Recession and financial development: An empirical analysis

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Abstract

This paper mainly examine the sensitivity level of economic recession to the financial sector development by ascertaining whether such relationship is linear and contingent on trade openness, GDP per capita, financial openness, institution, democracy and fuels.

We employ annual data of 129 countries from all part of the world spanning 1990-2010 and invoke Ordinary Least Squares (OLS) estimation method; we applied Sasabuchi test to verify the inverse U-shape and estimate the extreme point. We also used semiparametric and regional exclusion based regression for robustness check.

The nexus between recession and financial development assessment suggest that, the nonlinearity and thus U-shaped relationship is operational; additionally, when financial development increases, it is accompanied by a reduction in the depth of recessions; and this, up to a certain threshold. Beyond this brink, financial deepening correlates with deep recessions. Additionally, we found that trade openness have a positive on economic recession independently to the estimation method.

For robustness check, estimations results first confirm the baseline findings in terms of magnitude and significance in the correlation coefficients; then, highlight sub-Saharan Africa (SSA), South Asia (SASIA) and Latin America and Caribbean (LAC) as the order of continental/regional importance in increasing magnitude. Finally, the semiparametric regression show that, the results of the parametric part converge with the previous results in general, and bear out with illustration the functional form of the nonlinear relation between recession and financial development.

To the best of our knowledge, this is the first study examining this relationship using 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".

Key words: Economic recession – Financial development – Macroeconomic disaster – Barro and Ursha data base.

JEL Code : E32, E44, O16; O50.

INTRODUCTION

There is no official definition of recession, but this term generally refers to a period of decline in economic activity. Seen in this light, most of the study often limited to the slowdown in GDP recession, but this measure can't define the situation as a whole from all economic sectors of a country. So, researchers at the NBER, through the Committee to date business cycles will extend this definition in terms of *"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".* Furthermore, according to the ILO (2009), an economic downturn can also be defined as a low decline in production. It is distinguished from the terms of depression, which means a very serious recession where the GDP decline is sustainable and where the economic cycle isn't recover naturally. It is this deepening of the crisis which is leading to global effects that affects all aspects of the real economy (for example a significant drop in purchasing power, increase of unemployment and in bankruptcies).

We can highlight several potential causes of the recession including: the sudden change in prices of inputs used in the production of goods and services; the decision of a country to reduce inflation through monetary and fiscal policies (Hsieh, 2011). The recession may also result from a weakening in external demand, particularly in countries with vigorous finally exportation sectors and finally for the problems of financial markets, these recessions are often more costly than others; this is the reason why it is an important focus and challenge for economist. Depending on the selected causes, several indicators have been identified in empirical literature to measure the transmission channels of the financial crisis on economic recession for example in developing countries in one part, the rate of the GDP or the growth, raise of unemployment, reducing income, level of sales and effect on industrial production, etc.

From a theoretical point of view, financial development is born of financial liberalization policies, but these policies are at the base of potential recession since they may have quite negative consequences on economic activity namely global imbalances and financial crises. In this context, financial development means the liberalization of the financial system to combat under development and growth as directed by Mac Kinnon (1973) and Shaw (1973). For neoclassical economists, the market is self-regulating, so if no external factor disturbs the functioning of the market, it cannot be lasting imbalance in the financial markets.

We are talking of financial crisis to qualify a cyclical downturn in the financial system, that's mean, the moment that closes a phase of expansion and opens a recession or even depression. Financial crises are from the instability of financial markets instability who itself is related to the rapid growing of the financial market. They may take the form of currency crisis, sovereign debt crisis, stock market crisis and finally banking crisis. The gradual integration and interdependence between the recent financial markets between banks and between the banking sector and financial markets facilitate contagion from one crisis to the entire national and international financial system. Thus, the developed and emerging countries could transmit the crisis through several potential transmission channels such as: Prices, FDI, exports, remittances, ODA, scholarship, tariff and non-tariff barriers and humanitarian aid (Snooks, 2008; Hsieh, 2011; McKinley and Naret, 2009; Beachy, 2012; Petralias, Petros and Prodromidis, 2013; Ball, 2014; Gabbi et al., 2014).

While it is true that developing economies have experienced very few true depressions since the years, the developing countries against face an ever lived phenomenon. In 2008, the global economy tipped into recession. The financial crisis that began in 2007 in the US subprime market, was then amplified and propagated in advanced economies and the major emerging countries creating the recession (Redoulès**,** 2009). This recession has driven firstly contraction in demand from households and businesses due to the tightening of credit standards by banks and the fall of their earned income, resulting from the rise in unemployment and the collapse of world trade. On the other hand, companies that have delayed adjusted their activity to falling demand, are facing high inventories and difficult financing conditions. So it is important for both of the States and international organizations are setting up powerful and robust diagnostic means to comprehensively assess the real impact of recent and past crises on the real economy, in order to defend social and economic impact of too rapid financial development and that would insidiously associated with an underlying recession.

This brief theoretical/empirical framework and literature review about financial development and recession issue highlight the fact that there could be a positive or a negative relation between financial development and economic recession. In order to feel the gap in the existing literature, we will therefore give full interest to the question of the level of sensitivity of economic performance to the financial sector performance.

Such an investigation has a fourfold interest. First, we will present an up-to-date literature review on the important question of financial development and its link with economic

performance. Secondly, our empirical methodology is based on a world-wide approach with the consideration of 129 countries from all part of the world. Thirdly, we use primary and hitherto almost unexploited "Rare macroeconomic disasters" data from Barro and Ursua (2012); this data base allow us to have a more specific proxy of the variable "economic recession"; along this line, compared with data from other sources (IMF, World Bank) this recent dataset on economic recession from the said source should provide findings with updated and more focused policy implications. Fourthly, as far as we have reviewed, no study has employed the empirical approach we are about to use in tackling the problem using a world-wide approach and focusing specifically on economic recession; thus, the paper also contributes to the existing literature from a methodological standpoint. Finally, given the destabilization challenges of globalization, especially in terms of 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.

By examining 129 countries with average contemporary data for the period 1990-2010, we mainly found that: the nonlinearity and thus U-shaped relationship is effective; when financial development increases, this is accompanied by a reduction in the depth of recessions; and this, up to a certain threshold. Exceeding this threshold, financial deepening correlates with deep recessions. These results appeared to be consistent with the robustness cheek results.

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

I. LITERATURE REVIEW

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

I.1. Global review of empirical studies on the relationship between finance and 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 relation between financial development and economic recession, is analysing usually the effect on the previous indicators.

There are several studies which show that there are various speculative and financial causes of the deep recession which have affected capitalist economies after each crisis, such as that of 1929 and that of 2007. Brahmi and Zouari (2014) for example, described the global economic conditions after the last financial crisis, its causes and effects on the global economy and recommendation on action to take. He concluded that the financial crisis affected the financial system development and was the main explanation of the global recession which followed

Bashir et al. (2010) attempt to analyse the concept of financial crisis, describing the causes and consequences of the 2007 financial crisis and its effects on the world economy, and especially on achieving the MDGs in the Tunisian context. He found that Tunisian banks were not directly affected by the credit crisis and bullet premiums since they do not have many assets abroad. Additionally, the crisis did not affected the opening of programs to the global economy established by Tunisia since policymakers continued lowering tariffs to meet international commitments and stimulate economic exchanges with the rest of the world. The global recession had the effect of removing 38,000 jobs in Tunisian manufacturing sector.

Parejo and Sudrià (2012) highlight an important point of the recession that would ensure that the financial crisis has an impact on the development by focusing on the performance of the industrial sector. With data from multiple sources (Eurostat, INE, Thomson Reuters DataStream, the International Yearbooks of Industrial Statistics and Vox Eu etc.), they use the evolution of the Industrial Production Index of the Spanish economy during the 1929 crisis and 2007 according to the method proposed by Eichengreen and O'Rourke's (2009). They conclude that in the years that preceded each crisis, some countries are particularly affected compared with other developed countries with similar income levels and initialization (Euro area in this case). This recession has not only affected the economy in terms of industrial production, but also investment, domestic consumption, and especially employment (with an unemployment rate of 19% in 2010).

Again in developed country, some authors show that because of the 2007 great recession and financial crisis, households are not more optimistic than companies about their future economic prospects. Hurd and Rohwedder (2010) estimate on American data collected between 2008 and 2009, that more than 39% of American households are unemployed, have

not been treated fairly and have Housing payment arrears. Moreover, they forecasted an increase of goods and services market prices and real estate prices.

Other studies focus on the impact of policies, predictions and recommendations that followed the recession and show that in general they can be wrong at 2.9-7.2%. According to Petralias et al. (2013), this situation illustrates the high degree of uncertainty surrounding gain, loss or stagnant growth predictions in Greece during the year 2013.

Concerning developing countries, Alia and Chassem (2009) analyse the Cameroonian case by using annual data over the period 1979-2004 and show that financial development stimulates growth while trade openness seems to reduce it. Financial development is approached by a composite indicator of financial development and trade openness by the degree of Cameroonian economic openness. According to them, structural policies of stronger growth could undoubtedly have positive effects on growth within both short term and long term. Aka (2008), using a GARCH *(General Auto Regressive Conditional Heteroskedasticity)* coming from the model of Engle (1982), analyse the effects of the *subprime* crisis in the US on the WAEMU economies and leads to the conclusion that all sectors are affected by significant contagion effects in stock returns and volatility.

Thus, it is the development of the financial system in time which facilitates the transmission of the recession even if the financial systems of some countries are weakly connected to the global financial system. The different development models, such as industrial organization, the role of the state and social institutions may yet make the spread of crisis in some developed countries different. This is for example the case of Japan; after having known the fastest growth of all time, now suffers from many problems that cannot be called cyclic (that is to say related to the Japanese recession) but rather structural and are obstacles to economic dynamism and achievement of long term growth (Siddiqui, 2009).

Maswana (2009), investigates the impact of the global financial and economic crisis on African economic development focussing on Botswana, Cameroon, Cote d'Ivoire, DRC, Ghana, Kenya, Mauritius, Nigeria, Senegal, South-Africa, Tanzania and Zambia. He used a nonlinear generalization of integration, the threshold auto-regression model (TAR), with employment of the method of Chan (1993) to estimate the threshold value because larger shocks bring about a different response than do smaller shocks. The main finding is 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*),* analyse what provoked the largest financial and economic collapse in decades. He estimate that the proximate causes of the recent crisis are the housing bubble and subprime mortgage lending boom, but the groundwork for all the crisis are skewed financial sector incentives, errant economic assumptions, and inequitable socioeconomic structures laid. Fernald (2014), chows that, the pre-recession trends in less developed countries reflects a reduction in the level of potential output in 2013 as U.S. labour and total-factor productivity growth was slowed prior to the Great Recession. One explanation can be find on disruptions during or since the recession, and industry and state data rule out "bubble economy" stories related to housing or finance. So, he use a calibrated growth model to estimate productivity growth in 1973-1995. The productivity growth remain slower for the less economic, this implies that, slack than recently estimated by the Congressional Budget Office.

Gabbi et al. (2014) attempts to explain the recent financial crisis and the subsequent Great Recession from the point of view of incentives that change as a consequence of securitization and contagion processes. It provides a critical analysis of the basic principles of the Asymmetric Information Approach and its two branches that view differently the evolution of banking and the role of securitization in it.

I.2. Review of empirical studies based on major results

In reviewing the literature regarding major empirical results, the different contributions to the analysis of the relationship between finance and the recession reveal many twists and turns in the results (Eggoh, 2009). The first line of research concerns the works that concentrate their research 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 consist of the works that address this relationship through other transmissions channels; and finally, there are the authors who analysed the direct effect of policies.

While the first works reveals 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.

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

I.3. Review of empirical studies based on methodology used

Considering the methodology with which the relationship between financial development and the recession is studied, several approaches can be identified include: macroeconomic and microeconomic approaches. Regarding the macroeconomic approaches, we distinguish in one hand, studies that use data descriptive statistics methods to describe 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 activity (GDP) through different transmission channels (exports, remittances, inflation, and official development assistance).

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

Thus, the first research using statistical data, simply analyse 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 question. Regarding the transmission channels of the crisis which are often considered by the authors, the first and most used in macroeconomic analysis is the GDP growth rate; this method is used in order to observe the trend during the recession (Siddiqui, 2009 for Japan; Petralias et al, 2013 for Greece and Parejo and Sudrià, 2012 for Italy; Beachy 2012; Fernald, 2014, in 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.

The second research axes consists 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 cointegration methods, or the nonlinear generalization of integration (Maswana, 2009). From a microeconomic point of view, fewer 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.

I.4. Review of empirical studies based on geographical orientation

With the objective of grouping by region, we can mainly say that there are two different work groups. The first is obviously the studies that are interested only of developed countries or advanced and major emerging countries (China, India and Japan) such as the study of Brahmi and 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 developed countries, namely the European Union and the United States that are most affected by the economic and financial crises and in which the recession is the most maligned. However, some individual work on 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, considering the fact that the geographical orientation of empirical works previously implemented until today have never included 129 world-wide countries and that the usage of barro and 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.

II. DATA AND METHODOLOGY

II.1. Data

We examine a sample of 129 countries with average contemporary data for the period 1990-2010.

The large recession dependent variable is computed 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).

The independent variable of interest is the financial development indexed by private domestic credit as a percentage of GDP. 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.

II.2. Empirical specification

We employ Ordinary Least Squares (OLS) in order to assess the nexus between recession and financial development. The specification is presented in Eq. (1).

$$\text{Recession}_i = \alpha_1 + \alpha_2 FD_i + \alpha_3 X_i + \varepsilon_i \qquad (1)$$

Where: Recession_i (FD_i) represents a recession (financial development) indicator for country i , α_1 is a constant, X is the vector of control variables, and ε_i the error term. X consists of: trade openness, GDP per capita, financial openness, institution, democracy and fuels.

Within the framework of our results robustness, we will estimate the following function:

$$Recession = \propto + f(Y) + \gamma X + \varepsilon, \qquad (2)$$

Where X is a set of explanatory variables that are assumed to have a linear effect on $Recession$, *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 (1997) to fit the partial 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 OLS, using the differences of *X* and recession variable. (3) The original dependent variable Recession is adjusted for the linear effects by calculating $Recession$ - $\grave{\gamma}X$. (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).

III. Empirical results

III.1. Parametric regressions

Table 1 presents findings based on regressions in Eq. (1). We find that our variable of interest is significant. Traditionally, one can consider that there is a quadratic form which is verified in this study. But, "Lind and Mehlum[1] (2010) showed in a recent paper that statistically significant regression coefficients of a variable and its squared term that have opposite signs, plus a computed extreme value based on these estimated coefficients that lies inside the data range, are only necessary but not sufficient to proof the existence of a U-shaped (or inverted U-shaped) relationship. Specifically, Lind and 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." They note that standard testing methodology is no longer suitable 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 and 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 the Fieller (1954) method to compute the confidence interval for the estimated extreme value." (Schnabel & Wagne, 2012, p.28)

Table 1: Parametric estimates

	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)

[1] All computations use Stata 10.0 and the ado-file utest provided by Lind and Mehlum.

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	.00504					.00597	
Estimated extreme point (years) (bounds of 95% Fieller interval)	[1.0576497; 1.6399369]					[.94628621; 1.5265758]	
Extremum point	1.195					1.1528	

note: 0.01 - ***; 0.05 - **; 0.1 - *;

Source: Author's computation

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 thus a U-shaped relationship: when financial development increases, this is accompanied by a reduction in the depth of recessions; and this, up to a certain threshold. Exceeding this threshold, financial deepening correlates with deep recessions.

Table 2: Robustness with respect to influential observations and regional exclusion

	IRWLS (1)	**Exclusion SSA (2)**	**Exclusion SASIA (3)**	**Exclusion 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

In the first column, we use Iteratively Reweighted Least Squares (IRWLS) to control the extremes values. The other columns above presents a further robustness check in which we

exclude regions. The interest is to assess the behavior of the variables of interest when a continent 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 regions means the excluded region has a larger variation and more related variables to financial development. In addition to the baseline findings being confirmed in terms of magnitude and significance in the correlation coefficients, the following is the order of continental importance in region in increasing magnitude: sub-Saharan Africa (SSA), South Asia (SASIA) and Latin America and Caribbean (LAC).

III.2. Semiparametric regressions

This section presents estimation results using a semiparametric regression, using the Yatchew. This procedure is available as a Stata routine and was graciously provided by Lokshin (2006). The estimation output consists of two parts: (1) a table which reports the regression coefficients of the linear part of the model, and (2) a graph which illustrates the functional form of the nonlinear part, that is, the relationship between recession and financial development. Table 3 reports the 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 the test V, which attests that the relation is non-linear.

Table 3 : Semiparametric regressions

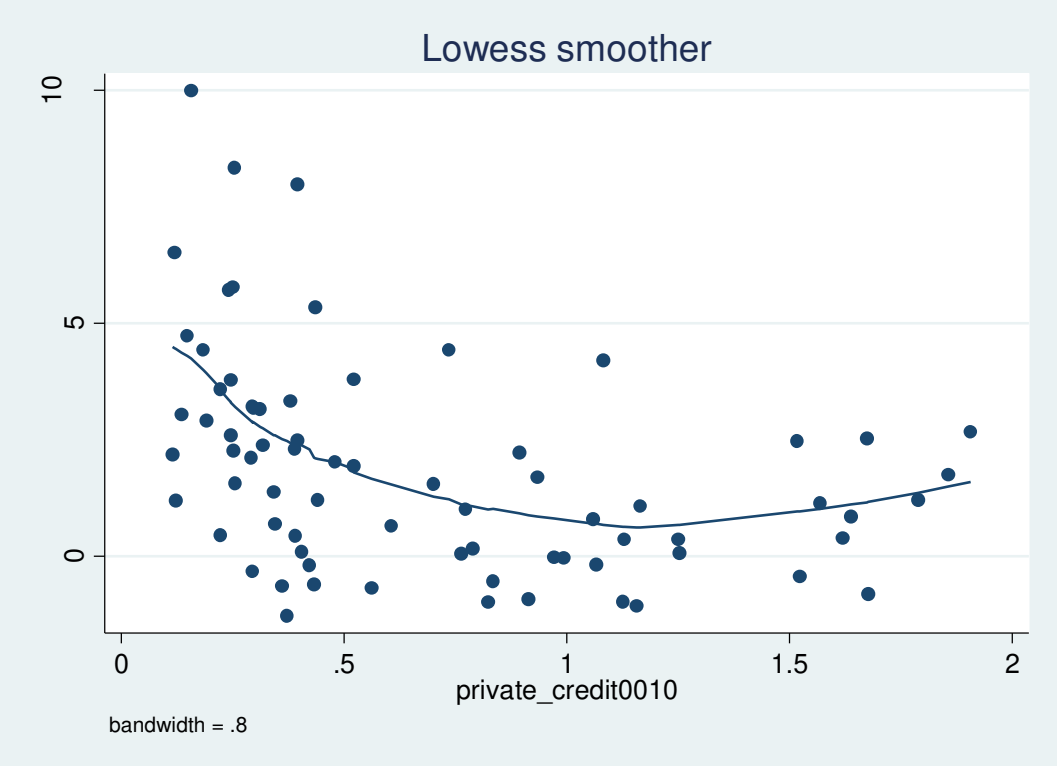
	All sample	**SSA**	**SASIA**	**LAC**
Trade openness	1.054	1.599*	.859	1.433*
	(.913)	(.751)	(.905)	(.831)
Financial openness	-.091	-.280	-.155	-.125
	(.326)	(.264)	(.323)	(.288)
Democracy	.001	.110	-.1267	-.022
	(.137)	(.131)	(.146)	(.119)
Institution	-.043	.149	-.001	.022
	(.290)	(.245)	(.284)	(.285)
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 development V (p-value)	0.046	0.078	0.020	0.316

note: 0.01 - ***; 0.05 - **; 0.1 - *;

Source: Author's computation

Figure 1. Nonlinear relation illustration



Source: Author's computation

CONCLUSION

This brief theoretical/empirical framework and literature review about financial development and recession issue highlighted the fact that there could be a positive or a negative relation between financial development and economic recession. In order to feel the gap in the existing literature, the present research paper gave full interest to the question of the level of sensitivity of economic performance to the financial sector performance. Thus, we mainly employed Ordinary Least Squares (OLS) in order to assess the nexus between recession and financial development.

We used the approach proposed by Yatchew (1997) to fit the partial linear model, which consisted of four steps: (1) The data was sorted by ascending values of Y, and first differences of all the sorted data was calculated. (2) The parameters was computed with OLS, using the differences of *X* and recession variable. (3) The original dependent variable Recession was

adjusted for the linear effects by calculating $Recession$ - $\grave{\gamma}X$. (4) The resulting "purged" dependent variable was 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).

The results of our depth investigation can be presented as follow:

We found that the nonlinearity is effective. This probability is given for the first specification and the last specification. There is thus a U-shaped relationship: when financial development increases, this is accompanied by a reduction in the depth of recessions; and this, up to a certain threshold. Exceeding this threshold, financial deepening correlates with deep recessions.

For robustness check, we implemented several estimation using (1) Iteratively Reweighted Least Squares (IRWLS) to control the extremes values that could influence the baseline findings and (2) an exclusions of regions in order to assess the behavior of the variables of interest when a continent is excluded from the sample. In addition to the baseline findings being confirmed in terms of magnitude and significance in the correlation coefficients, the following is the order of continental importance in region in increasing magnitude: sub-Saharan Africa (SSA), South Asia (SASIA) and Latin America and Caribbean (LAC).

Finally, we implemented several estimations using a semiparametric regression with a procedure provided by Lokshin (2006). The estimation output consisted of two parts: (1) a table which reports the regression coefficients of the linear part of the model highlighting the fact that in general, the results of the parametric part converge with the previous results, and (2) a graph which illustrates the functional form of the nonlinear part, that is, the relationship between recession and financial development; the nonparametric part is validated by the p-value of the test V, which attests that the relation is non-linear.

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APPENDICES

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), average over 2000–2010	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

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

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 openness	-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	-0.2085	-0.0837	-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