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Labor Market in Algeria: The Determinants of Labor Demand during (2000-2018) -Econometric Study-

سوق العمل في الجزائر: محددات الطلب على العمل خلال (2000-2018)

- دراسة قياسية -

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Abstract:

One of the challenges facing the active category 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 study, we tried to find the nature of the relationship between these determinants and the labor demand in Algeria during the period 2000-2018. In the long run, the results did not differ from economic theory, except public investment.

Key Words:

Labor market; labor demand; determinants of labor demand; econometric study.

الملخص:

من بين التحديات التي تواجه القوة العاملة هو نقص فرص العمل، حيث إذا تجاوز عرض العمل الطلب عليه نتجت البطالة. يعتبر النمو الديمغرافي من أهم محددات عرض العمل، بينما تتحكم في الطلب على العمل مجموعة من المحددات يمكن مراقبتها و التحكم فيها.

من خلال هذه الدراسة حاولنا إيجاد طبيعة العلاقة بين هذه المحددات و الطلب على العمل في الجزائر خلال الفترة 2000-2018. وجدنا أن النتائج كانت موافقة للنظرية الاقتصادية في المدى الطويل ما عدا الاستثمار العمومي.

الكلمات المفتاحية:

سوق العمل؛ الطلب على العمل؛ محددات الطلب على العمل؛ دراسة قياسية.

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Introduction:

The labor market is one of the most important economic markets; it has a great impact on other markets. It is also the field in which there are different conditions facing supply and demand of 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 the 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, 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 the inability to take responsibility for their families.

Some 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?

To answer this problem we ask the following questions:

- What's means labor demand and how is it function derived?
- What are the most important determinants of labor demand?
- What is the nature of the relationship between these determinants and labor demand?

This study is one of the few topics that touched on labor demand, while many studies 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 2000 and 2018 was also chosen because it was characterized by political and economic stability.

Literature review:

Labor demand definition:

The labor demand represents "the total number of jobs available in the 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)

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

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

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

Determinants of labor demand:

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. The classic believes that the low

real wage can eliminate unemployment, because it has an inverse relationship with labor demand. Keynes believes that nominal wage is the only factor affecting employment if demand in the goods and services market can absorb the increase in production resulting from increased employment.

- *The elasticity of substitution between employment and other factors:* positively affects 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. The high reliance on technology leads to a reduction in employment opportunities.

- *The productivity of the worker:* The qualifications of the worker are one of the most important determinants of labor demand. The productivity of the worker is strongly related to his ability to participate in the production process.

- *Investment:* Increasing the volume of investments (public or private) leads to increased labor demand.

- *Inflation:* Increased inflation (rising prices of produced goods) leads to increased labor demand

Previous studies:

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

Foreign studies

- *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 elasticities as a determinant of labor demand. They found that

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 a high rate of unemployment. For researcher, the Polish labor market is characterised by the structural qualification, intensity of emigration and the decline of the 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* (Maleszyk, 2014)*:* the researcher aimed to characterise 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 elasticities. Based on 942 elasticity estimates from 105 different studies, they found that the own-wage elasticity is the most frequently used determinant.

Arabic studies

- *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* (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.

- *Study of* (Majahdi, 2018)*:* The researcher tried to modeling the balance of the labor market by proposing a model consisting of the function of labor demand and labor supply. The labor demand was dependent on many determinants as real wages, real GDP and total investment. The researcher applied the 2SLS method. The results obtained were consistent with economic theory, where there was an inverse relationship between real wages and labor

demand, while a positive relationship was found between real GDP and total investment and labor demand.

Method (econometric study):

The model:

The formulation of the econometric model is one of the most important and most difficult stages of the study. It is necessary to determine the variables that must be included in the model or that must be excluded from it. Based on previous and theoretical studies, the model can be written as follows:

$$L_{dt} = f(GDP_t, PINV_t, GINV_t, SALA_t, INF_t)$$

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.

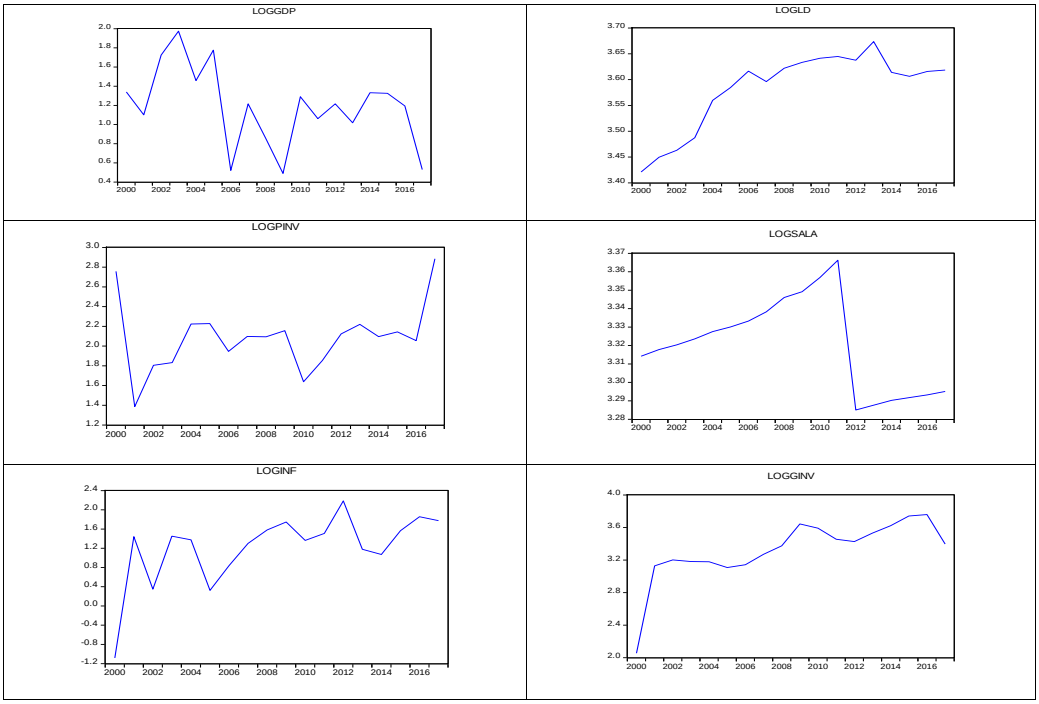
INF: Inflation.

C: constant, α_i: parameters to be estimated, εi: random error

Study data:

The study data were obtained from the World Bank, from 2000 to 2018. The following diagram shows the evolution of model variables during this period:

Figure N° 1: Evolution of variables



Source: Eviews 10 outputs

Through the graphical representation of the variables we show that there is a trend so these variables are not stationary in level.

Stationary of variables:

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 defined as a zero based on the partial auto-correlation function. The following table summarizes the PP test:

Table N° 1: PP test of stationary

variables	Level		First difference	
	PP^c	**Prob**	**PP^c**	**Prob**
$logL_d$	1.52	0.96	-3.42	0.002
logGDP	-1.01	.026	-6.64	0.000
logPINV	-0.26	.057	-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

Source: Eviews 10 outputs

From the results of the stationary we notice that all the time series are stationary after the first difference. Therefore, since all variables are cointegrate in

the same class (I (1)) we estimate the model using ARDL (Auto-regressive Distributed Lag models) presented by Pesaran and Al (2001). The ARDL is based on the optimal lag length, and in order to facilitate economic interpretation, we based on lag length 0.

The ARDL methodology for co-integration differs from other co-integration methods by applying the bounds test whether independent variables are I (0) or I (1). The only condition for applying this test is that there is no variable in I (2). ARDL can be applied in case if the sample size is small and this is the reverse of most traditional co-integration tests that require a large sample size to be more efficient results.

Co-integration test (bounds test):

The co-integration according to Pesaran and Al (2001) in the ARDL models is based on the null hypothesis test that there is no co-integration between the model variables (H0) and the alternative hypothesis that there is a co-integration between the model variables (H1).

If F-stat is greater than the upper limit of critical values, we reject the null hypothesis. If F-stat is less than the minimum limit of critical value, we accept the null hypothesis. If the F-stat value is between the upper and the minimum limit of critical values proposed by Pesaran and Al (2001), we cannot decide. The following table summarizes the bounds test:

Table N° 2: Bounds test

k	**value**	
5	8.55	**F-statistics**
critical value		
I_1	**I_0**	**Signification**
3	2.08	10%
3.38	2.39	5%
4.15	3.06	1%

Source: Eviews 10 outputs

From Table 2, the calculated F statistic value (8.55) is greater than the upper limit of critical values, so we reject the null hypothesis (H0) and accept the alternative hypothesis (H1).

Estimating the model using ARDL:

After confirming that there is a co-integration between independent variables and labor demand, we estimated the model coefficients for the long and short-run. The results are shown in table 3 and 4:

Table N° 3: long-run estimation results

variables	Coefficients	T- statistic	prob
LOGGDP	0.08	1.16	0.28
LOGGINV	-0.21	-1.38	0.20
LOGPINV	0.01	0.15	0.87
LOGSALA	0.87	1.24	0.25
LOGINF	0.23	2.56	0.03
C	1.03	0.40	0.69

Source: Eviews 10 outputs

Table N°4: short-run estimation results (ECM)

variables	Coefficients	T- statistic	prob
D(LOGGDP)	-0.01	-3.42	0.01
D(LOGPINV)	-0.03	-5.21	0.00
D(LOGINF)	0.01	3.94	0.00
ECT(-1)	-0.25	-10.54	0.00
Statistical indicators			
R^2	0.90	AIC	-6.22
R^2adj	0.87	SC	-6.03
F pro	0.00	HQ	-6.20
DW	2.84		

Source: Eviews 10 outputs

Through the results obtained, we note that:

- Independent variables explain 97% of the dependent variable and the 3% are explained by other variables so there is a good explanatory power of the model;

- Student test indicates that all the parameters of the model have a statistical significance in the short run, but in long run all the parameters are not significant except INF;

- 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 negative impact of economic growth on labor demand in the short run, the increase in economic growth by 1% leads to a decrease in labor demand by 0.01%, while there is a not significant positive effect in the long run, the increase in economic growth by 1% leads to an increase in labor demand by 0.08%;

- There is a significant negative impact of private investment on the labor demand in the short run, the increase in PINV by 1% leads to a decrease in labor demand by 0.03%, while in the long run there is not significant positive effect, the increase of investment by 1% lead to an increase in labor demand by 0.01%;

- There is not significant negative effect of public investment on labor demand in long run, an increase in GINV by 1% leads to a decrease in labor demand by 0.21%, while in the short run there is no relationship between them;

- There is not significant positive effect of mass wage on the labor demand in long run, an increase in SALA by 1% leads to an increase in labor demand by 0.87%, while in the short run there is no relationship between them;

- 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.

The quality of the model:

In order to study the quality of the model, we apply the following diagnostic tests:

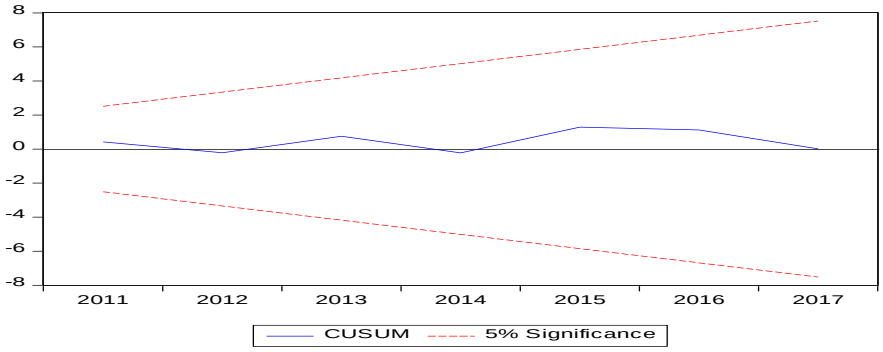
Table N°5: Results of diagnostic tests of the model

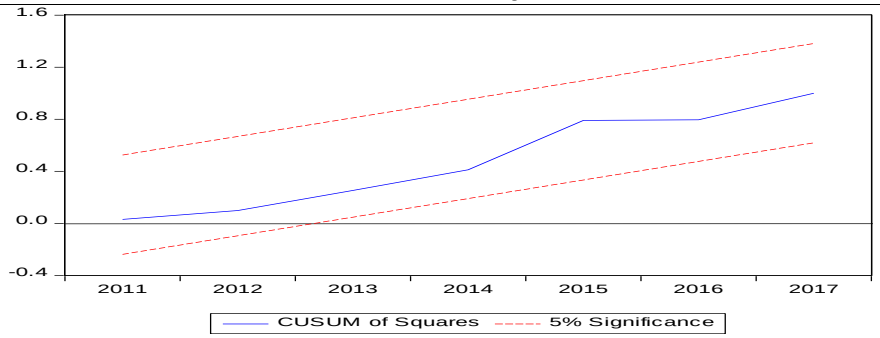
Breusch-Godfrey Serial Correlation LM Test			
Null hypothesis (H0): There is no auto-correlation of residuals			
0.14	Prob F (2,13)	2.34	F-statistique
Heteroskedasticity Test ARCH			
Null hypothesis (H0): stability of variance			
0.12	Prob F (1,14)	2.65	F-statistique
Normality test Jarque-Bera			
Null hypothesis (H0): Residuals are normality distributed			
0.90	Prob	0.20	Jarque-Bera
Ramsey Reset Test			
Null hypothesis (H0): the model is correctly specified			
0.65	Prob	0.45	t-statistique
0.65	Prob	0.20	F-statistique

Source: Eviews 10 outputs

From the table, the results of the diagnostic tests of the model confirm the following:

- The Serial Correlation LM test indicates that Fisher's probability 0.14 is greater than 5%, so we accept the null hypothesis; there is no auto-correlation of residuals;
- The heteroskedasticity test indicates that Fisher's probability 0.12 is greater than 5%, so we accept the null hypothesis; the variance is stable;
- The normality test indicates that Jarque-Bera's probability 0.65 is greater than the 5%, so we accept the null hypothesis; the residuals are normality distributed;
- Ramsey Reset test indicates that Fisher's probability 0.65 is greater than the 5%, so we accept the null hypothesis; the model is correctly specified.
- Structural stability test of the model (CUSUM and CUSUM^2 test) indicates that the model is structurally stable.





Analysis of results:

In this study, which was aimed to identify the relation and impact that could be between the most important determinants of labor demand (according to economic theory and previous studies) and the labor demand in Algeria, we found that most of the results were statistically significant in short run and not significant in the long run (except inflation). The results showed that there is a long run relationship between the variables and the determinants had a difference in the impact on labor demand.

We found that economic growth has a negative impact on labor demand in the short run, while it has a positive effect in the long run. This indicates that production processes in Algeria are not labor intensive because economic growth depends on one sector (hydrocarbon sector). In the long run, this growth (after the accumulation of hydrocarbon revenues) turns into a source of labor creation (that does not reflect the productive capacity of the economy).

For public investment, we find that it has a negative impact on labor demand in long run; this is contrary to economic theory. The majority of these investments go to public works projects, housing…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 workers to alleviate unemployment and gain experience.

For private investment, we found that it has a negative impact on labor demand in short run, while it has a positive effect in the long run. This explains that the private productive sector in Algeria is not flexible and it depends on projects that do not require intensive labor (an emerging sector). However, in the long run, it creates few jobs, which raises questions about the role of the state in accompanying this sector by overcoming all obstacles.

We also found that the wage mass has a positive impact on labor demand in long run, 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 was the only significant determinant that has a positive impact on labor demand (accord to the economic theory). The increase in inflation and in the prices of products leads to increase labor demand to raise production. In the 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 economic 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.

Conclusion:

In this work we have applied an econometric study of the most important determinants of labor demand. Through economic thought, there are many determinants that 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 our study, we found that there is a difference in the results between the short and the long run and in some cases does not agree with the economic theory (especially in the short run). In the long run, the determinants of labor demand in Algeria are consistent with economic theory and with the same effect (excluding public investments). However, the labor market in Algeria faces challenges such as the deterioration of the quality of employment and the informal sector.

In order to control the labor market by the state, it is necessary to adopt real policies to control the formal and informal sectors, based on the principle of decent jobs adopted by the International Labor Organization ILO, and this will be only by the real statistics of unemployment rates.

The Algerian economy has a major imbalance in its sectors. The service sector is the source number one in employment creation, while agriculture occupies the last position. Therefore, sectors must be organized to provide permanent and decent jobs through the creation of small and medium enterprises in all sectors of the economy (agriculture, industry, services).

In order to create jobs, the state must provide the right investment climate, industrial development, innovation and entrepreneurship, private sector development, education, social protection, etc.

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