Informality and bank stability

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Abstract

While financial development (FD) has been widely studied in the literature as a determinant of informal sector size, there has been no focus on the role of financial stability. We find banking stability has a significant and robust negative effect on informality across countries. Using a recently available testing methodology based on a heteroskedasticity-robust lasso we also find strong support for Rule of Law as a key determinant of informal sector size, and some evidence for the effect of FD.

Keywords:
Informality, bank stability, financial development, robust Lasso, rule of law

1. Introduction

We propose a new determinant of informal sector size - bank stability. Besides the relatively well understood macroeconomic effects of bank stability, see for example Laeven and Valencia (2013), a lower level of bank stability may result in households working more in the unregulated, non tax-paying informal sector. While the level of financial development has been widely studied as a potential driver for informality, see for example Antunes and Cavalcanti (2007), the stability of the financial system has not been explored. Yet, its potential importance seems clear. On the one hand, a more stable banking system inspires greater trust and reliance on formal banks, which lend against declared assets and income generating capacity of businesses, maintain records of transactions, and require a level of tax reporting to authorities. This inclines businesses relying on formal banks to declare their income and assets accurately and to operate formally. On the other hand, safer banks that hold more capital create less credit, thus limiting the borrowing incentive of small businesses to leave the informal sector. We assess the importance of bank stability using a state-of-the-art continuous treatment test due to Belloni et al. (2014), which uses a heteroskedasticity-robust version of the Lasso to select appropriate sets of control variables from a larger set.

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We also revisit other key determinants of informality identified in the literature, including aspects of institutional quality and economic freedom (e.g. Aruoba, 2010), the level of financial development (e.g. Antunes and Cavalcanti, 2007; Dabla-Norris and Gradstein, 2008), the tax rate (e.g. Mitra, 2017 and references within) and political stability (e.g. Elgin, 2015). Of the sixteen measures of institution quality or economic freedom in our analysis, it is found that Rule of Law, a measure provided by Worldwide Governance Indicators (WGI), has a highly significant negative effect on informal sector size. Moreover, it is selected throughout by the robust lasso as a key predictor of informality.

2. Data

Schneider et al. (2016) provides estimates of informal sector activity (% of GDP) from 1999 to 2007, which have been widely used in the literature (Chatterjee and Turnovsky, 2018; Mazhar and Mon, 2017). Our analysis uses average values over the three year period 2005-2007, where ten measures of institutions quality or economic freedom are available from the Heritage Foundation (HF).[2] Our full set of institutions variables, including the six provided by the World Governance Indicators (WGI) dataset, see Kaufmann et al. (2011), is summarised in Table 7 of the Supplementary Appendix, along with our two financial system variables (Bank Stability and FD) and a set of macroeconomic controls.

Bank Stability is proxied by aggregate bank Z-score, a Global Financial Development Database (GFDD) indicator provided by the World Bank, following its use by Fielding and Rewilak (2015), Frost and van Stralen (2018) and others as a measure of banking sector distance to default. As noted in the source documentation, it "compares the buffer of a country's banking system (capitalization and returns) with the volatility of those returns", and is computed as (ROA+(Equity/Assets))/sd(ROA), where ROA (Return on Assets), Equity, and Assets are aggregates of individual bank data. As a proxy for FD we use Domestic Credit to the Private Sector (DCPS) as a % of GDP (GFDD) as in for example Beck et al. (2000), and our tax rate measure is total tax revenue as a % of GDP (WDI).

3. Methodology

The lengths of our informality series and institutions series are relatively short, therefore we use the average values over the three year period where all of the variables are available. A single-year panel approach was an option, but this would be subject to the concerns raised in Beck and Levine (2004) over possible business cycle movements. By using the country averages instead, some of the unsystematic error in the index values may also be mitigated.

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[2]Two additional indices, *Judicial Effectiveness* and *Fiscal Health*, are available for later years.

The following model is considered for the informal sector size:

$$\text{inform}_i = \alpha_0 \text{ bank stability}_i + \alpha_1 \text{ FD}_i + \alpha_2 \text{ tax rate}_i + \gamma_1{'} \text{ institutions}_i$$
$$+ \gamma_2{'} \text{ interactions}_i + \gamma_3{'} \text{ other controls}_i + \varepsilon_i \tag{1}$$

where i is the country index, institutions$_i$ is a vector of 16 measures, interactions$_i$ is a vector comprised of interactions of these with tax rate$_i$, with FD$_i$, and the interaction of tax rate$_i$ with FD$_i$.

The test for the significance of α_0 that we use, due to Belloni et al. (2014), assumes there is "approximate sparsity", which means that the model in (1) can be well approximated using only a subset of the full set of controls, therefore some, potentially many, of the coefficients in (1) are actually zeros. The test is based on the *post-double selection estimator* $\breve{\alpha}_0$, which involves (i) selecting a set of controls that are strongly related to the proposed causal variable, bank stability, in order to control for the most important confounding factors, (ii) selecting a set of controls that predict informality well, in order to reduce residual variance and potentially control further for confounding factors and (iii) applying OLS estimation to the union of controls selected in each case.[3]

The two selection stages can be performed using any method that satisfies the theoretical requirements set out in Belloni et al. (2014), but we use the recommended approach, a new heteroskedasticity-robust version of the Lasso. The estimated effect of bank stability, $\breve{\alpha}_0$, is therefore obtained by OLS regression of informal sector size on the union of controls selected in the following two reduced form equations:

$$\text{bank stability}_i = \pi_1{'} z_i + v_{i1} \tag{2}$$
$$\text{inform}_i = \pi_2{'} z_i + v_{i2} \tag{3}$$

where $z_i = (\text{FD}_i, \text{ tax rate}_i, \text{ institutions}_i{'}, \text{ interactions}_i{'}, \text{ other controls}_i{'})$. Computation of the test statistic, which is asymptotically standard normal under the null hypothesis value of α_0, is described in Theorem 1 of Belloni et al. (2014).

Moreover, since we have quite a rich set of institutional variables available that may be causal variables for informality, we do an additional run of the robust Lasso directly on (1) as a discovery step, to find variables that are at least good predictors of informal sector size - the effects of these are then tested as well.

4. Results

Tables 1 (no interactions included) and 2 (interactions included) present the test results for bank stability, for other candidates studied in the literature as drivers of informality

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[3]There are $\sum_{r=1}^{22} \binom{22}{r} \approx 4.2 \times 10^5$ possible subsets of the controls with interactions excluded, and $\sum_{r=1}^{55} \binom{55}{r} \approx 3.6 \times 10^{16}$ with interaction terms included.

(see Section 1), and for ("Selected") variables selected as predictors of informality in the separate application of the robust Lasso. The bank stability effect is estimated to be negative, and is highly significant throughout except for countries with FD<75%.[4] There are less advantages for businesses from using commercial banking services when FD levels are relatively low, therefore the stability of the banking sector may indeed become less important to the decision whether to operate in the formal sector. None of the variables under "Other candidates" - FD, tax or political stability - were found to have significant effects, though significance was found in the Supplementary Appendix robustness checks for tax and political stability.

Two of the three variables selected as predictors of informality in the separate application of the robust Lasso are measures of institutional quality, while the third is GDP per capita. *Rule of Law* in particular is found to be highly significant and negative throughout. The variable may be regarded as a proxy for the level and quality of enforcement, and our results (significant treatment effect *and* selected by the robust Lasso as a predictor) confirm that it is a very important driver of informality.[5] Similar results were found in two robustness checks detailed in the Supplementary Appendix. The main results, and to some extent the supplementary robustness checks, also suggest that FD may play a role in reducing informality when combined with low perceptions of corruption or, for countries with lower levels of FD, a strong rule of law.[6]

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[4]As an example of the effect, if a country moved from the median Bank Stability to the sample maximum (10.85 to 54.5), the estimated reducion in informal sector size would be 12.67% of GDP.

[5]If a country moved from the median level of Rule of Law to the sample maximum (-0.12 to 1.94), the estimated reduction in informal sector size would be 30.78% of GDP (based on Table 1), or 39.08% (Table 2).

[6]While neither interaction is selected as an important predictor when using the FD<75% set of countries, we found *Rule of Law × FD* was significant at 5%.

Table 1: Test results for Bank Stability and other candidates

	(1)		(2) FD < 100%		(3) FD < 75%	
	Effect	*p*-value	Effect	*p*-value	Effect	*p*-value
Bank Stability	-0.29***	0.002	-0.29***	0.005	-0.29	0.227
Selected						
Rule of Law	-14.94***	0.005	-18.81***	0.003	-18.1***	0.002
GDP per capita	-0.24**	0.030	-0.29**	0.048	-0.48***	0.000
Government Effectiveness	-4.15	0.426				
Other candidates						
Tax rate	0.04	0.602	-0.04	0.741	-0.10	0.314
FD	-0.01	0.696	0.03	0.685	-0.003	0.970
Political Stabilty	-2.04	0.227	-2.48	0.163	-3.19	0.135
N	84		67		61	
p	23		23		23	

Significance at 10%, 5%, and 1% is denoted by * , **, and ***, respectively. Columns (2) and (3) are results for the subsets of countries with DCPS less than 100% and 75%, respectively. All predictors selected by the robust Lasso are listed under "Selected". Effects are estimated using the heteroskedasticity robust post-double Lasso method in Belloni et al. (2014) with a data-driven penalty parameter, see also Chernozhukov et al. (2016). One of the HF measures included, Fiscal Freedom, is a composite measure of the burden of taxes. We tested the "Tax rate" effect with and without this control variable included, and the test results were identical.

Table 2: Test results for Bank Stability and other candidates, interactions included

	(1)		(2) FD < 100%		(3) FD < 75%	
	Effect	*p*-value	Effect	*p*-value	Effect	*p*-value
Bank Stability	-0.29***	0.002	-0.32***	0.006	-0.17	0.415
Selected						
Rule of Law	-18.97***	0.001	-22.55***	0.002	-26.18***	0.000
Government Effectiveness	-9.17	0.131				
Freedom from corruption × FD	-0.01*	0.078				
Investment freedom × FD	-0.002	0.216				
GDP per capita	-0.28**	0.015			-0.44***	0.000
Rule of Law × FD			-0.31*	0.059		
Other candidates						
Tax rate	-0.62	0.447	-0.18	0.861	-0.36	0.712
FD	-0.11	0.725	0.21	0.643	-0.39	0.508
Political Stability	-4.04	0.136	-5.02	0.112	-2.49	0.482
N	84		67		61	
p	56		56		56	

Interactions are included between tax and FD, tax and institutions (16) and between FD and institutions. The presented results for "Tax rate" are with HF measure Fiscal Freedom excluded. The results with the measure included were similar, and the effects were again insignificant. See Table 1 for further details.

Figure 1 presents subsample robustness checks for the Bank Stability result. On the left, the estimated Bank Stability main effects along with 90% and 95% confidence intervals are plotted for a rolling window of 60 countries after ordering the countries by GDP, with $\overline{GDP}_{max}$ being the maximum GDP in a given window. The effect of Bank Stability on informality is negative throughout, and there is a narrowing of the confidence intervals when higher income economies are considered. On the right, the Bank Stability estimated main effects and test *p*-values are plotted for 10,000 randomly chosen groups of 70 countries (black dots) and 60 countries (red dots), and the effects are found to be significant in the vast majority of country groups.

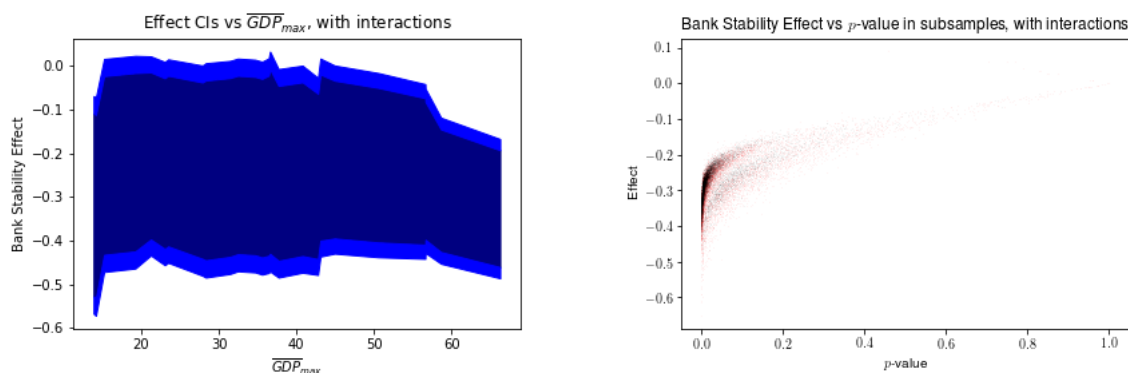Figure 1: Subsample robustness checks

Figure 1: Left panel: Bank Stability main effects and confidence intervals for a rolling window of 60 countries after ordering the countries by GDP, with $\overline{GDP}_{max}$ being the maximum GDP in a given window. Right panel: Bank Stability main effects and test p-values for 10,000 randomly chosen groups of 70 countries (black dots) and 60 countries (red dots).

5. Conclusion

We find bank stability has an important negative effect on informal sector size, a result that is robust to different income levels and in a large number of randomly selected subsamples of countries. An exception is when the level of financial development is relatively low, which corresponds to a situation where businesses have less to gain from formal banking regardless of the stability of the sector. Our results are novel in the literature and suggest an important role for bank stability in theoretical and empirical models of informality going forward, and may have implications for macroprudential policymaking in advanced nations.

Finally, we find strong evidence that rule of law is the most important institutional variable for determining informal sector size. Out of sixteen measures of institution quality considered, and after allowing for a large number of interaction terms via a robust lasso methodology, the WGI measure Rule of Law was selected throughout and found to be highly significant.

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