



THE DETERMINANTS OF LABOR DEMAND IN ALGERIA: AN ARDL APPROACH (1990-2018)

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Abstract: *One of the challenges facing the active category in Algeria is the lack of employment opportunities. If the labor supply exceeds labor demand, unemployment will result. The labor supply is largely controlled by demographic factors. Labor demand is influenced by determinants that can be controlled or managed. In this research paper, we tried to find the most determinants of labor demand in Algeria during the period 1990-2018. In the short and long-run, the most results did not differ from economic theory (except wage). We found that all the determinants in the model have a positive correlation with labor demand except public investment.*

JEL classification: J23, C13.

Key words: Labor demand; Determinants of labor demand; Econometric study; Algeria.

1. INTRODUCTION

The labor market is one of the most important economic markets; it has a great impact on the other markets. It is also the field in which there are different conditions facing the supply and demand labor. The study of the labor market is considered one of the most important economic topics because it is related to the problem of unemployment and its negative impact on the economy. Unemployment is an economic phenomenon that has started to emerge with the development of industry. It has become a normal phenomenon in any economy. It is difficult to reach the full employment level of all members of the labor force and this becomes a serious problem for all people. Unemployment is defined as: "voluntary or involuntary interruption of a certain number of the labor force, despite the ability and willingness to work"(Wasef & Hussein Al-Refai, 1999, p. 265). Unemployment is considered one of the most important economic and social problems. Therefore, research into the causes and



methods of confronting them occupies an important position in economic thought, in his different schools, in order to try to find appropriate solutions. The classic school saw that the national economy is always equilibrated at the level of full employment. If unemployment is found, it will be voluntary.(El-Leithy & al, 1997, p. 253). Marxist thought criticized classical thought. For him, unemployment is caused by an increase in population size and technology developments (El-Sherif Elman, 1994, p. 105). Keynes considered that there is not necessarily equilibrium in the labor market at the level of full employment. The equilibrium can be achieved at different levels under the full employment level. This equilibrium is linked to the total effective demand. Therefore, the concept of unemployment is mainly related to the low level of total effective demand (Majeed Al-Musawi, 1999, p. 338). Unemployment in monetarism thought is due to increased state intervention in the economy, which has reduced the efficiency of the price mechanism in the labor market in order to achieve full employment. (Zaki, 1997, p. 388). Unemployment in many countries became complex problems, which may have toppled some governments. Demonstrations, violence and revenge are directed against rulers and capitalists, who are responsible for the unemployed. Statistics show that tens of millions of unemployed people around the world are young people, thus suffering from poverty and deprivation and inability to take responsibility for their families. There are many researches and studies that focused on the excess of labor supply and neglect labor demand done by the productive sector. If the determinants that explain and control the demand for labor are identified, we can find solutions to these imbalances. Algeria, like other countries, suffers from this phenomenon. Many studies have shown that increasing of labor supply, especially from the outputs of education has exacerbated the problem of unemployment (demographic problem). It is important to identify the factors affecting labor demand, in order to measure the impact and nature of the relationship between these determinants and the labor demand to identify appropriate economic policies to alleviate the problem of labor market imbalance.

Through this, we raise the following problem:

What are the most important determinants of labor demand in Algeria?

This study is one of the few topics that touched the field of labor demand, while there are many studies that dealt with labor supply. This study also identifies the most important determinants of labor demand for the development of appropriate policies by the public or



private sectors. The period between 1990 and 2018 was also chosen because from 1990 the Algerian economy moved to the capitalist system.

2. LITERATURE REVIEW

The labor demand represents "the total number of jobs available in economy in a country" (Haidar Abdul-Ali, 2011, p. 200) and is considered a derivative demand. The productive sector requires workers only to produce goods or services to sell its. Labor demand is linked to demand for goods and services. The producer in classical thought offers employment when the worker creates a profit, and avoids that if the last worker does not create a profit. In this case, we say that the producer achieved the greatest possible profit. So, we can say that the **marginal productivity** of the worker is equal to **the real wage**, according to the following equations: (Guennouni & al, 2016, p. 21)

$$\pi = R - C, \pi_{max} \implies \pi_m = 0 \left(\frac{\delta \pi}{\delta Q} = 0 \right) \implies R_m - C_m = 0 \implies R_m = C_m$$

$$P_{mL}P = w \implies \frac{\delta Q}{\delta L}P = w \implies \frac{\delta Q}{\delta L} = \frac{w}{P} \implies P_{mL} = W$$

π : profit, R : revenue, C : cost, π_m : marginal profit, R_m : marginal revenue, C_m : marginal cost.

The labor demand depends on many determinants, most importantly: (Al-Rasheed Mohamed Mustafa, 2017, pp. 37-43)

- *The wage*: The wage is one of the basic determinants of labor demand, whether for the classical or Keynesian model with negative effect.
- *The elasticity of substitution between employment and other factors*: positively affect the elasticity of demand and depends on the nature of the goods produced and the possibility of changing the production factors.
- *Demand level in the production market*: The increase in the demand for goods and services push the producer to increase the labor demand, but the total demand must be able to absorb the new production.
- *The elasticity of the productive sector*: If the productive sector is characterized by high elasticity, increasing demand in the goods and services market leads the sector to increase the labor demand in order to increase production.



- *Economic Growth*: Economic growth creates facilities that help supply response to demand changes.
- *Technology evolution*: Technology evolution is an important factor in determining labor demand. The relationship between them is negative.
- *Productivity of the worker*: The qualifications of the worker are one of the most important determinants of labor demand.
- *Investment*: Increasing the volume of investments (public or private) leads to increased labor demand.
- *Inflation*: Rising prices of produced goods leads to increased labor demand.

There are some studies directly addressed the determinants of labor demand, while there are researches that dealt indirectly with this subject:

- *Study of (Raquel & Mauricio, 2003)*: this study has analyzed the determinants of labor demand in Colombia's urban sector. The researchers based on own-wage elasticity as determinant of labor demand. They found that an elimination of the 9% of taxes could result in a 1,3% increase in employment in the urban areas. Also, a 10% reduction in labor costs could result in a 5% increase in labor demand.
- *Study of (Piekutowska, 2007)*: the researcher aimed at introduces the determinants of demand for foreign labor in Poland where is high rate of unemployment. For researcher, the Polish labor market is characterized by the structural qualification, intensity of emigration and the decline of number of people at the labor productivity age. This study found that immigrants contribute to the small growth of GDP and the qualifications are the most important factor in demand for foreign labor.
- *Study of (Issa Salim Batarseh, 2007)*: The researcher tried to analyze the determinants of labor demand in Jordan and to predict the future labor demand, using the multiple regression models and the SLS method. She has concluded that wage policy affects labor demand, qualifications are fundamental determinants of wage policy and the relationship between labor and capital is complementary.
- *Study of (Maleszyk, 2014)*: the researcher aimed to characterize labor demand in the Lubelskie region and some of it determinants. This study found that product market situation, rural areas and agriculture and the weaker position of the region's business sector are the most determinants of labor demand.



- *Study of* (Andreas, Andreas, & Sebastian, 2014): they conduct a comprehensive meta-regression analysis to re-evaluate the empirical literature on labor demand elasticity. Based on 942 elasticity estimates from 105 different studies, they found that the own-wage elasticity is the most frequently used determinant.
- *Study of* (Al-Rasheed Mohamed Mustafa, 2017): The researcher tried to clarify the determinants of labor demand by proposing an econometric model, consisting of labor demand as a dependent variable, and government spending, GDP, investment and inflation as independent variables. After using the ARDL model, the researcher found that there is a positive impact between the determinants and labor demand in the short and long run.

3. ECONOMETRIC STUDY

3.1. The Model

Assuming the linear relationship between the variables and by entering the logarithm, the model is written as follows:

$$\log L_d = C + \beta_1 \text{LogGDP} + \beta_2 \text{LogPINV} + \beta_3 \text{LogGINV} + \beta_4 \text{LogSALA} + \beta_5 \text{LogINF} + \varepsilon_i$$

Where:

L_d : Labor demand (as a proportion of the population over 15 years);

GDP: Economy growth rate;

PINV: Ratio of private investment to GDP;

GINV: Ratio of public investment to GDP;

SALA: Ratio of wage mass to GDP;

INF: Inflation;

C: Constant;

α_i : Parameters to be estimated (elasticity);

ε_i : Random error.



3.2. Unit Root Test

The study data were obtained from the World Bank Data base from 1990 to 2018 and we will use the unit root test (using PP test) on all model variables. The PP test depends on the lag length and it is 3 based on the partial auto-correlation function:

Tab.1-Unit Root Test

variables	Level		First difference	
	PP ^c	Prob	PP ^c	Prob
logL _d	1.52	0.96	-3.42	0.002
logGDP	-1.01	0.26	-6.64	0.000
logPINV	-0.26	0.57	-7.82	0.000
logGINV	0.69	0.85	-7.11	0.000
logSALA	-0.26	0.57	-4.33	0.00
logINF	-1.07	0.24	-13.52	0.00

Note: eviews 10 outputs

From the results of the stationary, we notice that all the time series are stationary after the first difference I(1). Therefore, since the all variables are cointegrate in the same class, we estimate the model using ARDL (Auto-regressive Distributed Lag models). Based on AIC, SC and HQ tests, the optimal lag length is 1.

3.3. Co-integration Test (Bound Test)

If the value of F-stat is greater than I(1) of critical values, we reject the null hypothesis. If F-stat is less than I(0) of critical value, we accept the null hypothesis. If the F-stat value is between I(0) and I(1) of critical values, we cannot decide.

Tab.2- Bound Test

F-statistics	8.55	
Signification	I ₀	I ₁
10%	2.08	3
5%	2.39	3.38
1%	3.06	4.15

Note: eviews 10 outputs

From Table 2, the calculated F statistic value (8.55) is greater than I(1) of critical values, so we reject the null hypothesis (H₀) and we accept the alternative hypothesis (H₁) (there is a long run relationship between independent variables and dependent variable).

3.4. ARDL Estimation

We estimated the model coefficients for the long and short-run. The results are shown in table 3 and 4:

**Tab.3- Long Run Estimation Results**

variables	Coefficients	T- statistic	prob
LOGGDP	0.08	1.16	0.08
LOGGINV	-0.21	-1.38	0.02
LOGPINV	0.01	0.15	0.07
LOGSALA	0.87	1.24	0.05
LOGINF	0.23	2.56	0.03
C	1.03	0.40	0.09

Note: eviews 10 outputs

Tab.4- Short Run Estimation Results

variables	Coefficients	T- statistic	prob
D(LOGGDP)	0.01	3.42	0.01
D(LOGGINV)	-0.15	-1.56	0.03
D(LOGPINV)	0.03	5.21	0.00
D(LOGSALA)	0.95	1.45	0.01
D(LOGINF)	0.01	3.94	0.00
ECT(-1)	-0.25	-10.54	0.00
R ²	0.90	F pro	0.00
R ² adj	0.87	DW	2.04

Note: eviews 10 outputs

From these results, we note that:

- Independent variables explain 87% of the dependent variable and the 13% are explained by other variables so there is a good explanatory of the model;
- Student test indicates that all the parameters of the model have a statistical significance in short and long-run;
- The model is statistically acceptable and this is demonstrated by the Fisher test where prob F-stat = 0 (<0.05);
- DW test indicates that there is no auto-correlation between errors;
- The error correction coefficient CointEq(-1) has a statistical significance and has a negative sign (-0.25). This negative signal confirms the convergence from the short-run equilibrium to the long-run equilibrium. It measures the percentage of imbalance in labor demand that can be adjusted from year to year by 25%.

For the estimated parameters, we find that:

- There is a significant positive impact of economic growth on labor demand in the short and long-run, the increase in economic growth by 1% leads to an increase in labor demand by 0.01% in short-run and by 0.08% in long-run;



- There is significant negative effect of public investment on labor demand in short and long- run, an increase in GINV by 1% leads to a decrease in labor demand by 0.15% in short-run and 0.21 in long-run;
- There is a significant positive impact of private investment on the labor demand in the short and long-run, the increase in PINV by 1% leads to an increase in labor demand by 0.03% and 0.01 respectively;
- There is a significant positive effect of mass wage on the labor demand in the both term, an increase in SALA by 1% leads to an increase in labor demand by 0.95% in short-run and 0.87% in long-run;
- There is a significant positive effect of inflation on the labor demand in the short and long run, an increase of 1% leads to an increase in the labor demand by 0.01% and 0.23%, respectively.

3.5. The Diagnostic Tests

In order to accept statistically the model, we must apply the following diagnostic tests:

Tab. 5- Diagnostic Tests

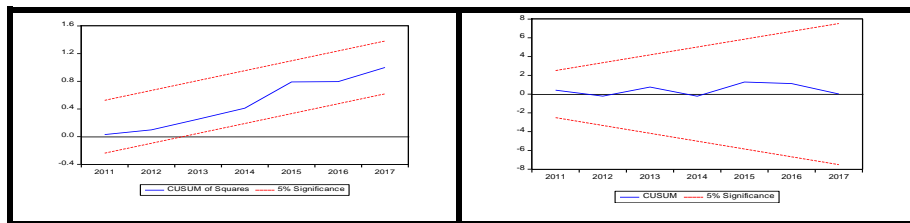
Tests	H0	F-stat	Prob
B-G Serial Correlation LM	There is no auto-correlation of residuals	2.34	0.14
Heteroskedasticity Test ARCH	stability of variance	2.65	0.12
Jarque-Bera Normality test	Residuals are normality distributed	0.20	0.90
Ramsey Reset Test	the model is correctly specified	0.20	0.65

Note: eviews 10 outputs

From these results of the diagnostic tests (all Prob>5%), we can confirm the following:

- There is no auto-correlation of residuals;
- The variance is stable;
- The residuals are normality distributed;
- The model is correctly specified.

Through the structural stability test (CUSUM and CUSUM² test) the model is structurally stable.

Fig. 1 – CUSUM and CUSUM² Tests

CONCLUSIONS

Through the economic thought, there are many determinants have a positive impact on labor demand (economic growth, investments, inflation, etc.), while real wage (Classic thought) or nominal wage (Keynesian thought) has a negative impact on it. Many previous studies have shown this theoretical proposition, with a few differences. In this study, which was aimed to identify the most important determinants of labor demand in Algeria, we found that most of the results were statistically significant in short and long run. The results showed that the determinants had a different impact on labor demand. Economic growth had a positive impact on labor demand in short and long-run. This indicates that the accumulation of hydrocarbon revenues become a source of labor creation (that does not reflect the productive capacity of the economy). For public investment, it had a negative impact on labor demand in short and long-run; this is contrary to Keynesian theory. The majority of these investments go to public projects, housing, infrastructures...which depends on foreign companies that employ foreign employees. So the government must review the policy of dependence on foreign companies or require the employment of local labor to alleviate unemployment and gain experience. For private investment, it had a positive impact on labor demand. This explains that the private sector (an emerging sector) creates jobs (The service sector is the source number one in employment creation). So, the state must accompany this sector by overcoming all obstacles. The wage mass has a positive impact on labor demand (contrary to the economic theories), through large social transfers for the purchase of social peace, by creating non-permanent jobs in the public sector. This non-economic logic adopted by the government affects the resources of the treasury, while it is necessary to push the private sector to play this role. For inflation, it had a positive impact on labor demand (agree with the economic theory). In Algerian economy which depends on imported products, the increase in price leads to an increase in the distribution chain by the creation of new shops (absorption a part of unemployment). This



situation has a negative impact on the economy growth. In order to raise the productivity of the economy and create permanent jobs and contribute to economic growth, we must move from imported goods to local goods. So we can say that the economic growth and private sector are the most determinants of labor demand in Algeria.

CONFLICTS OF INTEREST AND PLAGIARISM

The authors declare that this paper:

- Is an original paper;
- It was written by the authors;
- The material of this paper was not published in any other publication;
- The paper does not contain statements which do not correspond to reality.

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