

The Impact of Financial Inclusion on Unemployment in Algeria

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Received: 20/04/2025 | Accepted: 21/06/2026 | Published: 04/09/2026

Abstract

This research paper investigates the impact of financial inclusion in Algeria on unemployment during the period from 2004 to 2021. The Autoregressive Distributed Lag (ARDL) bounds-testing approach is used to capture the dynamic short-run and long-run relationships between the evolution of the number of automated teller machines (ATMs), the number of commercial bank branches, the share of domestic credit provided to the private sector, and the unemployment rate. The study finds an inverse (negative) relationship between the evolution of the number of ATMs and commercial bank branches on one hand and unemployment in Algeria on the other, over the period studied. As for the share of domestic credit provided to the private sector, a positive relationship with unemployment is observed. A full battery of diagnostic tests (normality, serial correlation, heteroskedasticity, functional form, and parameter stability) is reported to assess the robustness of the estimated model.

Keywords: Financial inclusion; Unemployment; ARDL model; Algeria; Bounds test.

1. Introduction

Financial inclusion can play an important role in reducing unemployment rates. When there is broader access to financial services, individuals and small businesses can obtain the financing necessary to expand their activities and create new job opportunities. In addition, financial inclusion can support entrepreneurship and the development of small and medium enterprises, which in turn contributes to enhancing economic activity and reducing unemployment.

1.1 Problem statement

What is the impact of financial inclusion on unemployment in Algeria over the period 2004–2021?

1.2 Sub-questions

- Is there a statistically significant effect of the number of ATMs on unemployment in the short and long term?
- Is there a statistically significant effect of the number of commercial bank branches on unemployment in the short and long term?
- Is there a statistically significant effect of the share of domestic credit provided to the private sector on unemployment in the short and long term?

1.3 Hypotheses

- H1: There is a statistically significant effect of ATMs on unemployment in the short and long run.
- H2: There is a statistically significant effect of the number of commercial bank branches on unemployment in the short and long run.
- H3: There is a statistically significant effect of the share of domestic credit provided to the private sector on unemployment in the short and long run.

1.4 Method

The study relies on a descriptive approach for the theoretical part, drawing on the literature and previous studies related to the subject, whether in books or scientific periodicals. For the applied part, the EViews software package is used to estimate the impact using the Autoregressive Distributed Lag (ARDL) methodology.

1.5 Literature review

(Thanh Van & Ha Linh, 2019): This paper evaluates the impact of financial-inclusion indicators on economic development. The results show that correlations exist between the number of bank branches, ATMs, domestic credit to the private sector, and the pace of economic development, with people gaining a more prosperous life as a result. The paper also offers recommendations for developing-country governments to improve financial inclusion.

(Boulenfad & Hacini, 2021): This study analyses the nature of the relationship between financial inclusion and financial stability in North African countries using panel data for 2004–2016. One of the key findings is a positive relationship between financial inclusion and financial stability in North Africa.

(Wen, Hon-We, Yang, Muda, & Zhaoyi, 2023): This study examines the relationship between financial inclusion, workers' remittances, and the unemployment rate in Asian economies using two-stage least squares (2SLS) and generalized method of moments (GMM) estimators. Both approaches show that ATMs, remittances, internet users, GDP, and financial globalization reduce unemployment across several Asian sub-regions, while inflation has a favourable effect on unemployment in some regions. The authors recommend prioritising policies that expand access to banking, credit, and insurance, and that reduce transaction costs for remittances.

(Noufé & Adama, 2022): This article studies the effects of financial inclusion on employability in a sample of 32 sub-Saharan African countries, finding that financial inclusion improves employability: a 10-percentage-point increase in financial inclusion raises the probability of having a job by 4.4 percentage points. Account ownership, mobile-money ownership, savings, and access to borrowing are the main drivers.

Overall, previous studies have mostly examined the link between financial inclusion and economic growth or poverty, leaving the relationship between financial inclusion and unemployment comparatively under-explored. Financial inclusion facilitates access to credit, extends financial services to a wider share of society, supports the creation of new institutions, and can thereby help lower unemployment. This is the gap that the present study addresses.

2. Theoretical Background

2.1 Definition of financial inclusion

Financial inclusion is defined as access to financial products and services that are useful and affordable in meeting the needs of the community and their businesses — namely transactions, payments, savings, credit, and insurance — used responsibly and sustainably (Nagian & Bestadrian, 2023).

The World Bank defines financial inclusion as the proportion of individuals and companies that use financial services. This definition focuses on the actual use of financial services rather than the potential ability to use them. Moreover, "access" implies affordable access accompanied by safeguards, such as appropriate regulation of financial-service providers, consumer-protection laws, and institutions that shield consumers from inappropriate products, deceptive practices, and aggressive collection practices (Boulenfad & Hacini, 2021).

In Algeria, the Bank of Algeria defines financial inclusion as the availability and use of financial services by all segments of society — institutions and individuals alike — through official channels, including current and savings accounts, payment and transfer services, insurance, and financing and credit services at competitive and reasonable prices. It also aims to protect consumers so they can properly manage their funds and savings, and to discourage recourse to informal, unsupervised channels that tend to charge relatively high prices (Rahima & Samiya, 2022).

2.2 Dimensions of financial inclusion

Accessibility: measured as commercial bank branches per 100,000 adults. Commercial bank branches are retail locations of resident commercial banks (and other resident banks functioning as commercial banks) that provide financial services and are physically separate from the head office, though not organised as legally separate subsidiaries (Antonio & Carmen, 2024).

Usability: the extent to which individuals use and benefit from financial services provided by approved institutions and access points. Assessing usability requires data on the regularity and frequency of customers' use of these services over a given period (Qasim & Mohyi Aldin, 2023).

Quality: captures the consumer experience, distinguished through consumer opinions of the products on offer. Quality is therefore used to characterise the relationship between the financial-service provider and the consumer, together with the range of options available and how well consumers understand them (Boulenfad & Hacini, 2021).

2.3 The importance of financial inclusion

Financial inclusion enables low-income people to benefit from high-quality, affordably priced financial services, and gives the topic appropriate priority within economic policy — encouraging legislation, regulation, and oversight frameworks that improve the reach of financial and banking services and foster innovation. Broadening the range of beneficiaries of financial services thereby contributes to empowering society as a whole, strengthening the financial resilience of individuals, and supporting the banking sector and savings mobilisation. Financial inclusion is also an important channel for supporting entrepreneurs and start-ups by providing financing that allows them to grow into small and medium-sized enterprises that generate jobs (Belaa, 2022).

2.4 Unemployment

The International Labour Organization's definition of unemployment is strict: a person is already considered employed if they worked for at least one hour during the reference week. Although the "official" definition of unemployment is likely to differ from the "actual" level in a country — the gap being positively correlated with the size of the informal economy — the official definition

remains the most widely used indicator in the literature owing to its consistency and comparability across countries (Benard, Vasques, & Yedginov, 2023).

Unemployment can also be defined as encompassing all individuals who have both the desire and the ability to work but are without a job; as a percentage, the unemployment rate is computed as the total number of unemployed persons divided by the total number of people actively seeking employment (Karrar & Al-Saadi, 2022).

2.5 Categories of unemployment

There are several categories of unemployment, the most prominent of which are (Karrar & Al-Saadi, 2022):

- Frictional unemployment: short-term unemployment arising from the normal turnover of the economy, as workers change jobs, professions, or places of residence and need time to find new employment — a temporary interruption due to factors outside the individual's control.
- Structural unemployment: arises from a mismatch between the skills required by employers and the skills held by job seekers, and results from a rise in untrained or unskilled labour relative to demand in other sectors; it is generally driven by shifts in the structure of demand, technological change, economic integration, or broader mismatches in the labour market.
- Cyclical unemployment: arises from the business cycle, as demand for labour falls during downturns and rises during the recovery phase.

2.6 Causes of unemployment in Algeria

Following (Laachemi, 2013), the main causes include:

- State intervention in the normal functioning of the labour market — particularly minimum-wage guarantees — where lower taxes and charges would otherwise be sufficient to encourage investment, generate wealth, and create jobs.
- The Algerian economy's heavy reliance on the hydrocarbon sector, with other sectors together accounting for only about 2% of Algeria's trade balance.
- Reluctance of capital owners to invest when expected returns fall short of their objectives.
- Demographic growth.
- The continuous intensification of mechanisation and rising productivity, which reduces labour requirements and displaces workers.
- Security crises that undermine the foundations of the state and depress domestic and foreign investment — one of the most important determinants of unemployment.

3. Econometric Study

3.1 Study variables

To analyse the impact of financial inclusion on unemployment in Algeria over the period 2004–2021, annual time series were constructed for the study variables using the World Bank database.

Table 1. Definition of study variables

Variable	Type	Time series	Symbol
Financial inclusion	Independent	Automated teller machines (per 100,000 adults)	ATM
		Commercial bank branches (per 100,000 adults)	CBK

		Domestic credit to the private sector (% of GDP)	DC
Unemployment	Dependent	Unemployment, total (% of total labor force)	UEMP

Source: prepared by the researchers based on the World Bank database (2024).

The general functional form of the model is:

$$UEMP_t = f(ATM_t; CBK_t; DC_t)$$

which is estimated in linear form as:

$$UEMP_t = c + \alpha_1 ATM_t + \alpha_2 CBK_t + \alpha_3 DC_t + \varepsilon_t$$

3.2 Stationarity of the time series

To establish the stationarity properties of the model's variables, the Augmented Dickey–Fuller (ADF) unit-root test is applied, as reported below.

Table 2. Unit-root test results (Augmented Dickey–Fuller)

Level	Test	ATM	CBK	DC	UEMP
At Level					
With Constant	t-Statistic	-2.4801	-4.7242	-0.6148	-4.1298
	Prob.	0.1371	0.0028 ***	0.8427	0.0062 ***
With Constant & Trend	t-Statistic	-0.3423	-4.5733	-2.2688	-2.9174
	Prob.	0.9809	0.0118 **	0.4266	0.1815
Without Constant & Trend	t-Statistic	0.5486	1.4020	1.5688	-1.6141
	Prob.	0.8236	0.9531	0.9653	0.0985 *
At First Difference — d(ATM), d(CBK), d(DC), d(UEMP)					
With Constant	t-Statistic	-2.4667	-3.1877	-3.9799	-4.3712
	Prob.	0.1410	0.0413 **	0.0089 ***	0.0042 ***
With Constant & Trend	t-Statistic	-3.8614	-8.5786	-3.7452	-5.6330
	Prob.	0.0403 **	0.0001 ***	0.0490 **	0.0019 ***
Without Constant & Trend	t-Statistic	-1.5850	-3.1880	-3.2024	-4.4020
	Prob.	0.1039	0.0036 ***	0.0033 ***	0.0002 ***

Note: ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively; blank cells indicate non-significance.

Source: prepared by the researchers based on EViews outputs.

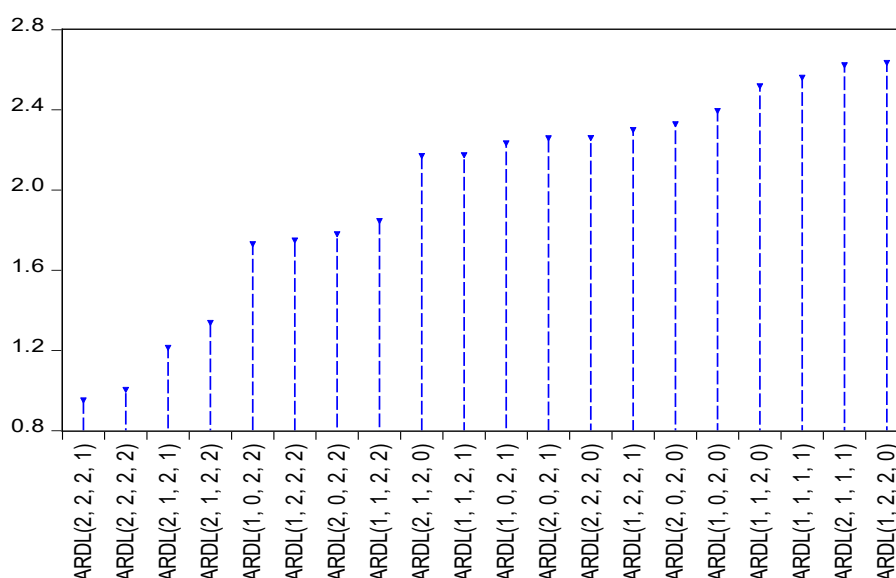
The table shows that the series describing financial inclusion and unemployment in Algeria are stationary either at level or at first difference, at the 5% significance level. This mixed order of integration — I(0) and I(1), with none integrated of order I(2) — satisfies the pre-condition for applying the ARDL bounds-testing methodology.

3.3 Optimal lag selection

Before estimating the short- and long-run relationships, the optimal lag length for each variable is selected according to the Akaike Information Criterion (AIC). The selected specification is ARDL (2, 2, 2, 1), as shown below.

Fig. 1. Lag-order selection according to the Akaike criterion

Akaike Information Criteria (top 20 models)



Source: prepared by the researchers based on EViews outputs.

3.4 Cointegration test (ARDL bounds test)

The ARDL specification for the study variables is written as:

$$\Delta UEMP_t = c + \alpha_1 EMP_{t-1} + \alpha_2 ATM_{t-1} + \alpha_3 CBK_{t-1} + \alpha_4 DC_{t-1} + \sum_{i=1}^k \beta_{1,i} \Delta UEMP_{t-i} + \sum_{i=0}^{k1} \beta_{2,i} \Delta ATM_{t-i} + \sum_{i=0}^{k2} \beta_{3,i} \Delta CBK_{t-i} + \sum_{i=0}^{k3} \beta_{4,i} \Delta DC_{t-i} + \varepsilon_t$$

where ($\alpha_1; \alpha_2; \alpha_3; \alpha_4$) are the long-run parameters of the independent variables; ($\beta_{1,i}; \beta_{2,i}; \beta_{3,i}; \beta_{4,i}$) are the short-run parameters of the independent variables; c is a constant; ε_t is the random error term; and Δ denotes first differences.

To test for the existence of a long-run equilibrium relationship (cointegration) between financial inclusion and unemployment, the null hypothesis (H_0) of no cointegration is tested against the alternative (H_1) of cointegration among the model's variables:

$$\begin{cases} H_0 : \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = 0 \\ H_1 : \alpha_1 \neq \alpha_2 \neq \alpha_3 \neq \alpha_4 \neq 0 \end{cases}$$

The cointegration (bounds) test relies on the F-statistic, as reported below.

Table 3. Bounds-test results for cointegration

Test Statistic	Value	k (regressors)
F-statistic	32.43916	3

Critical value bounds (Pesaran, Shin & Smith, 2001):

Significance level	I(0) bound	I(1) bound
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10%	2.37	3.20
5%	2.79	3.67
2.5%	3.15	4.08
1%	3.65	4.66

Source: prepared by the researchers based on EViews outputs.

The computed F-statistic (32.44) exceeds the upper-bound critical value $I(1)$ at the 5% significance level (and indeed at 1%), leading to rejection of the null hypothesis (H_0) in favour of the alternative (H_1). This confirms the existence of a cointegrating relationship among the explanatory variables — i.e., a long-run equilibrium relationship between financial inclusion and unemployment in Algeria.

3.5 Short-run and long-run estimates

Having confirmed cointegration via the bounds test, the short-run dynamics and the error-correction term (ECM), together with the long-run parameters, are estimated.

Table 4. Short-run error-correction model (ECM) estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(UEMP(-1))	0.972647	0.102498	9.489459	0.0002
D(ATM)	0.641215	0.262230	2.445237	0.0583
D(ATM(-1))	-0.406102	0.174929	-2.321528	0.0679
D(CBK)	-0.811891	0.824736	-0.984425	0.3701
D(CBK(-1))	9.948470	1.008251	9.867057	0.0002
D(DC)	0.316953	0.039655	7.992772	0.0005
CointEq(-1)*	-2.227258	0.130351	-17.08662	0.0000

Source: prepared by the researchers based on EViews outputs.

The error-correction term, CointEq(-1), is negative (-2.227) and highly significant ($p = 0.000 < 5\%$), confirming that short-run deviations from equilibrium are corrected automatically over time, converging towards the long-run relationship. A coefficient with an absolute value above one — as here — implies an oscillatory, but still convergent, adjustment path back to equilibrium.

Table 5. Long-run estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ATM	-0.646055	0.126957	-5.088772	0.0038
CBK	-5.692596	1.792534	-3.175726	0.0247
DC	0.282460	0.029828	9.469663	0.0002
C	39.27767	8.966338	4.380569	0.0072

Source: prepared by the researchers based on EViews outputs.

Based on Table 5, the following can be observed:

- For ATMs and commercial bank branches, the effect on unemployment is statistically significant ($p < 0.05$) with a negative coefficient, indicating an inverse relationship. This is consistent with economic theory: financial inclusion expands access to credit and other financial services, helping individuals and firms start or grow businesses and thereby create jobs.
- For domestic credit to the private sector, the effect on unemployment is statistically significant ($p < 0.05$) but with a positive coefficient, indicating a direct relationship. This runs counter to

conventional theory; the relationship is evidently not absolute, and other factors — such as government policy and general macroeconomic conditions — may be shaping how private-sector credit translates (or fails to translate) into employment in Algeria.

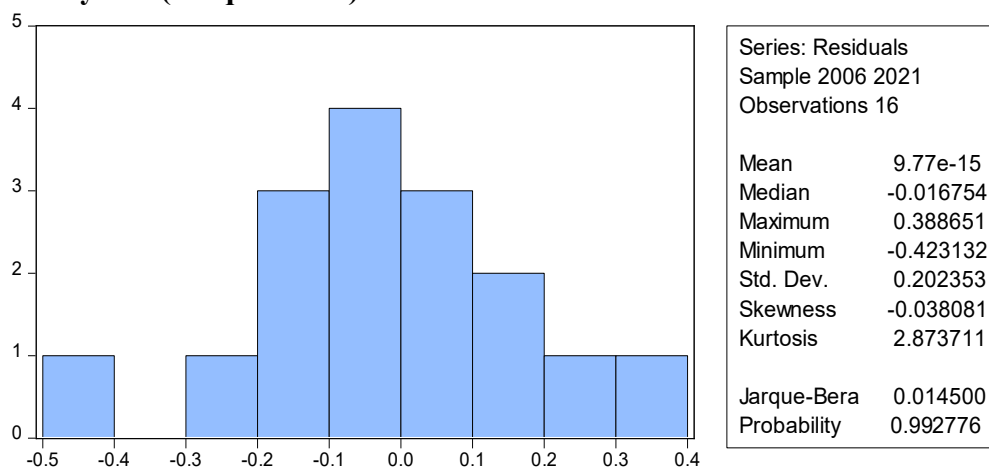
3.6 Diagnostic tests

To assess the quality and reliability of the estimated model, the following diagnostic tests are performed.

3.6.1 Normality test

As shown in the figure below, the Jarque–Bera probability is 0.9928, well above the 5% significance level. The null hypothesis of normally distributed residuals is therefore not rejected.

Fig. 2. Normality test (Jarque–Bera)



Source: prepared by the researchers based on EViews outputs.

3.6.2 Serial correlation test

The Breusch–Godfrey LM test yields an F-statistic probability of 0.3769, above 5%, suggesting no autocorrelation problem in the regression residuals on the basis of the F-statistic.

Table 6. Breusch–Godfrey serial correlation LM test

Statistic	Value	Statistic	Value
F-statistic	1.375024	Prob. F(2,3)	0.3769
Obs*R-squared	7.652244	Prob. Chi-Square(2)	0.0218

Source: prepared by the researchers based on EViews outputs.

3.6.3 Heteroskedasticity test

The ARCH heteroskedasticity test gives an F-statistic probability of 0.6516, above 5%. The null hypothesis of homoskedastic residuals is not rejected, so no heteroskedasticity problem is detected.

Table 7. Heteroskedasticity test (ARCH)

Statistic	Value	Statistic	Value
F-statistic	0.213647	Prob. F(1,13)	0.6516
Obs*R-squared	0.242530	Prob. Chi-Square(1)	0.6224

Source: prepared by the researchers based on EViews outputs.

3.6.4 Functional-form test

The Ramsey RESET test gives a t-statistic / F-statistic probability of 0.4146, above 5%. The null hypothesis that the model is correctly specified is not rejected.

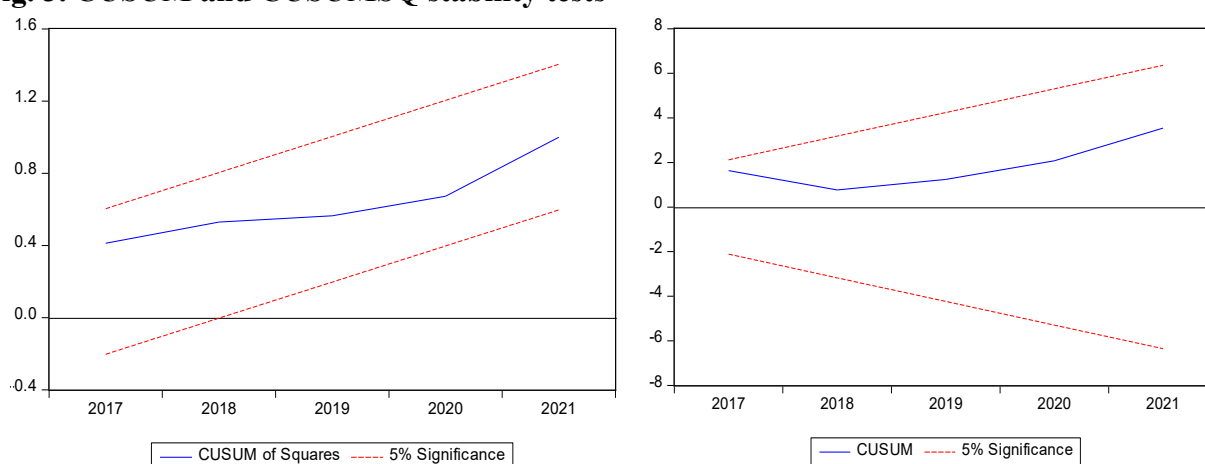
Table 8. Ramsey RESET test

	Value	df	Probability
t-statistic	0.909386	4	0.4146
F-statistic	0.826983	(1, 4)	0.4146

Source: prepared by the researchers based on EViews outputs.

3.6.5 Parameter-stability test

To verify the absence of structural change in the estimated relationship, both the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) are examined.

Fig. 3. CUSUM and CUSUMSQ stability tests


Source: prepared by the researchers based on EViews outputs.

The CUSUM statistic remains within the 5% critical bounds throughout the sample, indicating the absence of structural instability in the model's parameters. Likewise, the CUSUMSQ statistic stays within its critical bounds, confirming the stability of the estimated relationship at the 5% significance level.

3.7 Summary of hypothesis testing

The table below maps the study's three working hypotheses onto the long-run and short-run estimates in Tables 4 and 5, to give a direct, at-a-glance answer to the research questions posed in section 1.2.

Table 9. Hypothesis-testing summary

Hypothesis	Long-run result	Short-run result	Decision
H1 — ATM → unemployment	Negative, significant ($\beta = -0.646$, $p = 0.0038$)	Significant at 10% ($p = 0.058 / 0.068$)	Supported
H2 — Bank branches (CBK) → unemployment	Negative, significant ($\beta = -5.693$, $p = 0.0247$)	Highly significant, lag 1 ($p = 0.0002$)	Supported
H3 — Private credit (DC) → unemployment	Positive, significant ($\beta = +0.282$, $p = 0.0002$)	Highly significant ($p = 0.0005$)	Statistically supported; sign contrary to theory

4. Conclusion

The relationship between financial inclusion and unemployment is multifaceted. Access to financial services can empower individuals to start businesses, invest in education, and manage their finances more effectively, potentially reducing unemployment. Financial inclusion can also widen access to credit, enabling entrepreneurs to create jobs. Conversely, lower unemployment can itself foster greater financial inclusion, as more individuals gain the means to participate in the formal financial system.

Results

- There is a statistically significant negative effect of ATMs on unemployment.
- There is a statistically significant negative effect of the number of commercial bank branches on unemployment.
- There is a statistically significant positive effect of the share of domestic credit provided to the private sector on unemployment.

Recommendations

1. Enhancing access to financial services: financial inclusion should be broadened to reach economically disadvantaged and marginalised groups, including individuals in rural and remote areas. Wider access to financial services can empower individuals, stimulate economic activity, and help reduce unemployment.

2. Encouraging entrepreneurship and small enterprises: financial inclusion can help channel financing towards entrepreneurship and the development of small and medium-sized enterprises, creating new jobs and lowering unemployment.

3. Promoting financial education: financial-literacy awareness and training should be strengthened, particularly among young people, so they can manage their finances and use financial services more effectively — supporting better employment outcomes.

4. Developing financial infrastructure: expanding banking services, Islamic finance, microfinance, and financial technology (fintech) can support financial inclusion and create new employment opportunities.

5. Encouraging cooperative and social financing: cooperative and social-finance schemes can promote financial inclusion and support local social and economic projects, generating jobs and reducing unemployment in local communities.

6. Reconciling domestic credit growth with employment goals: because the estimated relationship between domestic credit to the private sector and unemployment is positive rather than negative, expanding aggregate credit alone is unlikely to be sufficient. Policy should pay closer attention to the sectoral allocation of credit — for example, directing a larger share towards labour-intensive small and medium enterprises rather than capital-intensive or non-tradable activities — and should be evaluated jointly with complementary active labour-market policies.

These recommendations underline the importance of strengthening financial inclusion as a lever for improving economic opportunity and reducing unemployment — while recognising that the composition and targeting of credit expansion matters as much as its volume.

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