Unemployment hysteresis: empirical evidence for the case of Mexico (2006-2023)

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Abstract

This paper aims to demonstrate that the dynamic properties of unemployment in Mexico can be explained from the point of view of hysteresis, showing that movements in demand caused unemployment rates to deviate from their long-term trend. Unit root tests were performed on two variables which allowed us to understand unemployment. First, in accordance with conventional literature, the unemployment rate was used. Then, following the post-Keynesian view, the percentage of installed capacity utilization was used. Based on the econometric results, we test the hysteresis hypothesis for the unemployment rate and suggest policies aimed at strengthening effective demand, thus increasing the percentage of installed capacity utilization to reduce unemployment levels in Mexico.

Keywords: unemployment dynamics; hysteresis, NAIRU; unit root tests; installed capacity.

INTRODUCTION

The Covid-19 pandemic and the war between Russia and Ukraine have significantly changed unemployment rates in countries. This situation continues to be of interest to researchers and society in general, as unemployment is one of the main challenges that must be addressed due to its potential to cause social damage.

In Latin America, the Covid-19 pandemic caused an unprecedented 8.2% decline in the employed population, the first documented decline since 1950, greater than that of developed and other emerging economies (ECLAC-ILO, 2022).

In Mexico, employment fell significantly during the pandemic compared to other Organization for Economic Cooperation and Development (OECD) countries. Due to vaccinations and the revival of domestic consumption, the unemployment rate had returned to pre-pandemic levels by July 2022, falling from a peak of 5.5% in June 2020 to 3.3% in July 2022. However, behind this apparent recovery in unemployment, issues remain, such as Mexico's high informal employment rate, which reached 56% in March 2022 (OECD, 2022).

Based on this scenario, we decided to analyze the problem of unemployment in Mexico in terms of its dynamic properties, specifically from the perspective of hysteresis –a term from electromagnetism in physics that refers to temporary causes with permanent effects. Economists introduced this concept to study unemployment, indicating that the rate of unemployment is a non-stationary process with a unitary root that never returns to equilibrium. This means that temporary shocks, whether positive or negative, have permanent effects on the rate of unemployment (O'Shaughnessy, 2011).

Due to the limited literature on this topic in the context of the Mexican economy, the primary objective of the analysis, as outlined by Ahedo García and Cruz (2023), is to determine whether the dynamic properties of unemployment in Mexico can be explained by hysteresis, considering the shifts in unemployment rates resulting from the pandemic and the war between Russia and Ukraine. If so, the next question is: What type of shock—supply or demand—diverted unemployment from its long-term trend? To answer this question, unit root tests were performed on two variables that provide insight into unemployment, first from the conventional perspective, based on the rate of unemployment, and second, from the post-Keynesian perspective in terms of idle productive capacity.

After the introduction, the second section presents conventional hypotheses that explain the dynamics of unemployment. The third section discusses post-Keynesian studies on unemployment hysteresis, introducing the debate on whether it responds to supply or demand shocks. The fourth section describes studies of unemployment hysteresis in Mexico. It analyzes the behavior of the unemployment rate and installed capacity utilization percentage to determine if the empirical evidence in Mexico indicates the hysteresis phenomenon and its causes. Finally, the last section presents conclusions and proposals regarding policies to reduce unemployment in Mexico.

2. EXPLANATIONS OF THE DYNAMICS OF UNEMPLOYMENT FROM A CONVENTIONAL PERSPECTIVE

From a conventional theoretical perspective, employment levels are determined in a labor market with the assumption of perfect flexibility and the absence of involuntary unemployment, i.e., the unemployed exist only due to frictional or structural reasons or by their own volition. Various arguments arise in this context that attempt to explain the dynamics of unemployment. These arguments generate a debate about whether the persistence of unemployment revolves around deviations from the natural rate and whether these deviations are permanent. The following arguments stand out: the natural rate of unemployment, the structuralist argument, the persistence argument, the reaction chain argument and the hysteresis argument. These arguments are discussed below.

The natural rate of unemployment

The natural rate of unemployment assumes that agents' decisions in the labor market regarding prices and wages are in equilibrium, thus clearing the market (Blanchard, 2009). This rate stems from an extended Phillips curve with adaptive inflation expectations as a trade-off exists between inflation and unemployment in the short term. However, in the long term, when expectations are met, there is no such trade-off because the economy settles at a rate of unemployment compatible with any rate of inflation. Consequently, the long-term Phillips curve would be vertical at this rate of unemployment. Friedman called this rate the Non-Accelerating Inflation Rate of Unemployment (NAIRU), which he defined as the absence of excess demand in each market or the fulfillment of all expectations. According to Friedman (1968), the NAIRU could be reduced by improving the availability of information regarding job vacancies and labor supply.

In summary, the NAIRU represents a unique long-term equilibrium; however, in the short term, depending on whether the economy is performing well or poorly, temporary deviations from this equilibrium may occur, causing unemployment to increase or decrease. Therefore, rates of unemployment are a stationary process of reversion to the mean, where shocks only have temporary effects (Ayala *et al.*, 2012).

The structuralist hypothesis

In this scenario, unemployment fluctuates around the NAIRU. However, changes in economic fundamentals, such as interest rates, exchange rates and labor market interventions through employment taxes or welfare benefits, can alter the equilibrium level of unemployment rates. This makes unemployment rates a stationary process subject to occasional, yet persistent, structural changes (Phelps, 1994 and 1995; Ayala *et al.*, 2012).

The hypothesis of persistence in rates of unemployment

According to the persistence hypothesis, after a shock, unemployment rates adjust slowly until they reach the long-term equilibrium rate again. This gives rise to non-stationary processes with long memory (Ayala *et al.*, 2012). Consequently, unemployment will rise persistently (Badagian *et al.*, 2001; Blanchard, 1988; Layard and Bean, 1989; Layard and Nickell, 1986; Malinvaud, 1982; Modigliani *et al.*, 1987; Phelps, 1995).

The chain reaction hypothesis

According to this hypothesis, short-term and long-term unemployment evolve together. First, it identifies the short-term adjustment mechanisms operating in the labor market. Then, it evaluates the persistence of the effects of temporary shocks. These shocks give rise to a chain reaction of lagged adjustments as they modify their trajectory through a network of complementary effects. This network is presented through a system of equations representing labor demand, wage setting and labor force participation. These equations are characterized by lags that exert a complementary influence on persistence. Finally, the hypothesis analyzes how variables outside the labor market interact with supply and demand adjustment processes and affect the long-term level of unemployment. This pushes unemployment rates away from equilibrium for extended periods (Leites and Porras, 2016; Henry *et al.*, 2000).

The unemployment hysteresis hypothesis

The term "hysteresis", from the Greek *hystérēsis* ("delay" or "deficiency"), was first applied in electromagnetism in physics. It indicates a system's dependence on its own history, consisting of transient causes with permanent effects (Bajo and Monés, 1996). This notion had been addressed by Schumpeter (1934), Haavelmo (1944), Samuelson (1968), Phelps (1972), Hargreaves Heap (1980), Johansen (1982), Weitzman (1982) and Diamond (1982), although they did not expressly use the term "hysteresis".

However, Blanchard and Summers (1986) were the first to apply the concept of hysteresis to unemployment. They explained why unemployment in the United States fell to pre-oil price crisis levels while Europe's unemployment remained higher. They modeled the behavior of insiders and outsiders separately and found that a temporary but relatively long-lasting increase in unemployment reduces the number of insiders and increases the number of outsiders. Since only insiders participate in salary negotiations, the equilibrium wage is higher and employment is lower than if outsiders could also negotiate jobs, which would put downward pressure on wages. One consequence is an increase in production and it is likely that the demand for labor may generate inflationary pressures despite high unemployment, thereby increasing the natural rate of unemployment. Blanchard and Summers (1986) developed a methodological instrument to demonstrate hysteresis through unit root tests (O'Shaughnessy, 2011).

In summary, the unemployment hysteresis hypothesis, initially proposed by Blanchard and Summers (1986), suggests that a shock to the labor market causes rising unemployment with no possibility of returning to the original level. The dynamics of unemployment can be viewed as a non-stationary process, which is typically proven through integration order tests (Cross *et al.*, 1990a and 1990b; Maurer and Nivia, 1994; Dias, 1995; Mejía and Hernández, 1998; Spremolla, 1999 and 2001; Díaz *et al.*, 2001; Castellar and Uribe, 2002; Rangel, 2007; Cheng-Hsun *et al.*, 2008; Barboza and Hernández, 2009; Candelon *et al.*, 2009; Mednik *et al.*, 2012; Ayala *et al.*, 2012; Dritsaki and Dritsaki, 2013; Ahedo García and Cruz, 2023).

3. UNEMPLOYMENT HISTERESIS: SHOCKS TO SUPPLY OR DEMAND?

From a post-Keynesian perspective, the hysteresis hypothesis describes an inverse relationship between capital accumulation and unemployment. When investment (and capital stock) increases, unemployment decreases.

Since investment is determined by effective demand, shocks to demand ultimately determine the level of unemployment. Given a level of capital stock, an equilibrium level of unemployment is established, which is mainly involuntary. If a shock reduces effective demand, employers will lay off workers and postpone investments. This results in idle productive capacity. Since there is no automatic mechanism to reverse this, the level of unemployment will likely increase. Representative works on unemployment hysteresis from the post-Keynesian perspective include those by Rowthorn (1995), Carlin and Soskice (1989 and 1990), Alexiou and Pitelis (2003), and O'Shaughnessy (2000 and 2011).

Regarding the NAIRU, Rowthorn (1995) assumes that, with unanticipated inflation at 0, prices increase at a constant rate. However, if oil prices rise, the question of who will bear the cost leads to accelerated inflation. In order to control inflation, demand must be reduced, forcing unemployment to rise. However, as demand falls, businesses will find themselves with excess capacity and respond by reducing their capital stock. This causes the NAIRU to rise even further. If oil prices then fall back to their previous level, inflationary pressures will decrease, allowing the economy to expand and move back to a lower NAIRU. In any case, the capital stock will be smaller than before, so a temporary oil shock will cause an increase in the NAIRU because it will lead to a loss of capital stock. The economy may then become locked into a situation of high unemployment combined with "normal" capacity utilization.

Rowthorn (1995) explains how temporary shocks in unemployment can have permanent effects in terms of capital stock and a decline in demand. This is the main argument of those who study the phenomenon of unemployment hysteresis from a post-Keynesian perspective. According to this author, the empirical evidence of the relationship between capital stock and employment in most OECD countries shows that these countries have experienced a significant slowdown in their capital stock growth rate since 1973. This slowdown has been accompanied by a substantial decline in employment growth.

Other studies, such as those by Carlin and Soskice (1989 and 1990), explain unemployment hysteresis in terms of capital stock. The behavior of capital stock is influenced by exogenous variables, such as declining trade, union power, changes in installed capacity and ongoing deflationary policies. These studies propose policies aimed at stimulating demand to increase capital stock and lead to higher employment.

Alexiou and Pitelis (2003), on the other hand, explore the relationship between capital stock and unemployment rates on the demand side. Using a panel data model, they find that many European Union countries had persistently high unemployment rates during the period from 1983 to 2003 due to a decline in capital stock and insufficient aggregate demand, which they attribute to restrictive economic policies. This coincides with the need to establish policies that increase and sustain demand in order to restore capacity utilization to full employment levels.

O'Shaughnessy (2000) proposes another possible cause of unemployment hysteresis in open economies. He argues that the real exchange rate permanently impacts unemployment rates through a hysteresis mechanism. A restrictive monetary adjustment, whether present or anticipated, causes an exchange rate appreciation. This leads to a loss of competitiveness and pushes production below its potential capacity. When the currency appreciates, it can lead to a loss of profits in the tradable goods sector and a decline in investment. Thus, a lower capital stock leads to higher unemployment in the sector. If this situation is sustained in the long term, it could have permanent effects on the capital stock and unemployment levels, generating hysteresis.

O'Shaughnessy (2011) points out that adverse unemployment shocks in the 1970s and 1980s could have long-lasting effects with serious economic and social consequences. These consequences include significant costs in terms of increased inflation, loss of production, income and opportunities for millions of people. Hysteresis occurs when temporary increases in unemployment generate supply or demand-side shocks that have permanent or at least persistent effects. For this reason, most countries in his study (OECD countries) should be cautious about fiscal consolidation policies because consolidation can be costly. In contrast, short-term policies should be established to achieve positive hysteresis that will bring substantial long-term benefits.

From a post-Keynesian perspective, emphasis is placed on the role of capital stock in hysteresis behavior of unemployment. Policies aimed at achieving full employment are considered effective, as positive shocks through such policies can have long-term or permanent effects on employment levels, in such a way that as investment (capital stock) increases, unemployment decreases. However, since investment depends on effective demand, shocks to demand ultimately determine the level of unemployment. Therefore, to reduce unemployment, they propose policies that expand demand, consequently increasing, capacity utilization and investment (capital stock).

This argument from the post-Keynesian perspective has gained influence among neoclassical authors such as Ball (2015), Cerra and Saxena (2008), Reinhart and Rogoff (2009), and Reifschneider *et al.* (2013). These authors point out that recessions reduce the potential output of economies by reducing capital accumulation and affecting workers who lose their jobs, as well as interrupting the economic activities that produce technological progress. For this reason, they associate the hysteresis process with potential output.

4. DYNAMICS OF UNEMPLOYMENT IN THE MEXICAN ECONOMY

There are only a few studies on the dynamics of unemployment in Mexico from a hysteresis perspective. One such study is that of Ayala *et al.* (2012), which analyzes unemployment dynamics between 1970 and 2009 in 18 Latin American countries, including Mexico. Unit root tests revealed evidence of the structuralist hypothesis in 16 of the analyzed countries, including Mexico.

Meanwhile, Mednik *et al.* (2012) conducted tests demonstrating the existence of unemployment hysteresis between 1980 and 2005 in 13 Latin American countries, including Mexico. Their results confirm unemployment hysteresis for most countries, including Mexico. Notably, after the 2000-2002 crisis, Mexico's unemployment rate did not return to pre-crisis levels, even though production did. This suggests that Okun's coefficient may have changed during the economic recovery, resulting in lower employment growth. This suggests that unemployment is slowly returning to average levels or undergoing hysteresis.

Given the scarcity of literature on the dynamics of unemployment in Mexico and the contradictory results of existing studies, it is necessary to determine whether hysteresis can explain the dynamic properties of unemployment in Mexico. Initially, this involves corroborating conventional theory, which states that high unemployment is fundamentally due to supply shocks.

Additionally, we seek to test the post-Keynesian approach, which states that the dynamics of unemployment are due to the behavior, which states that capital stock (or the firms' degree of capacity utilization). In other words, insufficient effective demand leads to slow capital accumulation and slow demand for labor, thereby increasing unemployment.

To achieve the objective of this paper, we use two variable unit root tests to study unemployment. First, following traditional literature, we will use the unemployment rate. Second, from a post-Keynesian point of view, we will use the percentage of productive capacity utilization, which indicates the volume of production generated by an establishment relative to its total production capacity, considering the characteristics of its machinery and equipment, number of employees and average length of workday. The analysis period is 2006-2023, as this is the most recent data available from the National Institute of Statistics and Geography (INEGI, 2024).

Unit root tests are analyzed in two phases. The first phase is a graphical analysis to determine the behavior of the series. The second phase uses the method to perform Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit root tests in the following order: first with a constant and trend, then with only a constant (intercept) and finally with neither a constant nor a trend. The tests were applied to the variable in the following order: first in levels, then in first differences, then in second differences, and so on until the null hypothesis of a unit root was rejected. This will make it possible to corroborate whether a time series follows a stationary process, which is important because it indicates whether shocks have permanent or only temporary effects, i.e., it shows whether hysteresis is present and consequently, the most important question of whether employment policies effectively reduce unemployment.

According to INEGI data (2024), one of the initial findings (see Figure 1) is that the unemployment rate fell between 2006 and 2023 from 3.19% in January 2006 to 2.78% in December 2023. However, Mexico's unemployment rate has been unstable, reaching its highest point in September 2009 at 5.96%, due to the 2008-2009 international financial crisis and its lowest point in June and October 2023 at 2.67%. Notably, the unemployment rate during the 2008-2009 international financial crisis was higher than that of the post-pandemic crisis, reaching 5.48% in June 2020.

Figure 1. Rate of unemployment in Mexico (2006:01-2023:12)

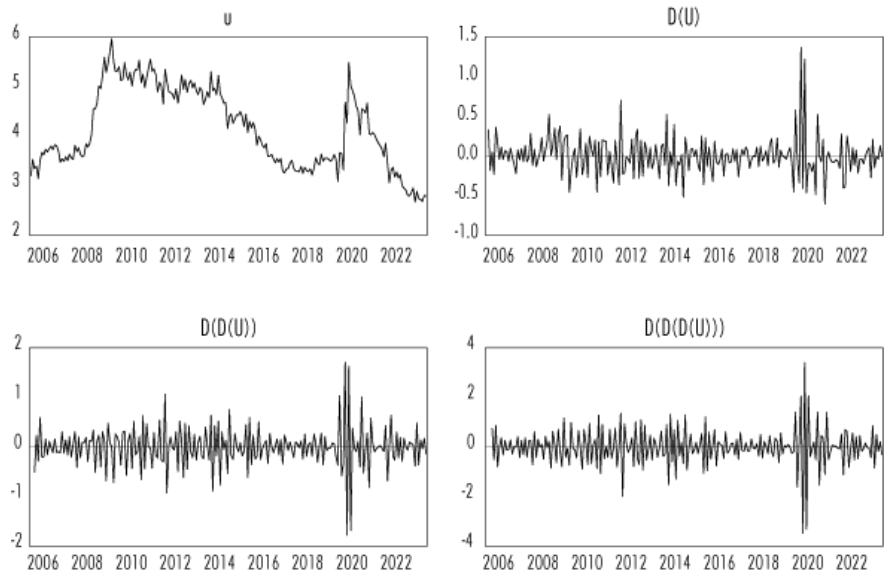
Source: prepared by the authors with data from INEGI (2024).

A study by Samaniego and Escobar (2024) highlights significant changes during the previous six-year presidential term, implementing reforms to the labor law framework and the reversal of minimum wage restraint policies in place since the 1990s. Nevertheless, some structural problems persist, including gaps and inequalities in social protection and unequal access to quality jobs across regions, genders and age groups, with marked disadvantages for women, young people and older workers.

Having described the behavior of employment indicators in Mexico, we will now move on to unit root tests. We will proceed with a visual exploration of the time series.

Figure 2 shows the evolution of the unemployment rate and its first three differences. The series evolution suggests that it is non-stationary showing a downward trend (unit root) since 2009 and evolving as a random walk with drift. The first difference does not contain a trend but shows changes in variance that may indicate structural changes. The stabilization of the series that occurs with the first difference improves with the second difference but not with differences greater than two.

Figure 2. Rate of unemployment in Mexico (2006:01-2023:12)



Source: prepared by the authors using data from INEGI (2024).

The graphical analysis shows that the series has a trend in levels that disappears in the first differences. This indicates that the trend is stochastic and originates from a negative unit root, as it exhibits oscillations. Structural changes in behavior could be considered in 2009 and in 2020 because there were significant increases in the unemployed population during these periods, which were attributable to the 2009 international economic crisis and the 2020 pandemic . Heteroscedasticity can also be inferred given the significant changes in the magnitude of the oscillations.

Table 1. Statistical summary. Rate of unemployment

Mean	*Std Dev.*	*Min.*	*Max.*	*Skew.*	*Kurt.*
4.14	0.81	2.67	5.96	0.17	1.79

Source: prepared by the authors.

In the second stage, unit root tests were performed on the variable rate of unemployment (see Table 2).

Table 2. Summary of unit root test results. Rate of unemployment

(Levels with constant and trend)	*(Levels with constant)*	*(Levels without constant or trend)*	*(First differences with constant and trend)*	*(First differences with constant)*	*(First differences without constant or trend)*
ADF	ADF	ADF	ADF	ADF	ADF
0.6098	0.7153	0.5090	0.0000	0.0000	0.0000
PP	PP	PP	PP	PP	PP
0.3638	0.4886	0.5305	0.0000	0.0000	0.0000
KPSS	KPSS	KPSS	KPSS	KPSS	KPSS
0.2328	0.6439	N/A	0.0688	0.2785	N/A
*(0.1460)	*(0.4630)		*(0.1460)	*(0.4630)	

Note: *statistically significant values at 5%.

Source: prepared by the authors.

When performing the ADF test on the variable at levels with a constant and trend, the null hypothesis (H_0) of the presence of a unit root is not rejected with a probability of 0.6098. Next, as part of the same test, an ADF unit root test was performed at levels with a constant. With a probability of 0.7153, the null hypothesis (H_0) of the presence of a unit root was not rejected. Continuing with the same ADF test at levels without a constant or trend, the null hypothesis (H_0) of the presence of a unit root is not rejected with a probability of 0.5090.

The H_0 hypothesis of the presence of a unit root is rejected when the test is conducted with a constant and trend. To confirm these results, the PP test was also performed at levels with a constant and trend, and with a probability of 0.3638, the H_0 is not rejected. Next, as part of the same test at levels with only a constant, with a probability of 0.4886, the H_0 hypothesis is not rejected. When the same test is performed at levels without a constant or trend, the probability is 0.5305 and again, the H_0 is not rejected.

Only when testing the first differences with a constant and trend is the H_0 rejected with a probability of 0.0000.

Finally, the KPSS test, whose null hypothesis is that the variable is stationary, at levels with trend and intercept, at statistically significant values of 5%, rejects H0 that the unemployed population variable has a stationary behavior of 0.2328 (0.1460) and at levels with an intercept, at values significant at 5% with values of 0.6439 (0.4630), H0 is also rejected. In first differences with trend and intercept, the (non-stationary) behavior of unit root disappears with values of 0.0688 (0.1460) and with intercept 0.2785 (0.4630).

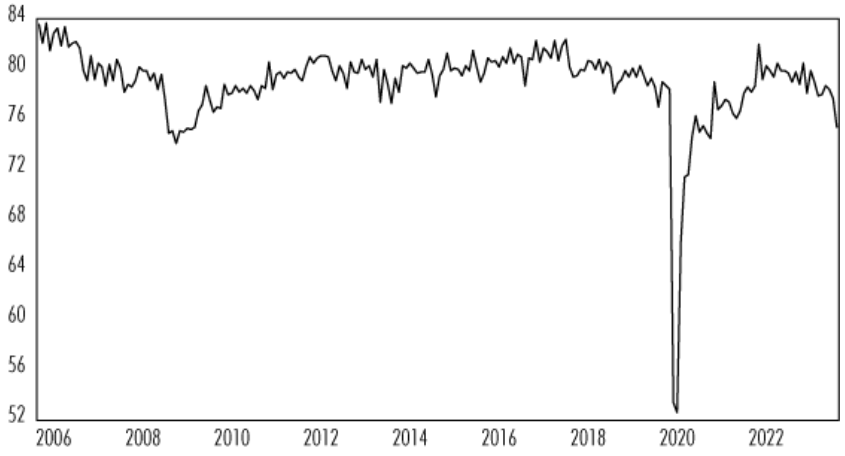
Therefore, using the method of going from the general to the specific, the KPSS test also demonstrates the existence of a unit root.

The ADF, PP and KPSS unit root tests show that the unemployed population variable in Mexico exhibits non-stationary behavior (unit root) which coincides with the results obtained by Mednik *et al.* (2011). This proves the existence of hysteresis behavior in the unemployed population variable that measures unemployment in Mexico. This means that the dynamics of unemployment in Mexico do not behave as conventional theory describes, so policies aimed at making the labor market more flexible are likely to be ineffective.

Analysis of the percentage of installed capacity utilization in Mexico

As can be seen in Figure 3, the percentage of installed capacity utilization during the period January 2006-December 2023 averaged 78.97%, with May 2020 being the month with the lowest percentage of installed capacity utilization at 52.6%. Notably, the five months with the lowest percentage of installed capacity utilization occurred between April and August 2020 due to the pandemic. Similarly, February 2009 had a low percentage of installed capacity utilization due to the 2009 financial crisis. In contrast, the highest percentage of installed capacity utilization in Mexico was recorded in March 2006 with 83.7% occupancy and 2006 was generally the year with the highest percentage of installed capacity utilization.

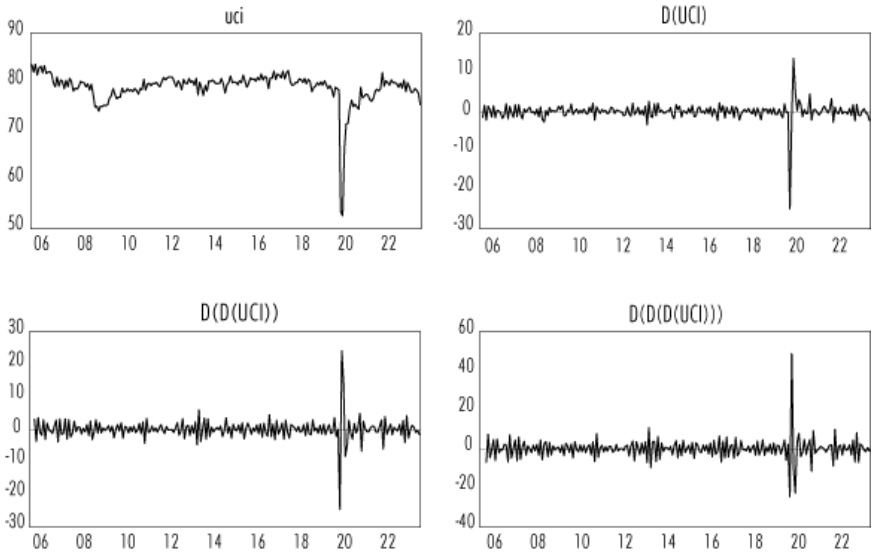
Figure 3. Percentage of installed capacity utilization in Mexico (2006:01-2023:12)



Source: prepared by the authors with data from INEGI (2024).

Figure 4 shows the behavior of the percentage of installed capacity utilization in Mexico at three levels: first, second and third differences.

Figure 4. Percentage of installed capacity utilization in Mexico (2006:01-2023:12)



Source: prepared by the authors with data from INEGI (2024).

Based on the analysis of these graphs, it can be concluded that the root, in this case, is different from 1, as the series does not show a trend in levels, nor does that trend appear in the first, second or third differences. The sign of the root is negative, showing fluctuations and, ultimately, two moments of structural change can be identified: the behavior in 2009 during the financial crisis and the behavior in 2020 due to the pandemic. These periods experienced larger decreases in installed capacity utilization compared to other periods (see Table 3).

Table 3. Statistical summary. Percentage of installed capacity utilization (ICU)

Country		*Mean*	*Std Dev.*	*Min.*	*Max.*	*Skew.*	*Kurt.*
Mexico ICU	*UCI*	78.97	3.31	52.60	83.60	-4.89	37.16

Source: prepared by the authors.

Secondly, ADF, PP and KPSS unit root tests were performed, confirming the visual inspection. There is no evidence of unit roots in the series on the percentage of installed capacity utilization in Mexico (see Table 4).

Table 4. Summary of unit root test results. Percentage of installed capacity utilization (ICU)

(Levels with constant and trend)	*(Levels with constant)*	*(Levels without constant or trend)*	*(First differences with constant and trend)*	*(First differences with constant)*	*(First differences without constant or trend)*
ADF	ADF	ADF	ADF	ADF	ADF
0.0000	0.0000	0.5147	0.0000	0.0000	0.0000
PP	PP	PP	PP	PP	PP
0.0000	0.0000	0.4208	0.0000	0.0000	0.0000
KPSS	KPSS	KPSS	KPSS	KPSS	KPSS
0.1031	0.2390	N/A	0.0764	0.0766	N/A
*(0.1460)	*(0.4630)		*(0.1460)	*(0.4630)	

Note: *statistically significant values at 5%.
Source: prepared by the authors.

When performing the ADF test on the variable "percentage of installed capacity utilization" at levels with a constant and a trend, with a probability of 0.0000, the H_0 of the presence of a unit root is rejected. Next, as part of the same test, a test was performed at levels with a constant and a probability of 0.0000,

rejecting the H0. Continuing with the same test at levels without a constant or trend, the H0 of the presence of a unit root is not rejected at a probability of 0.5147. In the test of first differences with constant and trend, a probability of 0.0000 rejects the H0. Therefore, using the method of going from the general to the specific, the ADF test demonstrated the absence of a unit root.

Unit root tests were performed at levels with a constant and trend with a probability of 0.0000, to confirm the results obtained, rejecting H0. A unit root test was then performed at levels with constant and a probability of 0.0000, which rejected H0. Finally, continuing with the same test at levels without constant or trend, with a probability of 0.4208, H0 is not rejected. In the test of first differences with a constant and trend, with a probability of 0.0000, H0 for the presence of a unit root is rejected.

The KPSS test, whose null hypothesis is that the variable is stationary at levels with a trend and intercept at statistically significant values of 5%, does not reject the H0 that the unemployed population variable exhibits stationary behavior with values of 0.1031 (0.1460). At levels with an intercept and significant values of 5% at 0.2390 (0.4630), the hypothesis that the unemployed population variable exhibits stationary behavior is also not rejected. In the test of first differences with a trend and an intercept, the (non-stationary) behavior of the unit root is maintained, with values of 0.0764 (0.1460) and an intercept of 0.0766 (0.4630). Therefore, using the method of going from the general to the specific, the KPSS test also demonstrated the absence of a unit root by rejecting H0.

The result of the ADF, PP and KPSS unit root tests concluded that the percentage of installed capacity utilization in Mexico exhibits stationary behavior (no unit roots), meaning there is no hysteresis behavior in this variable. Thus, the presence of a unit root was ruled out based on the results of the unit root tests. This result supports the argument that effective demand and capital stock determine the dynamics of unemployment in Mexico. Since there is no hysteresis process in the percentage of installed capacity utilization, one could argue that installed capacity adapts to the dynamics of demand and can increase or decrease freely (without barriers), as can unemployment. In this respect, the policy recommendation is to increase the average installed capacity utilization (and employment levels) by increasing aggregate demand and the capital stock.

5. CONCLUSIONS

First, this paper questioned the conventional view of the very existence of NAIRU. The results of unit root tests on Mexico’s unemployment indicator show hysteresis in dynamic properties of unemployment, allowing us to reject the hypothesis that unemployment returns to the NAIRU in the long term.

Second, based on these results, we revisited one of the most analyzed arguments in the specialized literature on the dynamics of unemployment, hysteresis, to determine whether it is due to labor inflexibility or insufficient effective demand. Unlike other studies, this one contrasted conventional and post-Keynesian theoretical views to verify the nature of the dynamics of unemployment. In the first case, the argument rests on the fact that, once the economy is no longer at full employment, labor market inflexibility prevents the unemployment rate from returning to its equilibrium level, resulting in constant and increasingly high unemployment. The second argument is that effective demand affects the level of capital stock, which increases or decreases the demand for labor and, consequently, unemployment. In this respect, the rate of unemployment undergoes a process of hysteresis. If the rate increases (decreases) above (below) its average, it is because effective demand is low (high).

As previously mentioned, two variable ad hoc integration tests were performed for each theoretical approach to carry out this analysis. The conventional argument used the rate of unemployment, and the post-Keynesian approach used the percentage of installed capacity utilization by companies.

The econometric analysis definitively ruled out the presence of a unit root in the percentage of installed capacity utilization. Regarding the unemployment rate, however, the results demonstrated the existence of a unit root, i.e., non-stationary behavior. This confirms the results of previous studies such as that of Mednik *et al.* (2011), which suggest the presence of unemployment hysteresis.

Based on these results, we can conclude that the unemployment rate in Mexico responds to demand-side shocks, as suggested by the post-Keynesian approach, rather than supply-side shocks, as proposed by the conventional approach.

Therefore, policies aimed at making the labor market more flexible may be ineffective in reducing unemployment. Conversely, policies that stimulate effective demand, thereby increasing the percentage of installed capacity utilization and subsequently accelerating capital accumulation, may be much more effective in reducing unemployment in Mexico.

Among the lines of research that emerge from this study, which for reasons of length are not addressed here, include the potential impacts of the following factors on the dynamic properties of unemployment. An economy such as Mexico's has grown very little in the last 40 years and, on a daily basis, it expels a significant portion of the population due to conditions in the productive sector. This phenomenon is exacerbated by the increase in deportations of migrants to Mexico resulting from Trump's return to the US presidency. Other factors include the prevalence of the informal labor market, technological unemployment due to the growing use of artificial intelligence, the continued application of contractionary monetary policy, probable and relative deglobalization due to economic and geopolitical factors; and international financial crises.

REFERENCES

Ahedo García, M. R. and Cruz, M. (2023). Capacidad productiva y pleno empleo: una alternativa de política. *Nóesis. Revista de Ciencias Sociales y Humanidades, 31(62).* https://doi.org/10.20983/noesis.2022.2.1

Alexiou, C. and Pitelis, C. (2003). On capital shortages and European unemployment: a Panel Data Investigation. *Journal of Post Keynesian Economics, 25(4).* 10.1080/01603477.2003.11051371

Ayala, A., Cuñado, J. and Gil-alana, L. (2012). Unemployment hysteresis: empirical evidence for Latin America. *Journal of Applied Economics, XV(2).* https://doi.org/10.1016/S1514-0326(12)60010-5

Badagian, A., Goyeneche, J., Rodríguez, S. and Selves, R. (2001). La tasa de desempleo de Montevideo: ¿raíz unitaria o cambio estructural? IESTA (Instituto de Estadística, Universidad de la República, Facultad de Ciencias Económicas y de Administración). https://www.iesta.edu.uy/wp-content/uploads/2009/07/raizunitaria.pdf

Bajo, O. and Monés, M. (1996). *Curso de macroeconomía*. Editorial Antoni Bosch.

Ball, L. (2015). Comment on "inflation and activity" by Olivier Blanchard, Eugenio Cerutti and Lawrence Summers. *ECB forum on Central Banking.* https://www.econ2.jhu.edu/People/Ball/BlanchardComment.pdf

Barboza, M. and Hernández, L. (2009). Una aproximación al fenómeno de histéresis laboral en Venezuela (1965-2003). *Revista de Ciencias Sociales, XV(2).* https://www.redalyc.org/articulo.oa?id=28011675006

Blanchard, O. (1988). Unemployment: getting the questions right and some of the answers. *NBER Working Papers, 2698.* https://ideas.repec.org/p/nbr/nberwo/2698.html

_____ (2009). *Macroeconomía*. Editorial Prentice Hall.

Blanchard, O. and Summers, L. (1986). Hysteresis and the European unemployment problem. *The National Bureau of Economic Research 1*. https://www.nber.org/system/files/chapters/c4245/c4245.pdf

Candelon, B., Dupuy, A. and Gil-Alana, L. (2009). The nature of occupational unemployment rates in the United States: hysteresis or structural? *Applied Economics, 41*. https://doi.org/10.1080/00036840802584950

Carlin, W. and Soskice, D. (1989). Medium-run keynesianism: hysteresis and capital scrapping. En P. Davidson and J. Kresel (eds.). *Macroeconomics problems and policies of income distribution.* Edward Elgar Publishing.

_____ and Soskice, D. (1990). *Macroeconomics and the wage bargain*. Oxford University Press.

Castellar, C. and Uribe, J. (2002). Estructura y evolución del desempleo en el área metropolitana de Cali, 1988-1998: ¿existe histéresis? *Sociedad y Economía, 3.* https://www.redalyc.org/articulo.oa?id=99617938006

Cerra, V. and Saxena, S. C. (2008). Growth dynamics: the myth of economic recovery. *The American Economic Review, 98(1).* DOI:10.1257/aer.98.1.439

Cheng-Hsun, L., Nai-Fong, K. and Cheng-Da, Y. (2008). Nonlinear vs. nonstationary of hysteresis in unemployment: evidence from oecd economies. Applied Economics Letters, 15. http://dx.doi.org/10.1080/1350 4850600706370

Cross, R., Hutchinson, H. and Yeoward, S. (1990a). The natural rate, hysteresis, and the duration composition of unemployment in the U.S. *Quarterly Journal of Business and Economics, 29(2).* https://www.jstor.org/stable/40472992

Cross, R., Hutchinson, H. and Yeoward, S. (1990b). The natural rate versus the hysteresis hypothesis: a century of prices and unemployment in the U.S. and U.K. *Weltwirtschaftliches Archiv, 126(1).* https://www.jstor.org/stable/40439771

Diamond, P. (1982). Aggregate demand management in search equilibrium. *Journal of Political Economy 90(5).* https://www.jstor.org/stable/1837124

Dias, N. (1995). Paradox of hysteresis and real-wage flexibility in Australia. *Journal of Post Keynesian Economics, 17(4).* https://www.jstor.org/stable/4538463

Díaz, Y., Guataquí, J. and Gutiérrez, J. (2001). La tasa de desempleo en Bogotá: teoría y evidencia empírica. *Estudios de Economía y Ciudad, 18.* https://www.researchgate.net/publication/5005979_La_tasa_de_desempleo_ en_BogotA_TeorA-a_y_evidencia_empA-rica

Dritsaki, C. and Dritsaki, M. (2013). Hysteresis in unemployment: an empirical research for three member state of European Union. *Theoretical and Applied Economics, 20, (4) (531).* https://www.researchgate.net/publication/273141274_Hysteresis_in_unemployment_An_empirical_research_for_three_member_states_of_the_European_Union

Economic Commission for Latin America and the Caribbean (ECLAC)-International Labor Organization (ILO) (2022). Coyuntura laboral en América Latina y el Caribe. CEPAL-OIT. https://www.ilo.org/wcmsp5/groups/public/---americas/---ro-lima/---sro-santiago/documents/publication/ wcms_863688.pdf

Friedman, M. (1968). The role of monetary policy. *American Economic Review, 58.* https://www.aeaweb.org/aer/top20/58.1.1-17.pdf

Haavelmo, T. (1944). The probability approach to econometrics. *Econometrica 12 (supplement).* https://doi.org/10.2307/1906935

Hargreaves Heap, S. (1980). Choosing the wrong natural rate: accelerating inflation or decelerating employment and growth. *The Economic Journal, 90(329).* https://doi.org/10.2307/2231931

Henry, B., Karanassou, M. and Snower, D. (2000). Adjustment dynamics and the natural rate: an account of UK Unemployment. *Oxford Economic Papers, 52.* https://doi.org/10.1093/oep/52.1.178

Instituto Nacional de Estadística y Geografía (INEGI) (2024). Banco de Información Económica (BIE). http://www.inegi.org.mx/Sistemas/BIE/Default.aspx?Topic=0&idserPadre=1000016001800070#D1000016001800070

Johansen, L. (1982). Some notes on employment and unemployment with heterogeneous labour. In *Economic Essays in Honor of J. H. Gelting,* Special issue of Nationaløkonomisk Tidsskrift, København.

Kalecki, M. (1963). Introduction to the theory of growth in a socialist economy. En J. Osiatynski (ed.) (1993), *Collected Works of Michal Kalecki,* vol. IV, Oxford University Press.

Keynes, J. (1936). *The general theory of employment, interest and money.* Harcourt Brace and Company.

Layard, R. and Nickell, S. (1986). Unemployment in Britain. *Economica, 53(210).* https://doi.org/10.2307/2554377

_____ and Bean, C. (1989). Why does unemployment persist? *The Scandinavian Journal of Economics, 91(2).* http://eprints.lse.ac.uk/6106/

Lee, J. and Strazicich, M. C. (2003). Minimum lagrange multiplier unit root test with two structural breaks. *Review of Economics and Statistics, 85.* https://doi.org/10.1162/003465303772815961

_____ and Strazicich, M. C. (2004). Minimum LM unit root test with one structural break. Unpublished manuscript. https://www.researchgate.net/publication/4983153_Minimum_LM_Unit_Root_Test_with_One_ Structural_Break

Leites, M. and Porras, S. (2016). La dinámica del desempleo en el Uruguay a través de la teoría de la reacción en cadena. *Revista CEPAL, 120*. https://doi.org/10.18356/afa0933a-es

Malinvaud, E. (1982). Wages and unemployment. *Economic Journal, 92(365).* https://doi.org/10.2307/2232252

Maurer, M. and Nivia, D. (1994). La histéresis en el desempleo colombiano. *Cuadernos de Economía.* https://revistas.unal.edu.co/index.php/ceconomia/article/view/14057/

Mednik, M., Rodríguez, C. and Ruprah, I. (2012). Hysteresis in unemployment: evidence from Latin America. *Journal of International Development Forthcoming. 24.* https://doi.org/10.1002/jid.1755

Mejía, P. and Hernández, Z. (1998). Evolución del Producto Interno Bruto de México, 1921-1995: ¿declinación o histéresis? Evidencia adicional. *Economía, Sociedad y Territorio, 1(3).* https://doi.org/10.22136/est001998505

Modigliani, F., Monti, M., Dreze, J., Giersch, H. and Layard, R. (1987). Reducing unemployment in Europe: The role of capital formation. In R. Layard and L. Calmfors (ed.). *The fight against Unemployment*. MIT Press.

Organization for Economic Cooperation and Development (OECD) (2022). OECD Employment Outlook 2022: Building Back More Inclusive Labour Markets. OECD Publishing. https://doi.org/10.1787/1bb305a6-en

O' Shaughnessy, T. (2000). Hysteresis in an open economy model. *Scottish Journal of Political Economy, 47(2)*. https://doi.org/10.1111/1467-9 485.00158

_____ (2011). Hysteresis in unemployment. *Oxford Review of Economic Policy, 27(2).* https://doi.org/10.1093/oxrep/grr018

Phelps, E. (1972). *Inflation policy and unemployment theory: The cost-benefit approach to monetary planning*. Macmillan Press.

_____ (1994). *Structural slumps: The modern equilibrium theory of unemployment, interest and assets*. Harvard University Press.

_____ (1995). The structuralist theory of employment. *The American Economic Review, 85(2).* https://www.jstor.org/stable/2117923

Rangel, A. (2007). ¿Histéresis en la tasa de desempleo de Bogotá? consideraciones sobre el uso de los test ADF y Zivot-Andrews. *Economía y Administración, 4(2).* https://revistas.uao.edu.co/ojs/index.php/REYA/article/ view/248

Reifschneider, D., Wascher, W. and Wilcox, D. (2013). Aggregate supply in the United States: recent developments and implications for the conduct of monetary policy. *IMF Economic Review, 63(1).* https://doi.org/10.17016/ FEDS.2013.77

Reinhart, C. and Rogoff, K. (2009). The aftermath of financial crises. *American Economic Review, 99(2).* https://doi.org/10.1257/aer.99.2.466

Rowthorn, R. (1995). Capital formation and unemployment. *Oxford Review of Economic Policy, 11(21).* https://doi.org/10.1093/oxrep/11.1.26

Samaniego, N. and Escobar, S. (2024). Comportamiento reciente del mercado de trabajo en México. Economía UNAM, 21(61). https://doi.org/10.22201/fe.24488143e.2024.61.851

Samuelson, P. A. (1968). What classical and neoclassical monetary theory really was. *The Canadian Journal of Economics / Revue Canadienne d'Economique, 1(1).* https://doi.org/10.2307/133458

Schumpeter, J. (1934). *The theory of economic development: an inquiry into profits, capital, credits, interest, and the business cycle*. Transaction Publishers.

Spremolla, A. (1999). Memoria y persistencia del desempleo en Uruguay. *Documento de trabajo, 19/99.* https://www.colibri.udelar.edu.uy/jspui/handle/20.500.12008/1906

_____ (2001). Persistencia en el desempleo de Uruguay. *Cuadernos de Economía, 38(113).* http://dx.doi.org/10.4067/S0717-68212001011300003

Weitzman, M. (1982). Increasing returns and the foundations of unemployment theory. *Economic Journal.* https://doi.org/10.2307/2232668