On recessive and expansionary impact of financial development: empirical evidence

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Abstract

We investigate the effects of financial development on recession while controlling for potential recession factors using data of about 129 countries covering the 1990-2010 period. To the best of our knowledge, this is the first study examining this relationship using a plural and innovative methodology along with a newly primary and hitherto almost unexploited "Rare macroeconomic disasters" data from Barro and Ursua (2012) which allow us to build a more specific proxy of the variable "economic recession". We executed step by step "Feasible Generalized Least Squares", "Locally Weighted Scatterplot Smoothing", "Local Linear" and "Iteratively Reweighted Least Squares" regression methods joint with a Sasabuchi test to verify the inverse U-shape and estimate the extreme point. Strong evidence of a nonlinear and U-shaped relationship between both phenomena with a threshold effect of 1.1528 emerged. Financial development presents an expansionary impact for countries with financial performance less than the threshold, while there is a recessionary impact for countries with financial performance above it. This last result is robust to the control of extreme values and heterogeneity within the sample. The semiparametric regression shows that the results of the parametric part converges with the previous results in general and reveals with illustration the functional form of the nonlinear relation between both indicators. Moreover, controlling the heterogeneity within our sample permitted us to demonstrate that fuels for South Asia (SASIA) and Latin America and Caribbean (LAC) countries and financial openness for sub-Saharan Africa (SSA) countries are negatively related to recessions. Related and relevant policy recommendations are highlighted and discussed.

JEL classification: E32, E44, O16, O50

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1. Introduction

How can we explain the cyclical fluctuations of the economy in general and the economic recession in particular? This is one of the most addressed and controversial issues among economists. According to Minsky (1975), the cumulative chain of increasing oversupply and insolvency of borrowers was probably at the heart of the "Great Depression" of the 1930s; this cumulative chain is also considered as a main factor explaining the "Great Recession" of the 2000s. This assertion of Minsky (1975) is

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based on Fisher's (1933) analysis of "debt deflation". According to him, the decrease in prices due to free-market play can trigger a deflationary spiral, leading to insolvency and chain bankruptcies; indeed, deflation increases the real value of corporate debt. To reimburse, they stop investing and hiring and destock greatly. This rational makes it important to focus on finance and its impact on the recession through its role in triggering crises. Since the invention of finance, it has been associated with episodes of excessive risk-taking and financial asset price bubbles (Nguena & Tsafack Nanfosso, 2014). Such episodes usually had a bad end, causing job and income losses far beyond the financial industry. Considering this, it is justified to verify the assumption of whether solving the problem of borrower insolvency through private domestic credit development would help or not combat the recession.

A recession is different from a simple slowdown in the economy that corresponds to a decline in the GDP[1] growth rate over two consecutive quarters. The National Bureau of Economic Research, through the Committee to date business cycles define it as a *"significant decline in economic activity affecting all sectors, for several months, normally visible in production, employment, real income and other indicators. A recession begins when the economy reaches a climax and ends when it reaches its lowest point".* The term depression, on the other hand, refers to a more intense and long-lasting fall in production as experienced in the United States after the stock market crash of 1929.

Financial development for its parts involves improvements in the following functions provided by the financial systems: (i) pooling of savings; (ii) allocating capital for investments; (iii) monitoring investments; (iv) risk diversification; and (v) exchange of goods and services (Levine, 2005). Moreover, funds allocation, savings and investment decisions are sensitive to each of these financial functions. As a consequence, total factor productivity along with physical and human capital accumulation are the main channels through which finance impact economic growth (Tsafack Nanfosso & Nguena, 2015; Nguena et al., 2021). With the possibility of reduction of information asymmetries and insurance of risk sharing, the financial sector can absorb shocks and reduce the amplification of cycles via the financial accelerator, and thus lowering inequality volatility (Bernanke et al., 1999).

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[1] Gross Domestic Product.

While it is true that developing countries have experienced very few depressions throughout the years, these countries faced and are facing many types of crises; the current pandemic crises is the last ever-lived phenomenon with effective and potential recessive and/or expansionary impacts. Before it, the global economy tipped into recession in 2008 due to the 2007 financial crises[2]. This recession has driven firstly a contraction in demand from households and businesses due to the tightening of credit standards by banks and the fall of their earned incomes, resulting from the rise in unemployment and the collapse of world trade (Redoulès, 2009). In such context, policymakers need to set robust diagnostic to comprehensively assess the impact of recent and past crises on the real economy, and the economic impact of financial development that would insidiously be associated with an underlying recession.

This brief theoretical and empirical presentation about the necessity to combat the recession and the importance of financial development implies the necessity to check the existence and the nature of the relationship between both phenomena. Thus, to contribute to the existing literature, the issues that this paper addresses is to qualitatively and quantitatively question the impact of financial development on economic recession. Practically, we examined this question using data for 129 countries covering the period 1990-2010 along with a plural and innovative methodology step by step.

We developed a *Sasabuchi* test to verify the inverse U-shape and estimate the extreme point for the non-linear specification. For robustness check, we used (1) an Iteratively Reweighted Least Squares method to control the extreme values that could influence the baseline findings and (2) an exclusion of regions technic to control the heterogeneity of the sample and assess the behaviour of the variables of interest. Indeed, given the heterogeneity of our sample, we considered a global sample of developing countries and a grouping sample based on regional ralations; this is mainly because we assume that financial development is correlated with the level of wealth and present divergent characteristics across regions (Demirguç-Kunt & Levine, 1999; Beck et al., 2014, 2016; Nguena, 2020).

Moreover, we implemented also "Feasible Generalized Least Squares", "Locally Weighted Scatterplot Smoothing" and "Local Linear" regression methods. Several

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[2] This financial crisis that began in the US financial market in general and in the subprime market in particular, was then amplified and propagated in advanced economies and the major emerging countries creating the recession.

estimations based on different specification using a semi-parametric regression with a procedure provided by Lokshin (2006) were executed. The estimation output consisted of two parts: (1) a table that reports the regression coefficients of the linear part of the model and (2) a graph that illustrates the functional form of the nonlinear part of the relationship between both indicators.

Such an investigation has numerous interests. Firstly, the focus on seeking solutions on hold issue such as recession linked to the past economic crisis and depression (The "Great Depression" of the 1930s, the "Great Recession" of 2007-2009 followed by the last financial crisis) and, more interestingly, to the current health crisis which is starting to imply an economic crisis. Secondly, we present a literature review and especially a theoretical framework on the important question of financial development and its link with the economic recession. Thirdly, our empirical methodology is based on a sample of 129 developing countries from all regions of the world.

Fourthly, we use primary and hitherto, almost unexploited "Rare macroeconomic disasters" data from Barro & Ursua (2012); this database permits us to have a specific proxy of "economic recession" closer to the reality; compared with data from other sources (IMF[3], World Bank) this recent dataset on economic recession from the said sources should provide findings with updated and more focused policy implications. Fifthly, as far as we have reviewed, no study has employed the empirical approach we use in tackling the problem; thus, the paper also contributes to the existing literature on the methodological aspect. Finally, given the challenges of globalization, especially considering financial sector performance, the analysis could serve as a basis for the implementation and/or revision of policies towards banking and financial system development by authorities/international organisations.

We mainly found strong evidence of the nonlinearity and U-shaped relationship along with a threshold effect. The semiparametric regression shows that the results of the parametric part converge with the previous results in general and shows with illustration the functional form of the nonlinear relation between recession and financial development. Verifying the robustness permitted us to confirm the results of the baseline and extended model specification in terms of coefficients sign and significance.

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[3] International Monetary Fund.

Controlling the heterogenity within the sample permitted to highlight SSA, SASIA and LAC as the order of continental/regional importance in increasing magnitude, demonstrating that fuels for South Asia (SASIA) and Latin America and Caribbean (LAC) countries and financial openness for sub-Saharan Africa (SSA) countries are negatively related to recessions. The control of extreme values confirmed the baseline findings and highlighted the following as the order of regional importance in increasing magnitude: sub-Saharan Africa (SSA), South Asia (SASIA) and Latin America and the Caribbean (LAC). Moreover, the turning point permitted to divide the sample into two parts: on one hand, countries or regions which are eligible to an expansionary impact of financial development, and on the other hand, countries or regions with a recessive impact of financial development.

The rest of the paper is organized as follows: In section 1, we present the updated literature review on the subject; in section 2, the theoretical framework and stylized facts; in section 3 we specify the model, discuss the data as well as sensitivity analyses for robustness checks. The empirical analysis is presented in Section 4. Section 5 concludes with policy recommendations.

2. Recessive and expansionary impact of finance: a literature review

Firstly, we start by the presentation of an overall up to date empirical studies analysing the relationship between financial development and economic recession and; secondly fall into a classification, step by step based on major results in the literature and different methodologies used and/or geographical orientation.

2.1. Empirical studies on the relationship between finance and economic recession

When a country is in recession, all the sectors affected are normally visible in production, employment, real income and other indicators. This is the main reason why, the literature on the relationship between financial development and economic recession, usually analyses the effect on the previously stated indicators.

Several studies show that there are various speculative and financial causes of the deep recession which have affected capitalist economies after each crisis, such as the one of 1929 and 2007. Brahmi & Zouari (2014) for example, described the global

economic conditions after the last financial crisis, its causes and effects on the global economy and recommendations or actions to take. He concluded that the financial crisis affected the financial system development and was the main explanation for the global recession which followed.

Mody et al. (2007) show that there is a strong correlation between economic cycles in developed countries. The presence of financial accelerator mechanisms seems to prevent for the moment any decoupling cycles, given the global distribution of financial centres and the globalized nature of finance. However, they indicate that a shock of credit is more persistent in Europe than in North America, and they explain it by disparities in the way the financial sector operates (financial renegotiations of loans, variable rates ...etc.) and a lower depth of European markets. Accelerator effects are felt 15 quarters (4 years) in European countries, while they disappear after 7 quarters (less than two years) in North America. On the other hand, the investment's response to a temporary shock on credit access for businesses is initially stronger in the United States than in Europe (65% elasticity in the United States compared to 43% in France).

Focusing on the achievement of Millennium Development Goals in the Tunisian context, Bashir et al. (2010) described the causes and consequences of the 2007 financial crisis along with its effects on the world economy. They found that Tunisian banks were not directly affected by the credit crisis and bullet premiums since they do not have many assets abroad. Additionally, given the fact that policymakers continued lowering tariffs to meet international commitments and stimulate economic exchanges with the global economy, the crisis did not affect the programs openness to the rest of the world established. The global recession had removed 38,000 jobs in the Tunisian manufacturing sector.

Following the 2007 great recession and financial crisis, households were less optimistic than companies about their future economic prospects; using American data collected between 2008 and 2009, Hurd & Rohwedder (2010) shows that more than 39% of American households were unemployed, had not been treated fairly and had housing payment arrears. Moreover, they forecasted an increase in goods and services market prices and real estate prices.

Maswana (2009) investigates the impact of the global financial and economic crisis on African economic development focussing on Botswana, Cameroon, Cote d'Ivoire,

DRC[4], Ghana, Kenya, Mauritius, Nigeria, Senegal, South Africa, Tanzania and Zambia. He used a nonlinear generalization of integration, the threshold auto-regression model (TAR), applying the method of Chan (1993) to estimate the threshold value because larger shocks bring about different responses than do smaller shocks. The main finding was that the current financial meltdown and economic recession crisis might have spread into Africa via business cycle and trade co-movement rather than financial links.

Beachy (2012), analysed what provoked the largest financial and economic collapse in decades. He showed that while the main causes of the recent crisis are the housing bubble and subprime mortgage lending boom, we have besides, errant economic assumptions, skewed incentives in the financial sector and inequitable socioeconomic structures as regular roots. According to Fernald (2014), mainly due to a decrease in the USA[5] labour and total factor productivity growth before the great recession, the developing countries pre-recession trends reflected a reduction of the potential level of production in 2013. One explanation can be found on disruptions since the beginning of the recession, and speculative bubbles related to housing finance activities.

Overall, in reviewing the literature regarding major empirical findings, the different contributions to the analysis of the relationship between finance and the recession reveal many twists and turn in the results (Eggoh, 2009). The first line of research concerns the works that concentrate their researches on the study of the relationship between financial development and overall indicators of the economic situation of the country including GDP growth. Then, the next line consists of the works that address this relationship through other transmission channels, and finally, the authors who analysed the direct effect of policies.

While the first works reveal in general a positive link between financial development and economic growth in line with the contribution of Keynesian authors (with the works of Mac Kinnon, 1973 and Shaw, 1973), a small part highlighted a negative relationship caused by an alternative version of the changes in interest rates, the dualism between formal finance and informal finance, and financial market imperfections.

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[4] Democratic Republic of Congo

[5] United States of America

The second major results derived from this literature are those in which the development of the financial system through time facilitates the transmission of a recession even if the financial systems of some countries are weakly connected to the global financial system. However, the authors do not seem to agree with the effects of each channel on the real economy.

2.2. Review of empirical studies based on the methodology used

Considering the methodology used to analyse the relationship between financial development and recession, two approaches can be identified: macroeconomic and microeconomic approaches. Regarding the macroeconomic approaches, we distinguish, on one hand, studies that use descriptive statistical methods to explain the contagion of the financial development on the real economy, and on the other hand, studies that evaluate the impact of financial development on the level of economic activity (GDP) through different transmission channels such as exports level, inflation, remittances, and/or ODA[6].

Several indicators are used in the empirical analysis of the link between financial development and growth or recession. The most commonly used indicators for financial development and recession available for many developing countries over a long period are: the GDP growth rate, liquid assets, or loans granted by financial intermediaries (excluding central banks and government agencies) to the private sector.

Thus, the first research using statistical data simply analyses the overall development of different transmission channels of the financial crisis from one country while comparing them with those of other countries in the sub-region. Regarding the transmission channels of the crisis which are often considered by the authors, the first and most used in the macroeconomic analysis is the GDP growth rate; this method is used to observe the trend during the recession (Siddiqui, 2009 for Japan; Petralias et al., 2013 for Greece; Parejo & Sudrià, 2012 for Italy; Beachy, 2012 and Fernald, 2014 for the less developed country; Ball, 2014 for the developed country). The second channel addressed is the regional exchange of securities (Aka, 2008), then comes the growth rate of exports/imports, the level of unemployment etc.

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[6] Official Development Assistance

The second research axes consist of studies using traditional models of endogenous growth autoregression which are most often estimated using a separate set of econometric methods that differ depending on whether one is in a longitudinal section study or cross-sectional (Petralias et al., 2013). Thus, there is the analysis of panel data on a set of countries estimated by error correction models or VAR as we want to take into account or not the interdependencies between macroeconomic variables (ILO, 2009), the fixed-effects models, the co-integration methods, or the nonlinear generalization of integration (Maswana, 2009). From a microeconomic point of view, few studies have focused on the social domain such as child abuse, worsening hunger and malnutrition and rising unemployment due to the lower wages on the labour market.

2.3. Review of empirical studies based on the geographical orientation

With the objective of grouping by regions, we can mainly say that there are two different workgroups. The first is the studies that are interested only on developed countries or advanced and major emerging countries (China, India and Japan) such as the study of Brahmi & Zouari (2014); the second are those who try to see the impact of financial development on the developing countries in general and Africa in particular (ILO, 2009; Bechir et al., 2010).

The major geographical grouping is in developed countries, namely the European Union and the United States that are mostly affected by the economic and financial crises and in which the recession is the most maligned. However, some individual works in some countries (Greece, Italy, Spain, Japan etc.) are also part of this burgeoning literature, but their goals are diverse (Petralias et al., 2013; Siddiqui, 2009).

Overall, because the geographical orientation of empirical works previously developped until today never used 129 countries worldwide and the use of Barro & Ursua (2012) is missing in the literature; we undertake the assignment to contribute to this literature review with the main objective to fill this specific gap.

3. Theoretical framework and some Stylized facts

3.1. From hold debate to new theoretical frameworks.

To build the theoretical framework, we move between hold debate, IS PM and financial accelerator theoretical models.

3.1.1. Hold debate

Two approaches (the classical and the Keynesian) belonging to the economic cycle and crises have refined the analysis of economic crises: mainly, we have on one hand classical and neoclassical which consider economic crises as an exogenous phenomenon (There is autoregulation of the economy and crises only come from state actions); and Marxist, Keynesian and neo-Keynesian which consider it as an endogenous phenomenon (crises is linked to the capitalism mechanism) on the other hand. For our own, we assume that crises, as well as recessions, are endogenous phenomena.

3.1.2. IS PM theoretical model

The question of the interaction between the financial bloc and the real bloc along with the explanation of recessions/economic crises has been the source of several analyses since Adam Smith. Indeed, from the invisible hand-related solution to Tirole's economic regulation and Keynes' economic policies, we are still confronted with the reality: economic recessions are present and even if they are resolved, nothing reassures us that they are impossible to reappear. Many empirical studies have addressed this issue with different approaches and samples. When considering the major controversies in economic theory, one can only be struck by the resurgence, at regular intervals, of a fundamental debate on the explanation of economic crises and unemployment and on the effectiveness of state intervention in combating fluctuations. Thus, in the second half of the 19th century, during a clash with Malthus, Say refuted the possibility of crises of overproduction, despite the periodic collapse of markets.

In the great depression of the 1930s, it was Pigou (1933) who denied the involuntary nature of unemployment as an equilibrium phenomenon, of which Keynes tried to make the pillar of his macroeconomic analysis. In the 1970s, it was the proponents of the "new classic economy" who questioned Keynesian intervention policies, at a time when Western countries were experiencing oil shocks and a significant

slump in growth synonym of recession. More recently, in the early 1980s, a current called "real cycles" has been developed, denying any legitimacy to stabilization policies, and particularly monetary policies, and insisting on the "real" nature of fluctuations, while monetary and financial shocks seem to have become decisive in the origin of cyclical disturbances, as evidenced by the succession of crises experienced by the world economy from the years 1990s. On each occasion, the observation seems to contradict the dominant model; which raises the question of whether we can trust theories that have been contradicted by facts. This question cannot be answered immediately, not without confirming our analysis with empirical investigation.

The IS-PM model provides an interesting theoretical framework for describing the mechanisms of economic and financial crises. The "Great Recession" of 2007-2009 following the last financial crisis has upset the consensus of stabilizing fluctuations and flattening cycles that had been successful until then. While monetary policies had become powerless, states were forced to intervene massively to bail out the banking system and support activity, thus exacerbating the imbalance in their public finances. This relative inefficiency of cyclical policies may have given a possibility to observe the potential of structural policies.

The pro-cyclical nature of the dynamics of the banking sector can, therefore, explain the recessive consequences associated with banking crises and/or in a direct way explain the economic recession. This places the level reached by the size and activity of financial intermediaries when banking crises approach at the centre of mechanisms to explain the cost of the real economy of these banking crises. This is why, beyond the effect of financial development on the likelihood of the occurrence of banking crises studied in a vast literature, it is essential to analyze now the recessive and/or expansionary effect of financial development given financial crises.

3.1.3. Financial accelerator

The role of the financial accelerator is at the basis of the transmission of financial sector movements on the real sector. The financial accelerator can generally be defined as a catalyst, causing the amplification and spread of a financial shock to economic activity. This mechanism is self-feeding. As a result, the degradation agents' wealth causes aggregate demand to slow down and domestic production, which creates a

further decline of the wealth. If no economic policy measures are taken to counteract the effects of the accelerator, a sustainable economic recession may follow.

The accelerator mechanism has its roots in imperfect financial systems. The presence of information asymmetries, between "principal" (lenders) and "agents" (borrowers), involves agency costs related to the need for monitoring and information gathering on the quality of the projects to be financed (Stiglitz and Weiss, 1981).

The financial accelerator acts through the "balance sheet channel" or "credit channel": it is the deterioration of the balance sheet position of the agents which triggers the spread of the initial shock (Bernanke et al., 1996 & 1999). This mechanism helps to explain why there are strong links between the real sphere and the financial sphere, as it strengthens significantly the effect of a simple decrease in the volume of banks loans, known as the "narrow channel of credit". By analyzing the cycle of credit, Kiyotaki and Moore (1997) points out that, considering that a large number of tangible assets serve both as a factor of production and collateral to credit, a shock on the value of these assets results in an increased tightening of the intermediary finance access conditions. Pro-cyclical fluctuations in asset prices generate changes in the value of collateral, reduce the possibilities and therefore the expenses of agents, which reduces the value of the company's assets and therefore the agents' lending opportunities to the period. This degenerative dynamic is referred to by authors under the terminology of "inter-temporal multiplier effect".

Overall, we can affirm that while the IS-PM model provides a good theoretical framework for describing the mechanisms of economic and financial crises, the role of the financial accelerator is at the basis of the transmission of financial sector movements on the real sector. The following part of the paper presents some statistical analysis and stylized facts.

3.2. Brief statistical analysis and stylized facts

Economic analysis of large recessions has been developed strongly over the past two decades and provides several insights. As shown in figure 1 below, a recession is by nature a rare phenomenon. It is, therefore, necessary to look through the past to gather a sufficient number of observations to characterize this phenomenon. This is what Barro did by mobilizing macroeconomic and financial data since the 19th century. He

has created a database of nearly two hundred economic recessions in which output fell by at least 10%.

Figure 1

The frequency of economic recessions since 1870: Real GDP growth rate per capita
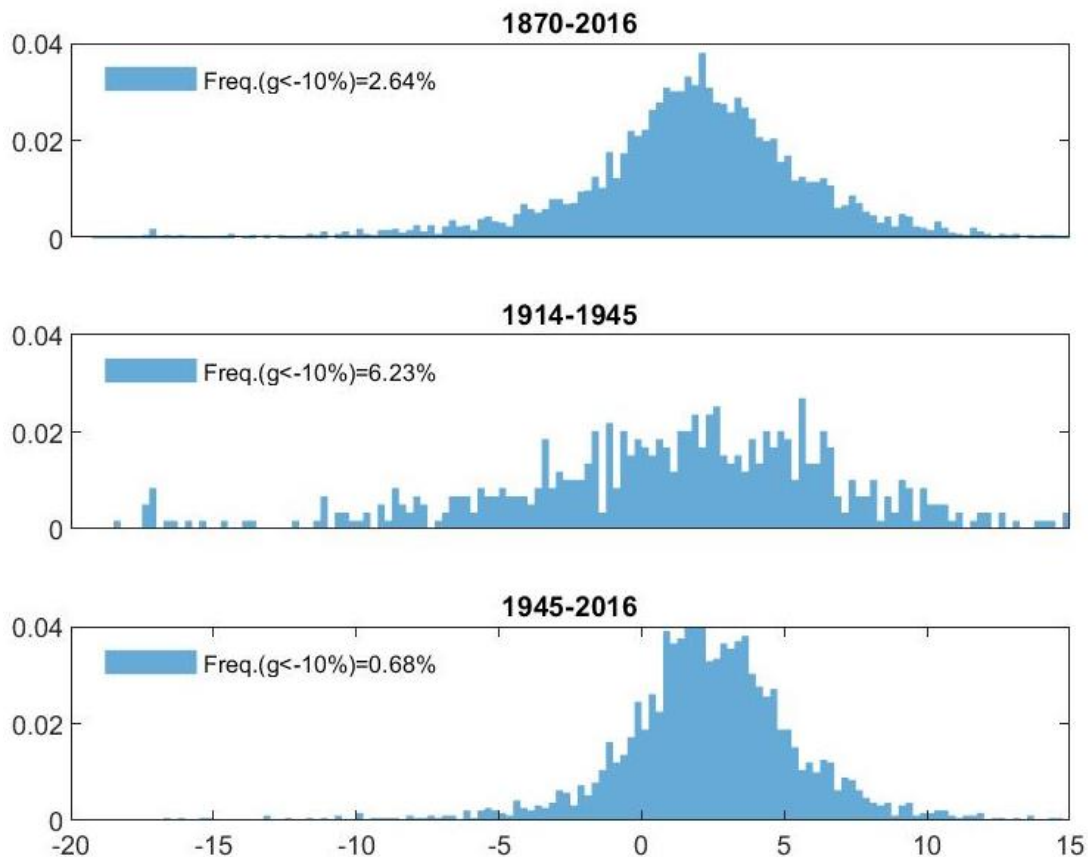
Reading: For each period, these graphs show the distribution of real GDP growth rates per capita in 27 countries, i.e. the frequency of observation of each of the values of the growth rates reported in abscises. The legend specifies the frequency of observation of growth rates below -10%. For example, over the period 1870-2016, 2.64% of growth rates were below -10%.

Countries selected on these charts: Australia, Austria, Belgium, Brazil, Canada, Chile, Colombia, Denmark, Spain, United States, Finland, France, Greece, Italy, Japan, New Zealand, Norway, Netherlands, Peru, Portugal, United Kingdom, Sri Lanka, Sweden, Switzerland, Uruguay, Venezuela.

Source: Maddison Project Database (MPD) 2018. www.ggdc.net/maddison.

The analysis of this database provides the following main lessons: Firstly, the origin of recessions is varied. A large recession can be the consequence of purely economic phenomena (such as the Great Depression), but also political (such as the two world wars), natural (such as earthquakes and tsunamis) or health (such as the Spanish flu). Secondly, the decrease in production observed during economic disasters averages 20% and can exceed 60% during wartime periods. Thirdly, the risk of an economic

recession is around 3%, which means that an economy experiences an average of three large recessions per century. There is, therefore, a 3% chance each year that we will experience a 20% decrease in production as a result of an economic, political, natural or health event.

4. Data description

Table A1 present the definition and the source of our variables. For the specific case of recession index as the dependent variable, the empirical works on recessions considered many alternative GDP based recession indicator.

Working on USA recession indicator, Anas and Ferrara (2002, 2004) and Hamilton (1989) proposed a methodology based on Markov-Switching economic processes; following them, Laurent (2006) proposed a new monthly index to identify the start and the end of an economic recession stage in real-time for the Euro region. However, this indicator is a Start-End Recession Indicator (SERI) and hence is only able to replicate all the recession stages experienced by a particular zone. Also, this last index is anticipating recession probabilities than other thing and is in this manner not valuable for us given our research question.

More recently, Hamilton (2020) and Sahm (2020) constructed respectively a monthly recession indicator called "Real-time Sahm Rule Recession Indicator" for the USA mainly based on the national unemployment rate; and a probability that an economy was in a recession during an indicated quarter. The Sahm (2020) indicator signals the start of a recession when there is a three-month average moving up of the national unemployment rate; while the Hamilton (2020) index corresponds to the probability that the fundamental real economic system is related to a recession based on the available data. However, they are both not useful for us given our research question since firstly they are new and relatively still under verification measure; secondly, they are more adapted to the USA than other country and data are only available for the USA for now; and finally, the Hamilton (2020) index is more predicting recession probabilities than other things.

Therefore, for our part and consistent with Berge & Jordà (2011), Liu & Moench (2016) and Huang et al. (2018), we defined a recession period relative to the National Bureau of Economic Research (NBER)'s classification of a recession. More specifically,

we constructed a binary dummy indicator series (1 if a country was in a large recession, and 0 otherwise) following Barro & Ursúa (2012); they consider large recessions indexed by using as a threshold 5% decline in GDP per capita growth. This specific last aspect makes it the best indicator of recession given our empirical model. Concerning the explanatory variables, the independent variable of interest is the financial development indexed, computed as private domestic credit over GDP; this is an indicator highly and extensively used in the empirical literature to index financial intermediation rather than the financial market itself (Easterly, 1993; Demirguc-Kunt & Levine, 1999; Beck, Levine, et Loayza, 2000; Ang, 2013; Ang & Kumar, 2014). Moreover, for our case, we consider that the existence in our sample of some countries with less, non-useful or non-existent financial markets is another reason justifying the choice of this variable.

We control for: financial openness, trade openness, GDP per capita, democracy, institution and fuel. The definitions of the variables, summary statistics and correlation matrix are provided in the Appendix. We discuss the expected signs concurrently with the estimation of results. We examine a sample of 129 countries from all regions of the world with average contemporary data for the period 1990-2010. This sample is constituted of countries from different regions, then we carried out additional estimations with 3 specific regions[7] samples extracted from the global sample to verify the robustness by controlling the heterogeneity of the regions. Since our main dependant variable is the recession, we consider that the sample is well representative and that there is no more action to take to rearrange it; indeed, all the countries are facing crises and recessions. Table A2 in appendix show descriptive statistics. The number of observations for each variable range between 128 and 180. Apart from Democracy and fuel variables which present respectively a mean of 5.5 and 16.5, the means of the rest of the variables move between 0.5 and 3.8. Table A3 in the appendix presents the potential correlation between the recession and the other explanatory variables. Like almost all other variables, our main exogenous variable of financial development index presents a negative correlation with the recession.

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[7] Sub-Saharan Africa (SSA), South Asia (SASIA) and Latin America and Caribbean (LAC).

5. Methodology and econometric specification

Based on the theory of the financial accelerator and the statistical correlation analysis presented above, our testable hypothesis is that financial development can have both recessive and expansionary real impact. With this general setup, we analyse the effect of financial development on the recession, while controlling for potential recession determinants. We expect that we can have either a recessive or an expansionary impact depending on the level of the development of the financial sector which closely related to the speed. Indeed, we consider that the speed of financial development decrease while the financial market increase in development; we move from growth at an increasing rate to growth at a decreasing rate of the financial sector. We assume therefore that the real effect of financial development depends on the stage of development of the financial sector.

These different theoretical arguments and assumptions at the basis of the real effect of financial movements allow us to present the following baseline linear and non-linear specification of our equation of the recession respectively:

$$Recession_{it} = \alpha_1 + \alpha_2 FD_{it} + \alpha_3 X_{it} + \varepsilon_{it} \tag{1}$$

$$Recession_{it} = \alpha_1 + \alpha_2 FD_{it} + \alpha_2 FD_{it}^2 + \alpha_3 X_{it} + \varepsilon_{it} \tag{2}$$

Where: $\mathrm{Re}\,cession_i$ and FD_{it} represents recession and financial development indicator for countries i; derived from the equation (1), the model specification (2) objective is to assess the non-linear relation between recession and financial development. We expect a positive sign of the parameter of FD_{it}^2 in line with the theoretical assumption of both recessive and expansionary impact of financial development depending on the states of financial activities.

X is the vector of control variables which represent variables considered in the literature as a potential cause of the economic recession. It consists principally of the level of trade openness, the GDP per capita, the level of financial openness, the institutional along with the democracy aspect and finally energy at the bases of enterprises production aspect indexed by fuels.

α_1 is a constant and ε_i the error term. Concerning the estimation method of equation (2), following the structure of our database and the results of preliminary tests, we will be able to apply Feasible Generalized Least Squares (FGLS) along with Iteratively Reweighted Least Squares (IRLS) regression methods to our data sample.

The advantage of addressing non-linearity by introducing a quadratic term in the model is threefold. First, it allows to capture the shape of the relationship (U-shaped or inverted U-shaped). Secondly, it determines the threshold value endogenously through the first-order condition. Finally, it allows to compare the effects produced by all the explanatory variables across the different regimes, while other methods (like the panel threshold regression) report only the impact of the transition variable from one regime to another. Confirming the robustness of the obtained results requires simply to re-estimate the model for the two different regimes and to check that the transition variable produces different effects on the dependent variable from one regime to another.

Additionally, with the assumption of the existence of a quadratic form and exploiting Lind and Mehlum's (2010) statistical method, we will apply a *Sasabuchi* test which is best suited for testing U-shaped patterns. Indeed, Lind & Mehlum (2010)[8] showed in a recent study that having statistically significant regression coefficients of a variable and its squared term and a computed extreme value based on these estimated coefficients, are only necessary but not sufficient to prove the existence of a U-shaped (or inverted U-shaped) relationship. Specifically, Lind & Mehlum (2010, p.110) argue that "*this criterion is too weak. The problem arises when the true relationship is convex but monotone over relevant data values. A quadratic specification may then erroneously yield an extreme point and hence a U shape*". Considering this, standard estimation methodology is no longer valid for the U-shape test of the composite null hypothesis that the relationship is decreasing at the left-hand side of the interval and/or is increasing at the right-hand side (resp. the opposite in case of an inverted U shape). Lind & Mehlum (2010) adopt a general framework developed by Sasabuchi (1980) to test for the presence of a U-shaped or inverted U-shaped pattern and propose to estimate the confidence interval for the extreme value using the method of Fieller (1954).

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[8] All computations use Stata 10.0 along with the ado-file u-test provided by Lind and Mehlum.

After the confirmation of our non-linear model, considering the non-parametric approach, instead of the model (1) we consider the Local Linear Regression (LLR) model which can be specified as follow:

$$Recession = \propto + f(Y) + \gamma X + \varepsilon, \tag{3}$$

Where X is a set of only explanatory variables that are assumed to have a linear effect on *Recession*; assuming that the non-linear test is conclusive, these variables are the level of trade openness, the Gross Domestic Product per capita, the level of financial openness, the institutional aspect along also with the democracy and finally energy at the bases of enterprises production indexed by fuels.

A nonparametric approach is natural, and one nonparametric method is known as local linear regression (LLR). The idea of this method is that if $f(\cdot)$ has sufficient smoothness (say twice-differentiable), then the model will look linear in small regions of input-space. $f(.)$ is an unknown smooth function of Y, which we expect to be nonlinear, and ε is a random error term. Thus, X represents the parametric and $f(Y)$ the nonparametric part of the model. We use the approach proposed by Yatchew & Bos (1997) to fit the local linear model, which consists of four steps: (1) the data is sorted by ascending values of Y, and first differences of all the sorted data are calculated; (2) The parameters are computed with Ordinary Least Square (OLS), using the differences of X and recession variable; (3) The original dependent variable Recession is adjusted for the linear effects by computing *Recession - $\hat{\gamma}X$*; (4) The resulting "purged" dependent variable is used for a local linear regression on the independent variable Y to obtain an estimate of $f(.)$. Note that the use of higher-order differences increases the efficiency of the estimator (Lessmann, 2011).

Following Yatchew & Bos (1997) procedure of the semi-parametric regression and instead of doing a Locally weighted regression (LWR)[9], we choose to execute a Locally Weighted Scatterplot Smoothing (LOWESS), sometimes called Locally Weighted Smoothing (LOESS). The LOESS is a tool mostly used in regression analysis that creates a smooth line through a time-plot or scatter-plot which highlight the

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[9] LWR is a memory-based method that performs a regression around a point of interest using only training data that are "local" to that point.

relationship between variables and predict trends. Mainly, the LOESS is typically used for fitting a line to a scatter plot or time plot where noisy data values, sparse data points or weak interrelationships interfere with your ability to see a line of best fit; for linear regression where least-squares fitting doesn't create a line of good fit or is too labour-intensive to use; and for social sciences data exploration and analysis. LOESS, and least-squares fitting in general, are non-parametric strategies for fitting a smooth curve to data points. "Parametric" means that the researcher or analyst assumes in advance that the data fits some type of distribution (i.e. the normal distribution). Because some type of distribution is assumed in advance, parametric fitting can lead to fitting a smooth curve that misrepresents the data. In those cases, non-parametric smoothers may be a better choice. Without considering the data must fit some distribution shape, non-parametric smoothers like LOESS try to find a curve of best fit. In general, both types of smoothers are used for the same set of data to offset the advantages and disadvantages of each type of smoother.

The interest is to assess the behaviour of the variables of interest when a region is excluded from the sample. This is also a means of controlling for extreme values that could influence the baseline findings. The relatively lower correlation coefficient observed when regions are excluded implies that the excluded region has a higher level of recession. In the same line of intuition, a relatively higher correlation coefficient upon the exclusion of a region means the excluded region has a larger change and more related variables to financial development. Moreover, we also use Feasible Generalized Least Squares (FGLS) and Iteratively Reweighted Least Squares (IRWLS) estimation methods.

Concerning the statistical tests, firstly, we can start at the point that our database is trustable since it has been published by a well-known institution such as the National Bureau of Economic Research and the World Bank. However, after the consolidation of our database as mentioned above, we administrated the following usual preliminary tests to our sample data: Heteroscedasticity, Ramsey Regression Equation Specification Error Test (RESET), Multicollinearity and Normality tests. The results of all these tests were mainly conclusive and allowed us to move forward.

6.   Results and discussion

According to the empirical strategy set up in the previous sections, the present section is divided into the two following parts: the results of parametric and the semi-parametric regressions. Moreover, for robustness constraint we will consider baseline and extended model specifications along with regional exclusion sample regressions.

6.1. Results discussion of parametric regressions and non-linearity test

Equation (2) is estimated using: (1) baseline and extended model specifications; (2) regional exclusion samples along with (3) Feasible Generalized Least Squares (FGLS) and Iteratively Reweighted Least Squares (IRWLS) estimation methods. We start accordingly by the test of inverted U relation.

6.1.1. With or Without U? Testing the Hypothesis of an Inverted U-Shaped finance-recession Relationship

In table 1 below, the probability of the *Sasabuschi* test indicates that the nonlinearity is effective. This probability is given for the first specification and the last specification. There is an extremum point of 1.195 and 1.1528 depending on the model specification. Considering the sign of the coefficient of the scarred value of financial development, we find that these extremums are minimum.

Given our objective of testing the inverted U-shape hypothesis, we focus only on the estimated coefficients of the financial development and financial development squared indicator.

Our results accept the hypothesis of a U-shaped pattern of financial development in recession with a minimum of 1.1528. This is absolute and robust evidence since the Sasabuchi test have been executed two times using diverse model specification and with the acceptation of our hypothesis at 1 per cent for all of the models. The Fieller confidence interval is also rather specific, spanning a financial development performance from 0.95 to 1.64.

Table A2 in the appendix show that the maximum value and minimum value of our financial development index are respectively 0.019 and 2.303; the turning point is therefore 1.1528 and the Fieller confidence interval is included in this min-max interval. This turning point can permit to divide our sample into two parts: on one hand

countries or regions which are eligible to an expansionary impact of financial development, and on the other hand, countries or region with a recessive impact of financial development.

Table 1 Test of an inverse U-shaped relationship between finance and recession.

	eq1	eq2	eq3	eq4	eq5	eq6	eq7
Private credit (DF)	-6,034*** (1,472)	-7,508*** (1,531)	-7,437*** (1,516)	-7,546*** (1,743)	-7,745*** (2,166)	-7,106*** (2,190)	-6,918*** (2,342)
Private credit	2,523***	3,233***	3,158***	3,305***	3,373***	3,058***	3,000***
squared	(0,773)	(0,803)	(0,795)	(0,890)	(1,040)	(1,039)	(1,064)
Observations	129	126	126	114	112	96	96
R^2	0,146	0,185	0,185	0,172	0,162	0,180	0,180
Sasabuchi-test of inverse U-shape in DF prob-value	0,00504					0,00597	
Estimated extreme point (years) (bounds of 95% Fieller interval)	[1,0576497; 1,6399369]					[0,9462862; 1,5265758]	
Extremum point	1.195					1.1528	

*Note: 0.01 - ***; 0.05 - **; 0.1 - *; We estimate 7 equations based on 7 different specifications; this table report only the variables of interest which are financial development and financial development squared. For more details concerning other variables, check table 2 in the next sub-section.*

Source: Author's computation

6.1.2. Baseline and extended non-linear specification regressions

Consecutively to the validation of the non-linearity test, table 2 below presents findings based on the non-linear regression specification in equation (2) above. We find that our variable of interest is significant independently to the model specification. Additionally, the results show that there is a U-shaped relationship: financial development is accompanied by a decrease in the depth of recessions; and this, up to a certain limit. Above this threshold, financial development correlates with deep recessions.

Additionally, the above *Sasabuschi* test has shown that the impact of financial development on recession depends on its current level. Considering the sign of the financial development and the squared financial development index, it is now possible to affirm that: the financial development process presents an expansionary impact for countries with financial performance less than 1.1528, and countries with financial performance above the threshold of 1.1528 present a recessionary financial

development process. Concerning recession, policymaker should not implement financial development policies in an absolute manner as confirmed by most of the hold and recent literature; but administrate financial development policies relative to the current financial sector performance to avoid the dark side of the process which is recessive impact.

Moreover, trade openness appears also to be recessive. This is in line with the theory about globalisation which considers that this phenomenon contributes to putting the domestic economy on a relative bad connexion with other economies; thus, this connexion allows financial crisis to impact the local economy and therefore causes an economic recession. These results highlight a relative campaign for the conclusion of Bekaert *et al.* (2011) that globalization tends to decrease during crisis periods.

Table 2 Parametric estimation results of the baseline and extended specification

	eq1	eq2	eq3	eq4	eq5	eq6	eq7
Private credit (DF)	-6,034***	-7,508***	-7,437***	-7,546***	-7,745***	-7,106***	-6,918***
	(1,472)	(1,531)	(1,516)	(1,743)	(2,166)	(2,190)	(2,342)
Private credit squared	2,523***	3,233***	3,158***	3,305***	3,373***	3,058***	3,000***
	(0,773)	(0,803)	(0,795)	(0,890)	(1,040)	(1,039)	(1,064)
Trade openness		0,883***	0,817*	1,273**	1,263**	1,056*	1,073*
		(0,285)	(0,429)	(0,526)	(0,534)	(0,542)	(0,559)
Financial openness			0,035	-0,132	-0,161	-0,140	-0,142
			(0,141)	(0,131)	(0,136)	(0,130)	(0,130)
Democracy				0,089	0,062	0,011	0,018
				(0,082)	(0,087)	(0,092)	(0,098)
Institution					0,089	0,056	0,068
					(0,176)	(0,174)	(0,170)
Fuels						-0,018	-0,017
						(0,013)	(0,013)
GDP per capita (log)							-0,083
							(0,377)
_cons	4,499***	4,189***	4,173***	3,530***	3,807***	4,356***	4,935*
	(0,509)	(0,514)	(0,507)	(0,630)	(0,886)	(0,988)	(2,843)
Observations	129	126	126	114	112	96	96
R^2	0,146	0,185	0,185	0,172	0,162	0,180	0,180

*Note: 0.01 - ***; 0.05 - **; 0.1 - *.*

Source: Author's computation

The next step of the methodology presented above is to verify the effect of region extractions and the implementation of different estimation methods.

6.1.3. Non-linear effect considering influential observations and regional exclusion

In the first column of Table 2 below, we present the results using the Iteratively Reweighted Least Squares (IRWLS) to control the extremes values. The next columns of the table present a further robustness check in which we exclude regions according to the methodology presented above. More interestingly, this division of our global sample implicitly allows us to verify the robustness of our results. In addition to the fact that the above baseline and extended specifications findings are confirmed in terms of magnitude and significance of the coefficients, we found the following order of regional importance in increasing magnitude: sub-Saharan Africa (SSA), South Asia (SASIA) and Latin America and Caribbean (LAC).

Moreover, financial openness appears to have an expansionary real impact For SSA countries only; fuels for LAC countries only also which means that countries who manage their oil production in a good manner will also reduce the probability and impact of recessions. However, trade openness for SSA and LAC countries impact positively on recessions. Thus, to fight against recession, SASIA and LAC countries will have to well manage oil production and usage while SSA countries may manage their financial and trade openness.

Table 3 Robustness check considering influential observations and regional exclusion

	IRWLS (1)	SSA (2)	SASIA (3)	LAC (4)
Private credit	-7,858***	-8,573***	-6,535***	-4,850*
	(2,474)	(1,858)	(2,355)	(2,854)
Private credit squared	3,501***	3,611***	2,759**	2,035
	(1,249)	(0,878)	(1,070)	(1,247)
Trade openness	0,975	1,333**	0,911	1,252**
	(0,664)	(0,507)	(0,559)	(0,603)
Financial openness	-0,173	-0,252**	-0,146	-0,158
	(0,187)	(0,106)	(0,125)	(0,138)
Democracy	0,050	0,080	0,006	0,058
	(0,097)	(0,097)	(0,103)	(0,102)
Institution	0,140	0,179	0,023	0,042
	(0,198)	(0,127)	(0,172)	(0,196)
Fuels	-0,022*	-0,011	-0,021	-0,024**
	(0,012)	(0,015)	(0,014)	(0,012)
GDP per capita (log)	-0,072	0,282	-0,040	-0,359
	(0,440)	(0,421)	(0,377)	(0,449)
Constant	4,782	1,484	4,895*	6,599**
	(3,231)	(3,256)	(2,859)	(3,150)
Number of observations	96	74	92	80
R^2	0,206	0,241	0,201	0,214

*Note: 0.01 - ***; 0.05 - **; 0.1 - *.*

Source: Author's computation

The validation of non-linear relation is sufficient with the estimation of semiparametric regressions.

6.2. Result discussion of semi-parametric regressions

All other things equal, from our overall sample of 129 countries, we execute estimation with full sample and by country groups based on geographical position. The idea is that consideration of the level of development and wealth specific to heterogeneous regions can give us information that the overall estimate hides. Thus, we divided our global sample of 126 countries into the three following group of countries: Sub-Saharan Africa (SSA), South Asia (SASIA) and Latin America and Caribbean (LAC).

The estimation procedure follows the one used and provided by Lokshin (2006). The estimation output consists of two parts: (1) a table that reports the regression

coefficients of the linear part of the model, and (2) a graph that illustrates the functional form of the nonlinear relationship between recession and financial development.

6.2.1. Result discussion of local linear regressions

In table 3 below, we present estimation results using the Yatchew & Bos (1997) technics of the semi-parametric regression corresponding to the equation (3) above.

Moreover, table 3 above reports the following corresponding results. In general, the results of the parametric part converge with the previous results. The nonparametric part is validated by the p-value of test V, which attests that the relationship is non-linear. Moreover and consistent with the theory, fuels appears to be negatively related to economic recession for SASIA and LAC exclusion; these results which are in line with the expected impact confirm the fact that fuels as principal input for any industry or production enterprises, can be used to fight against recession. The countries that manage their oil production in a good manner will also reduce the probability and impact of recessions.

Table 4: Semiparametric regressions

	Full sample	SSA	SASIA	LAC
Trade openness	1.054	1.599*	.859	1.433*
	(.913)	(.751)	(.905)	(.831)
Financial openness	-.091	-.280	-.155	-.125
	(.326)	(.264)	(.323)	(.288)
Democracy	.001	.110	-.1267	-.022
	(.137)	(.131)	(.146)	(.119)
Institution	-.043	.149	-.001	.022
	(.290)	(.245)	(.284)	(.285)
Fuels	-.024	-.016	-.0329*	-.028*
	(.017)	(.014)	(.017)	(.015)
GDP per capita (log)	.269	.071	.486	-.642
	(.619)	(.672)	(.639)	(.615)
Number of observations	95	73	91	79
R^2	0.061	0.155	0.076	0.183
Significance test on Financial evelopment V (p-value)	0.046	0.078	0.020	0.316

*Note: 0.01 - ***; 0.05 - **; 0.1 - *;*

Source: Author's computation

6.2.2. Locally Weighted Scatterplot Smoothing Result

Following Yatchew & Bos (1997) procedure of the semi-parametric regression and instead of doing a Locally Weighted Regression (LWR)[10], we choose to develop a Locally Weighted Scatterplot Smoothing (LOWESS), sometimes called locally weighted smoothing (LOESS) method. The LOESS is a tool mainly used in regression analysis that creates a smooth line through a time-plot or scatter-plot which help to observe the relationship between variables and prognosticate trends. As you can see by observing figure 1 below, the nonlinear specification is confirmed; thus overall, there is a nonlinear relation between financial development and economic recession independently of empirical method and model specification.

Figure 2

Recession and financial development: a nonlinear relation illustration
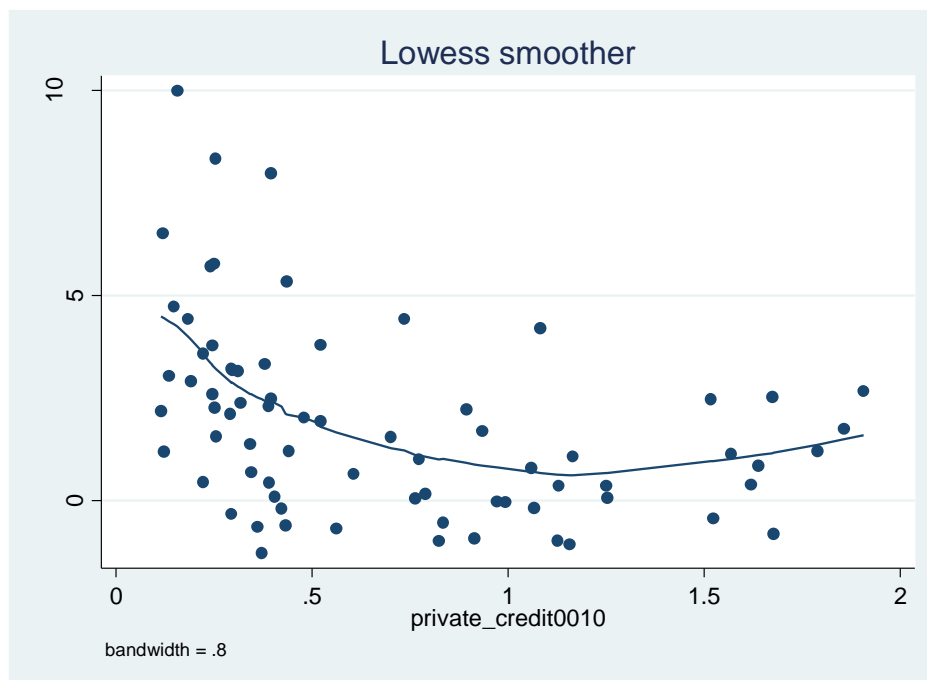
Source: Author's computation

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[10] LWR is a memory-based method that performs a regression around a point of interest using only training data that are "local" to that point.

7. Conclusion

The main objective of this paper was to examine the effect of financial development on the recession while controlling for potential recession factors. The theoretical/empirical framework and literature review about financial development and economic recession issue highlighted the fact that there could be a positive or negative relationship between financial development and economic recession. To fill the gap in the existing literature, the present research paper gave a full interest to the question of the level of sensitivity of economic recession to the financial sector performance.

For an assessment of the nexus between recession and financial development, we mainly used a panel data of 129 countries spanning 1990-2010 and carried out "Locally Weighted Scatterplot Smoothing", "Local Linear" and "Iteratively Reweighted Least Squares" regression methods along with a Sasabuchi test to verify the inverse U-shape to estimate the extreme point for the non-linear specification. Moreover, we controlled also potential factors which consisted principally of the level of trade openness, the Gross Domestic Product per capita, the level of financial openness, the institutional aspect along also with the democracy and finally energy at the bases of enterprises production indexed by fuels. At the end of our econometric gymnastic, we found the following main results:

There is a nonlinear and U-shaped relationship (the *Kuznets curve* is therefore not valid considering these phenomena) between recession and financial development with a threshold effect of 1.1528 which validate financial development recessive and expansionary real impacts: the development of the financial sector is accompanied with a reduction in the depth of recessions ; and this, up to a certain threshold. Exceeding this threshold, financial development correlates with deep recessions. The financial development process presents an expansionary impact for countries with financial performance less than 1.1528, and countries with financial performance above the threshold of 1.1528 present a recessionary financial development process. Moreover, this turning point can permit to divide the sample into two parts: on one hand countries or regions which are eligible to an expansionary impact of financial development, and on the other hand, countries or region with a recessive impact of financial development.

For robustness check, we executed several estimations using (1) Iteratively Reweighted Least Squares (IRWLS) to control the extreme values that could influence

the baseline findings and (2) exclusion of regions to assess the behaviour of the variables of interest when a continent is excluded from the sample. We administrated also the "Locally Weighted Scatterplot Smoothing", "Local Linear" regression method. In addition to the baseline findings being confirmed in terms of sign and significance in the correlation coefficients, the following is the order of regional importance in increasing magnitude: sub-Saharan Africa (SSA), South Asia (SASIA) and Latin America and the Caribbean (LAC).

Finally, we carried out several estimations based on different specification using a semi-parametric regression with a procedure provided by Lokshin (2006). The estimation output consisted of two parts: (1) a table that reports the regression coefficients of the linear part of the model and (2) a graph that illustrates the functional form of the nonlinear part, of the relationship between recession and financial development.

In general, the results of the parametric part converge with the previous results. The nonparametric part is validated by the p-value of test V, which attests that the relationship is non-linear. Consistent with the theory, fuels appears to be negatively related to economic recession for SASIA and LAC exclusion; these results which are in line with the expected impact confirm the fact that fuels as principal input for any industry or production enterprises, can be used to fight against recession. The member countries of these regions which manage their oil production in a good manner will facilitate the reduction of recessions appearance probability and impact. Moreover, financial openness for SSA countries is negatively related to recessions. Thus, to fight against recession, SASIA and LAC countries should well manage oil production and usage while SSA countries may focus on their financial openness. Moreover, the LOESS confirmed the non-linearity of the relation.

Instead of absolutely seeking the development of their financial sector, policy makers/countries should try to continuously search the fine tuning in light of the evident recessive and expansionary impact of the financial sector. To the best of our knowledge, this is the first study that examines this relationship and demonstrates this evidence using newly primary and hitherto almost unexploited "Rare macroeconomic disasters" data from Barro and Ursua (2012) which allowed to build a more specific

proxy of the variable "economic recession" along with a battery of innovative estimation methods.

Appendix A. Data sources and summary statistics of variables

Table A1. Definitions and Sources of variables.

Variables	Definition	Source
Private credit	Value of financial intermediaries' credits to the private sector as a share of GDP (excludes credit to the public sector and credit issued by central and development banks)	World Bank WDI online database; Beck et al. (2010)
GDP per capita (log)		Pen World Tables 7v
Trade openness	Sum of exports and imports of goods and services as a share of GDP in 2000	World Bank WDI online Database
Financial openness	Sum of gross stock of foreign assets and liabilities as a share of GDP in 2000	Lane et al. (2007)
Large Recession	Using real GDP per capita from the World Development Indicators, large recessions are identified by following Barro and Ursúa 2012 and using as a threshold a 5% decline in GDP per capita growth from peak to trough. The constructed variable is a dummy variable (1 if a country was in a large recession, and 0 otherwise). Data sources: Barro, Robert J., and José F. Ursúa, (2012), "Rare Macroeconomic Disasters," Annual Review of Economics 4 (1): 83–109), with data available at http://scholar.harvard.edu/barro/publications/barroursua-macroeconomic-data; World Bank national accounts data, at http://data.worldbank.org; OECD National Accounts data, at http://stats.oecd.org/.	World Bank. 2013. World Development Report 2014: Risk and Opportunity—Managing Risk for Development. Washington, DC: World Bank. DOI: 10.1596/978-0-8213-9903–3.
Institution	Quality of formal institutions. We consider an index that averages six Indicators from the Worldwide Governance Indicators (WGI), averaged over 1996-2010: 1) Voice and Accountability; 2) Political Stability and Absence of Violence; 3) Government Effectiveness; 4) Regulatory Quality; 5) Rule of Law; and 6) Control of Corruption.	World Bank Governance indicator. The measures come from the dataset compiled by Kaufmann, Kraay and Mastruzzi at the World Bank, (2010)
Democracy		Politics IV

Source: Authors construction

Table A2. Descriptive statistics

Variables	Observations	Mean	Standard Deviation	Minimum	Maximum
Private credit	180	0.504	0.463	0.019	2.303
Large recession	133	2.669	2.862	0	11
Trade openness	180	.902	.550	.011	3.720
Democracy	144	5.535	3.881	0	10
Financial openness	177	2.156	2.521	0.424	23.977
Fuel	128	16.448	25.603	0	97.909
Institution	189	2.338	3.782	-6.654	9.419
GDP per capita	180	8.528	1.304	5.561	11.142

Source: Authors construction

Table A3. Correlation Matrix

	Recession	Private credit	Trade open	Financial openness	Democracy	Institution	Fuel	GDP per capita
Recession	1.0000							
Private credit	-0.3041	1.0000						
Trade open	-0.0000	0.2320	1.0000					
Financial open	-0.1153	0.5105	0.5187	1.0000				
Democracy	-0.1266	0.4546	0.0472	0.2488	1.0000			
Institution	-0.2042	0.6735	0.3289	0.5487	0.6128	1.0000		
Fuel	-0.0940	-0.208	-0.084	-0.1484	-0.2980	-0.2737	1.0000	
GDP per capita	-0.2962	0.7316	0.3019	0.4174	0.5922	0.7349	0.0300	1.0000

Note: GDP: Gross Domestic Product.

Source: Authors construction

References

Aghion P., Howitt P., Mayer-Foulkes D. (2005), 'The Effect of Financial Development on Convergence: Theory and Evidence', *Quarterly Journal of Economics,* 120, 173–222.

Aka Brou E. (2008), 'La crise des subprimes aux Etats-Unis et les économies des pays de l'UEMOA : une évaluation économétrique à partir de la BRVM', *PED*, 07/2008.

Anas J., Ferrara L. (2002), 'Un indicateur d'entrée et sortie de récession: Application aux Etats Unis', *Document de travail*, 58, Centre d'Observation Economique.

Anas J., Ferrara L. (2004), 'Turning points detection: The ABCD approach and two probabilistic indicators', *Journal of Business Cycle Measurement and Analysis*, 1, 2, 1-36.

Ang, J. B., Kumar S. (2014), 'Financial development and barriers to the cross-border diffusion of financial innovation', *Journal of Banking & Finance*, 39(C), 43-56.

Ang J. B. (2013), 'Are modern financial systems shaped by state antiquity?', *Journal of Banking & Finance*, 37(11), 4038-4058.

Arcand J. L., Berkes E., Panizza U. (2012), 'Too Much Finance?', *IMF Working Paper*, 12/161

Barro R.J., Ursúa J. F. (2012), 'Rare Macroeconomic Disasters', *Annual Review of Economics,* 4(1), 83–109.

Beachy B. (2012), 'A Financial Crisis Manual Causes, Consequences, and Lessons of the Financial Crisis', *Global development and environment institute, GDAE Working Paper*, 12-06, A Financial Crisis Manual.

Bechir R. et al. (2010), 'Impact de la crise financière sur les Objectifs du Millénaire pour le Développement dans les pays en voie de développement: cas de la Tunisie', *New medit,* 4.

Beck T. (2009), 'The Econometrics of Finance and Growth', In *Palgrave Handbook of Econometrics*, vol. 2, ed. Terence Mills and Kerry Patterson, 1180–1211, Palgrave Macmillan, Houndsmill.

Beck T. *et al.* (2016), 'Financial innovation: The bright and the dark sides', *Journal of Banking & Finance*, 72, 28-51.

Beck T., Degryse H., Kneer C. (2014), 'Is more finance better? Disentangling intermediation and size effects of financial systems', *Journal of Financial Stability*, 10, 50-64.

Beck T., Demirgüç-Kunt A., Levine R. (2010), 'Financial Institutions and Markets Across Countries and Over Time: The Updated Financial Development and Structure Database', *World Bank Economic Review,* 24, 77-92.

Beck T., Levine R. E., Loayza N. (2000), 'Finance and the sources of growth', *Journal of financial economics,* 58 (1-2), 261-300.

Bekaert G., Harvey C. R., Lundblad C. T., Siegel S. (201), 'What segments equity markets?', *Review of Financial Studies*, 24, 3847-3890.

Berge T. J., Jordà O. (2011), 'Evaluating the classification of economic activity into recessions and expansions', *American Economic Journal: Macroeconomics*, 3(2), 247-277.

Bernanke B., Gertler M., Gilchrist S. (1996), 'The financial accelerator and the flight to quality', *The review of Economics and Statistics*.

Bernanke B., Gertler M., Gilchrist S. (1999), *The financial accelerator in a quantitative business cycle framework,* Handbook of Macroeconomics, chapter 21.

Bolt J. *et al.* (2018), 'Rebasing "Maddison": new income comparisons and the shape of long-run economic development', *Maddison Project Working paper*, 10.

Brahmi M., Zouari S. (2014), 'Transformations de l'économie mondiale, dernière crise financière et récessions économiques mondiales: mesures et précautions', *Journal of Economic& Financial Research,* ISSN: 2352 – 9822, Second Issue / December 2014.

Demirguc-Kunt A., Levine B. (1999), 'Bank-based and market-based financial systems: Cross-country comparisons', *World Bank Policy Working Paper*, 2143.

Easterly W. (1993), 'How Much Do Distortions Affect Growth', *Journal of Monetary Economics,* 32(4), 187-212.

Eggoh J. C. (2009), 'Développement Financier et Croissance: une Synthèse des Contributions Pionnières', *Document de Recherche*, 2009-18.

Fernald J. G. (2014), 'Productivity and Potential Output Before, During, and After the Great Recession', *working paper series*, 2014-15, Federal Reserve Bank of San Francisco.

Fieller E. C. (1954), 'Some problems in interval estimation', *Journal of the Royal Statistical Society, Series B,* 16(2), 175-185.

Fisher I. (1933), 'The Debt-Deflation Theory of Great Depressions', *Econometrica*, 1(4), 337-357.

Goodwin N. *et al.* (2015), *Macroeconomics in Context*, Second Edition. Copyright Tufts University. Chapter 15: The Financial Crisis and The Great Recession

Hamilton J. (2020), 'GDP-Based Recession Indicator Index retrieved from Federal Reserve Bank of St. Louis', https://fred.stlouisfed.org/series/JHGDPBRINDX,

Hamilton J. D. (1989), 'A new approach to the economic analysis of non-stationary time series and the business cycle', *Econometrica*, 57(2), 357-384.

Hsieh W. (2011), 'The Global Economic Recession and Industrial Structure: Evidence from Four Asian Dragons', *ADBI Working Paper*, 315, Asian Development Bank Institute, Tokyo.

Huang M. Y., Rojas R., Convery P. D. (2018), 'News Sentiment as Leading Indicators for Recessions', *Cornell University open-access archive,* https://arxiv.org/pdf/1805.04160.pdf

Hurd M., Rohwedder S. (2010), 'Effects of the Financial Crisis and Great Recession on American Households', *Netspar Discussion Paper*, 09/2010-046

Keynes J. M. (1936), *Théorie générale de l'emploi, de l'intéret et de la monnaie*, trad. Française Payot, 1966.

King R. G., Levine R. (1993), 'Finance and Growth: Schumpeter Might Be Right', *Quarterly Journal of Economics,* 108, 717–738.

Kiyotaki N., Moore J. (1997), 'Credit cycles', *Journal of Political Economy*, 105(2), 211-248.

Lane P. R., Milesi-Ferretti G. M, (2007), 'The external wealth of nations market: Revised and extended estimates of foreign assets and liabilities, 1970–2004', *Journal of International Economics* 73, 223–250.

Laurent F. (2006), 'A real-time recession indicator for the Euro area', *Centre d'Observation Economique, MPRA Paper*, 4042, posted 07 November 2007 / 03:38.

Lavender B., Parent N. (2012), 'La reprise de l'économie américaine au sortir de la Grande Récession: le rôle de la dette et du désendettement', *Revue de la Banque du Canada*, 14-28.

Lessmann C. (2011), 'Spatial Inequality and Development – Is there an Inverted-U Relationship?', *CESifo Working paper*, 3622.

Levine R. (2005), 'Finance and Growth: Theory and Evidence', in *Handbook of Economic Growth*, ed. P Aghion and S. N. Durlauf, 865–934, Elsevier, Amsterdam.

Lind J. T., Mehlum H. (2010). 'With or Without U? – The Appropriate Test for a U-Shaped Relationship', *Oxford Bulletin of Economics and Statistics,* 72(1), 109-118.

Liu W., Moench E. (2016), 'What predicts US recessions?', *International Journal of Forecasting*, 32, 1138-1150.

Lokshin M. (2006), 'Difference-based semiparametric estimation of partial linear regression models', *Stata Journal*, 6(3), 377-383.

Maswana J. C. (2009), 'Global Financial Crisis and Recession: Impact on Africa and Development Prospects', Japan International Cooperation Agency - Research Institute Task Force on Africa Meeting, Pretoria, South Africa.

McKinley T., Naret K. A. (2009), 'What Could Happen to Major Emerging Economies?', *Centre for Development Policy and Research School of Oriental and African Studies SOAS*, 26

Mody A., Sarno L., Taylor M. P. (2007), 'A cross-country financial accelerator: evidence from North America & Europe', *Journal of International Money and Finance*, 26(1), 149-165.

Nguena C. L., Tchana Tchana F., Zeufack A. (2021), 'Housing Finance and Inclusive Growth in Africa: Benchmark, Determinant & Effect', *International Economic Journal*, 35(2), 259-287.

Nguena C. L. (2020), 'Workforce Productivity Growth and Inequality Reduction in Developing Countries: The role of Mobile Banking & Financial Services Development in Africa', *Economics Bulletin*, 40(2), 1146-1158.

Nguena C. L., Tsafack Nanfosso R. (2014), 'On the Sensitivity of Banking Activity Shocks: Evidence from the CEMAC Sub-region', *Economics Bulletin*, 34(1), 354-372.

Tsafack Nanfosso R., Nguena C. L. (2015), 'Importance des Politiques Financières dans la Croissance Economique en zone CEMAC: Approche en Données de Panel', *African Development Review*, 27(1), 52–66.

OCDE (2009), *Réformes économiques: objectif croissance*. ISBN 978-92-64-05279-6.

Parejo A., Sudrià C. (2012), 'The Great Depression versus The Great Recession. Financial crashes and industrial slumps', *Revista de Historia Industrial*, 48, Año XXI. 2012.1.

Petralias A., Petros S., Prodromidis P. (2013), 'Greece in recession: Economic predictions, mispredictions, forecast suggestions and policy recommendations', *Cyprus Economic Policy Review*, 7(2), 53-80 1450-4561

Pigou (1933), *The Theory of Unemployment*, London, Macmillan

Redoulès O. (2009), 'L'économie mondiale en 2008 : du ralentissement à la récession', *L'économie française*.

Sahm C. (2020), 'Real-time Sahm Rule Recession Indicator retrieved from Federal Reserve Bank of St. Louis'. https://fred.stlouisfed.org/series/SAHMREALTIME

Sasabuchi S. (1980). 'A test of a multivariate normal means with composite hypotheses determined by linear inequalities', *Biometrika*, 67(2), 429-439.

Siddiqui K., (2009), 'Japan's Economic Recession', *Research in Applied Economics*, 1(1: E91).

Smith A. (1776), *Recherches sur la nature et les causes de la richesse des nations*, traduction française Gallimard, 1976

Snooks G. D., (2008), 'Recession, Depression, and Financial Crisis: Everything Economists Want to Know But Are Afraid to Ask', *Australian National University Working paper*, 7.

Stiglitz J., Weiss A. (1981), 'Credit rationing in markets with imperfect information', *American Economic Review,* 71(3), 393-410.

Yatchew A., Bos L. (1997), 'Nonparametric Least Squares Regression and Testing in Economic Models', *Working Papers*, University of Toronto, Department of Economics.