economy, demand increase means economic growth but employment change depends on the share of different economic sectors in this increase. If final demand increases in whole economy, but demand in some labor intensive sectors decreases, then employment may decrease in this case. Finally, interpretation in technology change and its relation with economic growth and employment has the same interpretation as final demand change. The relationship between multiplier coefficient and economic growth in whole economy is positive but its effect on employment depends on the combination of technology change and the importance of labor intensive sectors.

Generally, if the share of labor productivity change in employment change is high, it shows that the share of capital in production has increased and the share of labor in production has decreased in this period. This issue can have an important role in explaining jobless growth but we cannot ignore the other two components. Technology change component can be an appropriate measure in explaining structural change.

Table 4, compares the percentage change in the number of employees in the economy and 8 sectors during 2001-2006 and 2006-2011. The employment growth which was 20 percent in the first period has decreased to zero in the second period. Its main reason is the significant decrease in the employment of manufacturing and other services sectors and also significant decrease in the employment growth of transportation and communication sector. Employment growth of manufacturing sector in 2001-2006 was 13 percent while it becomes minus 11 in 2006-2011 period. Employment growth of Transportation and communication sector has decreased from 42 percent in the first period to 4 percent in the second period and the employment growth of other services sector decreased from 25 percent to minus 5 percent. However, the economic growth of these sectors will not show significant changes during these periods. Apart from these sectors, the employment growth of Agriculture and Oil sectors, which experienced significant reduction in their economic growth, has increased in the second.

Table 4- The comparison between sectoral employment growth of 2001-2006 and 2006-2011 period

|  |  |  |  |
| --- | --- | --- | --- |
| **Sector** |  | **2001-2006** | **2006-2011** |
| Agriculture | 1 | 4% | 6% |
| Oil | 2 | 10% | 21% |
| Manufacturing | 3 | 13% | -11% |
| Mining | 4 | 25% | 37% |
| Transportation and Communication | 5 | 42% | 4% |
| Provision of Water, Electricity and Gas | 6 | 17% | 17% |
| Construction | 7 | 26% | 18% |
| Services | 8 | 25% | -5% |
| Total |  | 20% | 0% |

Sources: Management and Planning Organization

Table 5 shows that in the first period, more than 3.3 million people were added to the number of employees while in the second period only 71 Thousand were added to the number of employees. As it was mentioned before, manufacturing, other services and transportation and communication sectors are the most important sectors in explaining this change. In manufacturing sector, the employment change has decreased from 393 Thousand in the first period to mines 383 Thousand in the second period. In both periods, the share of labor productivity change in employment of this sector is negative and almost the same. The share of final demand in both periods is also positive. But, its reduction is significant. The technology change has a major change and it has significantly decreased in this sector. The same as manufacturing sector, the share of each three components in transportation and communication sector has decreased, but there is a significant change in the final demand and technology change. Generally, the employment growth in the transportation and communication sector has decreased from 572 Thousand during 2001-2006 to 83 Thousand during 2006-2011. The share of each three components in increasing employment has decreased in other services sector but the main share is for technology change and after that it belongs to final demand change. In other services sector, the employment change has changed from more than 1.67 million in the first period to mines 416 Thousand in the second period.

In spite of the important role of final demand change component in decreasing the sectoral employment growth and by considering its expected positive relationship with sectoral production growth, the main reason for jobless growth in 2006-2011 is best described by the technology change and labor productivity change components. If for a moment, we ignore I-O methodology and Leontief multiplier coefficient as technological criteria and we consider that the change in labor productivity is a result of replacement of capital with labor (increase in capital share in production) then we can consider the productivity change as a technology change. Table 6 shows the percentage changes in sectoral employment.

Table5- The state of sectoral employment growth of 2001-2006 and 2006-2011 period

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | 2001-2006 | | | | 2006-2011 | | | |
| Sector |  | Total | Labor input coefficient change | Technology change | Final demand change | Total | Labor input coefficient change | Technology change | Final demand change |
| Agriculture | 1 | 132 | -900 | -1,180 | 2,212 | 216 | -341 | 578 | -22 |
| Oil | 2 | 11 | -7 | -7 | 25 | 26 | 37 | -1 | -10 |
| Manufacturing | 3 | 393 | -1,477 | -3 | 1,874 | -383 | -1,294 | -344 | 1,254 |
| Mining | 4 | 13 | -15 | -9 | 38 | 24 | -28 | 3 | 50 |
| Transportation and Communication | 5 | 572 | -380 | 81 | 870 | 83 | -606 | -37 | 726 |
| Provision of Water, Electricity and Gas | 6 | 33 | -43 | -68 | 145 | 39 | -18 | 10 | 47 |
| Construction | 7 | 539 | 62 | 25 | 452 | 481 | -132 | -130 | 743 |
| Services | 8 | 1,671 | -1,422 | 295 | 2,797 | -416 | -1,964 | -497 | 2,046 |
| Economy-wide |  | 3,364 | -4,182 | -867 | 8,413 | 71 | -4,346 | -417 | 4,833 |

Source: Authors.

Table 6- Percentage changes in the sectoral employment

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | 2001-2006 | | | | 2006-2011 | | | |
| Sector |  | Total | Labor input coefficient change | Technology change | Final demand change | Total | Labor input coefficient change | Technology change | Final demand change |
| Agriculture | 1 | 4% | -25% | -33% | 62% | 6% | -9% | 16% | -1% |
| Oil | 2 | 10% | -6% | -7% | 22% | 21% | 30% | -1% | -8% |
| Manufacturing | 3 | 13% | -48% | 0% | 61% | -11% | -38% | -10% | 36% |
| Mining | 4 | 25% | -28% | -17% | 70% | 37% | -42% | 4% | 74% |
| Transportation and Communication | 5 | 42% | -28% | 6% | 64% | 4% | -31% | -2% | 37% |
| Provision of Water, Electricity and Gas | 6 | 17% | -23% | -35% | 75% | 17% | -8% | 4% | 21% |
| Construction | 7 | 26% | 3% | 1% | 22% | 18% | -5% | -5% | 28% |
| Services | 8 | 25% | -21% | 4% | 42% | -5% | -24% | -6% | 24% |
| Economy-wide |  | 20% | -24% | -5% | 49% | 0% | -21% | -2% | 24% |

Source: Authors.

As the results show the ongoing Iran economic recovery has been characterized as a jobless growth. In this period unemployment has remained persistently high, in spite of 3 thousand job vacancies and 4.1 percent growth rate. Analyzing the reasons of determining role of technology and productivity change or in general structural changes in describing jobless growth can be a subject of another research, but as a general idea, there are two important candidates for explaining why structural changes happened in this period: trade openness (especially huge increasing of oil exports) and skill mismatch in labor market.

Figure 3 shows that volume of foreign trade of Iran in the years 2006-2011 has been doubled in comparison of 2001-2005 period and this volume is five times higher than the volume of foreign trade in 1995-2000 period. The main reason for this growth is increase in the oil export.

Existing evidence shows that economy of Iran has experienced an increase in capital formation growth and import with the growth in oil revenues. Increase in capital formation can increase the share of capital in production which means need less labor for a specific production level (increase in labor productivity). Increase in Intermediate import can affect the internal production chains of each sector and it leads to a technology change in loss of employment.

Figure 3- Volume of foreign trade of Iran 1992-2011(Billion dollar)

Source: Central Bank of Iran

In addition, job mismatch may have accelerated effect on the nature of employment growth. This situation has prompt us to consider whether skills mismatch in labor market is having a dampening effect on employment. Table 7 shows the total and educated unemployment rate and the share of educated employment flow during 2006-2011. The total unemployment rate which was 11.3 percent in 2006 has increased to 12.3 in 2011. However, the educated unemployment rate increased from 15 percent to 19.5 percent in this period. It also shows that the share of educated employment has faced 12.6 percent decrease. The high educated unemployment in 2006-2011 can be the result of replacement of capital by labor (as discussed before) or skills mismatch. Our calculation shows that capital share in production has increased but it is not enough to describe the unemployment rate alone.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Table 7- labor market index | | | | |
| year | Total unemployment rate | Educated unemployment rate | Educated participation rate | educated employment percentage |
| 2006 | 11.3 | 15 | 79 | 67.2 |
| 2007 | 10.5 | 15.9 | 77.8 | 65.5 |
| 2008 | 10.4 | 16 | 72.6 | 61 |
| 2009 | 11.9 | 16.2 | 70.6 | 59.2 |
| 2010 | 13.5 | 19.6 | 70.3 | 56.5 |
| 2011 | 12.3 | 19.5 | 67.8 | 54.6 |

Source: Statistical Center of Iran

The change on unemployment percentage of high skill workers is always higher than low and medium skill workers in this period. Which shows that this workers are unable to find suitable job or there are not enough job vacancies.

***Summary and Conclusion***

What make labor market different from other markets in economy such as goods and services or monetary markets are the relationships between this market and other markets. According to economic theories, employment variable is a pro cyclical variable but since 1990s in many countries around the world this variable lags behind the output or takes longer to recover than in previous cycle. This phenomenon is known as jobless growth. Knowing the factors that cause this phenomenon makes understanding the behavior of employment in recoveries.

Study over employment and economic growth shows that there are evidences of jobless growth in Iran. The employment growth rate in 2006-2011 is significantly reduced compared to the earlier periods. However, the average annual economic growth rate in this period was not significantly different from the previous, employment growth rate reduced from 3.7 to 0.1 percent.

Comparing the percentage change in the number of employees, in the economy and 8 sectors during 2001-2006 and 2006-2011, shows that the employment growth which was 20 percent in the first period has decreased to zero in the second period. Its main reason is the significant decrease in the employment of manufacturing and other services sectors and also significant decrease in the employment growth of transportation and communication sector. Employment growth of manufacturing sector during 2001-2006 was 13 percent while it becomes minus 11 during 2006-2011. Employment growth of transportation and communication sector has decreased from 42 percent in the first period to 4 percent in the second period and the employment growth of other services sector decreased from 25 percent to minus 5 percent. However, the economic growth of these sectors will not show significant changes during this period. Apart from these sectors, the employment growth of agriculture and oil sectors which experienced significant reduction in their economic growth in the second period than the first period has increased.

In spite of the important role of final demand change component in decreasing the sectoral employment growth and by considering its expected positive relationship with sectoral production growth, the main reason for jobless growth in 2006-2011 is best described by the technology change and labor productivity change components. If for a moment, we ignore I-O methodology and Leontief multiplier coefficient as technological criteria and we consider that the change in labor productivity is a result of replacement of capital with labor (increase in capital share in production) then we can consider the productivity change as a technology change.

Analyzing the reason of determining the role of technology and productivity change or in general structural changes in describing jobless growth can be a subject of another research, but as a general idea, the role of oil revenues in the mentioned periods can be explained here. Existing evidence shows that economy of Iran has experienced an increase in capital formation growth and import with the growth in oil revenues. Increase in capital formation can increase the share of capital in production which means need for less labor for a specific production level (increase in labor productivity). Increase in intermediate import can affect the internal production chains of each sector and it leads to a technology change in loss of employment.

There are two important candidates for explaining why structural changes happened: trade openness (especially huge increasing of oil exports) and skill mismatch in labor market. Labor mismatch, also known as structural imbalance, can be defined as a poor match between the characteristics of unemployed workers and those required for vacant jobs

Existing evidence shows that economy of Iran has experienced an increase in capital formation growth and import with the growth in oil revenues. Increase in capital formation can increase the share of capital in production which means need less labor for a specific production level. Increase in Intermediate import can affect the internal production chains of each sector and it leads to a technology change in loss of employment.

In fact, skill mismatch is produced by different factors, such as technological progress (for instance, digital development), economic developments (for example, industrial restructuring), or social changes (for example, demographic phenomena). What is important for policymakers is to know whether or not there is a skills mismatch in the labor market, because the unemployment it creates is structural in nature

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5. For more information see: Dietzenbacher and Hoen (1998) and jahangard (2005). [↑](#footnote-ref-5)
6. For more information see: Mousavinik et.al (2011). [↑](#footnote-ref-6)