

Gadatsch, Niklas; Mann, Lukas; Schnabel, Isabel

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A New IV Approach for Estimating the Efficacy of Macroprudential Measures

Niklas Gadatsch
(Staff of the German Council of Economic Experts)

Lukas Mann
(University of Bonn)

Isabel Schnabel
(University of Bonn and German Council of Economic Experts)

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A New IV Approach for Estimating the Efficacy of Macroprudential Measures

By NIKLAS GADATSCH^a, LUKAS MANN^b AND ISABEL SCHNABEL^{c1}

^a Staff of the German Council of Economic Experts, Wiesbaden, Germany.

^b University of Bonn, Germany.

^c University of Bonn and German Council of Economic Experts, Wiesbaden, Germany.

Abstract

We propose a new identification strategy to assess the efficacy of macroprudential measures. We propose a novel instrumental variable that is based on the idea that a politically sensitive macroprudential measure is more likely to be implemented if a politically independent institution, such as a central bank, is in charge. Our results show that borrower-based macroprudential measures have had a strong and statistically significant dampening effect on credit growth in the European Union.

1. Introduction

Macroprudential policies are increasingly becoming part of the standard policy toolkit to maintain financial stability. At the same time, the understanding of the functioning of these instruments is still limited. The literature trying to assess the impact of macroprudential measures is still in its infancy. In particular, there are very few studies dealing with the European Union. Methodologically, any estimation must deal with the inherent endogeneity problem: Policymakers typically implement measures in response to systemic risk, indicated, e. g., by excessive credit growth. Hence, measures are likely to be influenced by the target variables themselves, thereby creating reverse causality. This may result in an estimation bias such that the policies' effectiveness may be underestimated (Kuttner and Shim, 2016).

¹ **Corresponding author.** Address: Institute for Finance & Statistics, University of Bonn, 53012 Bonn, Germany, isabel.schnabel@uni-bonn.de.

The common solution is to employ a panel GMM estimator.² While this is in principle a valid solution, it may not always be an ideal one. Panel GMM estimators are susceptible to the weak-instrument problem (Bun and Windmeijer, 2010). Furthermore, they yield an abundance of econometric instruments since their number grows quite rapidly with the time dimension. As a result, the model can be overfitted and tests for the validity of instruments may be impaired (Roodman, 2009).

We offer an alternative in the form of a simple instrumental variable (IV) approach. IV estimation is often not feasible due to a lack of suitable instruments. We propose a new instrument based on the institutional arrangement of national macroprudential policy and present estimations employing the new approach to EU data. Our IV results show that borrower-based macroprudential measures have a strong and statistically significant effect on credit growth. The results are robust to a variety of specifications.

2. Empirical Strategy

Our IV approach is based on the idea that a politically sensitive macroprudential measure is more likely to be implemented if a politically independent institution is in charge. Hence, we expect that countries are more likely to implement measures like LTV- or DSTI-ratios if the central bank plays a larger role in macroprudential supervision.³ Borrower-based measures, in particular, are politically more controversial because they directly interfere with the contractual freedom of banks and their customers. At the same time, we do not expect such institutional arrangements to affect credit growth directly. Furthermore, institutional arrangements are predetermined. This makes the involvement of the central bank in macroprudential supervision a valid instrument.

To quantify the involvement of the central bank in the EU, we use a recommendation of the ESRB (2011) on the macroprudential mandate of national authorities and its following assessment. The ESRB has recommended that the central bank plays a leading role in macroprudential policy (sub-recommendation “B3”). After three years, the ESRB (2014)

² Examples are Lim et al. (2011), Akinci and Olmstead-Rumsey (2015) and Cerutti et al. (2017) on country level, as well as Claessens et al. (2013) using bank-level data.

³ Lim et al. (2013) find that a larger role of the central bank in macroprudential policy leads to a speedier application of macroprudential measures.

assessed quantitatively to which degree member states have fulfilled this recommendation (see Table 1).⁴

Our econometric specification is similar to Claessens et al. (2013). We first consider an IV regression based on bank-level data from all 28 EU member states:

$$\text{Second stage: } Y_{cit} = \beta_t + \gamma \cdot Y_{cit-1} + \delta \cdot \text{Macropru}_{ct} + \theta \cdot X_{ct-1} + \vartheta \cdot Z_{cit-1} + \varepsilon_{cit}$$

$$\text{First stage: } \text{Macropru}_{ct} = \alpha_t + \varphi \cdot B3_{ct} + \mu \cdot Y_{cit-1} + \zeta \cdot X_{ct-1} + \phi \cdot Z_{cit-1} + \nu_{cit}$$

Y_{cit} denotes gross loan growth of bank i in country c at time t . We include a lagged dependent variable to control for natural persistence. Macropru_{ct} is an index of macroprudential policy that is based on the ESRB's documentation of macroprudential policies in the EU.⁵ We distinguish borrower-based and capital-based measures: $BBM1$ comprises LTV, LTI and DSTI caps, while $BBM2$ further includes restrictions on loan maturity and loan amortization. CBM comprises countercyclical buffers, systemic risk buffers, and risk weights. Each index equals the number of activated instruments (Table 1).⁶ Our data does not allow us to capture objectively the intensity of the measure, nor does it provide information on whether a measure is actually binding. X_{ct-1} and Z_{cit-1} are vectors of country- and bank-specific controls, respectively. In our baseline estimation, we include bank capitalization (equity/assets), real GDP growth, and the first difference of the policy rate. In a robustness check, we include further controls. Finally, each country's observations are weighted by the inverse number of banks. Due to data restrictions, we are constrained to a one-period analysis on the micro-level. To test our instrument with an expanded time dimension, we resort to macro-data as a robustness check.

3. Results

As shown in Table 2, the econometric instrument works very well for borrower-based measures (columns 1 and 2). In the first-stage regression, the central bank's role, quantified by $B3$, is highly significant and the corresponding F value lies well above the conventional threshold of 10. In contrast, the instrument does not work for capital-based measures (column 3). This does not come as a surprise because implementing capital-based measures is politically much less

⁴ We adjust the rating whenever a member state received a low rating due to an unfinished legislative process (see ESRB, 2014, table 8 and section 8).

⁵ See https://www.esrb.europa.eu/national_policy/shared/pdf/overview_macroprudential_measures.xlsx.

⁶ This approach is standard in the literature. See, for instance, Cerutti et al., 2017.

controversial. An activation of an additional borrower-based measure leads to a statistically and economically significant decrease in bank loan growth by 3 to 4 percentage points on average, while the effect is statistically insignificant in the OLS estimation. Control variables enter with the expected sign or insignificantly.

The results are robust to a number of different specifications (Table 3). First, we include additional controls, namely bank profitability (return over assets), bank size (logarithm of assets), the sovereign debt-to-GDP ratio, sum of imports and exports in terms of GDP, and the current account balance to GDP (see Claessens et al., 2013), which lowers the size and statistical significance of coefficients (columns 1 and 2). However, borrower-based measures still have economically significant effects. Second, we include additional controls and use unweighted data, which leaves results largely unchanged compared to the baseline (columns 3 and 4). Third, we use macro data from 2011Q1 to 2016Q4 (columns 5 and 6). These regressions yield very similar results to the baseline regressions at bank level.

4. Conclusion

The role of the central bank in macroprudential policy matters. This insight leads us to a new identification strategy to assess the efficacy of borrower-based macroprudential measures in the EU. The strategy helps to avoid the inherent endogeneity problem while circumventing the difficulties of GMM estimation techniques. Thereby, our paper adds to the literature on the efficacy of macroprudential measures. It provides evidence for EU countries that borrower-based macroprudential measures dampen credit growth. This is particularly relevant amid growing vulnerabilities in European residential real estate markets (ESRB, 2016).

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Table 1: Involvement of the central bank in macroprudential policy and macroprudential measures

Country	B3	BBM1	BBM2	CBM	Country	B3	BBM1	BBM2	CBM
Austria	0.5	0	0	0	Italy	1	0	0	0
Belgium	1	0	0	1	Latvia	1	1	1	0
Bulgaria	0.5	0	0	1	Lithuania	1	2	3	0
Croatia	1	0	0	2	Luxembourg	0.25	0	0	1
Cyprus	1	2	2	0	Malta	1	1	1	0
Czech Rep.	1	1	1	0	Netherlands	1	1	2	0
Denmark	0.75	0	0	0	Poland	1	2	3	0
Estonia	1	0	0	1	Portugal	1	0	0	0
Finland	0.25	0	0	0	Romania	1	2	3	1
France	0.5	0	0	0	Slovakia	1	2	4	0
Germany	0.75	0	0	0	Slovenia	0.75	0	0	0
Greece	1	0	0	0	Spain	0.75	0	0	0
Hungary	1	2	2	0	Sweden	0.25	1	1	2
Ireland	1	2	2	1	Unit. Kingdom	0.5	1	1	1

Notes: The index B3 reflects the role of the central bank in macroprudential policy and is based on the degree of fulfillment of sub-recommendation B3 as outlined by ESRB (2011, 2014). The indices BBM1, BBM2 and CBM denote the number of activated instruments in 2015. Data on these measures stems from the ESRB's macroprudential policy database. In particular, BBM1 includes LTV, LTI, DSTI measures, while BBM2 additionally includes requirements for loan maturity and loan amortization. CBM includes countercyclical buffers, systemic risk buffers, and risk weights.

Table 2: Second-stage IV regressions and OLS regressions

Variable	IV (second-stage)			OLS		
BBM1	-4.197** (0.034)			-0.741 (0.542)		
BBM2	-2.887** (0.035)			-0.170 (0.811)		
CBM	9.451 (0.139)			2.114 (0.110)		
Lagged loan growth	0.416*** (0.000)	0.413*** (0.000)	0.370*** (0.000)	0.404*** (0.000)	0.403*** (0.000)	0.395*** (0.000)
Additional controls	Equity/Assets, GDP Growth, Difference in policy rate (all lagged), Euro dummy					
R ²	0.171	0.156	0.112	0.203	0.202	0.209
Number of obs.	3182	3182	3182	3182	3182	3182
B3 (first-stage)	1.248*** (0.000)	1.814*** (0.000)	-0.554 (0.200)	-	-	-
F-value (first-stage)	12.80	13.50	1.583	-	-	-

Notes: Table shows second-stage regressions in case of IV estimations and OLS estimations. Regressions include robust standard errors. p-values in parentheses. *, **, *** indicate significance at 10 %, 5 % and 1 % levels. The dependent variable is bank gross loan growth in 2015. The source for bank-level data is Orbis Bank Focus. Sources for country-specific variables are AMECO (real GDP growth) and national central banks (policy rates). “B3 (first stage)” indicates the coefficient of the excluded instrument B3 (see Table 1) in the first-stage regression. “F-value (first-stage)” denotes the F-statistic for the significance of the excluded instrument B3 in the first-stage regression.

Table 3: Second-stage IV regressions with additional controls

Variable	Weighted, more controls		Unweighted, more controls		Macro Data, full set of macro controls	
Dependent Variable	Bank loan growth		Bank loan growth		Private credit growth	
BBM1	-1.826*		-4.233**		-4.059**	
	(0.058)		(0.020)		(0.020)	
BBM2		-1.168*		-2.504**		-2.777**
		(0.062)		(0.013)		(0.023)
Lagged loan growth	0.330***	0.329***	0.316***	0.317***	0.253***	0.217***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Additional Controls	Equity/assets, ROA, log of assets, GDP Growth, difference in policy rate, sovereign debt-to-GDP, sum of imports and exports to GDP, current account balance to GDP (all lagged), Euro dummy					
R ²	0.299	0.297	0.158	0.158	0.0889	0.0951
Number of obs.	3179	3179	3179	3179	598	598
Weighting	Yes	Yes	No	No	-	-
F-value (first-stage)	25.64	23.94	13.55	20.84	10.76	11.71

Notes: Table shows second-stage regressions of the IV estimation. Regressions using macro data include time-fixed effects. All regressions use robust standard errors. p-values in parentheses. *, **, *** indicate significance at 10 %, 5 % and 1 % levels. In case of “more controls” and “unweighted”, the dependent variable is bank gross loan growth in 2015. The source for bank-level data is Orbis Bank Focus. In case of macro data the dependent variable is (annualized) quarterly real credit growth of the private sector. Data span from 2011Q1 to 2016Q4. Sources for aggregate variables are ECB (private credit growth), Eurostat (sovereign debt ratio), AMECO (real GDP growth), World Bank (trade volumes and current account balances) and national central banks (policy rates). “F-value (first-stage)” denotes the F-statistic for the significance of the excluded instrument B3 in the first-stage regression.