Income inequality, fiscal consolidation and banking crises

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ABSTRACT

This paper employs a dataset of 36 EU and OECD countries for the period 1961–2012 and estimates a population-averaged panel logit probability model to test the importance of income inequality in banking crises, capturing the most relevant crisis determinants in the literature. As far as we know, this is the first paper in analyzing income inequality measured by the Gini index in a panel logit probability model explanatory of banking crises. As theoretically expected, we find banking crises in this period used to be preceded by income inequality. Policy measures are provided and tested empirically: whilst in general terms higher levels of fiscal deficit are associated with financial crises; only countries with high levels of inequality would have to increment the budget surplus in order to avoid the crisis. The results of this paper are useful for academics and policy makers.

Keywords: Income Inequality, Fiscal Consolidation, Banking Crisis

JEL Classification: I32, H62, G01

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1. Introduction

Many papers have theoretically analyzed the post-Keynesian view that considers the influence of inequality on financial crises (Claessens and Perotti, 2007; Rajan, 2010; Kumhof and Rancière, 2011; inter alia), but none of them have empirically tested the impact of inequality, measured by the Gini coefficient, as a determinant of banking crises in a panel logit probability model. Regarding the link between inequality and banking crises, Morelli and Atkinson (2015) state that "the overall evidence is far from being conclusive and there are several reasons to shed further light on this important research topic". As far as we are know, this is the first paper to apply this methodology to test the influence of inequality on financial crises. The multivariate logit model has been used in the literature to test the post-Keynesian view and to find new policy measures to reduce the probability of a financial crisis.

In this paper we aim to shed further light on the topic, testing empirically the theoretical view. We employ a new dataset of 36 EU and OECD countries for the period 1961–2012 to study the importance of income inequality on banking crises. We estimate a panel logit probability model with population-averaged results that explains banking crises, capturing the most relevant crisis determinants in the literature. We analyze the impact of economic inequality on the risk of a banking crisis, providing policy measures. The main results are two. First, the corroboration of the Post-Keynesian view that income inequality leads to banking crises. Second, the fact that whilst in general terms higher levels of fiscal deficit are associated with financial crises; only countries with high levels of inequality would have to increment the budget surplus in order to avoid the crisis. We provide two main contributions. First, in the estimation of the population-averaged panel logit probability model the Gini index is used and, as far as we know, it has never used before with this methodology to explain banking crises. This

methodology has the advantage of including the consensus determinants in a panel data basis. Second, new policy measures are provided, as the necessity of fiscal consolidation for economies with high income inequality levels in order to avoid financial crises.

The rest of the paper is divided into eight sections. The second section contains the literature review of the topic and the third section develops the hypothesis of the paper. The fourth section explains data and methodology, using a multivariate logit panel data model. The empirical results are provided in the fifth section. The main result is the corroboration of the post-Keynesian view by a significant and robust positive impact of inequality on the likelihood of a banking crisis. The sixth section discusses the results and explains the causality of the effects, and the seventh section contributes with policy measures. Finally, the eighth section provides conclusions and final remarks.

2. Literature review

Recently, several studies have aimed to explain banking crises. Boudriga and Ghardallou (2012) provide a good review of the literature of banking crisis determinants. Gavin and Haussmann (1996) provide theoretically a seminal study of the main factors that trigger a banking crisis, related to liberalization, banking competition, regulation of deposit interest rates, information, macroeconomic volatility, capital assets ratio, bank liquidity, monetary policy and lending booms.

Nocetti (2006) states the importance of the use of probit or logit models to identify economic weaknesses and anticipate crises. An analysis of banking crises is carried out by Demirguc-Kunt and Detragiache (1998). They estimate the probability of banking crises using a multivariate logit model. To capture adverse macroeconomic shocks, they use the rate of growth of real GDP, the external terms of trade and the real short-term

interest rate. High short-term real interest rates affect bank balance sheets adversely if banks cannot increase their lending rates quickly enough. Financial liberalization may increase banking sector fragility since risk taking and fraud are more likely. They introduce the ratio of credit to the private sector to GDP to capture financial liberalization, in addition to the real interest rate. Another proxy they use is lags of the change in real credit. Inflation is introduced as a measurement for macroeconomic mismanagement. Furthermore, the rate of depreciation of the exchange rate is used to test whether bank crises are driven by excessive foreign risk exposure. In addition, they introduce the ratio of M2 to foreign exchange reserves as a predictor of balance of payment crises. Government surplus as a percentage of GDP is used to capture the financial needs of the public administration. They provide two reasons: first, a high deficit involves postponing measures to strengthen bank balance sheets in order to avoid public expenditure, and second, a failure to control the budget deficit is an impediment to successful financial liberalization, which creates problems for banks. The last relevant variable is the ratio of bank cash and reserves to bank assets.

Other studies that incorporate new variables, such as Beck et al. (2006), find that bank concentration increases banking crisis probability. Hardy and Pazarbasioglu (1999) also include consumption and investment variables. They find that a consumption boom in the years prior to a crisis can be a good indicator of banking crises. These authors state that "banking crises are associated with a sharp decline in the real effective exchange rate, but an appreciation in this rate often precedes a crisis". The arguments they give are that adverse terms of trade shock and a real exchange rate appreciation affect the competitiveness of the economy and lead to a deterioration in the profitability of the corporate sector. The correction of that phenomenon by a depreciation of the exchange rate leads to losses for corporations indebted in foreign currency.

Rose and Spiegel (2010, 2011) include exports/GDP ratio as a factor of a financial crisis, but without strong evidence. Büyükkarabacak and Valev (2010) differentiate private credit from household and enterprise credit. Ye and Han (2010) show that financial contagion decreases with geographical distance from the United States, which was the center of the 2008 subprime mortgage crisis, and that the closer the distance to that center, the greater the effect. Boudriga and Ghardallou (2012) find that deterioration in competitiveness is associated with an increased risk of problems in the banking sector.

3. Development of hypothesis

The importance of inequality on banking crises has been theoretically explained by Claessens and Perotti (2007), Rajan (2010) and Kumhof and Rancière (2011) who propose that an increment in inequality led to a credit boom and finally to a financial crisis in the USA at the beginning of the 21st century, as it did in the 1920s. Krugman (2007) focuses on the extension of bad loans by the private sector, whereas Rajan (2010) highlights the role of the government through its agents. For the determinants of the financial crisis of 2008, Wisman (2013) considers that income inequality, jointly with wage stagnation, generated three dynamics that made the economy vulnerable to crisis. The first dynamic is that the two variables constrained consumption, diminishing profitable investment potential, and encouraging rich people to flood financial markets with credit, the creation of new credit instruments, and fueling speculation. The second is that consumption externalities were generated, compelling individuals to find ways to preserve their welfare and their relative social status. The consequence was that over the preceding three decades household saving rates fell, households increased debt, and worked longer hours. The third dynamic is that, as the rich people reached a larger proportion of income and wealth, they gained more command over ideology and

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politics. This ideology supported reducing tax rates for the rich and welfare for the poor, deregulating the economy, and failing to regulate newly developing credit instruments. Stockhammer (2013), based on post-Keynesian theory, identifies two additional channels by which inequality has contributed to crises. First, an increase of inequality leads to a decrement on aggregate demand since poorer have high propensities to consume. Second, international financial deregulation has led to have larger current account deficits and for longer period, and reacting to a potentially paralyzed demand, two growth models have raised: a debt-led model and an export-led model.

This relationship has been empirically tested. For instance, Icaviello (2008) finds that the long run rise in household debt is explained by higher income inequality. Roy and Kemme (2012) use the difference of the average productivity and the real wage rate as a measure of income inequality. They also find that the rise of income inequality also contribute to global financial crises.

Nevertheless, other authors do not find a significant relationship or they consider economic crises provoke income inequality, and not the opposite. According to Atkinson and Morelli (2011), nowadays the relationship may work in the opposite direction. On the one hand, pressures for fiscal consolidation may encourage a constant decrease of the welfare state. On the other hand, for the authors the avoidance of economic crises may be necessary to warrant the sustainability of the social institutions we have developed to control inequality, the welfare state and the stability of the governance. Atkinson and Morelli (2011) find that income inequality seems not to precede banking crises, but they find more evidence on the opposite: income inequality is preceded by banking crises. Roine et al. (2009) use data during the period 1900-2000 for 16 countries and they concluded that a financial crisis would reduce the top 1 percent income share by roughly 0.2 percentage points for each year of the crisis. The

results of Bordo and Meissner (2012) suggest there is no significant relationship between inequality and credit booms. Using data from 14 advanced countries between 1920 and 2000, they obtain these are not general relationships. The find credit booms heighten the likelihood of a banking crisis. Nevertheless, they find no evidence that a rise in top income shares leads to credit booms. Instead, the only two robust determinants of credit booms in their data set are economic expansions and low interest rates. Hence they do not find evidence for the inequality, credit, crisis nexus; but a traditional boom-bust pattern of reductions in interest rates, excessive growth, increasing credit, asset price booms and crises.

In this paper we will check whether there is evidence that financial crises are preceded by income inequality, measured by the Gini index. Being aware other determinants of financial crises, we follow the post-Keynesian view of considering inequality as a determinant of financial crises and formulate a theoretical hypothesis:

H: "Income inequality, measured by the Gini index, increases the risk of a banking crisis. The relationship is significant and robust even after controlling other determinants of financial crises."

As Roy and Kemme (2012, p.274) suggest, "[…] consistent data on Gini ratios or other similar measures are not readily available […]" for datasets as the one of this paper. This may be the reason for, as far as we know, nobody has ever estimated a panel logit probability model explanatory of banking crises using the Gini index. We do so by merging data of Gini from Eurostat and OECD database, as next section will show.

4. Data sample and methodology

Our dependent variable, *crisis*, is available in the World Bank and represents a dummy variable that is one if the country is experiencing a banking crisis and zero if not. We

estimated the equations using a population-averaged panel logit probability model, as Büyükkarabacak and Valev did (2010)[1].

$$\text{logit } \Pr\left(Y_{it}=1\mid X_{it}\right)=\alpha^{*}+\beta^{*}X_{it} \qquad [1]$$

Where Y_{it} represents the dependent variable *crisis*, X_{it} the explanatory variables, β^{*} the change in the logit of the proportion with $Y=1$ for an increase in X of a unit and α^{*} is the constant.

The main advantage of the population-averaged method to the others is that it allows us to use the Huber/White/Sandwich estimator of variance. This estimator reduces the impact of outliers and generates valid standard errors. Robust standard errors are obtained by the generalized estimating equations (GEE) method.

Panel data is used, specifically, an unbalanced panel from the year 1961 to 2012 from 36 countries, all the EU (27) and OECD countries with the exceptions of Switzerland, Cyprus, Romania and Malta. Table 1 gives some basic information about data.

Table 1. Countries and years in the sample.

Years: 52	*Countries: 36*
1961-2012	Australia, Austria, Belgium, Bulgaria, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Iceland, Israel, Italy, Japan, Korea, Luxembourg, Latvia, Mexico, Lithuania, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Turkey, United Kingdom, United States.

Source: By the authors

The explanatory variables used in this paper are the main determinants of banking crises that do not present multicollinearity problems, in addition to our target variables. The

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[1] As these authors state, for a detailed description of the population-averaged model, see Zeger et al. (1988), Neuhuas et al. (1991), and Wooldridge (2002). We also estimated our equations using a random effects logit model. Our estimated coefficients are similar to those of the population-averaged model.

main determinants of financial crises used in this paper are: *balance*, which is the difference between the export and imports of goods and services. The increment of the external balance is the reaction a potentially paralyzed demand. The variable *terms* is the terms of trade effect and equals capacity to import less exports of goods and services in constant prices and *exch* is the official exchange rate (national currency unity per US$, average for a period). Adverse terms of trade shock and a real exchange rate appreciation affect the competitiveness of the economy and lead to a deterioration in the profitability of the corporate sector leading to financial crisis. The budget surplus is measured by *surplus*, public cash surplus or deficit is revenue (including grants) minus expense, minus net acquisition of nonfinancial assets In general terms, a high surplus involves postponing measures to strengthen bank balance sheets and is an impediment to successful financial liberalization, which creates problems for banks. Both effects provoke banking crises. The variable *lerner* is the Lerner index, a measurement of banking competition that compares output pricing and marginal costs (that is, the mark-up) in the banking market: an increase in the Lerner index indicates a deterioration in the competitive conduct of financial intermediaries. A low banking competition provokes banking concentration and this generates systemic risk, which is involved in crises. The logarithm of the sum of the bilateral distance of a country to the USA, France and Japan is measured by *dist*. A nearer distance with these three economic potencies means a higher level of contagion of financial crises.

Our target variables are *gini2*, which is the Gini index lagged two periods, measuring the extent to which the distribution of income (or, in some cases, consumption expenditure) among individuals or households within an economy deviates from a perfectly equal distribution, and *surplusgini2*, which represents interaction of the variables *surplus* and *gini2*, and we will explain in depth in the section 7.

Table 2 show the main characteristics of the variables.

Table 2. Summary statistics.

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
crisis	1,836	0.083	0.276	0	1
balance	1,632	-0.348	6.548	-34.68	32.268
terms	1,527	7.04E+11	6.09E+12	-3.58E+13	6.97E+13
exch	1,489	87.25574	237.40600	0.00001	1,909.43900
surplus	575	-1.54559	4.35130	-29.42016	20.00958
lerner	535	0.18510	0.11775	-1.60869	0.50311
dist	1,872	9.84431	0.24965	9.65257	10.67034
gini2	428	29.43027	10.21554	0.28300	56.21000

We lagged measure of inequality (the Gini coefficient) for two periods, to minimize simultaneity problems (Büyükkarabacak and Valev, 2010). Data were obtained from the World Bank Database, except *gini2*, which the author obtained from Eurostat and OECD Database, and *distance*, obtained from the GeoDist Database (Mayer and Zignago, 2011). In Table 3 we can see the name of the variable with the respective source, and expected sign of the coefficients of our variables with its references, based on the arguments in section 1. The effect of *surplusgini2* on the dependent variable will be discovered empirically and discussed theoretically in section 7.

Table 3. Expected signs of the variable coefficients.

Variable	Source	Sign	References	Variable	Source	Sign	References
balance	World Bank	+	Rose and Spiegel (2009) and Stockhammer (2013)	*lerner*	World Bank	+	Beck et al. (2006)
terms	World Bank	+	Hardy and Pazarbasioglu (1999)	*dist*	GeoDist Database (Mayer and Zignago, 2011)	-	Ye and Han (2010)
exch	World Bank	-	Hardy and Pazarbasioglu (1999)	*gini2*	By the authors using OECD and Eurostat databases	+	Stockhammer (2013) and Wisman (2013)
surplus	World Bank	-	Demirguc-Kunt and Detragiache (1998)	*surplusgini2*	*surplus*gini2*	-	By the authors

Source: By the authors

Correlations among independent variables used in the model are shown in Table 4. Variables with a high correlation were not included in the models and hence, in the matrix. Some variables were omitted due to a high correlation with other variables. Avoiding these variables, the highest one is the correlation between *dist* and *gini2*, with a value of 0.3. This correlation is below 0.5, so it can be said that there are no multicollinearity problems. In spite of that, we have checked with a VIF test the presence of multicollinearity among these variables and the results indicate these variables are far from multicollinearity.

Table 4. Correlation matrix of independent variables.

	balance	terms	exch	surplus	lerner	dist	gini2
balance	1						
terms	0.0106	1					
exch	0.1315	0.1005	1				
surplus	0.2295	0.1065	0.0579	1			
lerner	-0.1685	0.0417	0.0385	0.1966	1		
dist	-0.2783	-0.0438	0.1435	-0.2432	0.1799	1	
gini2	-0.011	-0.0544	0.2184	0.0353	0.0347	0.3051[ii]	1

[i] Other variables have been tested, but they have been eliminated due to multicollinearity.

[ii] The correlation is more than 0.3, suggesting that a multicollinearity test (e.g. VIF) should be conducted to check the presence of multicollinearity among these variables. The VIF is 1.24, and the 1/VIF, 0.807533, being far from multicollineality.

5. Empirical results

The main findings of the paper are summarized in Table 5, which show the effects of the variables on the likelihood of a banking crisis.

The models are estimated following the population-averaged panel logit probability model and using robust standard errors obtained by the generalized estimating equations (GEE) method, as we stated in section 4.

Table 5. Estimated models (a).

lnloan	(I) Complete model		(II) Check model	
	Coefficient	p-value	Coefficient	p-value
balance	0.185**	0.014	0.209**	0.04
terms	9.72E-14*	0.075		
ex	-0.004**	0.036	-0.005*	0.055
surplus	-0.2**	0.019	-0.215***	0
lerner	-4.332	0.252		
dist	-0.557**	0.001	-0.609***	0
gini2	0.131***	0.01	0.120***	0
No observations	167		198	
No groups	28		29	
Wald	107.38		40.13	
Wald p-value	0		0	

* Significance level of 90%, ** significance level of 95%, *** significance level of 99%.

Models (I) is the definitive logit model estimated, and has good econometric properties, as joint significance of the parameters, based on a *p-value* of the Wald test that equals to zero. Model (II) is the robustness check model, which also have good statistical properties. We see that as the signs both the amount and the coefficients of the explanatory variables are equal or similar in both models.

In models I and II, we assess the post-Keynesian thesis that inequality increases the risk of a banking crisis. Model (II) was estimated on the base of model (I), consecutively eliminating non-significant variables to obtain a simpler and more explanatory model, and keeping interest variables in the successive estimations.

6. Discussion

Definitive model (I) and check model (II) are used to interpret the results. A significant and robust positive influence of inequality, measured by the Gini index, on the banking crisis risk can be observed. This result confirms the expectations of Stockhammer (2013) and others that developed the idea of a positive impact of economic inequality

on financial crises, corroborating the post-Keynesian theory. We also corroborate the hypothesis of section 3.

Other relevant variables with a robust and significant effect on the likelihood of a financial crisis which have the expected sign are: the external balance, with a positive sign, because rising the external balance is a reaction to a potentially paralyzed demand. This result is coherent with Rose and Spiegel (2009) and Stockhammer (2013). The sign of the terms of trade coefficient is positive and the exchange rate is associated to a coefficient with negative sign (that is, the adverse terms of trade and a shock appreciation of the national currency are associated with a banking crisis in the current period), as Hardy and Pazarbasioglu (1999) find. The prediction of Demirguc-Kunt and Detragiache (1998) that fiscal deficit is linked to financial crises is corroborated. As we showed in section 2, first, fiscal deficit involves postponing measures to strengthen bank balance sheets and is an impediment to successful financial liberalization, which creates problems for banks. Second, a failure to control the budget deficit is an impediment to successful financial liberalization, which creates problems for banks. The lack of banking competition is obtained with a negative coefficient, in contrast to Gavin and Haussmann (1996) expectations, but it is not statistically significant. The coefficient of the bilateral distance of a country to the USA, France and Japan is negative, as Ye and Han (2010) expected. A nearer distance with these three economic potencies means a higher level of contagion of financial crises.

7. Policy measures

Taking into account the results of the paper, it is important to take the following policies in order to avoid the risk of a financial crisis. For instance, is there any measure of fiscal consolidation depending on the level of income inequality? In the previous section we

saw that the reduction of budget surplus is a general rule to avoid financial crises. Nevertheless, we want to know whether it is always true or it depends on the level of inequality. To answer this question, in model (III) we incorporate the variable *surplusgini2* to the model (I) in order to find the impact of the interaction of income inequality and fiscal consolidation on the probability of a banking crisis. Finally, model (IV) allows a robustness check of model (III) by consecutively eliminating non-significant variables on the base of model (III) and keeping interest variables in the successive estimations in order to obtain a simpler model and to check robustness.

Table 6. Estimated models (b).

lnloan	(III) Complete model "b"		(IV) Check model "b"	
	Coefficient	*p-value*	*Coefficient*	*p-value*
balance	0.174**	0.039	0.209**	0.042
terms	7.9E-14*	0.081		
ex	-0.003	0.169	-0.004	0.111
surplus	0.610	0.119		
lerner	-5.522	0.192		
dist	-0.442***	0	-0.564***	0
gini2	0.096**	0.011	0.105***	0
surplusgini2	-0.025**	0.042	-0.007***	0
No observations	167		198	
No groups	28		29	
Wald	102.14		43.09	
Wald p-value	0		0	

* Significance level of 90%, ** significance level of 95%, *** significance level of 99%.

A robust and significant negative impact of the interaction term on the likelihood of a financial crisis is observed. This can be interpreted as whilst countries with low income inequality do not have to increase the budget surplus in order to avoid a crisis, economies with high Gini coefficient have to practice fiscal consolidation in order to avoid banking crises. The reason could be that households of countries with high income inequality are also highly indebted, and it is necessary a budget surplus in order

to prevent from possible banking crashes due to bad debts. If fiscal consolidation is settled, banks with bad debts would be easily rescued by the governments, and then the probability of a crisis would be reduced. We are also based on Burman et al. (2010) and others, who state that the fears of investors about future deficits (due to bad debts, in this case) can trigger a financial crisis.

8. Concluding remarks

This paper provides further evidence on banking crises determinants. We have analyzed the impact of inequality on banking crunches and provided policy measures to decrease the risk of a banking crisis.

Using a large sample of countries and years, we find a robust significance of the positive influence of income inequality on banking crises, corroborating previous theoretical frameworks and arguments of the post-Keynesianism and others. The contributions of the paper are the following. First, the obtainment of a positive impact of inequality on banking crises by the estimation of a population-averaged panel logit probability model using an own elaborated Gini index based on Eurostat and OECD databases. As far as we know, this is the first paper in using a Gini coefficient to explain banking crises with this methodology. Second, we provide a policy measure useful for lawmakers: whilst countries with low levels of income inequality do not have to increase the budget surplus to avoid crises; economies with high levels of income inequality should settle fiscal consolidation in order to reduce the probability of a banking crisis. The reason may be that households of countries with high income inequality are also highly indebted, and fiscal consolidation is necessary for prevent from possible banking crashes due to bad debts and to rescue banks before a banking crisis starts.

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