Journal of Economic Cooperation and Development, **45**, 3 (2024), 89-116

Examining the Interactions of Economic Growth and Bank Credit to the Private Sector in Morocco: A causality Analysis

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ABSTRACT

Our paper examines the relationship between bank credit to the private sector and economic growth in Morocco during the period 2003-2020. We employ a VECM in an econometric framework that controls for the impact of structural breaks. In the short run, we provide robust evidence for a one-way causal impact of bank credit to the private sector on economic growth in Morocco. In the long run, we show a feedback relationship between bank credit and economic growth, which explains the concordance between the evolution of the two variables. Finally, our results show that foreign direct investment contributes most to explaining the forecast errors of bank credit intensity to the private sector and nonagricultural GDP. These results illustrate the impact of exogenous FDI shocks on output and credit in Morocco in the short run.

ملخص

تفحص ورقتنا العلاقة بين الائتمان المصرفي للقطاع الخاص والنمو الاقتصادي في المغرب خلال الفترة 2003-2020. نستخدم نموذج متجه تصحيح الخطأ (VECM) في إطار اقتصادي قياسي يتحكم في تأثير الفواصل الهيكلية. على المدى القصير، نقدم أدلة قوية على تأثير سببي أحادي الاتجاه للائتمان المصرفي للقطاع الخاص على النمو الاقتصادي في المغرب. أما على المدى الطويل، فنظهر وجود علاقة تغذية راجعة بين الائتمان المصرفي والنمو الاقتصادي، مما يفسر التطابق بين تطور المتغيرين. أخيرًا، تظهر نتائجنا أن الاستثمار الأجنبي المباشر يساهم أكثر في تفسير أخطاء التوقع في كثافة الائتمان المصرفي للقطاع الخاص والناتج المحلي الإجمالي غير الزراعي. توضح هذه النتائج تأثير الصدمات الخارجية للاستثمار الأجنبي المباشر (FDI) على الإنتاج والائتمان في المغرب على المدى القصير.

RÉSUMÉ

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Notre étude examine la relation entre le crédit bancaire au secteur privé et la croissance économique au Maroc au cours de la période 2003-2020. Nous utilisons un VECM dans un cadre économétrique qui contrôle l'impact des ruptures structurelles. À court terme, nous fournissons des preuves robustes d'un impact causal unidirectionnel du crédit bancaire au secteur privé sur la croissance économique au Maroc. A long terme, nous montrons une relation de rétroaction entre le crédit bancaire et la croissance économique, ce qui explique la concordance entre l'évolution des deux variables. Enfin, nos résultats montrent que les investissements directs étrangers contribuent le plus à expliquer les erreurs de prévision de l'intensité du crédit bancaire au secteur privé et du PIB non agricole. Ces résultats illustrent l'impact des chocs exogènes d'IDE sur la production et le crédit au Maroc à court terme.

Keywords Bank credit, Economic growth, Causality, VECM

JEL Classification: C32; E44; G21

1. Introduction

The financial crisis of 2008 confirmed the crucial importance of the two-way interactions between the real economy and the financial sphere. Indeed, this crisis was a cruel reminder of the impact of fluctuations in asset prices, bank credit, and capital flows on economic growth. As a result, an old debate within the economic discipline has been revived, and macro-financial linkages have become a major concern of economists today.

For developing countries where the banking sector dominates, a solid and well-performing banking sector can contribute to long-term economic growth. In particular, it reduces transaction friction and thus contributes to improved economic performance. On the other hand, the role of the banking system in the creation, transmission, and amplification of macroeconomic shocks is well documented, making it essential to consider the impact of banking activity on economic performance (Levine, 1997). In this sense, it is necessary to understand how banking activity interacts with macroeconomic performance to ensure macroeconomic stability.

In a global context marked by uncertainty, the Moroccan economy has experienced a substantial slowdown in economic growth over the past ten years, which coincides with an unprecedented reduction in bank credit

granted to economic agents. Furthermore, the concordance between bank credit and economic growth in Morocco leads us to assume the existence of a causal relationship between these two variables. However, the verification of this hypothesis requires a detailed analysis of the economic literature on the subject and the development of a rigorous empirical analysis interested in detecting the causal relationship and identifying its meaning.

Given the limited role played by the stock market and nonbank financial intermediaries in financing the Moroccan economy, enhancing access to bank credit is essential to meet the financing needs of the private sector. In this context, it is necessary to analyze the causal relationship between bank credit and economic growth.

Based on the above, the following question seems relevant: is there a causal link between the slowdown in economic growth and bank credit?

We divide this paper into three sections to examine the causality between economic growth and bank credit. The first section analyzes the evolution of bank credit's role in Morocco's private-sector financing. Furthermore, the second section explores the theoretical underpinnings of the different hypotheses on the existence and direction of causality between bank credit and economic growth and the empirical studies that support each hypothesis. Finally, the third section presents an empirical study on the causal link between economic growth and bank credit to the private sector.

2. Bank credit as the main engine of private-sector financing in Morocco

Morocco has pursued multiple reforms of the banking system over the last three decades aimed at strengthening the role of private commercial banks in allocating financial resources, improving the ability of financial institutions to mobilize domestic savings, and enhancing competition in the banking sector to support the stability of financial intermediaries (Yu et al., 2014).

Multiple financial sector reforms were adopted, ranging from banking and capital market reforms to monetary policy tools and banking supervision. The banking sector reforms included changes to the legislative framework

governing the activities of commercial banks and the central bank's powers, strengthening prudential regulation in line with international standards, and deregulating banking activity (Bendouz, 2015).

In parallel with these reforms, the banking sector has seen a massive expansion of its branch network, from an annual average of 10.26 bank branches per 100,000 adults between 2003 and 2005 to 24.41 between 2019 and 2020, an increase of more than 100%. During the same period, ATMs per 100,000 adults increased from 11.6 to 28.60.

To illustrate the role of bank credit in financing the Moroccan economy, table 1 below shows that bank credit intensity to the private sector declined from 71.02 percent between 2009 and 2011 to 65.12 percent between 2018 and 2020.

Table 1: Evolution of types of financing in Morocco between 2003 and 2020

	03-05	**06-08**	**09-11**	**12-14**	**15-17**	**18-20**
Bank credit to the private sector (% of GDP)	48.15	64.10	71.02	69.29	63.53	65.15
Credit to the private sector by other financial institutions (% of GDP)	-	-	23.54	22.76	22.67	24.42
Stock market financing: IPOs and capital increases (as % of GDP)	4.62	2.85	1.50	0.57	0.61	0.53

Source: Authors' calculations based on Global Financial Development Database data.

Although the intensity of credit to the private sector has slowed over the past decade, bank credit remains the primary source of financing for the Moroccan economy. Indeed, comparing financing through bank credit, credit from other financial institutions, and stock market financing show that the banking sector is the primary financing provider to the private sector in Morocco.

A comparison of credit extended to the private sector by banks and other financial institutions as a percentage of GDP shows that the latter has not been dynamic over the past decade. Indeed, the average annual credit intensity of other financial institutions to the private sector remained

between 22 and 23 percent throughout 2010-2020. Moreover, the banking sector remains the source of most private-sector financing in Morocco. The intensity of bank credit to the private sector is almost three times greater than that of other financial institutions, constituting about three-thirds of credit financing to this sector.

Since 2000, the Casablanca Stock Exchange has undergone significant transformations in its operational framework (Bourse de Casablanca, 2022). However, despite these reforms, IPOs are characterized by their low contribution to the financing of the Moroccan economy. The figures in Table 1 show the stock market's low contribution to the Moroccan economy's financing. The causes of the weakness of IPOs are not only limited to economic and financial factors such as weak economic dynamism, the reduced number of listed companies, the instability of stock market returns, etc., but they are also due to the presence of institutional and socio-cultural factors such as the family character of SMEs, the lack of transparency and financial communication and the aversion of investors to risk (El M'Kaddem & El bouhadi, 2006) In addition, access to the stock market for SMEs is minimal. SMEs only have access to the third compartment of the IPO market (the growth market). However, the number of IPOs in this compartment remains very low (12 in 2018). This weakness is mainly due to the lack of tax incentives, restrictive conditions for issuance and listing, and high costs of issuing securities (Oudgou & Zeamari, 2018).

Based on the above, bank credit is crucial in financing the private sector in Morocco. Therefore, a slowdown in bank credit can have significant macroeconomic consequences, hence the importance of analyzing the fundamental relationship between bank credit and economic activity in Morocco.

3. The causal link between bank credit and economic growth: theoretical underpinnings and empirical evidence

3.1. Theoretical literature review

Abstracting economic analysis from financial considerations has been a lasting tradition in economic theory. Indeed, most traditional Classical, Keynesian, and Monetarist models are only interested in financial markets and institutions as mere intermediaries for exchanging goods and

services, neglection their role as providers of financing (Gertler, 1988). This idea is mainly illustrated through the (Modigliani & Miller, 1958) theorem that suggests the independence of economic actors' decisions from financial structure (i.e., the sources of financing). The main advantage of this widely influenced idea is that it provided an elegant justification for economists to abstract from the complications that financial markets introduce to formal economic analysis (Gertler, 1988).

Since the seventies, the emergence of new literature on the impact of informational asymmetries on the well-functioning of financial markets, and credit markets in particular (see (Jaffee & Stiglitz, 1990) for a review) has led to an intense debate over the interactions between financial market performance and aggregate economic activity. This debate is Moreso relevant for the case of countries where banks dominate the largely underdeveloped financial systems that characterize developed countries (Nyasha & Odhiambo, 2014).

This extensive debate over the causal nexus between financial development and economic growth reveals three possible directions of the causality between bank credit to the private sector and economic growth. First, the supply-leading hypothesis suggests that developing financial services (such as bank credit) promotes economic growth. Second, the demand-following hypothesis suggests that the development of financial services passively responds to growth in real activity. Third, the feedback hypothesis suggests that the relationship between the two phenomena is either bidirectional or time-varying (Nyasha & Odhiambo, 2018).

According to the proponents of the supply-leading hypothesis, the development of the financial sector stimulates economic growth by better allocating scarce financial resources toward their most efficient uses (Nyasha & Odhiambo, 2014). This hypothesis implies that banks can promote economic growth through maturity transformation and money-creation functions. Banks collect the liquidity necessary to manage extending loans to the private sector. Economic agents spend these loans on consumption and investment, contributing to economic growth.

This hypothesis is supported by (Schumpeter, 1934), who argues that financing commercial applications of innovative entrepreneurial ideas is vital in stimulating economic development. Accordingly, promoting bank credit to the private sector is necessary to emerge new industries and

stimulate economic growth. Also, (McKinnon, 1973; Shaw, 1973) supports the supply-leading hypothesis by arguing that banking system regulation through direct monetary policy intervention hinders economic growth.

The effect of bank credit on economic growth also works through the impact of the economy's financial structure on capital formation (Goldsmith, 1959; Greenwood & Smith, 1997), savings allocation efficiency (Zilibotti, 1994), and enhanced productivity (Greenwood & Smith, 1997).

Finally, (Levine, 1997)'s extensive literature review suggests financial development's impact on economic growth work through capital accumulation and technological innovation. In particular, the development of financial services enhances the accumulation and allocation of savings. Furthermore, financial development can also affect the rate of technological innovation by providing funds necessary for the emergence of risky and innovative sectors (Saint-Paul, 1992).

The demand-following hypothesis suggests that the development of financial services merely reacts to their existing demand (Patrick, 1966). Hence, bank credit follows the growth of real activity. In other words, the development of the financial system requires the existence of a demand for financing and financial intermediation, which in turn comes from the growth of real activity (Nyasha & Odhiambo, 2018).

This hypothesis is supported by (Robinson, 1952), who argued that financial services such as credit extension emerge to satisfy the demand for financial intermediation resulting from economic growth. Also, (Gurley & Shaw, 1967) suggests that financial development emerges primarily from the labor division. Financial development occurs as this division creates the need for monetization and debt. They also argue that the division in labor and production results in specialization in saving and investment.

Finally, (Patrick, 1966) suggests that the relationship between growth and finance is neither unidirectional nor static. He suggests that feedback mechanisms between the economy's growth and the financial sector's development could exist. Some theoretical arguments supporting the bidirectional causality hypothesis were presented by (Blackburn & Hung,

1998; Greenwood & Jovanovic, 1990). For instance, (Greenwood & Jovanovic, 1990) argues that the extent of financial intermediation and economic growth rate are endogenously determined. Accordingly, financial intermediation promotes economic growth by improving the profitability of capital and, therefore, investment efficiency. Real activity growth, in turn, provides the necessary means for establishing financial structures.

Furthermore, (Blackburn & Hung, 1998) argues that there is a positive feedback relationship between the two dimensions as economic growth both promote and require the development of financial services such as credit. These authors also argue that creating loan contracts requires costly monitoring activities that lenders can undertake themselves or have delegated to a financial intermediary. Financial intermediaries such as banks are essential as delegated supervisory agencies that emerge endogenously to provide the most efficient means of channeling savings to investment. Thus, banks reduce the agency costs firms must pay to obtain loans.

(Patrick, 1966) also argue that the direction of the causality between economic growth and financial development can change over the stages of economic development. In particular, the supply-leading hypothesis is more valid in the early stage of economic development, while the demand following is more valid in the latter stages of this process.

3.2. Empirical literature review

Studies addressing the causality between economic growth and bank credit in a cross-country context are diverse. Panel data econometric methods widen the scope of analysis and increase the sample size and, consequently, the robustness of the results.

(Calderón & Liu, 2003; Zang & Kim, 2007) applied Geweke decomposition on large samples of developed and developing countries. (Calderón & Liu, 2003) tested the degree of linear dependence and feedback between economic growth and financial development for a large panel of countries. Their results show that the direction of causality from bank credit to growth dominates the linear dependence between the two variables. However, these authors show that the sample separation reveals a feedback effect between the two variables where credit slightly

dominates in the case of developing countries and growth slightly dominates in the case of developed countries. Using the same analytical framework, (Zang & Kim, 2007) found no empirical evidence of a unidirectional causality link from bank credit to economic growth. Furthermore, their study shows substantial evidence to support a causality from economic growth to bank credit.

Other studies have mobilized conventional Granger causality tests. For instance, (Rachdi, 2011) used the Granger test on a panel of OECD and 4 MENA countries, revealing a long-run causal relationship between economic growth and bank credit. In line with (Calderón & Liu, 2003), the result provided evidence of a bidirectional causality for developed countries. On the other hand, the causality test results for developing countries show that the direction is from economic growth to bank credit in line with the results of (Zang & Kim, 2007). Furthermore, (Acaravci et al., 2009; Swamy & Dharani, 2018) support the results of (Calderón & Liu, 2003) after sample separation providing evidence for a feedback relationship between economic growth and bank credit.

The results of the consulted panel data studies are contradictory. Admittedly, separating the sample into developed and developing countries allows for a better understanding of the direction of causality, which presumably depends on the degree of economic development and the country's financial structure. (Demetriades & Hussein, 1996), among others, argue that panel data methods are not appropriate to investigate causality for a group of countries with heterogenous causality patterns. This problem is illustrated by examining the results of (Caporale & Helmi, 2018). These authors tested the causality between economic growth and bank credit in fourteen developing countries by dividing their sample into two sub-samples and mobilizing both time-series and panel data methodologies to test for causality and both short- and long-run. On the one hand, their tests on panel data show that the causality direction depends on the sub-sample. On the other hand, the tests on separate time series show different directions of causality for different countries.

These inconsistencies between panel data and time series results can be addressed by keeping the cross-country framework and using time series methods by limiting the analysis to case studies.

One of the first proponents of the first solution is (Demetriades & Hussein, 1996) who examined the direction of causality between economic growth and financial development in a sample of 16 developing countries to show that the direction of causality depends on the characteristics of each country. Similarly, (S. M. Ahmed & Ansari, 1998) examined credit-growth causality in India, Pakistan, and Siri and showed the existence of causality from bank credit to economic growth in all three countries. Finally, (Abu-Bader & Abu-Qarn, 2008b) analyzed the causality relationship between financial development and economic growth for six MENA countries using the procedure of (Toda & Yamamoto, 1995) and provided evidence for a unidirectional causal relationship from bank credit to private sector to economic growth in the case of Algeria, Egypt, and Tunisia, a causal relationship in the other direction in the case of Syria, and the absence of causality in the other two cases.

For developed countries, (J. Shan et al., 2001) provided evidence of a bidirectional causality in half of its case studies. (J. Shan & Morris, 2002) also examined the direction of causality for a sample of 20 advanced economies and showed that no causality exists between bank credit and economic growth for half of the sample and that credit causes economic growth in only 6 cases.

The synthesis of the empirical literature consulted to this point in Appendix 1 shows that the level of economic development moderates the direction of the causality between bank credit and economic growth. Most studies on developed countries support a bidirectional causal relationship between the two variables. The results of the studies on developing countries are less consistent and show that they differ depending on the case, which explains the choice of a large part of the studies to limit the analysis to a single country.

The results of the consulted studies confirm the absence of a consensus on the direction of causality between bank credit and economic growth in developing countries. However, most results (A. A. Ahmed, 2018; Ananzeh, 2016; Eita & Jordaan, 2010; K. Ghali, 1999; Odhiambo, 2004) confirm that bank credit causes economic growth. These results show the importance of bank credit for growth in developing economies where banks play a primary role in financing the economy and financial markets are as underdeveloped. Annex 2 presents a synthesis of the above studies.

For Morocco, (Alaoui Moustain, 2004) used the empirical approach proposed by (Demetriades & Hussein, 1996) to investigate the causal nexus for the 1970-200 period, showing the absence of cointegration between economic growth and bank credit, implying the nonexistence of a long-run relationship between the two variables. The use of the Granger test in the first difference shows the existence of a unidirectional causality of bank credit to economic growth in Morocco during the study period. The results of the causality test contradict this result according to the approach of (Toda & Yamamoto, 1995) developed by (Abu-Bader & Abu-Qarn, 2008b), which did not find a short-term causality relationship between the variables between 1960 and 2004 and those of (Menchif et al., 2020) which provide evidence for a causal impact of economic growth on bank credit during the study period.

These empirical studies of the Moroccan case suffer from significant shortcomings, namely, the study period, the sample size, and the choice of causality test. First, these studies cover the periods with the various reforms in the Moroccan banking sector without considering the impact of possible structural breaks that result. Second, the use of annual data significantly reduces the sample size; this problem is compounded in the case of dynamic models that require the estimation of coefficients on lags of variables. Finally, the causality test (Abu-Bader & Abu-Qarn, 2008b) and (Menchif et al., 2020) do not test for long-run causality.

More recently, (Kchikeche & Khallouk, 2021) provided more recent evidence on credit-growth causality. These authors studied the causality between bank-based financial development and economic growth in Morocco using quarterly data between 2002 and 2018. Their results provide evidence of a unidirectional causal effect of bank credit on economic growth in the short run and bidirectional causality between the two variables in the long run.

In the following section, we build on the work of (Kchikeche & Khallouk, 2021) by narrowing our focus on the causality between bank credit to the private sector and economic growth, extending the study period to include the post-COVID19 data and significantly improving the robustness of the results by accounting for the impact of structural breaks.

4. Data and Methodology

4.1. Empirical Methodology

The first step of our analysis is unit root detection by conducting the augmented Dickey-Fuller test described in (Dickey & Fuller, 1979). We will also use the unit root test in the presence of a structural break developed by (Perron, 1989).

If the series are integrated in the first order, we will test for cointegration using a VAR model as presented by (Lütkepohl, 1999) in equation 1 as follows:

$$y_t = A_1 y_{t-1} + \cdots + A_p y_{t-p} + u_t \quad (1)$$

To test for cointegration, we conduct the tests developed by (Johansen, 1995). Furthermore, we use the (Johansen et al., 2000) extension of the cointegration test to account for the impact of structural breaks by modifying the trace statistics in the standard cointegration test.

A cointegrating relationship between nonstationary variables may indicate a long-run relationship that we can formalize using a VECM (Engle & Granger, 1987). Thus, a long-term cointegrating equation can be estimated if a cointegrating relationship is detected. Therefore, causality tests could be conducted using a vector error correction model (VECM) that we present in equation 2 as follows:

$$\Delta y_t = \Pi y_{t-1} + \Gamma_1 \Delta y_{t-1} + \ldots + \Gamma_{p-1} \Delta y_{t-1} + u_t \quad (2)$$

Where $\Pi = -(I_K - A_1 - \ldots A_p)$ and $\Gamma_i = -(A_{i+1} + \ldots + A_P)$ for $i = 1, \ldots, p-1$.

The long-run component of the model is represented through the matrix Πy_{t-1} comprised of the cointegrating equations and the vector Π representing the error correction coefficients. The short-run component of the models is comprised of the autoregressive coefficients Γj.

Based on this VECM model, we conduct two causality tests. First, we conduct the short-run VEC-based Granger causality test developed by

(Granger, 1986, 1988). The granger causality test tests the joint significance of each block of short-run parameters Γj. Second, we test long-run causality using the weak exogeneity test. This test examines the significance of each element in Π and can be, in the presence of cointegration, evidence of causality in the long run (Hall & Milne, 1994).

4.2. Data and model specification

In line with (Kchikeche & Khallouk, 2021), our econometric model used in this study is a dynamic model incorporating our two variables of interest and two control variables. We measure economic growth in Morocco using nonagricultural GDP per capita. In addition, we use bank credit to the private sector to measure the effect of the essential function of the banking sector on economic growth.

We use foreign direct investment as a percent of GDP to control for confounding external macroeconomic variables. Indeed, in addition to their effects on output and employment, FDI stimulates investment in developing countries, which are characterized by a low savings rate and an underdeveloped financial system, and promotes the transfer of technology, which helps improve the productivity of domestic firms, and therefore stimulate growth (Lahlou, 2019). In addition, they contribute significantly to bank liquidity, facilitating credit provision.

On the other hand, we use government spending as a percent of GDP to control short-term internal macroeconomic dynamics. Keynesian theory suggests that government spending stimulates economic growth through two main channels. The former directly affects economic growth by increasing aggregate demand through expansionary fiscal policy, and the latter indirectly affects growth by providing the necessary infrastructure for private investment (Nyasha & Odhiambo, 2019).

Our sample extends from 2003, when data on FDI is first available, to 2020. We deflated all our variables using the CPI to control for inflation before adjusting them for seasonal variation using the X-13 procedure. Finally, the log transformation is used to unify the measurement scales, obtain more homogeneous variances, and make the distributions of our series more normal (Lütkepohl & Xu, 2012).

5. Empirical Results

5.1. Preliminary tests

The first step of our modeling exercise is the analysis of the stationarity of our variable. For robustness, we conduct two separate stationarity tests. Table 2 below presents the results of both the standard (Dickey & Fuller, 1979) unit root test and the unit root test of (Perron, 1989) in the presence of structural breaks.

Table 2: Unit root tests

Variables	ADF test			Perron test		
	Level	**1st difference**	**I(d)**	**Level**	**1st difference**	**I(d)**
GDP	1.320	-9.927***	I(1)	-3.894	-13.085***	I(1)
CDTP	-1.800	-7.374***	I(1)	-3.932	-7.997***	I(1)
GS	-2.470	-3.384***	I(1)	-2.656	-10.632***	I(1)
FDI	-0.356	-24.811***	I(1)	-9.212***	-	I(0)

Note: *, **, *** means that the test statistic is above the critical value at the 10%, 5%, and 1% thresholds, respectively.

The results of the ADF test indicate that the null hypothesis is not rejected for all variables. However, all series become stationary in the first differences. Therefore, the results of the stationarity test indicate that all series are first-order integrated. Furthermore, (Perron, 1989) 's test indicates the existence of a break in the trend and constant of the series during the third quarter of 2009, which coincides with the manifestation of the impact of the 2008 financial crisis on the Moroccan economy.

Overall, the results of both types of stationarity tests indicate that the two variables of interest, nonagricultural GDP per capita and private sector credit intensity, are integrated in the first order. The cointegration study is, therefore, necessary to verify the existence of a long-run relationship between the two variables.

We conduct the Johansen cointegration test using a VAR model with six lags. We also conduct the modified cointegration test of (Johansen et al., 2000) to account for the impact of structural breaks in the deterministic component of our VAR model.

The estimated VAR model is augmented with three exogenous dummies for three possible structural breaks. The first dummy variable is introduced to account for the impact of the 2008 financial crisis, taking the value of 1 from the second quarter of 2009 and 0 before that date. The second indicator variable representing the impact of the COVID-19 crisis takes the value one from the second quarter of 2020. The dates of these two breaks are chosen based on the two shocks' impact on economic growth dynamics and bank credit to the private sector in Morocco. Finally, the date of the third structural break is detected using the test developed by (Andrews & Ploberger, 1994) and takes the value one from the fourth quarter of 2012.

The rest of the two cointegration tests are presented in table 3 below.

Table 3: Cointegration tests

Test	**(Johansen, 1995)**		**(Johansen, 2000)**	
H0	**Trace**	**Max-Eigenvalue**	**Trace**	**Adjusted critical value at 5%**
r = 0	78.732**	35.332**	78.732**	74.200
r ≤ 1	43.400**	25.761**	43.400	50.968
r ≤ 2	17.639	17.291**	17.639	31.529
r ≤ 3	0.348	0.348	0.348	15.772

Note: ** indicates the rejection of the null hypothesis at the critical value at the 5% thresholds.

The results of the above cointegration tests indicate the existence of at least one cointegrating equation between the variables. Notably, the Johansen cointegration test requires all variables to be integrated in the first order. The possible stationarity of the foreign direct investment variable could render the cointegration test results invalid. To further check the robustness of our results, we conduct the (Pesaran et al., 2001) causality test that allows for cointegration between stationary and nonstationary variables[3]. The results of this test are shown in Table 4 below.

[3] We also checked for cointegration using a VAR model of the three nonstationary variables (GDP, Credit intensity, and government spending). The results of this test indicate the existence of 1 cointegration relationship.

Table 4: Cointegration test at the bounds

F-statistic value	Significance level	Lower bound	Upper bound
6.211	10%	2.37	3.2
	5%	2.79	3.67
	1%	3.65	4.66

To reject the hypothesis of cointegration, the F-statistic should be above the critical value of the upper bound I(1). As the results show, we can reject the null of no cointegration at the 1% significance level. The above tests show robust evidence of cointegration among the four variables. Accordingly, we will use a VECM to capture the cointegrating relationships between our variables

5.2. Causality tests

Based on the tests above, we conclude that there is a long-run causal relationship between our variables in at least one direction. The short-run causal relationship can be captured using a Granger causality test based on the vector error correction model. We present the result of both short and long-run causality tests in table 5 below.

Table 5: Causality tests

Direction of causality	Granger causality test	Weak exogeneity test
GDP → CDTP	8.018	32.060***
CDTP → GDP	27.559***	23.176***
GS → CDTP	22.275***	2.008
GS → GDP	40.887***	
FDI → GDP	15.828***	0.776
FDI → CDTP	20.118***	

Note: *** indicates the rejection of the null hypothesis at the critical value at the 1% threshold.

The results of testing the joint significance of the coefficients (Γ_i) of each explanatory variable for each error correction equation do not reject the hypothesis that economic growth does not cause growth in private sector credit intensity. On the other hand, the results reject the null hypothesis that changes in private sector credit intensity do not cause short-term economic growth. Accordingly, these results show a unidirectional causal relationship in the short term from bank credit to the private sector toward the nonagricultural GDP. Moreover, the results show that FDI and government spending stimulate economic growth and private-sector credit in the short run.

While the results of the Granger causality test show the dynamics of the two variables of interest in the short term, they do not allow us to compare the effects of the explanatory variables on each variable to be explained.

In this sense, the forecast error variance decomposition measures the information contribution of each variable to the other variables in the model. More precisely, it allows us to calculate the contribution of the exogenous shocks of each variable in the model to the variance of the forecast error of the variable of interest (Lütkepohl, 2005).

Table 6 below presents the aggregated yearly average of each variable contribution to the GDP and credit intensity forecast error.

Table 6: Variance decomposition results

	Variance decomposition of GDP				**Variance decomposition of CDTP**			
	GS	CDTP	GDP	FDI	GS	CDTP	GDP	FDI
2-year average	2.9	10.0	57.3	29.8	5.1	75.8	1.7	17.4
5-year average	2.2	10.2	42.7	44.8	3.9	73.7	1.6	20.8
10-year average	1.9	12.5	32.2	53.5	3.3	73.2	1.7	21.9

The results of the Granger causality test show that all variables in the model cause nonagricultural GDP in the short run. However, their contributions to the error variance are significantly different. Being stock variables, nonagricultural GDP and bank credit are persistent and contribute significantly to their forecast variance after two years. Moreover, the variable that contributes most to explaining the forecast errors of the two variables of interest is FDI, which shows the impact of exogenous shocks on output and credit in Morocco in the short run.

In all, the results of the short-run causality test are consistent with the findings of (S. M. Ahmed & Ansari, 1998; Ananzeh, 2016; Caporale & Helmi, 2018; K. H. Ghali, 1999; Odhiambo, 2004) in the case of developing countries and (Alaoui Moustain, 2004) in the case of Morocco between 1970 and 2000. However, our results contradict the findings of (Acaravci et al., 2009; A. A. Ahmed, 2018; Araç & Özcan, 2014; Calderón & Liu, 2003; Demetriades & Hussein, 1996; Odhiambo, 2008; Rachdi, 2011) in the case of developing countries and those of (Menchif et al., 2020) in the case of Morocco between 1987 and 2017.

Our results suggest a strong impact of the opening of the Moroccan economy to foreign capital on the dynamics of bank credit to the private sector. The effect of external shocks goes through bank liquidity, affecting banks' balance sheet constraints and, subsequently, bank credit supply. The impact of FDI can also affect production, investment and employment, disposable income, and subsequently, economic agents' debt and repayment capacity, which will impact the demand for bank credit. The results of the Granger causality test show that the impact of external shocks is mainly through the bank liquidity channel and affects banks' ability to grant credit.

The use of the VECM model is not limited to testing short-term causality but also allows for testing long-term causality using the weak exogeneity test. Based on our results, we reject the hypothesis of the non-significance of the error correction terms in the equations of nonagricultural GDP per capita and bank credit to the private sector. However, we cannot reject the insignificance of government spending and FDI. Therefore, a long-run bidirectional causal relationship exists between nonagricultural economic growth and bank credit.

Our results are in line with the findings of (Araç & Özcan, 2014; Calderón & Liu, 2003; Ghali, 1999; Siddique, 2018) in the case of developing countries, but they contradict the results of (S. M. Ahmed & Ansari, 1998; Araç & Özcan, 2014; Caporale & Helmi, 2018; Eita & Jordaan, 2010; Odhiambo, 2004) that show the nonexistence of a causal impact of GDP on credit, those of (Demetriades & Hussein, 1996; Odhiambo, 2008; Rachdi, 2011) which show the inexistence of a causal impact of credit on GDP and the results of (Alaoui Moustain, 2004) which support the inexistence of a long run causality between the variables in the Moroccan case.

Thus, our results show a feedback relationship between bank credit and economic growth in the long run, which implies the importance of real activity growth for the development of the banking sector in the long run. Moreover, the contribution of the banking sector to the financing of the economy stimulates growth in the short and long run.

6. Conclusion

Our paper investigates the causality between economic growth and credit to the private sector in Morocco between 2003 and 2020. To do so, we used a VECM to conduct short-run and long-run causality tests.

We provide robust evidence for a one-way causal impact of bank credit to the private sector on economic growth in Morocco in the short run. Furthermore, the results show that FDI and government spending stimulate economic growth and private-sector credit only in the short run. Furthermore, we show that the variable that contributes most to explaining the forecast errors of bank credit intensity to the private sector and the nonagricultural GDP is foreign direct investment, which shows the impact of exogenous capital inflow shocks on output and credit in Morocco in the short run.

In the long run, we show a feedback relationship between bank credit and economic growth, which explains the concordance between the evolution of the two variables. These results could indicate the operation of the (Bernanke & Gilchrist, 1996)'s financial accelerator in the long run, which could explain the concurrent decline of the levels of economic growth and credit extension to the private sector during the study period.

Our results have significant implications for economic policy in Morroco. Indeed, Morocco has embarked on various structural reforms to develop its financial system. Nonetheless, the banking sector is still the primary financing provider to a significant portion of the private sector, as the contribution of the compartments of the nonbank segments of the financial sector to this process is still unsatisfactory. The existence of a robust causal impact of bank credit to the private sector on economic growth sheds light on the importance of stimulating bank credit to bank-dependent firms and households. While Bank Al-Maghrib started to experiment with nonconventional tools of monetary policy to stimulate credit to the private sector in 2012 and 2013 (Bank Al-Maghrib, 2014) and reinforced and extended their use in the aftermath of the COVID-19 crisis (Bank Al-Maghrib, 2021), the reach of these instruments should be further extended as they proved effective in promoting bank credit to medium and small firms (Queyranne et al., 2021).

One more significant implication of our result is that there is no long-run measurable benefit of the financial liberation and the measures undertaken to attract foreign direct investment on either economic growth or bank credit to the private sector. However, as a source of bank liquidity, the resulting capital inflows strongly impact short-term bank credit. Based on these results and in the context of the growing openness of the Moroccan economy, external economic shocks will likely have an increasing impact on bank credit dynamics in Morocco.

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Appendices

Appendix 1: Summary of the empirical literature consulted on the causality between bank credit (C) and economic growth (Y) in a transnational context

Study	Full sample	Developed	Developing
(Calderón & Liu, 2003)	$C \rightarrow Y$ (81%)	$C \leftrightarrow Y$ (63%)	$C \leftrightarrow Y$ (60%)
(Zang & Kim, 2007)	$C \leftarrow Y$	No separation	No separation
(Rachdi, 2011)	NA	$C \leftrightarrow Y$	$C \leftarrow Y$
(Acaravci et al., 2009)	NA	Not included	$C \leftrightarrow Y$
(Swamy and Dharani, 2018)	NA	$C \leftrightarrow Y$	NA
(Caporale & Helmi, 2018)	-	Not included	$C \rightarrow Y$ (64% in SR, 86% in the LR)
(Demetriades & Hussein, 1996)	-	Not included	$C \leftarrow Y$ (56%)
(S. M. Ahmed & Ansari, 1998)	-	Not included	$C \rightarrow Y$
(Abu-Bader & Abu-Qarn, 2008)	-	Not included	$C \rightarrow Y$ (50%)
(J. Z. Shan et al., 2001)	-	$C \leftrightarrow Y$ (50%)	Not included
(J. Shan & Morris, 2002)	-	$C \nleftrightarrow Y$ (50%)	Not included

Note 1: The column (Full Sample) shows the results of studies that do not separate the sample into developed and developing countries.

Note 2: The percentages in parentheses in the first row of the table show the contribution of bank credit to the causal relationship. However, this figure in the rest of the table is a percentage of cases that support a given hypothesis

Appendix 2: Summary of the empirical literature consulted on the causality between bank credit (C) and economic growth (Y) in a domestic context

Study	**Short-run causality**	**Long-run causality**
(Ghali, 1999)	$C \rightarrow Y$	$C \leftrightarrow Y$
(Odhiambo, 2004)	$C \rightarrow Y$	$C \rightarrow Y$
(Odhiambo, 2008)	$C \leftarrow Y$	$C \leftarrow Y$
(Abu-Bader & Abu-Qarn, 2008a)	$C \leftrightarrow Y$	$C \leftrightarrow Y$
(Eita & Jordaan, 2010)	$C \rightarrow Y$	$C \rightarrow Y$
(Araç & Özcan, 2014)	$C \leftrightarrow Y$	$C \rightarrow Y$
(Ananzeh, 2016)	$C \rightarrow Y$	Not Tested
(A. A. Ahmed, 2018)	$C \leftrightarrow Y$	Not Tested
(Hondroyiannis et al., 2005)	$C \leftrightarrow Y$	$C \leftrightarrow Y$
(J. Shan & Jianhong, 2006)	$C \leftrightarrow Y$	Not Tested
(Alaoui Moustain, 2004)	$C \rightarrow Y$	$C \nleftrightarrow Y$
(Menchif et al., 2020)	$C \leftarrow Y$	Not Tested
(Kchikeche & Khallouk, 2021)	$C \rightarrow Y$	$C \leftrightarrow Y$