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Structural Transformation and Employment Trends in Jordan

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Abstract: Historical experience suggests that improving employment and working conditions is not achievable without structural transformations in the economy. Through these transformations, surplus labor in informal sectors and activities can be moved to higher-productivity economic activities. In this research paper, the trends in the relationship between structural transformation and employment in Jordan during the period 1990-2022 were analyzed. The research highlights several key findings from the analysis. First, it identifies long-term equilibrium relationships between structural transformation and employment fluctuations. Secondly, the main research variable total production (LY) is statistically significant in all models, but it varied in terms of magnitude and direction. Its impact was positive in the agricultural and industrial models, with an elasticity of approximately 2.2%, and 0.48% respectively. In the services sector, the coefficient of total production was negative 1.4%. Thirdly, the results show that the impact of financial crises, Arab sprig, and COVID-19 on the role of structural transformation in employment was negative as indicated by the significant and negative dummy coefficients.

Keywords: Jordan, Structural transformations, Employment, ARDL.

Introduction

Economic development is a fundamental objective for nations, and enhancing the standard of living along with the economic and social conditions of the population is a challenge that policymakers and economists face today. Every year, aid, investments, policies, and well-structured plans are allocated to achieve this goal, or at least move closer to it. Questions arise about what is needed to achieve development and what distinguishes successful economies from those struggling to reach higher income levels.

The Jordanian economy faces significant challenges, including low employment levels and high unemployment rates, especially among the youth. Due to the mismatch between the outcomes of education and the Jordanian labor market in recent decades, unemployment rates have risen from 14.7% in 2000 to 22.8% in 2022 (Jordanian Department of Statistics, 2022).

The challenge of creating productive and decent employment opportunities requires demographic shifts, given the increasing numbers of young people eager to enter the labor market. This situation will worsen if development indicators related to health and life expectancy improve. Jordan's workforce comprises approximately 1,839,000 individuals, with about 1,419,000 of them employed, while the rest are unemployed. The youth unemployment rate in the fourth quarter of 2022 reached about 47.2%. (Jordanian Department of Statistics, 2022)

The economic participation rate of Jordanians in the working age (15 and above) in the local labor market was approximately 33.4% in 2022, with 14% being females and 55% males. This is relatively low, and when translated into numbers, there are approximately 1.8 million economically active Jordanians. Among them, there are 1.2 million employed males and 298,000 unemployed males, while there are approximately 265,000 employed females and 121,000 unemployed females. These numbers are extremely unfavorable when compared to the average labor force participation rate in the Middle East, which was about 50% in 2009, and the global average of about 64.7% in the same year. (International Monetary Fund, 2022)

Structural transformation in the production sector may lead to a change like available jobs, necessitating new skills and different experiences than those required in traditional industries. If competencies and skills are not developed, the transformation may lead to a decrease in employment or a decline in the quality of available job opportunities. The speed at which structural transformations occur is a key factor in distinguishing successful countries from others (McMillan and Rodrik, 2011)."

The importance of the study stems from its potential to provide an understanding of the factors driving structural transformation in production and its relationship with employment in Jordan. It will also identify the industrial sectors most susceptible to job loss and those with a greater capacity for employment. Additionally, it can contribute to the current literature on the relationship between structural transformation in production and employment, especially in the absence of substantial research in this area.

Jordan is facing a significant challenge in terms of employment and the labor market, with structural transformation in sectoral production emerging as a key factor influencing employment patterns (Mryyan, 2014). Structural transformation arises from changes in the composition of production from one sector to another, leading to shifts in labor demands and job opportunities across different sectors.

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Despite the importance of structural transformation in sectoral production, there is a lack of studies explicitly addressing the impact of this transformation on employment. While some studies have shown an increase in employment opportunities in the emerging new sectors, there are still criticisms regarding the quality of these jobs and their availability to an adequately skilled labor force.

Therefore, the problem of this research lies in identifying the factors driving structural transformation and how these may affect employment in Jordan. It can be highlighted by answering:

Is there a relationship between structural transformation in production and employment in Jordan during the period 1990-2022?

THE AIM OF THE STUDY

The study main objective is to investigate the impact of structural transformation in sectoral production on employment in Jordan from 1990 to 2022. In addition, the structural composition of the Jordanian economy will be evaluated.

Based on the above, the hypothesis can be formulated as follows:

"There is a long-term impact of structural transformation in sectoral production on employment in Jordan during the period 1990-2022."

THEORETICAL FRAMEWORK AND PREVIOUS STUDIES

Definitions and Concepts

Structural transformation is defined as the movement of labor or other production factors from activities with less to those with high productivity. It can be beneficial for developing countries due to differences in their economic structures, which reflect imbalances in production gaps between sectors. (Mkandawire, 2016)

Structural transformation occurs over time or due to technological changes, demographic shifts, shifts in industry structure, globalization, trade patterns, and other factors. As economies evolve, resources shift from low-productivity traditional sectors to high-productivity modern sectors, driven by technological progress, changes in trade patterns, and consumer demand. (Acemoglu and Autor, 2011)

Structural change refers to the transformation of an economy's production and employment patterns over time, typically involving shifts in resources between sector, such as agriculture to manufacturing or services. It encompasses changes in the composition of output, employment, and productivity across different sectors of the economy. (Saviotti, et al. 2020)

In the case of Jordan, structural change can be seen in the transition from a predominantly agricultural economy to one that is increasingly diversified, with a growing focus on manufacturing and services sectors. This shift reflects changes in technology, market demands, and government policies over time. (Jordan Strategy Forum, 2020)

Measuring structural change involves several indicators, the most known with available data on it is the one prepared by the World Bank. Other indicators include the following:

Sectoral Contribution to GDP: Tracking the share of each sector (agriculture, industry, and services) in the Gross Domestic Product (GDP) over time can provide insights into structural changes in the economy.

Employment Patterns: Analyzing changes in employment shares across different sectors helps to understand shifts in labor allocation and structural transformation.

Value Added and Productivity Growth: Assessing changes in value-added and productivity levels across sectors indicates how efficiently resources are being used and distributed within the economy.

Many Researchers use productivity to measure efficiency, compare production processes, and track technological change. Structural transformation is typically measured by the share of employment in sectors as a percentage of total employment in various sectors, the share of value-added as a percentage of total value-added, or the shares of sectoral exports as a percentage of GDP. (UNCTAD, 2016).

Employment shares may not reflect changes in "real" labor efficiently due to variations in working hours or differences in human capital among workers because they are linked to development levels. Value-added shares do not differentiate between changes in quantities and changes in price. Therefore, it is essential to know the sectoral composition of employment and production, and labor productivity at both the economy-wide and sectoral levels. (Laurente, 2022)

The Driving Forces of Structural Transformation

The driving forces of structural transformation consist of three fundamental aspects. Firstly, education and skills are considered essential for building the necessary productive capabilities for development. However, in developing countries, there are only a few incentives for education and training due to easy labor mobility. The second driver is technology and innovation, both of which are transformative factors for competitiveness. However, the lack of specialization, insufficient competitive financing, and limited coordination in developing countries make them vulnerable to failure and underinvestment. The last driver consists of production inputs, which are crucial for local industries. Developing countries lack a reliable supply system for production inputs, leading to increased costs and decreased quality. Trade liberalization reduces costs for imported inputs, which has a positive impact on local industries. (Amiti and Konings, 2007)

Economic Growth and Structural Transformation

The relationship between economic growth and structural transformation consists of multiple processes according to the work of Solow, Kuznets, and Lewis. One is related to labor productivity growth within the sector due to capital accumulation and technological change. Another process involves the shift of labor from agriculture to high-value-added activities, starting with industry and then services. The last process involves the transition of labor from educational activities to profit-oriented activities. The integration of these processes results in a well-structured cycle that achieves structural transformation and rapid growth. However, there is a possibility of low equilibrium or an empty circle if growth is limited to the modern sector only, and the type of growth that requires balance in labor distribution is incorrect, leading to a lack of structural transformation. (Michael, et al. 2000)

Structural Transformation in Development Theories

The methodologies of structural transformation have evolved along several paths, including theories of growth associated with new imitation, and theories of development linked to structural imitation. Subsequently, a third pathway emerged, known as "New Structural Economics."

Neoclassical Growth Models

Neoclassical growth models are based on several assumptions, including the production technology represented by total production functions, constant returns to scale, and perfectly competitive markets. These models often assume

neutrality of technological change, meaning that it improves labor and capital productivity equally.

These models oversimplify various aspects, neglecting the process of structural transformation and how to deal with technological progress. Modern economic growth models expand the single-sector framework to align with the realities of structural transformation and aim to understand why technology spreads in some countries but not in others, and how this can lead to changes in production and employment shares. (Barro, et al.,1991)

Structuralism Approaches

The structuralism school of thought in development began making contributions in the 1940s and 1950s, based on the idea that economic development depends on structural transformation. Kuznets (1979) wrote, "It is impossible to achieve high rates of growth per capita or per worker without significant changes in the relative shares of various sectors." Researchers such as Rosenstein-Rodan (1943), Chang (1949), Nurkse (1953), and Lewis (1954) conducted extensive research that became known as the structuralism approach to economic development. (Todaro, et al., 2006)

This approach is based on the following key assumptions:

- Economic growth depends on the path: Accumulated knowledge during the production process leads to dynamic economies of scale, resulting in further economic growth and development.
- Structural divergence in developing economies: This implies that modern economic activities with high productivity and advanced technologies coexist with traditional economic activities that have lower productivity, as seen in the models by Lewis (1954) and Ranis and Fei (1961). Economic growth is driven by the reallocation of labor from traditional to modern activities.

New Structuralism Economics: This body of literature acknowledges the significance of changes in production structure and their role in economic development. It aligns more with neoclassical trade models, assuming that structural changes should depend on firm specialization in industries compatible with specific comparative advantages determined by production factors. (Lin and Chang, 2009).

New Latin American Structuralism: This approach focuses on the main development variable in Latin American structural transformation: the exchange rate. It combines both the structuralism and Prebisch approaches, emphasizing structural transformation and technological progress.

Evolutionary Economics, or Schumpeterian Economics: Nelson and Winter (1982) and Dosi et al. (1990) are key pioneers of this approach, which emphasizes the role of innovation and explores how capabilities influence the learning process and development. This approach is founded on the notion that technological change varies across industries, and the pace of technological advancement is contingent upon the dynamics of structural transformation within the economy. (Dosi et al.,2000)

In contrast to the new economists of structural transformation, competitive advantages are not given but created and shaped by the production structure through learning and innovation. This approach emphasizes that the success of economies lies in shifting production structures toward more dynamic activities, rapid technological progress, increased productivity, and higher wages (Salazar et al., 2014).

Global Value Chain Literature: This concept describes the activities firms and workers undertake to bring a product from its initial idea to its final use (Gereffi and Fernandez, 2011). Value chains specific to the final product are defined as "value added to all activities that need to be directly or indirectly performed to produce it" (Timmer et al., 2014).

Resource-Based Manufacturing Literature: Economies rich in resources suffer from the "resource curse" also known as the "Dutch disease," which leads to adverse outcomes in industry and long-term economic growth.

The impact of the global financial crisis, the Arab Spring, and the COVID-19 pandemic on structural transformation

The impact of the global financial crisis, the Arab Spring, and the COVID-19 pandemic on structural transformation has been immense and interrelated on both economic and political levels. The global financial crisis, which began in 2008 as a result of the subprime mortgage crisis and the collapse of the real estate market in the United States, significantly affected global economies, leading to slowed growth and increased unemployment rates. (OECD)

As for the Arab Spring, which erupted in early 2011, it had massive effects on the Middle East and North Africa. These revolutions, demanding democracy, freedom, and social justice, resulted in significant political and economic transitions, constituting an integrated process of structural transformation. (World Bank report)

The COVID-19 pandemic, which broke out in 2020, had devastating effects on public health and the global economy. Precautionary measures such as lockdowns and curfews led to economic activity slowdowns and job losses, resulting in the postponement of planned investments and structural transformations. (World Health Organization)

Overall, the interplay of these three crises demonstrates how structural transformation can be influenced by major global events and underscores the need for governments and international institutions to adapt to these changes and plan for the future accordingly.

Previous Studies

In this section, a brief overview of the most prominent studies on the research topic will be presented, listed in chronological order. In the study by Hussein (2023), the relationship between economic growth and employment in Egypt was targeted. It concluded that there is a weakness in the rate of economic growth and employment growth, as well as the existence of a long-term equilibrium relationship between economic growth and employment. On the other hand, the study by Al Freijat and Hammouri (2022) found an inverse relationship between economic growth in Jordan and the unemployment rate, and through the evaluation of "Okun's Law" during the period 1980-2022, they found a long-term co-integrating relationship between the variables. Meanwhile, Laurente (2022) aimed to analyze the impact of structural transformation on labor productivity and employment in the Philippines and found that structural transformation has a positive relationship with labor productivity in the Philippines, where labor productivity increases as structural transformation increases or vice versa. The study by Tarawneh (2022) examined the Economic Potential of Tourism in Jordan through input-output table analysis. The results indicated that a one-dinar increase in tourist spending leads to an increase of 0.069 employment opportunities. Pratomo and Manning (2022) examined the effects of formalizing employment and concluded that the growth of public sector employment is mainly a result of younger and better-educated new entrants. The study by Yao & Zhu (2021) indicated that aggregate employment in advanced countries is strongly procyclical, fluctuating similarly to the output pattern. In contrast, in China, the correlation between aggregate employment and output is nearly zero, with aggregate employment exhibiting very low volatility. The study proposed that understanding the fluctuations in aggregate employment in China lies in the process of labor reallocation between the agricultural and non-agricultural

sectors. The study by Sbaih (2013) aimed to analyze the labor-intensity of economic growth in the Palestinian economy between 2001 and 2010 and to determine whether economic growth generates jobs or not. The results showed a positive but weak effect of real GDP growth on employment, with an employment elasticity of 0.37, along with variations in employment elasticity across different sectors and years. The study also revealed the phenomena of "jobless growth" and the "growth paradox," where economic growth is associated with high unemployment rates. Additionally, some factors may play a role in determining the dynamics of this reallocation in both the short and long term. The model used in this study was employed to illustrate the relationship between structural transformation and employment trends in Jordan. The study by Driouche, D. (2013) aimed to examine the Okun's Law relationship in the Algerian economy and determine the GDP growth rate required to achieve full employment. It analyzed annual data from 1980 to 2011 using time series techniques to test the relationship between unemployment and economic growth, and to estimate Okun's coefficient. The study concluded that there is a causal relationship between GDP and unemployment. According to a study by Liu (2020), to understand the structural transformations that the Chinese economy has undergone, it is closely associated with the economic reforms that China has experienced over various stages. It provided a summary of the developments and structural transformations in the Chinese economy over the past forty years, emphasizing that it has been an economic miracle accompanied by profound changes in the economic structure. What sets it apart is the continuous process of transitioning from a traditional agrarian economy to a highly productive industrial economy.

Previous studies have played a significant role in enriching the theoretical framework of the study and in identifying the economic variables in the study model, as well as in selecting appropriate methodology and economic and statistical analysis methods suitable for deducing the relationship between structural transformation and employment in Jordan.

Guided by the economic analysis of structural transformation and previous empirical studies that have been presented in this section, an econometric model is developed to achieve the objective of this study. In particular, the model format and variables follow closely: Laurente (2022), Yao & Zhu (2021), Liu (2020).

EMPLOYMENT DEVELOPMENT IN JORDAN

Before delving into the sectoral relationships between structural transformations and employment trends in Jordan, it is essential to understand the current state of employment in Jordan, even if only minimally, to provide a more realistic and explanatory picture of possible outcomes. In this section, we provide a brief overview of the employment and unemployment situation. It is known that unemployment is not classified by sectors; however, we present some unemployment rates according to the classifications used in labor force surveys, which give us an insight into the nature of unemployed Jordanians. This enables us to align educational outcomes with the requirements of the labor market, regardless of its sectoral origin.

Jordan has witnessed decent economic growth in some years during the period 1990-2022. However, during the same period, it has consistently faced high unemployment rates, especially among the youth. The average annual growth rate was around 5.3% from 1990 to 2008, while the unemployment rate fluctuated between 10.7% and 24.1% over the same period.

In 2009, the rates of GDP growth significantly declined after reaching nearly 8.5% in 2007. This slowdown appears to have disproportionately affected job seekers. The employment challenges faced by graduates are rapidly increasing in an economy that creates a significant number of low-quality informal jobs in construction and services, primarily filled by foreign labor.

Economic Growth, Employment, and Unemployment in Jordan

Jordan experienced significant growth in 2004 and 2005 but faced substantial slowdowns in 2008 and 2009 due to the global financial crisis. The growth rate increased from approximately 4.1% in 2003 to around 8.5% in 2005. The average growth rate during the 2000-2008 period was about 6.5%. Despite this growth acceleration, unemployment rates remained at around 14%.

After revisions to the labor methodology in 2017, unemployment rates significantly increased to about 18.3%. Due to the COVID-19 pandemic, Jordan recorded high unemployment levels, reaching as much as about 24.1% in 2021. It seems that the unemployment rate's response to overall economic growth is particularly weak, given the good growth rates achieved.

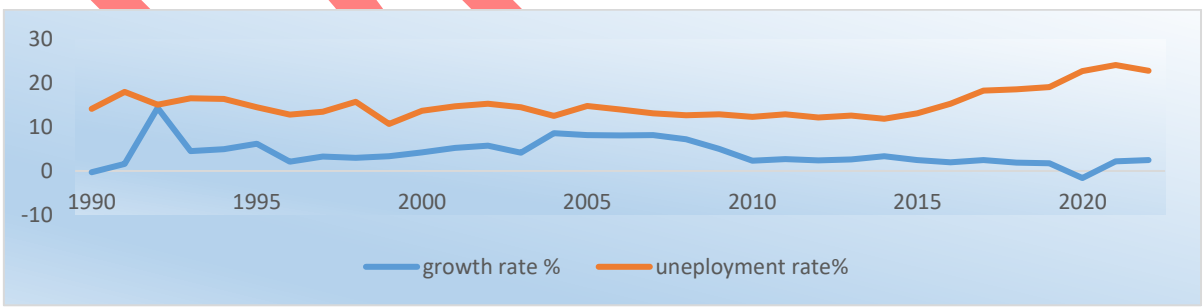


Figure (1): Growth and Unemployment Rates During the Period 1990-2022.

Source: Researcher's preparation based on DOS data.

The composition of the workforce in Jordan is shifting towards more educated categories, which tend to prefer formal and public sector jobs, leading to higher unemployment rates among them. Data indicates that the illiteracy rate among individuals aged 15 and older decreased from around 19.4% in the year 2000 to about 7.8% in 2022. Meanwhile, the percentage of those with primary education remained stable at around 50% between 2000 and 2022, while the percentage of those with secondary and intermediate diplomas remained stable or increased slowly.

Conversely, the percentage of university degree holders is the only category that increased, growing from around 8.4% in 2000 to approximately 18.7% in 2022.

This shift in the educational composition of the workforce, with a growing number of individuals attaining higher education levels, could contribute to the preference for formal and public sector employment. However, it also leads to challenges in accommodating these highly educated workers and addressing their unemployment concerns.

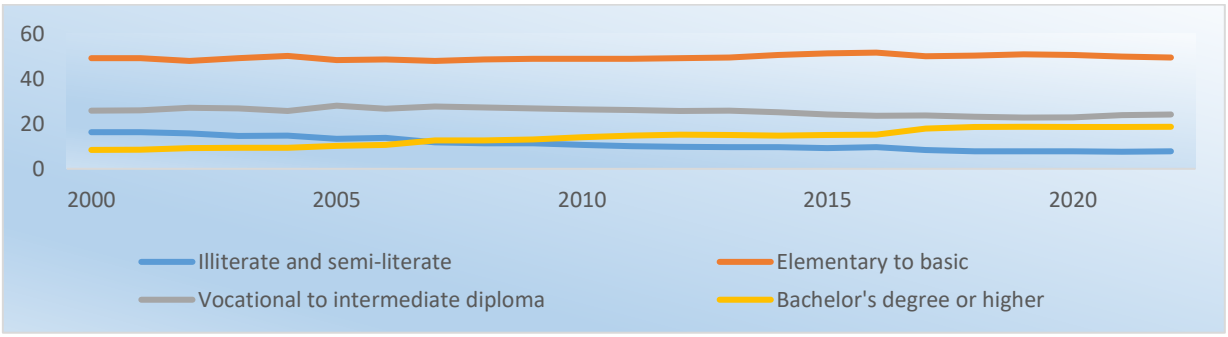


Figure (2): Jordanian Population Aged 15 and Above by Educational Attainment.

Source: Researcher's preparation based on DOS data.

Participation of educated individuals in the labor market is the highest, and consequently, their percentage among the employed is greater than their percentage among the working-age population (15+). While data reveals that the percentages for all educational groups either decrease or remain stable, as shown in the figure above, the percentage of university degree holders increased from about 17.6% of employed Jordanians in 2000 to around 33% in 2022. This suggests that their share in the new labor force inflow is not only high but is rapidly increasing.

When comparing the percentage of those with a bachelor's degree or higher among the unemployed to the percentage of those with a bachelor's degree or higher among the Jordanian population, it becomes evident that the unemployment rates for these graduates have risen significantly. The following figure illustrates the percentages of the unemployed by educational attainment, with a sharp increase in the percentage of university degree holders in the period from 2000 to 2017, followed by stabilization. This is a result of changes in the workforce composition.

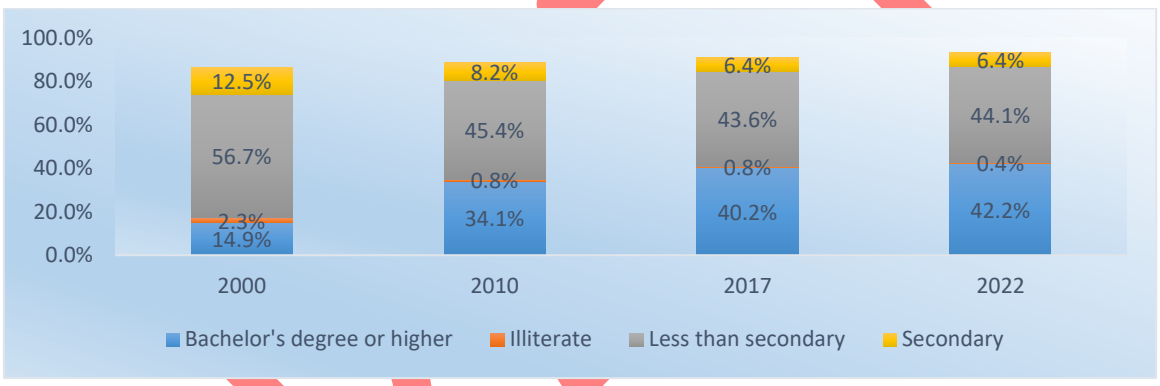


Figure (3): The Percentages of the Unemployed by Educational Attainment.

Source: Researcher's preparation based on DOS data.

STRUCTURAL TRANSFORMATION IN JORDAN

Figure (4) below illustrates the relative labor productivity (index, total average =1) in the main production sectors (agriculture, industry, services) in Jordan during the period 1990-2022."

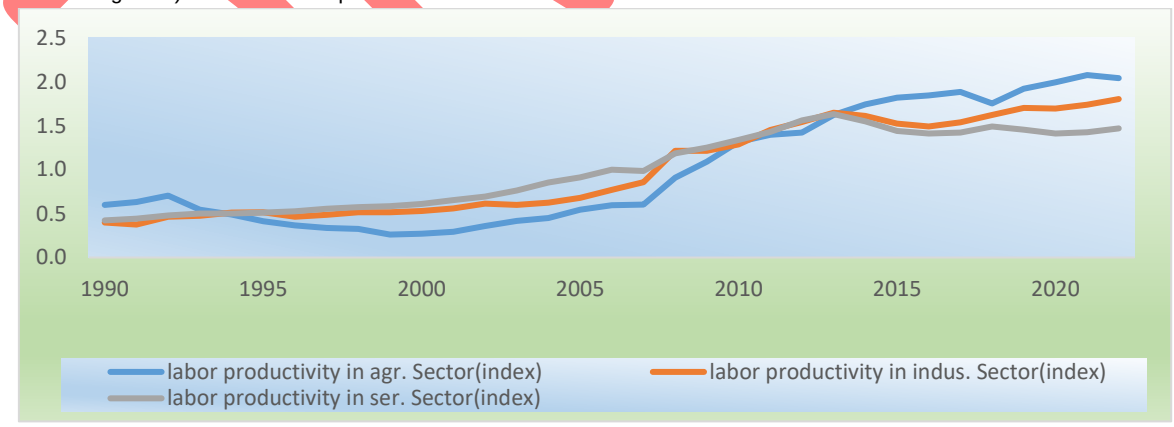


Figure (4): The Productivity of Labor by Sectors During the Period 1990-2022.

Source: Researcher's preparation based on WB data.

From Figure (4), it is evident that labor productivity in the agriculture sector had the highest fluctuations during the research period. Initially, productivity was highest in the agriculture sector, but it declined during the period 1994-2000, gradually rising again during the period 2014-2022. In contrast, productivity in the industry and services sectors fluctuated to a lesser extent, remaining at a similar level to each other. This is indicative of structural shifts from the agriculture sector to industry and services and vice versa during periods when productivity in the agriculture sector declined. The relationship between productivity in different sectors can be explained by the movement of labor from one sector to another. When labor shifts from the agricultural sector to another sector, productivity in the agricultural sector gradually increases, while productivity in the other sector decreases correspondingly.

To highlight the differences and variations in the production sectors during the study period, the coefficient of variation for labor productivity in each sector was calculated every five years and compared to the average labor productivity after converting it into an index over the same period. The results are shown in Figure (5):

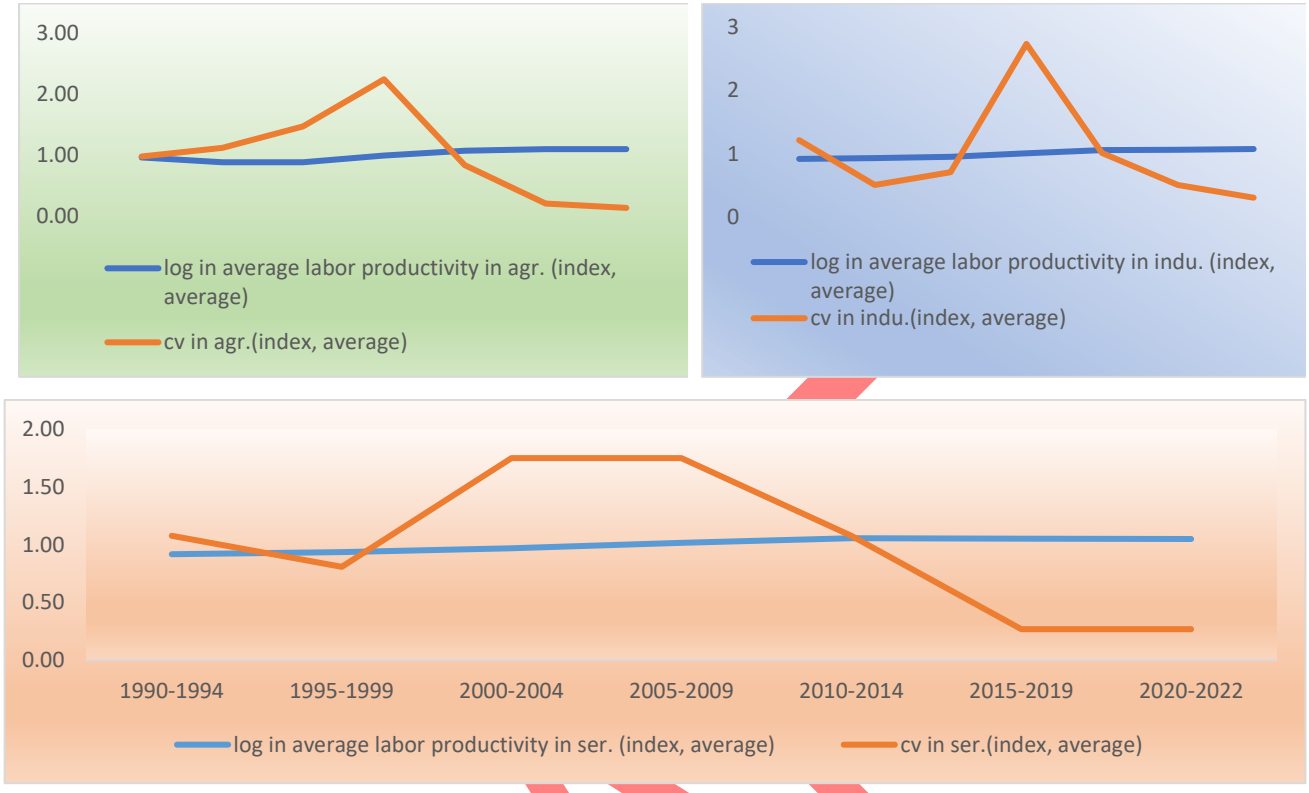


Figure (5): Inter-Sectoral Productivity Gaps and Average Labor Productivity.
Source: Source: Researcher's preparation based on WB data.

It is noticeable that the general behavior between the CV and the average productivity is somewhat similar in the industry and services sectors and slightly different in the agriculture sector. This may indicate that labor productivity is associated with other economic factors beyond structural transformation, and it is more likely to be linked to economic crises and general challenges facing the Jordanian economy.

Figure (6) illustrates the percentage of employment in each sector as a share of total employment during selected years. It is evident that the service sector has the highest employment percentage, ranging between 0.7-0.8, while the industrial sector's employment percentage ranged between 0.2-0.25, As for the agriculture sector, it ranged between 0.03-0.04. The relative stability in the employment percentage in the sectors compared to the changes in productivity mentioned above indicates that the change was in the values of production that affected productivity, rather than in the proportions of workers in the sectors as a share of total employment. This suggests that there is no clear evidence of the impact of structural change on employment in Jordan.

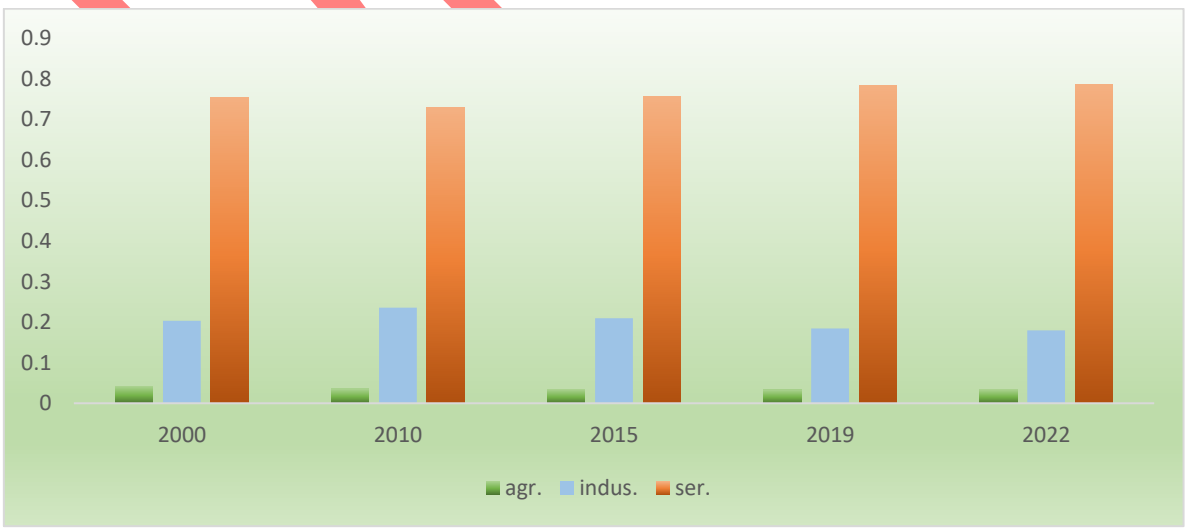


Figure (6): Employment in Sectors.
Source: Researcher's preparation based on WB data.

To clarify labor productivity for the selected years in the previous figure and compare it among the sectors, productivity was calculated and converted into an index and shown in Figure (7).

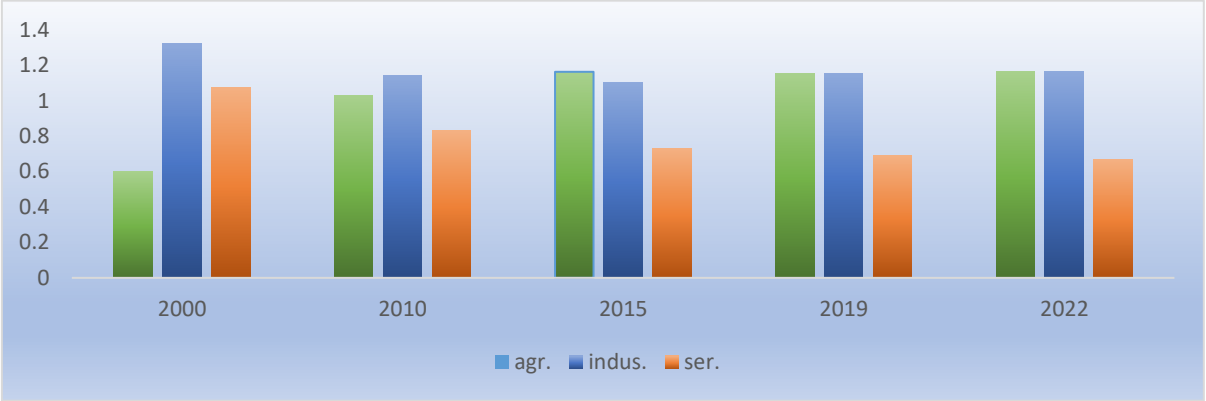


Figure (7): Labor Productivity (index, total average=1).
Source: Researcher's preparation based on WB data.

METHODOLOGY AND ECONOMETRICS ANALYSIS

As mentioned before the econometric model developed based on economic literature and theory related to structural transformation and is fully capable of assessing the relationship between structural transformation and employment in Jordan. Particularly the model follows closely the model used in the study by Yao & Zhu (2021), and can be written for each sector as follows:

Log Lt = β1 logY t + β2 (logY t × Ijt)+ β3 logI t+ ε t ..... (1)

Where: L t: Total employment in sector year t. Y t: Total output in the sector during year t. I t: The current share of the sector in total employment in year t. ε t: error term.

The model parameters will be estimated for each major economic sector, in particular, it will be estimated for the agricultural sector (A), the Industrial sector (I), and the services sector (S). The three sectors' models to be estimated are:

1. LogLA t = β1 logY A t + β2 logY A t × IAt + β3 logI At+ ε At ..... (2)
2. logLI t = β1 logY It + β2 logY I t × IIt + β3 logI It+ ε It ..... (3)
3. logLS t = β1 logY S t + β2 logY S t × ISt + β3 logI St+ ε St ..... (4)

This model reflects the impact of labor movement across sectors over time and is known as the structural component. It considers that when workers move from a sector with low productivity to one with higher productivity. the employment shares in the first sector decrease and increase in the second sector, thus increasing overall labor productivity.

Before conducting any econometric analysis, it is essential to perform some preliminary tests including stationarity and cointegration to make econometric estimation results more accurate and credible.

Unit Root Test

The augmented Dickey-Fuller test is used to test variables' stationarity; the results of the test are shown in Table (1). It is evident that all variables are non-stationary at levels but become stationary at the first difference at the 5% significance level. The computed t-values in the Dickey-Fuller test are greater than the critical values after taking the first difference, indicating the rejection of the null hypothesis (a unit root exists at the first difference), which means that the time series are integrated of order 1 (I (1)).

Table (1): ADF Test Results.

variable	t values	values			
		%1	%5	%10	
Log LA	-4.412818	-3.66166	-2.96041	-2.61916	1st difference
Log LI	-3.210314	-3.661661	-2.960411	-2.61916	1st difference
Log Ls	-2.979215	-3.661661	-2.960411	-2.61916	1st difference
Log Ya	-3.152923	-3.661661	-2.960411	-2.61916	1st difference
Log YI	-4.387113	-3.661661	-2.960411	-2.61916	1st difference
Log YS	-5.516383*	-5.347598	-4.859812	-4.607324	1st difference
Log ya * ia	-5.880754	-3.661661	-2.960411	-2.61916	1st difference
Log yi * ii	-2.748133	-3.661661	-2.960411	-2.61916	1st difference
Log ys * is	-2.886928	-3.661661	-2.960411	-2.61916	1st difference
Log Ia	-7.197466	-3.661661	-2.960411	-2.61916	1st difference
Log Ii	-2.567982**	-2.641672	-1.952060	-1.610400	1st difference
Log Is	-3.010089	-3.661661	-2.960411	-2.61916	1st difference

* The variable became significant at the first difference after taking Unit root with break test
** The variable became significant at the first difference after including "None" in the test equation
Source: Researcher calculation using EVIEWS software

The time series is non-stationary at its level and becomes stationary after taking the first difference. This indicates that they are integrated of order one, I (1), making the possibility of a long-run equilibrium relationship highly likely between the variables. To achieve this, the Autoregressive Distributed Lag (ARDL) self-regression approach is employed using the Bound Test proposed by Pasaran et al. (2001).

Lag Length Selection and Co-Integration Tests

After conducting the necessary tests to determine the optimal number of time lags (LLST), it was found that there are two lag periods, as indicated by the results in Table (2).

Table (2): Lag Length Selection results.

Lag	AIC		
	Agriculture's Models	Industry's Models	Service's Models
0	-14.15009	-11.59391	-12.95332
1	-23.92810	-21.40820	-26.02835
2	-26.26720*	-23.90954*	-31.27810*

Source: Researcher calculation using EVIEWS software
(AIC): Akaike Info Criterion

There are several tests available to assess co-integration, such as the Johansen and Juselius (1990) test and the Engle and Granger (1987) test. The latter is used in models with two variables, one being independent and the other dependent. In contrast, the former is used in multivariate models with two or more variables. Both tests require that all variables in the model are integrated to the same degree or order. However, these tests can sometimes yield misleading and non-realistic results when the sample size is small, for example.

To address these limitations and provide more flexibility, the Autoregressive Distributed Lag (ARDL) methodology, as introduced by Pesaran et al. in 2001, is used. This model is known for its versatility and can be employed when the data is stationary at level I (0), stationary at first difference I(1), or a combination of both (I(0)/I(1)). This flexibility makes the ARDL approach a valuable econometric tool for analyzing relationships between variables in various contexts.

Bound – Test

The time series data was non-stationary at its level and became stationary after taking the first difference. This suggests that it is integrated to the first degree, I (1), which makes the possibility of a long-run equilibrium relationship between the variables quite likely. To test for cointegration, the Autoregressive Distributed Lag (ARDL) method was employed, using the Bound Test proposed by Pesaran et al. (2001).

Table (3): The results of applying the bound cointegration test.

Bound Test								
Models	F cal.	%1		%5		%10		K=6
		I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	decision
Agriculture's Models	5.64	2.88	3.99	2.27	3.28	1.99	2.94	Co-integration
Industry's Models	22.11	2.88	3.99	2.27	3.28	1.99	2.94	Co-integration
Service's Models	9.35	2.88	3.99	2.27	3.28	1.99	2.94	Co-integration

Source: Researcher calculation using EVIEWS software.

The results of the bound test in Table (3) indicate that the variables have long-term relationships in the three sectors. This is inferred by comparing the computed F-statistic with the critical values, which allows us to reject the null hypothesis (no co-integration), signifying the presence of co-integrating relationships at a statistically significant level.

Estimating Long-Term Elasticities

Since the variables have exhibited co-integration, this suggests the presence of a long-term equilibrium relationship between these variables. We estimated the long-term elasticities using the Autoregressive Distributed Lag (ARDL) model, and the results are shown in Table (4):

Table (4): Estimated Long-Run Coefficients using ARDL, 1990-2022.

Agriculture's Models				
Dependent variable LL_a			**ARDL, Akaike criterion (AIC)**	
variables	**coefficient**	**St. error**	**t- statistic**	Prob.
LY_a	2.218822	0.689629	3.217412	**0.0041**
LY_a*i_a	-49.17433	16.78086	-2.930383	**0.0080**
Li_a	10.13685	3.905534	2.595509	**0.0169**
Dum1	-0.398589	0.137508	-2.898651	**0.0086**
Dum2	-0.501290	0.183561	-2.730918	**0.0125**
Dum3	-0.619790	0.252033	-2.459160	**0.0227**
intercept	28.80062	12.48965	2.305959	**0.0314**
R-squared	0.751024	Durbin Watson stat.		**1.593850**
Adjusted R-squared	0.733240	**CointEq(-1)***		**-0.269359**
Industry's Models				
Dependent variable LL_i			**ARDL, Akaike criterion(AIC)**	
variables	**coefficient**	**St. error**	**t- statistic**	Prob.
LY_i	0.477276	0.196517	2.428673	**0.0318**
LY_i*i_i	0.499584	0.919974	0.543041	**0.5970**
Li_i	-1.020912	1.660558	-0.614800	**0.5502**
Dum1	-0.240926	0.027992	-8.606843	**0.0000**
Dum2	-0.339768	0.027928	-12.16565	**0.0000**
Dum3	-0.442695	0.037567	-11.78427	**0.0000**
intercept	-6.824040	2.583693	-2.641196	**0.0215**
R-squared	**0.977074**	Durbin Watson stat.		**1.952255**
Adjusted R-squared	**0.963801**	**CointEq(-1)***		**-0.722004**

Service's Model				
Dependent variable LL_s			ARDL, Akaike criterion(AIC)	
variables	**coefficient**	**St. error**	**t- statistic**	**Prob.**
LY_s	-1.406824	0.502994	-2.796898	**0.0115**
LY_s*i_s	2.517862	0.656273	3.836609	**0.0011**
Li_s	-15.05267	4.616631	-3.260531	**0.0041**
Dum1	-0.108634	0.037837	-2.871080	**0.0098**
Dum2	-0.183946	0.041839	-4.396495	**0.0003**
Dum3	-0.210789	0.061913	-3.404580	**0.0030**
intercept	-8.027538	1.245561	-6.444917	**0.0000**
R-squared	0.867298	Durbin Watson stat.		**2.520558**
Adjusted R-squared	0.846882	**CointEq(-1)***		**-0.565762**

Source: Researcher calculation using EVIEWS software

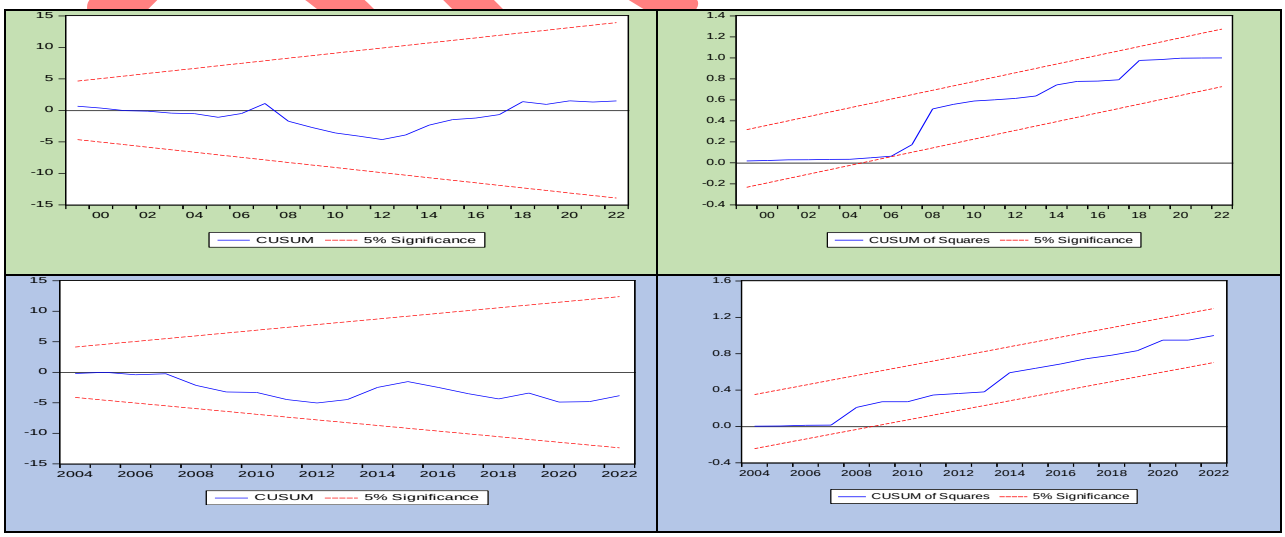
There exists a long-term equilibrium relationship between structural transformation and employment fluctuations. The value of R2 reached 0.75, 0.98, and 0.87 in the agriculture, industry, and services models, respectively. It should be noted that three dummy variables were included to distinguish the effects of the crises that the economy faced and their role in affecting employment. DUM1 refers to the financial crisis, DUM2 represents the Arab Spring, and DUM3 corresponds to the COVID-19 pandemic. All of them had a significant impact on all three models. As for the main research variable (LY), it was statistically significant in all models, but it varied in terms of magnitude and direction. Its impact was positive in the agricultural model, with an elasticity of approximately 2.2%, which is the highest among the models. In contrast, in the industrial model, it was around 0.48%, indicating that a 1% increase in production leads to a 2.2% increase in employment in agriculture and a 0.48% increase in the industrial sector. This implies that an increase in production leads to an increase in employment opportunities. As for the relationship in the services model, it is negative, which means that a 1% increase in production leads to a decrease in employment opportunities by 1.4%. This could be attributed to several factors, one possible explanation is the adoption of automation or technological advancements in the services sector, which can lead to increased efficiency and productivity and hence reduce the need for a large workforce. Alternatively, it could reflect a scenario where the demand for certain services does not necessarily increase proportionally with production, resulting in a negative impact on employment opportunities.

The error correction term was negative and less than one for all three sectors' assuming the existence of a partial correction mechanism. The absolute value of this coefficient indicates the degree of disequilibrium in the previous period that is corrected in a subsequent period. This ratio was 26.9% in the agriculture model, 72.2% in the industry model, and 56.6% in the services model, which indicates the proportion of the disequilibrium gap that was corrected in one period.

CUSUM AND CUSUM of Squares test

To test structural changes in the models, we will use the Cusum test. The results of this test are in the form of a curve of errors in the model resulting from estimating the Autoregressive Distributed Lag (ARDL) over the study period. If the curve stays within the critical boundaries throughout the study period, the parameters of this model are stable during that period, allowing us to make estimations without the need to break the period into segments. However, if the curve crosses the critical boundaries, it necessitates dividing the period into sub-periods, ensuring that these sub-periods are stable (Brown et al, 1975).

After conducting a test, it became evident from the results that there is no need to partition the research period into sub-periods.



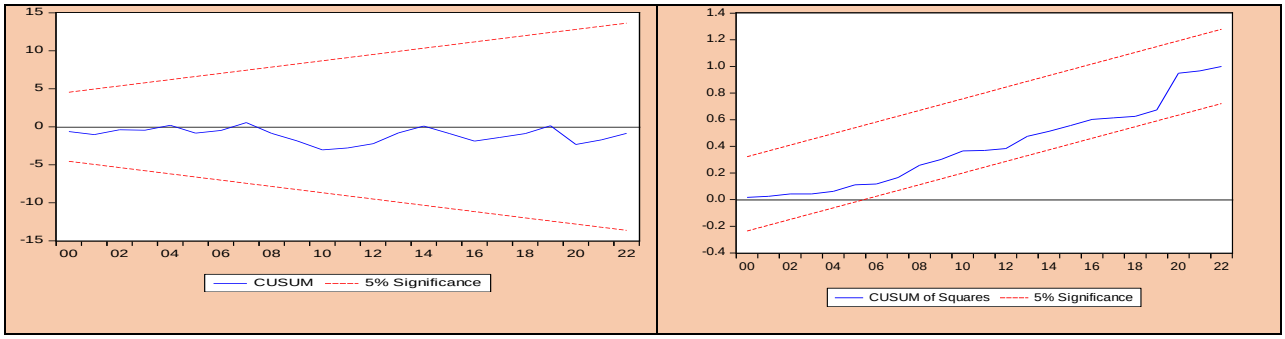


Figure (8): CUSUM AND CUSUM of Squares Results.
Source: Researcher calculation using EVIEWS software.

Diagnostic Test

To ensure that the model is free from common issues (autocorrelation, heteroscedasticity), appropriate diagnostic tests were conducted.

equations	test	Test statistic	Prob.
Agriculture's Models	Serial correlation test	F- Cal.=1.20	**32.24%**
	Heteroskedasticity test	F- Cal.=2.23	**6.24%**
Industry's Models	Serial correlation test	F- Cal.=0.22	**80.66%**
	Heteroskedasticity test	F- Cal.=0.63	**81.66%**
Service's Models	Serial correlation test	F- Cal.=1.82	**19.30%**
	Heteroskedasticity test	F- Cal.=2.01	**8.68%**

Table (5): Econometric diagnostic test results.
Source: Researcher calculation using EVIEWS software

From the previous table, we can observe that the probability values for the F-statistic are greater than 5% in all three models for both tests. This implies the acceptance of the null hypothesis (no autocorrelation between errors and constant error variance).

CONCLUSION

The cyclical behavior of employment varies significantly among economic sectors as well as over time, i.e., during the period from 1990 to 2022. This variation conceals cyclicality in the sectoral-level characteristics, with differences attributed to sectoral side effects, leading to a redistribution of labor between sectors. The research highlights several key findings. First, it identifies long-term equilibrium relationships between structural transformation and employment fluctuations. Secondly, the main research variable total production (LY), was statistically significant in all models, but it varied in terms of magnitude and direction. Thirdly, the results show that the impact of financial crises, Arab sprig, and COVID-19 regarding the impact of structural transformation on employment was negative as indicated by the significant and negative dummy coefficients.

Based on the results, given that the agriculture and industry models exhibit positive relationships between production and employment, it's advisable to prioritize these sectors for employment generation. Policies and investments aimed at increasing production in these sectors can help create more job opportunities. Policymakers and businesses should embrace technology to increase productivity in the services sector but also consider measures to reskill or retrain workers in this sector for alternative roles. Interventions within the agricultural sector can exert a significant influence on employment. Therefore, government policies should give special attention to this sector, particularly in terms of training, modernization, and support for agricultural activities.

Disclosure Statements

- **Ethical approval and consent to participate:** The commonly accepted laws have been applied.
- **Availability of data and materials:** There are no surveys or appendices except for the model estimation data, which is available upon your request and need. These data are published on official websites and available on the pages of those sources, as mentioned in the data sources in the text.
- **Author contribution:** The research is the result of a joint effort by the student Omar and Professor Dr. Taleb. A clear and strong guide to the research topic was provided through conducting econometric analysis and reaching valuable results that significantly contributed to achieving the research objectives and addressing the study's problem.
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مجلة جامعة النجاح للأبحاث – ب

العلوم الإنسانية

التحول الهيكلي واتجاهات التوظيف في الأردن

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تاريخ التسليم: (2023/12/13)، تاريخ القبول: (2024/6/17)، تاريخ النشر: ××××

مخطوطة مقبولة، قيد الطباعة

الملخص: تشير التجربة التاريخية إلى أن تحسن التوظيف وظروف العمل ليس ممكنًا دون تحولات هيكلية في الاقتصاد، ومن خلال هذه التحولات، يمكن نقل العمالة الزائدة في القطاعات والأنشطة غير الرسمية إلى أنشطة اقتصادية ذات إنتاجية أعلى. تم في هذه الورقة البحثية تحليل اتجاهات العلاقة بين التحول الهيكلي والتوظيف في الأردن خلال الفترة 1990-2022، ويسلط البحث الضوء على العديد من النتائج الرئيسية من التحليل. أولاً، يحدد العلاقات التوازنية طويلة الأمد بين التحول الهيكلي وتقلبات التوظيف. ثانياً، إن متغير البحث الرئيسي إجمالي الإنتاج (LY) له دلالة إحصائية في جميع النماذج، لكنه اختلف من حيث المقدار والاتجاه، كان تأثيره إيجابيًا في النموذج الزراعي والصناعي، بمرونة تقدر بحوالي 2.2% و 0.48% على التوالي، أما في قطاع الخدمات فقد بلغ معامل إجمالي الإنتاج سالب 1.4%. ثالثاً، تظهر النتائج أن تأثير الأزمات المالية والربيع العربي وجائحة كوفيد-19 على دور التحول الهيكلي في التوظيف كان سلبيًا كما تشير إليه معاملات المتغير الوهمي ذات القيم السالبة.

الكلمات الدالة: الأردن، التحول الهيكلي، التوظيف، الإنحدار الذاتي للإبطاءات الموزعة.

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