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Reviewed by: Lev Ratnovski (European Central Bank, International Monetary Fund)
Adam Kučera (Czech National Bank)

Project Coordinator: Simona Malovaná

Off the Radar: Exploring the Rise of Shadow Banking in the EU

Martin Hodula [*]

Abstract

This paper uses novel ECB/Eurosystem data on non-bank financial intermediation to investigate the potential factors of shadow banking growth for a panel of 24 EU countries. Consistent with several strands of literature, the EU shadow banking system is found to be highly procyclical and positively related to increasing demand of long-term institutional investors, more stringent capital regulation, and faster financial development. In addition, the paper offers two findings that have not been reported in the literature. First, it shows that the relationship between monetary policy and shadow banking growth is level-dependent and may be determined by the relative magnitude of interest rates in the economy. In this respect, two main motives driving the relationship are identified – the "funding cost" motive and the "search for yield" motive. Second, the driving forces of shadow banking differ between the old and new EU countries, largely due to the missing legal framework for securitization in the new members.

Abstrakt

Tento článek používá nová data ECB/Eurosystému o nebankovním finančním zprostředkování ke zkoumání potenciálních faktorů růstu stínového bankovnictví pro panel 24 zemí EU. V souladu s několika směry odborné literatury zjišťuji, že systém stínového bankovnictví v EU je velmi procyklický a vykazuje pozitivní vztah k rostoucí poptávce dlouhodobých institucionálních investorů, přísnější kapitálové regulaci a rychlejšímu rozvoji finančního sektoru. Kromě toho článek prezentuje dvě zjištění, která v literatuře nejsou uváděna. Zaprvé ukazuje, že vztah mezi měnovou politikou a růstem stínového bankovnictví je závislý na úrovni úrokových sazeb a může být určen relativní výší úrokových sazeb v ekonomice. V tomto ohledu byly identifikovány dva hlavní motivy, které stojí v pozadí uvedeného vztahu – motiv „nákladů financování" a motiv „honby za výnosem". Zadruhé se hnací síly stínového bankovnictví liší ve starých a nových členských zemích EU, a to převážně z důvodu chybějícího právního rámce pro sekuritizaci v nových členských zemích.

JEL Codes: E44, E52, G21, G23.
Keywords: European Union, monetary policy, panel data analysis, shadow banking.

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[*]Martin Hodula, Czech National Bank, Department of Financial Stability (martin.hodula@cnb.cz) and Technical University of Ostrava, Department of Economics.
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The views expressed in this paper are mine and do not necessarily represent those of the Czech National Bank or its staff.

Nontechnical Summary

After the global financial crisis (GFC) of 2007–2008, the problem of systemic risk and its relationship to financial structure attracted considerable international attention. The GFC also stimulated a great deal of research on "shadow banking," a specific form of market-based finance that is less resilient due to dense interconnectedness, liquidity and maturity mismatches, credit enhancement, significant leverage, a highly runnable funding base, and missing access to public backstops. Although all major European financial systems are currently rooted in universal banking, they went through extensive deregulation and financialization starting in the early 1980s. This led to their transformation from traditional banking into market-based and securitized banking systems, and finally to the rise of shadow banking.

This paper takes advantage of novel ECB/Eurosystem data on non-bank financial intermediation and investigates the potential drivers of shadow banking growth for a panel of 24 EU member countries. To account for the heterogeneity within the set of European countries, the panel is further split into two sub-groups labeled the "Old" and "New" EU member countries (OMCs and NMCs). Consistent with several strands of the shadow banking literature, I find that the EU shadow banking system can be generally described as procyclical. The procyclicality seems to pass through both the use of securitization and shadow lending. Shadow banking growth also seems to be exacerbated by increasing demand of long-term institutional investors, more stringent capital regulation, and faster financial development. Further, individual parts of the shadow banking system can act as both complements (mainly OFIs) and substitutes (IFs) of traditional banking.

Furthermore, I have identified two new possible stylized facts. First, the factors influencing shadow banking growth significantly differ between the pools of OMCs and NMCs. This might be explained either by the missing legal framework for securitization, or by the rich historical background of various types of semi-legal credit intermediation procedures in the NMCs. Second, I show that the relationship between monetary policy and shadow banking growth may depend on the relative magnitude of interest rates in the economy. When rates are high, the relationship is found to be positive; i.e., monetary policy tightening increases shadow banking growth (mainly through OFI products). In this respect, a funding cost motive drives the growth. When rates are low, the relationship switches to negative due to a change in bank motives from funding costs to search for yield. Monetary expansion would thus increase shadow banking growth (through the use of IF products).

The documented procyclicality and complementarity of shadow banking open up new issues for macroprudential policy. The Basel III reforms attempted to reduce the procyclicality of bank lending. The rise in the prevalence of shadow banking may turn out to undermine the effectiveness of both capital-based regulation and income-based limits (for instance on mortgages, such as LTV, LTI, or DSTI limits). Moreover, my findings complement the debate on the role of monetary policy in maintaining financial stability, as they identify yet another channel through which monetary policy may influence the stability of the financial system. In this respect, my findings conform to the idea that monetary policy should not be used as a safeguard for financial stability, and that monetary and macroprudential policy should work closely together.

1. Introduction

After the global financial crisis (GFC) of 2007–2008, the problem of systemic risk and its relationship to financial structure attracted considerable international attention. Two recent papers on this topic argue that bank-based financial intermediation generates systemic risk and countries can increase their resilience by increasing the share of market-based financing (Langfield and Pagano, 2016; Bats and Houben, 2017). However, the GFC also stimulated a great deal of research on "shadow banking," a specific form of market-based finance that is less resilient due to dense interconnectedness, liquidity and maturity mismatches, credit enhancement, significant leverage, a highly runnable funding base, and missing access to public backstops. While in general, market-based financing such as securitization, asset trading, and lending is a vital source of capital and enhances an economy´s ability to produce goods and services without threatening financial stability, it can be systemically harmful once it transforms into shadow banking. Therefore, it is important to closely examine the unique features of financial systems before deriving conclusions about their risk characteristics and the desirability of prudential regulation.

Although all major European financial systems are currently rooted in universal banking, they went through extensive deregulation and financialization starting in the early 1980s. This led to their transformation from traditional banking into market-based and securitized banking systems, and finally to the rise of shadow banking. This paper takes advantage of novel data from the ECB/Eurosystem database and analyzes the potential drivers of shadow banking growth for a panel of 24 EU countries. The panel is further split into two sub-groups labeled the "Old" and "New" EU member countries. This is to account for two facts: one, that the birth of the euro supported the financialization of Europe; and two, that numerous observations in the literature argue that less developed members may have generally worse institutional and regulatory frameworks and lower market discipline, capital capacity, and technical skills, and can be described by a strong dominance of the banking system (Claessens et al., 2002; Čihák and Fonteyne, 2009).

I find several factors behind the growth of the shadow banking system that are similar over time and across countries: increasing demand of long-term institutional investors, more stringent capital regulation, and faster financial development. I further show that the EU shadow banking system can be described as procyclical, with the procyclicality running through the use of securitized products and the issuing of shadow loans. Apart from that, I produce two new possible stylized facts. First, I demonstrate the relationship between monetary policy and shadow banking growth to be dependent on the relative magnitude of interest rates in the economy. Second, I find the factors influencing shadow banking to differ between the pools of "Old" and "New" EU member countries. These differences can be largely attributed to different levels of financial development and legal access to securitization.

Two caveats are worth mentioning regarding my findings. First, this paper is fundamentally empirical and about stylized facts. A formal model to account for them is not developed. Second, the results do not allow me to make claims about the potential effects of shadow banking growth on social welfare. There may be benefits associated with controlled use of shadow banking instruments (Gennaioli et al., 2013, and Ordonez, 2018, among others), but this paper does not measure or comment on such benefits. Nevertheless, I believe that a focus on the factors behind

shadow banking growth and a discussion aimed at highlighting possible risks may yield significant benefits to policy makers and regulatory bodies.

2. Literature Review

In general, we can split the extant shadow banking definitions into two groups according to their focus: (i) on the entity that carries on shadow banking activities (the entity-based approach) or (ii) on the activities that the entity carries on (the activity-based approach). For instance, under the entity-based approach, Pozsar et al. (2013) define shadow banks as: "financial intermediaries that conduct maturity, credit, and liquidity transformation without access to central bank liquidity or public sector guarantees." Claessens et al. (2012), on the other hand, propose to describe shadow banking within the activity-based approach as: "all financial activities, except regular banking, which rely on a private or public backstop to operate." This captures activities such as securitization, collateral intermediation, and wholesale funding arrangements. The FSB (2013) and IMF (2014) were among the first to combine the above-mentioned approaches and suggest considering both the financial entity and its market activities. This type of definition could be called an "activity-of-entity" based approach. The IMF (2014, p. 68) states that: "financing of bank- and non-bank financial institutions through noncore liabilities constitutes shadow banking, regardless of the entity that carries it out." Within the European Union, the European Commission (EC) published the first official note on the shadow banking system in the form of a Green Paper (see EC, 2012). The European Systemic Risk Board (ESRB) adopted the activity-of-entity approach and has regularly published a Shadow Banking Monitor since 2016. Throughout this paper, both broad and reduced-form measures of shadow banking are used. The former corresponds to the standard, entity-based approach used by the European Systemic Risk Board (ESRB), while the latter is a loan-based measure reflecting Economic Function 2 of the Financial Stability Board (FSB) narrow measure.[1] This approach enables study of the specific effects of bank capital regulation on non-bank lending dependent on short-term funding.

The literature on the shadow banking system has identified several factors that might be behind the boom seen during the last decade. Older studies emphasize the fact that tighter reserve and other regulatory requirements encourage the use of alternatives to traditional bank loans (Bernanke and Lown, 1991; Duca, 1992). Edwards and Mishkin (1995) also mention changes in information costs; however, these have rarely been empirically assessed. Newer studies generally agree that increases in the securitization of residential mortgages supported the rise of the shadow banking system prior to the global financial crisis (Pozsar et al., 2013) and analyze mostly the effects of procyclical liquidity premia and leverage on repos and securitization in general (Adrian and Shin, 2009a, 2009b, 2010; Gorton and Metrick, 2012). Detailed structural analyses of shadow banking have been conducted for several economies, most notably the United States (Adrian and Shin, 2009b; Pozsar et al., 2013; Claessens et al., 2012). Adrian and Ashcraft (2012) provide an excellent literature review on shadow banking. However, surprisingly little empirical work has been done to analyze the specific factors that contribute to the development of the shadow banking system, which suggests that obstacles or challenges to such research exist. In fact, most of the existing studies focus on the U.S., due to a lack of data in Europe and other regions. Based on the U.S. data, Duca (2016) finds that in the long run, the capital and reserve requirements,

[1] Entities which fall under Economic Function 2 engage in loan provision that is dependent on short-term funding (see FSB, 2018).

coupled with rising information costs, are the main drivers of shadow banking growth. Boulware et al. (2014) investigate the relationship between monetary policy instruments and repo activity as one of the main shadow banking activities on U.S. data. They argue that monetary policy can contribute to systemic risk in the shadow banking system by offsetting maturity substitution in the repo market. Several studies highlight the relevance of a *search for yield* effect, which postulates that investors search for higher-yielding assets in the shadow banking system (Goda et al., 2013; Lysandrou, 2014). Errico et al. (2014) explore the relationship between credit to U.S. domestic entities and growth of non-core liabilities. They find that the external debt liabilities of the financial sector are procyclical and closely aligned with domestic credit growth. There are also some single-country papers that suggest a possibly large role of country-specific factors in explaining shadow banking development, such as insufficient bank branch network development (Acharya et al. 2013), or central government measures (Acharya et al., 2016).

Due to the lack of statistics on shadow banking and the ambiguity regarding its definition, there are few empirical studies concerning continental Europe to provide the much-needed empirical insight. IMF (2014) collects evidence from cross-country data which covers some European countries. Specifically, it examines a large set of 26 mostly developed economies and concludes that search for yield, regulatory arbitrage, institutional cash pools, and financial development contribute to the growth of shadow banking. Beck and Kotz (2016) use flow-of-funds data for the euro area non-bank banking sector and reveal a declining role of banks (and, simultaneously, an increase in non-bank banking). They also show that non-bank banks have tended to take positions in riskier assets. Abad et al. (2017) analyze the cross-sector and cross-border linkages between EU banks and shadow banking entities within the global financial system. They document that many of the EU banks' exposures are to non-EU entities, particularly U.S.-domiciled shadow banking entities. Bengtsson (2013) focuses on European money market funds and discusses transmission channels through which financial instability may spread to the wider financial system.

3. A First Look at the European Shadow Banking Data

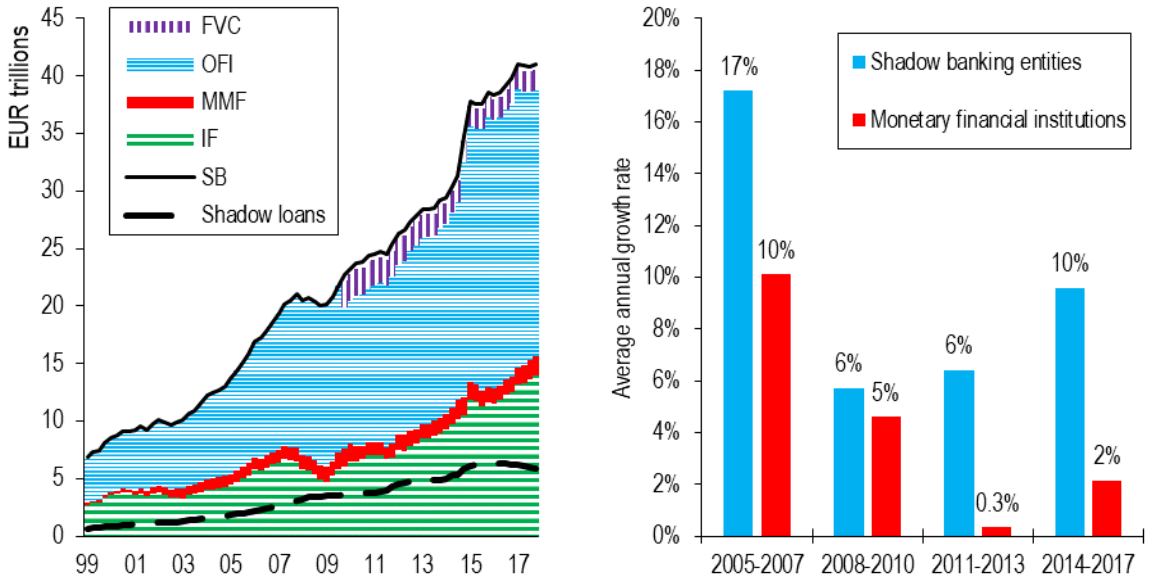
Compared to the U.S., the European data on types of other financial intermediaries is often not granular enough to build a rigorous empirical framework (see Grillet-Aubert et al., 2016, for an assessment of the remaining data gaps in Europe). In this paper, I make use of two sets of statistics compiled by the ECB/Eurosystem: the financial accounts data and the monetary statistics. The financial accounts data covers most shadow banking entities, grouped under: (i) Other Financial Intermediaries (OFIs),[2] which can be further broken down into Financial Vehicle Corporations (FVCs), and (ii) Investment Funds (IFs). The data runs from 1999 Q1 to 2017 Q4. The monetary statistics provide additional information in the form of high-frequency data on money market funds (MMFs), as well as on the balance sheets and flows of some institutions that are part of the OFI sector. The monetary statistics also hold information on

[2] The OFI sector comprises all financial institutions other than those included in the sectors Monetary Financial Institutions (MFIs) and Insurance Corporations and Pension Funds (ICPFs). Taken as such, it also includes captive institutions and money lenders (ESA2010 subsector S.127). This subsector may include a significant amount of assets which are in nature related to the real economy rather than the financial sector (captive institutions, trusts, units with sponsor funds, sovereign wealth funds, etc.). These assets are dependent on a significantly different set of factors than the rest of the shadow banking system (i.e., tax reasons, corporate governance, real sector regulation, etc.). However, the current state of the data makes it impossible to remove these assets from the shadow banking measure.

monetary financial institutions, i.e., the traditional banking system. **Box A1** summarizes the structure of the relevant data sources for the EU.

Figure 1 plots the total assets of the aggregate EU shadow banking system and shadow loans.[3] Under the entity-based approach, I mark the following entities as "shadow" and sum their total assets to obtain the size of the aggregate shadow banking system: financial vehicle corporations + investment funds + money market funds + other OFIs.[4] According to the latest data, the shadow banking system in the EU amounts to nearly €40 trillion, which represents approximately 45% of the EU financial sector. Looking at the cyclical developments, the shadow banking system grew at a steady pace prior to the GFC, followed by a sharp decline after the onset of the crisis. The tight correlation observed in the growth of the shadow and regular banking sectors over the 2005–2010 period was shattered after the crisis, with greater fluctuations seen in the growth rate of shadow banking. In fact, the volatility of the shadow banking growth was two and a half times that of the regular banking sector growth in the post-crisis period. This suggests that shadow banking may on the one hand react faster to changing conditions, but on the other hand is more vulnerable to adverse economic developments. Since 2011, shadow banking has significantly outperformed the regular banking sector. To some extent, this is a natural by-product of the deepening of financial markets, with a concomitant rise in the rest of the economy and the wealth of economic agents.

Figure 1: EU Shadow Banking System – Total Asset Volume and Growth Rates



Note: SBS – shadow banking system, IF – investment funds, FVC – financial vehicle corporations, MMF – money market funds, OFI – other financial intermediaries. Annual change is calculated on changes in amounts outstanding at the end of a period.

Source: ECB/Eurosystem data

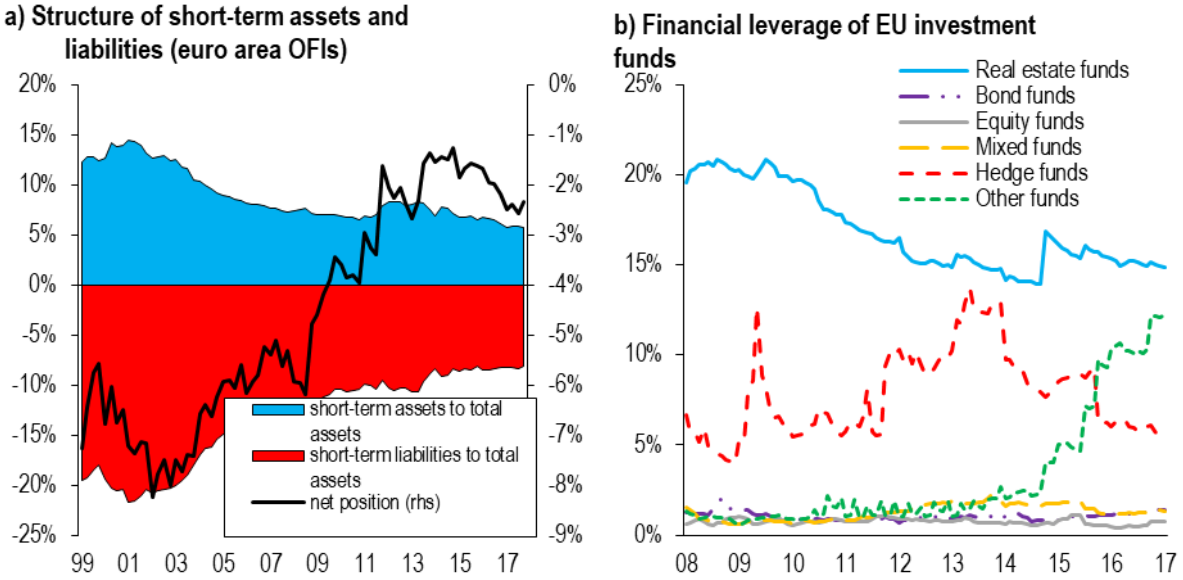
[3] The growth in shadow loans is mostly due to OFIs (96%, 2018 data).

[4] I do not consider insurance corporations and pension funds (ICPFs) to be shadow market entities, although they can carry out intermediation activities that can substitute for, or complement, banking activities. This exclusion stems from the fact that ICPFs fail the cross-check with common shadow banking characteristics, as they are commonly regulated (see OECD, 2015, for an overview of best practices). Note that this exclusion is rather common in the shadow banking literature (IMF, 2014; Pozsar et al., 2013; ESRB, 2016, among others).

The EU shadow banking system consists mostly of OFIs (56%) and IFs (34%), which can be further broken down into specific market entities. The ECB and ESRB have gradually started collecting data on all of these entity types; however, only the data on FVCs is public. The remainder is designated as classified or limited-access and cannot be shown here. Instead, I present a brief overview of the individual shadow banking entities, alongside their underlying risks (**Table A2**). Note that I do not propose that shadow banking activities would automatically pose a threat to financial stability in general. In fact, the use of some services marked as shadow under the existing methodology may actually be beneficial and even reduce market risks. For instance, securitization (carried out by specialized FVCs) transforms mostly illiquid assets (loans) into liquid securities, thereby increasing the liquidity of the entire financial system. Similarly, through securitization, money lenders can reduce the cost of credit due to a lower cost of capital, higher liquidity, and lower risks. This may act as a natural countercyclical buffer in times of higher financial stress. However, these benefits will only materialize in an appropriately structured system (and regulatory environment), with adequate risk assessment of both the securities themselves and their transformations, and when the products and participating institutions are transparent. Unless these conditions are met, the pitfalls of the shadow banking system will outweigh its benefits.

In the case of OFIs (such as leasing, forfeiting, and factoring companies), the risk stems especially from the short-term financing nature of these entities. For instance, if maturity and/or liquidity transformation is taking place, unstable short-term wholesale funds become more susceptible to market runs. **Figure 2a** shows the relative maturity transformation in the countries analyzed, expressed as the difference between the ratios of short-term assets and liabilities to total assets. As is apparent from the evolution of the net position (over the 2013–2017 period), it is highly sensitive to changes in market interest rates, as the current low interest rate environment (with expectations of future growth) is forcing OFIs to provide short-term credit products to a greater extent. The same factor alters the structure of liabilities, with the share of long-term loans growing at the expense of short-term ones. With the advent of higher interest rates and a change in the slope of the yield curve, this trend will likely be terminated or reversed, which may lead to a rapid increase in liquidity risk. At the same time, one must consider the risk of excessive exposures of these entities to a single counterparty or a single economic sector. This is especially troubling when the exposure is to highly procyclical sectors such as construction or manufacturing. If this is the case, then during an economic slump credit risk will be further exacerbated because of excess leverage.

Figure 2: Balance Sheet Structure of Euro Area OFIs and FVCs[5]



Note: In the left-hand chart, the net position is calculated as the difference between the ratios of short-term assets and short-term liabilities to total assets. In the right-hand chart, financial leverage is calculated as the ratio of loans received to total liabilities. During 2016, some hedge funds were reclassified as "other funds," affecting the series for these types of funds.

Source: ECB/Eurosystem data

The area of investment funds – and collective investment in general – is mainly associated with the risk of fire sales and associated runs. **Figure 2b** shows estimates of IFs' financial leverage. During periods of high systemic stress, the asset price slump leads to lower fund performance, which investors may respond to by requesting an exit. In the event of a large sell-off, funds are forced to sell their assets (even less liquid ones), which may contribute to a further drop in their prices and multiply the ongoing stress across the financial sector.[6] Certain types of IFs allow investors to withdraw on demand, making their resources highly liquid with almost zero maturity. This characteristic makes IFs highly susceptible to maturity and liquidity risks. To be able to successfully manage these risks, a sufficient volume of liquid assets is required to settle the claims of investors even in the event of a significant deterioration in the financial sector.

[5] EU-wide data is not available, as some countries started to collect detailed non-bank data only in 2014 (Romania, Bulgaria) or 2016 (Croatia). There are also many methodological issues on collecting and publishing this type of data outside the euro area which remain unaddressed.

[6] The issue is even worse in the case of a significant share of short-term wholesale funding, especially from repos. In this case, a fall in asset prices reduces the value of potential collateral and may cause a "run" in the area of wholesale funding as well.

4. Determinants of Shadow Banking Growth

In the empirical part of the paper, I attempt to verify the significance of the potential drivers of the shadow banking system most commonly found in the literature using data for 24 European countries. To my knowledge, no comprehensive empirical assessments of this sort have yet been conducted for these sample countries and this data frequency. I employ a dynamic panel regression with lagged dependent variables and a set of controls serving as instrumental variables (IVs).[7] One advantage of using IVs is that they act as a natural safeguard against reverse causality, which allows the results to be interpreted as causal relationships rather than mere correlations. Intuitively, reverse causality does not appear plausible on a general level. It would imply that, for instance, growth in the shadow banking system induces changes in the monetary policy settings or in the behavior of traditional banks that use shadow banking instruments. The model is specified in first differences (Δ) to remove country fixed effects, as follows:

$$\Delta y_{it} = \sum_{j=1}^{p} \alpha_j \Delta y_{i,t-j} + \beta \Delta X_{it} + \Delta \varepsilon_{it} \quad (1)$$

where i and t are the country and quarter indices. The dependent variables (various measures of the shadow banking system) are stacked in the vector y_{it} (they enter the model one-by-one). X_{it} contains the set of control variables, with β as the coefficient vector that is to be estimated. Note that in the differenced model, $\Delta\varepsilon_{it}$ is a function of $\varepsilon_{i,t-i}$, so there remains a correlation between the lagged dependent variable and the differenced errors. As shown by Nickell (1981), this correlation causes the commonly employed standard fixed effects estimator to produce biased estimates. Hence, I employ the system-GMM estimator by Arellano-Bond (1991), which addresses the endogeneity problem caused by the correlation. I also check for serial correlation of the idiosyncratic errors of the difference series and adjust the AR order p accordingly. I also perform a robustness exercise regarding the chosen estimator. These results can be found in **Appendix B**.

The vector of controls X includes the following variables: (i) traditional banking sector size; (ii) institutional cash pools; (iii) the three-month inter-bank rate; (iv) real GDP; (v) the term spread; (vi) capital regulation stringency (drawn from the surveys provided by Barth et al. (2013)[8] – see **Figure 1A** in the Appendix for a visual presentation); (vii) the financial development index (taken from Svirydzenka, 2016); and (viii) a binary dummy for the occurrence of a financial crisis (1 if crisis and 0 otherwise).[9] For details on the variables used and the transformations performed, please consult the Appendix (**Table A3**). In the estimation, the lags of the following control variables (up to lag 2) are used as IVs: traditional banking sector size, institutional cash pools, the three-month inter-bank rate, real GDP, the term spread, and the financial development index. The rest of the controls (capital regulation stringency and the crisis dummy) are considered to be exogenous.

[7] I experimented with different lag specifications for the set of controls. This yielded quantitatively similar results (available from the author upon request).

[8] I follow the methodology proposed in Barth et al. (2004) and build time series indices for each sample country. Since regulatory and supervisory practices are not surveyed each year, I assume that regulation is constant during the period between the surveys.

[9] The financial crises periods were selected based on the new European financial crises database (please refer to ESRB, 2017, for the underlying paper describing the methodology).

The choice of control variables deserves some explanation. The size of the traditional banking sector helps capture its possibly complementary character vis-à-vis shadow banking. There is some evidence that banks frequently sponsor shadow banking activities, often through financial vehicle corporations, but traditional banks might be involved in investment funds as well. Using similar logic, Pozsar (2011) argues that the rapid growth of shadow banking can be attributed to the rising demand of institutional cash pools, which I proxy by ICPFs' total assets, for alternatives to insured deposits and safe assets. The three-month inter-bank rate captures changes in the monetary policy settings, which are expected to affect the shadow banking sector somewhat (through supply- or demand-side effects). In fact, the estimated parameter could go either way and the relationship might even be level-dependent at some point. On the one hand, falling interest rates might expand shadow banking growth, since the lower yields associated with lower market interest rates motivate investors to search for more attractive returns in riskier places (the search for yield motive). On the other hand, increasing interest rates could also translate into higher shadow banking growth, since the increased cost of funding could raise traditional banks' incentives to securitize. I include real GDP because I suspect shadow banking to be highly procyclical, booming in good years and falling steeply in a recession. The addition of the term spread is meant to capture the maturity transformation motive, meaning that traditional banks often use shadow banking to transform illiquid assets into highly liquid financial securities. Capital regulation stringency should help verify whether higher banking regulation is associated with higher incentives to engage in shadow banking activities. Although higher regulation stringency is widely expected to foster financial stability, it may also induce some undesired outcomes, such as rent-seeking behavior and a reduction in the benefits stemming from economies of scale and diversification. Financial development is expected to boost shadow banking activities. The financial crisis dummy serves as a safeguard against non-linearities caused by the GFC.

4.1 Estimation Results and Discussion

This section concentrates on the aggregate results obtained from a balanced panel of 24 EU countries over the period 2004–2017 (**Table 1**). Several different model specifications are used for robustness purposes; a number of dependent variables are included to differentiate between shadow banking entities. Note that the estimated parameter for the lagged shadow banking growth is statistically significant across all model specifications, pointing to a relatively high persistence of shadow banking system growth. Turning to the control variables, some interesting patterns emerge.

Table 1: Shadow Banking Growth Determinants: Aggregate and Component Breakdown Results

Dependent variable	Shadow banking growth (broad)			Shadow loans	OFIs	IFs
	1	2	3	4	5	6
Lagged dependent variable	0.543***	0.585***	0.602***	0.598***	0.566***	0.579***
	(0.064)	(0.018)	(0.017)	(0.020)	(0.020)	(0.021)
Real GDP	0.525***	0.888***	1.220***	0.903***	0.664***	0.224*
	(0.123)	(0.052)	(0.054)	(0.085)	(0.166)	(0.181)
Traditional banking growth	-0.030	0.194***	0.134***	0.199***	0.188***	-0.079
	(0.069)	(0.018)	(0.018)	(0.032)	(0.025)	(0.057)
Institutional cash pools	0.161***	0.319***	0.369***	0.097***	0.095***	0.289***
	(0.064)	(0.010)	(0.015)	(0.025)	(0.020)	(0.048)
Real short-term interest rate	-0.148**	-0.047	-0.293*	-0.117	-0.146	0.125
	(0.078)	(0.041)	(0.039)	(0.138)	(0.122)	(0.130)
Term spread	0.017	0.309***	0.516***	0.041	0.238***	0.092*
	(0.102)	(0.039)	(0.037)	(0.025)	(0.025)	(0.025)
Capital regulation	-0.258	0.601***	0.456***	0.347**	0.514**	1.266*
	(0.230)	(0.192)	(0.173)	(0.105)	(0.240)	(0.691)
Financial development	0.498***	1.099***	0.905***	-0.007	0.410***	2.637***
	(0.082)	(0.069)	(0.064)	(0.136)	(0.095)	(0.205)
Crisis dummy	-1.350***	-1.121***	-2.822***	0.436***	-3.146***	0.179
	(1.493)	(0.441)	(0.414)	(0.298)	(1.446)	(0.547)
Hansen	0.215	0.465	0.154	0.498	0.425	0.463
AR(2)	0.241	0.315	0.314	0.289	0.301	0.284
No. of instruments		157	217	157	157	157
No. of countries	24	24	24	24	24	24
No. of obs.	1224	1224	1430	1224	1224	1224

Note: This table reports the estimated coefficients from a series of regressions for the independent variables listed in the first column. Column 1 is a first differences GMM regression, while columns 2 to 6 are system-GMM regressions. Columns 1 and 2 and 4 to 6 report estimates from balanced panel data over the 2004–2017 period; column 3 serves as a robustness check and reports unbalanced panel data over the 1999–2017 period. Driscoll and Kraay (1998) robust standard errors are in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively. AR(2) reports p-values for the test of the null hypothesis that the errors in the first difference regression exhibit no second-order serial correlation. Hansen reports p-values for the test of the null hypothesis that the instruments used are valid.

First, the evidence indicates that the shadow banking system is highly procyclical, owing to the positive relationship identified with real GDP growth. This obviously raises a number of issues for financial and macroeconomic stability. Market vulnerabilities may arise especially from liquidity transformation and the procyclical provision of liquidity to the financial markets. Adrian and Shin (2009b) argue that the procyclicality passes through shadow banking leverage. They find that shadow bank leverage tends to be high when balance sheets are large and credit intermediation is expanding, all of which coincides with business cycle expansion. The present research adds that the procyclicality appears to pass through the use of securitized products (carried out by FVCs in the OFI group). I also find a positive relationship between the growth of credit provided by shadow banking entities and real GDP growth, which points to a procyclical character of shadow bank lending. This finding should be viewed in the light of bank regulation, where the Basel III reforms in particular made an effort to reduce the procyclicality of bank lending. In some countries, shadow loans may turn out to undermine the effectiveness of capital-based regulations (such as the countercyclical capital buffer) or the introduction of LTV limits. Using a similar logic, it seems that countries with higher growth of the traditional banking system might experience higher growth of the shadow banking system as well, pointing to the existence

of a complementary relationship. However, I find evidence that the complementarity concerns mostly OFIs such as FVCs, which are often sponsored by traditional banks and carry out their securitization activities.[10] The complementarity could also be viewed from the perspective of mortgage financing. Where regulatory constraints do not permit traditional banks to provide mortgages on the full property value, shadow banks might step in to offer a way to finance the rest. Note that other shadow banking entities, such as IFs, act more like substitutes, offering a safe alternative to banking products, especially in times of high market stress.

Second, I find that the demand of long-term institutional investors for shadow banking instruments plays a crucial role in the growth of shadow banking. This result coincides with the view that the shadow banking system is truly complementary, not only to traditional banks but to the rest of the financial system as well. In this case, the complementarity with institutional investors passes through the use of IF products that yield a reasonable profit with a bearable market risk. Our results are in line with those of Lemma (2016), who claims that both insurance companies and pension funds are heavily involved in shadow banking activities. Insurance companies provide insurance services or derivative contracts and subscribe collateralized debt obligations in order to invest their cash. Pension funds invest in the securities issued by the shadow credit intermediation process, such as asset-backed commercial papers, asset backed securities, and collateralized debt obligations.

Third, regarding the influence of monetary policy, I report mixed and mostly statistically insignificant results across different model specifications, ranging from positive to negative. Apart from the obvious sensitivity to the dependent variable used, these results may also point to the presence of a level-dependent relationship, which is tested below in section 5.[11] Further, I find that widening the term spread is likely to increase shadow banking growth; this channel is expected to work via securitization and special purpose vehicles that are part of OFIs.

Fourth, the impact of bank regulation: While some studies argue that traditional banks should be subject to higher capital requirements to successfully mitigate risks and ensure financial stability (Admati et al., 2013; Thakor, 2014), others argue that increased regulation of banks may push them into unregulated parts of the financial sector (Fahri and Tirole, 2017; Plantin, 2014). Recently, the ECB (2017) presented a policy initiative aimed at enhancing and creating new secondary markets on which riskier loans can be traded while being subject to higher capital requirements. Despite the high importance of the relationship between bank capital regulation and shadow banking, the empirical evidence from the countries covered by my data is scarce at best. I find that a tightening of bank capital regulation generally increases the presence of non-banks. This is consistent with the notion that banks have an incentive to shift activities to the non-banking sector in response to certain regulatory changes. Note that I also identify a positive relationship between capital regulation stringency and shadow banking lending. There is a plurality of studies showing that more stringent capital regulation limits traditional bank lending (Hyun and Rhee, 2011, and Fraisse et al., 2017, to name a few), which may increase the demand for shadow banking loans, especially from households and non-financial corporations. These results should be viewed in relation to financial development, which is also found to strengthen

[10] For example, in Spain, over 99% of securitized assets are originated by banks and carried by financial vehicle corporations.

[11] The results of the IMF (2014) study support this idea, finding a statistically significant relationship between short-term interest rates and the expansion of shadow banking only after 2008.

shadow banking growth. Last, I find that shadow banking growth was negatively affected by the outbreak of the GFC, with the exception of IFs, which offered a way for investors to secure their money in longer-term and safer instruments when the market crashed.

4.2 Comparing the Pools of "Old" and "New" EU Member States

Next, I split the original panel into two sub-samples (see **Table 1A**), each containing 12 countries over the 2004–2017 period, to investigate whether the relative importance of individual factors differs between the "Old" and "New" EU member countries (OMCs and NMCs henceforth). **Table 2** summarizes the results obtained from the set of regressions. Five main findings are apparent in the results.

Table 2: Shadow Banking Growth Determinants: Old vs. New EU Member Countries

	Panel A: Old member countries (OMCs)				Panel B: New member countries (NMCs)			
Dependent variable	Shadow banking	Shadow loans	OFIs	IFs	Shadow banking	Shadow loans	OFIs	IFs
	1a	2a	3a	4a	1b	2b	3b	4b
Lagged dependent variable	0.596***	0.661***	0.601***	0.731***	0.620***	0.614***	0.579***	0.569***
	(0.076)	(0.026)	(0.024)	(0.024)	(0.079)	(0.027)	(0.087)	(0.076)
Real GDP	0.429**	-0.053	0.174*	0.388**	0.610***	1.099***	0.686***	0.451
	(0.190)	(0.104)	(0.092)	(0.162)	(0.175)	(0.123)	(0.207)	(0.432)
Traditional banking growth	-0.087	0.103***	0.144***	-0.219***	0.157	0.229***	0.309***	0.050
	(0.099)	(0.034)	(0.029)	(0.051)	(0.100)	(0.055)	(0.080)	(0.248)
Institutional cash pools	0.734***	0.581***	0.694***	0.443***	0.117**	0.096***	0.068*	0.346*
	(0.150)	(0.058)	(0.048)	(0.080)	(0.055)	(0.032)	(0.039)	(0.193)
Real short-term interest rate	0.172	0.125	0.763***	-0.095	-0.098	0.314***	-0.228**	0.127
	(0.153)	(0.090)	(0.079)	(0.134)	(0.094)	(0.098)	(0.114)	(0.313)
Term spread	0.022	-0.583***	0.002	0.009	-0.095	-0.353***	-0.228	1.715***
	(0.165)	(0.053)	(0.046)	(0.077)	(0.147)	(0.123)	(0.139)	(0.494)
Capital regulation	1.166**	0.390	3.109***	-0.873**	0.429	1.364***	0.643	0.929
	(0.488)	(0.251)	(0.234)	(0.422)	(0.504)	(0.227)	(0.382)	(1.041)
Financial development	0.403**	-0.997***	0.779***	0.824***	0.024	-0.362**	-0.434**	1.594***
	(0.188)	(0.156)	(0.108)	(0.182)	(0.254)	(0.171)	(0.184)	(0.297)
Crisis dummy	-1.411*	0.277	-4.192***	-0.047	1.144	3.890***	2.249*	-7.227**
	(0.810)	(0.536)	(0.469)	(0.767)	(1.723)	(1.105)	(1.267)	(3.392)
Hansen	0.164	0.254	0.246	0.310	0.157	0.315	0.298	0.227
AR(2)	0.236	0.486	0.421	0.366	0.285	0.339	0.264	0.294
No. of instruments	157	157	157	157	157	157	157	157
No. of countries	12	12	12	12	12	12	12	12
No. of obs.	612	612	612	612	612	612	612	612

Note: This table reports the estimated coefficients for the independent variables listed in the first column, the dependent variables being aggregate shadow banking growth (columns 1a and 1b), shadow banking loans (columns 2a and 2b), OFI growth (columns 3a and 3b), and IF growth (columns 4a and 4b). Estimation period: 2004–2017. The estimation is done using the Arellano-Bond system-GMM estimator. Driscoll and Kraay (1998) robust standard errors are in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively. AR(2) reports p-values for the test of the null hypothesis that the errors in the first difference regression exhibit no second-order serial correlation. Hansen reports p-values for the test of the null hypothesis that the instruments used are valid.

First, the procyclicality of shadow bank lending seems to be greater in the NMCs. This might be due to the fact that the NMCs' current modern market-economy systems are relatively recent (post-1990) and, as such, there tends to be a long and rich tradition of alternative (parallel) financial structures in the form of officially illegal loans and currency exchange provided by professional money changers. While the socialist-era systems of this type are now largely defunct, they have left behind a legacy of greater cultural tolerance of such practices. Second, I find some

evidence in support of the "waterbed" hypothesis of monetary policy for the OMCs. The estimation suggests that monetary policy tightening might increase the growth of OFIs, implying that a higher cost of funding increases traditional banks' incentives to engage in securitization, carried out and operationalized by OFIs (FVCs). This link is found to be insignificant in the NMCs, due to largely missing legal frameworks for securitization, as well as the fact that banks in these countries are generally well capitalized (Impavido et al., 2013). However, higher real interest rates seem to encourage growth of shadow loans only in the NMCs, giving additional support to the idea that the complementarity between shadow and traditional bank loans is greater in the NMCs due to the rich historical background of various types of semi-legal credit intermediation procedures. Third, I find some differences in the effects of capital regulation on shadow banking systems between the two panels. While in the OMCs, more stringent capital regulation increases the incentives for securitization, this channel is not functional in the NMCs, where the relationship passes through shadow loans instead. In general, more stringent capital regulation forces banks to alter their portfolio structure toward less risky assets or to acquire additional capital (thus raising its cost; see Pfeifer et al. 2017). As a result, some clients might not be able to secure credit within the traditional banking system and turn to its shadow counterparts. Fourth, the level of financial development also appears to influence the two shadow banking systems in a dissimilar fashion. In the OMCs, it expands the growth of OFIs and IFs, mainly through advances in the use of securitized products. At the same time, it dampens the growth of shadow loans, which are more likely to become obsolete in a more market-based environment that expands with the level of financial development and financial literacy. In the NMCs, advances in financial development also reduce the growth of shadow loans, but also that of OFIs, since here shadow loans form the majority of their balance sheets. Last, I find that the GFC episode impacted the two groups of countries differently. The OMCs saw a significant decrease in shadow banking growth, with OFIs leading the slowdown due to a general failure of the underlying assets used to back securitized products. On the contrary, the GFC seemed not to impact the shadow banking system in the NMCs. In fact, I find that the NMCs saw a significant increase in shadow loan (and OFI) growth. This increase was partially mitigated by a decrease in IF assets; however, this was due to a general decrease in their market value rather than a fall in demand for IF products.

5. What Matters When Rates Are Low: Search for Yield or Funding Costs?

This section sheds some light on the relationship between monetary policy and shadow banking development. One would generally assume the relationship to be negative, since the lower yields associated with lower market interest rates motivate investors to search for attractive returns in riskier places (the *search for yield motive*). However, there is a plurality of studies that view the relationship as positive (Loutskina, 2011; Den Haan and Sterk, 2011; Nelson et al., 2017), meaning that increasing market interest rates translate into higher shadow banking growth. In this respect, Nelson et al. (2017) speak of a "waterbed effect" of monetary policy, i.e., the view that credit extension by banks and non-banks tends to respond in the opposite direction to monetary shocks. They argue that traditional banks can circumvent the increased funding costs by increasing their securitization activity, which ultimately leads to a migration of lending beyond the traditional banking system (I label this as the *funding cost motive*). Their interpretation is focused solely on the supply side of the market, but this channel could also pass through the demand side. That is, higher market rates increase repayment costs on existing loan contracts, which might increase the motivation to refinance bank loans within the shadow banking system.

In this respect, I argue that the reaction of shadow banking development to monetary expansion/tightening could ultimately depend on the relative magnitude of interest rates in the economy. When rates are high, monetary tightening increases the cost of additional capital, and banks use securitization to circumvent the increased funding costs (this would imply a positive relationship). On the contrary, when rates are low, accommodative monetary policy could drive traditional banks into shadow banking because of the relative scarcity of profitable investment opportunities within the traditional banking system (the relationship would be negative). I approach this issue by testing for the presence of threshold values of the nominal short-term interest rate[12] beyond which banks or other financial entities alter their behavior and change their involvement in shadow banking activities. I follow Kremer et al. (2013), who extend the Caner and Hansen (2004) methodology for cross-sectional threshold models. I estimate the following panel threshold model:

$$y_{it} = \mu_i + \beta_1 i_{it}^r I\left(i_{it}^n \le \gamma\right) + \beta_2 i_{it}^r I\left(i_{it}^n > \gamma\right) + \phi Z_{it} + \varepsilon_{it} \qquad (2)$$

In this application, the nominal interest rate i_{it}^n is the threshold variable, while the real interest rate i_{it}^r is the regime-dependent regressor. I is the indicator function denoting the regime defined by the threshold variable and the threshold value γ. The vector Z_{it} holds the set of control variables and lagged values of the dependent variable y_{it}, where the slope coefficients are assumed to be regime independent. To eliminate the individual effects ϕ_i, I use the forward orthogonal deviations transformation suggested by Arellano and Bover (1995), which maintains the uncorrelatedness of the error terms. For technical details, please consult **Appendix C**. The results for the empirical relation between the monetary policy proxy and shadow banking growth for a balanced panel of 24 EU countries over the 2004–2017 period are presented in **Table 3**.[13] There are several key findings.

[12] I also experimented with alternative monetary policy proxies, namely, the shadow rate for the euro area as in Wu and Xia (2014), and the monetary conditions index of Babecká-Kucharčuková et al. (2016). The results remained unchanged in terms of sign and statistical significance and are available upon request.

[13] Note that I also estimate the model for the OMC and NMC panels. These results are available in Appendix C.

Table 3: Interest Rate Threshold and Shadow Banking Determinants

Dependent variable	Shadow banking	Shadow loans	OFIs	IFs
Threshold = $\hat{\gamma}$	4.72 [4.33; 4.73]			
Real short-term interest rate				
$\hat{\beta}_1$ (above threshold)	0.191*	1.428***	1.425***	-1.089***
	(0.033)	(0.424)	(0.374)	(0.397)
$\hat{\beta}_2$ (below threshold)	-0.518***	-0.791***	-0.392***	1.101***
	(0.160)	(0.126)	(0.108)	(0.227)
Regime-independent controls				
Real GDP	0.863***	0.722***	0.526***	2.446***
	(0.092)	(0.118)	(0.102)	(0.193)
Traditional banking growth	0.206***	0.405***	0.400***	0.087
	(0.039)	(0.050)	(0.043)	(0.083)
Institutional cash pools	0.399***	0.224***	0.268***	0.722***
	(0.033)	(0.043)	(0.037)	(0.070)
Term spread	0.189**	-0.023	0.581***	0.463
	(0.086)	(0.111)	(0.095)	(0.281)
Capital regulation	0.386**	-0.726***	0.111	-0.040
	(0.180)	(0.229)	(0.197)	(0.375)
Financial development	0.192***	0.257***	0.052	1.123***
	(0.073)	(0.093)	(0.080)	(0.153)
Constant	1.080***	2.265***	2.196***	3.865***
	(0.302)	(0.390)	(0.335)	(0.656)
F-statistic	68.65***	56.05***	65.21***	64.54***
R^2	0.311	0.269	0.286	0.271
No. of instruments	157	157	157	157
No. of countries	24	24	24	24
No. of obs.	1,248	1,248	1,248	1,248

Note: This table reports the results for the dynamic panel threshold estimation. Following Hansen (1999), each regime contains at least 5% of all the observations. The first row indicates the threshold estimate, with 95% confidence intervals in brackets (see Figure C1 for a visual presentation). Robust standard errors are in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively. F-statistic reports values for the test of the null hypothesis that the number of thresholds employed is valid.

The regime-independent controls are plausibly signed and largely correspond to the results obtained using the previous set of models. I therefore pay special attention to the real interest rate parameters $\hat{\beta}_1$ and $\hat{\beta}_2$, which represent the effect of changes in interest rate settings in the upper and lower regime, respectively. My model estimate does indeed point to the existence of a level-dependent relationship. Specifically, the relationship between the monetary policy proxy and shadow banking growth is positive if it is over the threshold (high-interest environment) and negative otherwise. This suggests that the funding cost motive dominates when interest rates are high, while the search for yield motive matters when interest rates are low. The level-dependency is apparent across different shadow banking specifications. Switching the dependent variable for shadow loans does not alter the sign or significance of the estimated parameters. This points to the relevance of demand not only from institutional investors, but also from households and non-financial corporations, who might turn to shadow banking to roll over their existing debt when operating in a high interest rate environment. I further find that the funding cost motive seems to pass through the use of securitized OFI products and the search for yield motive through the use of IF products.

6. Conclusion

This paper takes advantage of novel ECB/Eurosystem data on non-bank financial intermediation and investigates the potential drivers of shadow banking growth for a panel of 24 EU member countries. To account for the heterogeneity within the set of European countries, the panel is further split into two sub-groups labeled the "Old" and "New" EU member countries (OMCs and NMCs). Consistent with several strands of the shadow banking literature, I find that the EU shadow banking system can be generally described as procyclical. The procyclicality seems to pass through both the use of securitization and shadow lending. Shadow banking growth also seems to be exacerbated by increasing demand of long-term institutional investors, more stringent capital regulation, and faster financial development. Further, individual parts of the shadow banking system can act as both complements (mainly OFIs) and substitutes (IFs) of traditional banking.

I have identified two new possible stylized facts. First, the factors influencing shadow banking growth significantly differ between the pools of OMCs and NMCs. This might be explained either by the missing legal framework for securitization, or by the rich historical background of various types of semi-legal credit intermediation procedures in the NMCs. Specifically, the procyclicality of shadow bank lending seems to be greater in the NMCs and positively correlated with increasing real interest rates. Further, I find empirical support for the "waterbed" hypothesis of monetary policy in the OMCs and a positive link to growing financial development, both of which may be associated with advances in the use of securitized products. While no relationship between the growth of financial development and shadow banking in the NMCs was found, financial development seems to reduce the growth of shadow lending. Second, I show that the relationship between monetary policy and shadow banking growth may depend on the relative magnitude of interest rates in the economy. When rates are high, the relationship is found to be positive; i.e., monetary policy tightening increases shadow banking growth (mainly through OFI products). In this respect, a funding cost motive drives the growth. When rates are low, the relationship switches to negative due to a change in bank motives from funding costs to search for yield. Monetary expansion would thus increase shadow banking growth (through the use of IF products).

These findings have broader implications for the current policy debate and for financial stability. The documented procyclicality and complementarity of shadow banking open up new issues for macroprudential policy. The Basel III reforms attempted to reduce the procyclicality of bank lending. The rise in the prevalence of shadow banking may turn out to undermine the effectiveness of both capital-based regulation and income-based limits (for instance on mortgages, such as LTV, LTI, or DSTI limits). Also, I find a strong positive link between shadow banking and ICPFs. Given that different regulation applies to ICPFs, it would be beneficial to create a framework for macroprudential stress testing of the interconnectedness of financial institutions (banks, insurance companies, and investment and pension funds). Moreover, my findings complement the debate on the role of monetary policy in maintaining financial stability, as they identify yet another channel through which monetary policy may influence the stability of the financial system. In this respect, my findings conform to the idea that monetary policy should not be used as a safeguard for financial stability, and that monetary and macroprudential policy should work closely together.

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Appendix A: Underlying Data

Table A1: Composition of the Individual Panels

The composition reflects the 2004 EU enlargement but is broadly similar to that of Allard and Blavy (2011) and Bijlsma and Zwart (2013), who use principal components analysis of different financial structure indicators to cluster EU countries.

Country	Code	"Old"	"New"
Austria	AT	x	
Belgium	BE	x	
Bulgaria	BG		x
Cyprus	CY		x
Czech Rep	CZ		x
Estonia	EE		x
Finland	FI	x	
France	FR	x	
Germany	DE	x	
Greece	EL	x	
Hungary	HU		x
Ireland	IE	x	
Italy	IT	x	
Latvia	LV		x
Lithuania	LT		x
Luxembourg	LU	x	
Malta	MT		x
Netherlands	NL	x	
Poland	PL		x
Portugal	PT	x	
Romania	RO		x
Slovakia	SK		x
Slovenia	SL		x
Spain	ES	x	

Note: I do not include the following EU countries in the sample due to data gaps: the United Kingdom, Sweden, Denmark, and Croatia.

Box A1: How to Derive Shadow Banking Statistics from Euro Area Accounts

The shadow banking system monitoring exercise led by the ESRB takes a two-step approach to measuring and evaluating shadow banking developments. During the process, the ESRB casts the net wide to cover all areas where shadow banking-related risks to the financial system might potentially arise. First, authorities apply the entity-based monitoring approach, using aggregate balance sheet data complemented with data from other sources. Second, authorities apply the activity-based mapping approach to ensure that all segments of the shadow banking system are captured.

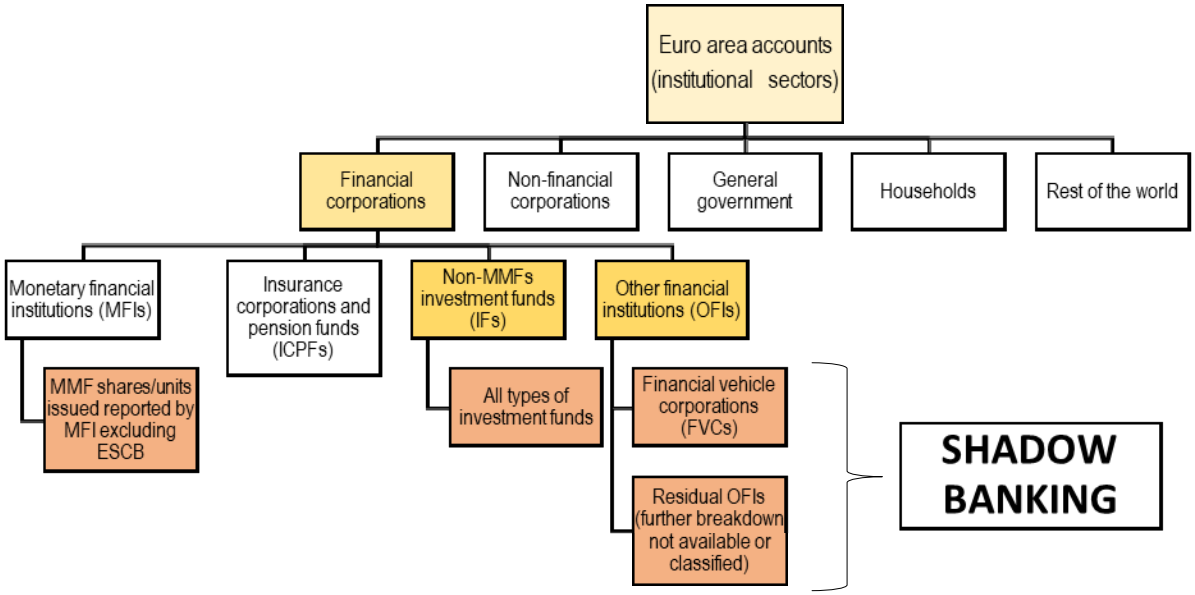


Table A2: Engagement of Market Entities in Shadow Banking Activities

	Credit intermediation	Maturity transformation	Liquidity transformation	Financial leverage	Inter-connectedness with banks
Other financial intermediaries (OFIs)					
FVCs engaged in securitization					
Security and derivative dealers					
Financial corporations engaged in lending					
Specialized financial corporations					
OFIs residuals					
Investment funds (IFs)					
Bond funds					
Money market funds					
Real estate funds					
Exchange-traded funds					
Hedge funds					
Private equity funds					

Note: The colors are meant to reflect the relevance of each possible engagement in shadow banking activities. The green coloring means high engagement, the orange coloring indirect or low engagement, and white no engagement or highly unlikely. The interconnectedness with traditional banks is identified by banks' total exposures to shadow banking entities.

Source: ESRB (2016, 2017)

Table A3: Summary Statistics

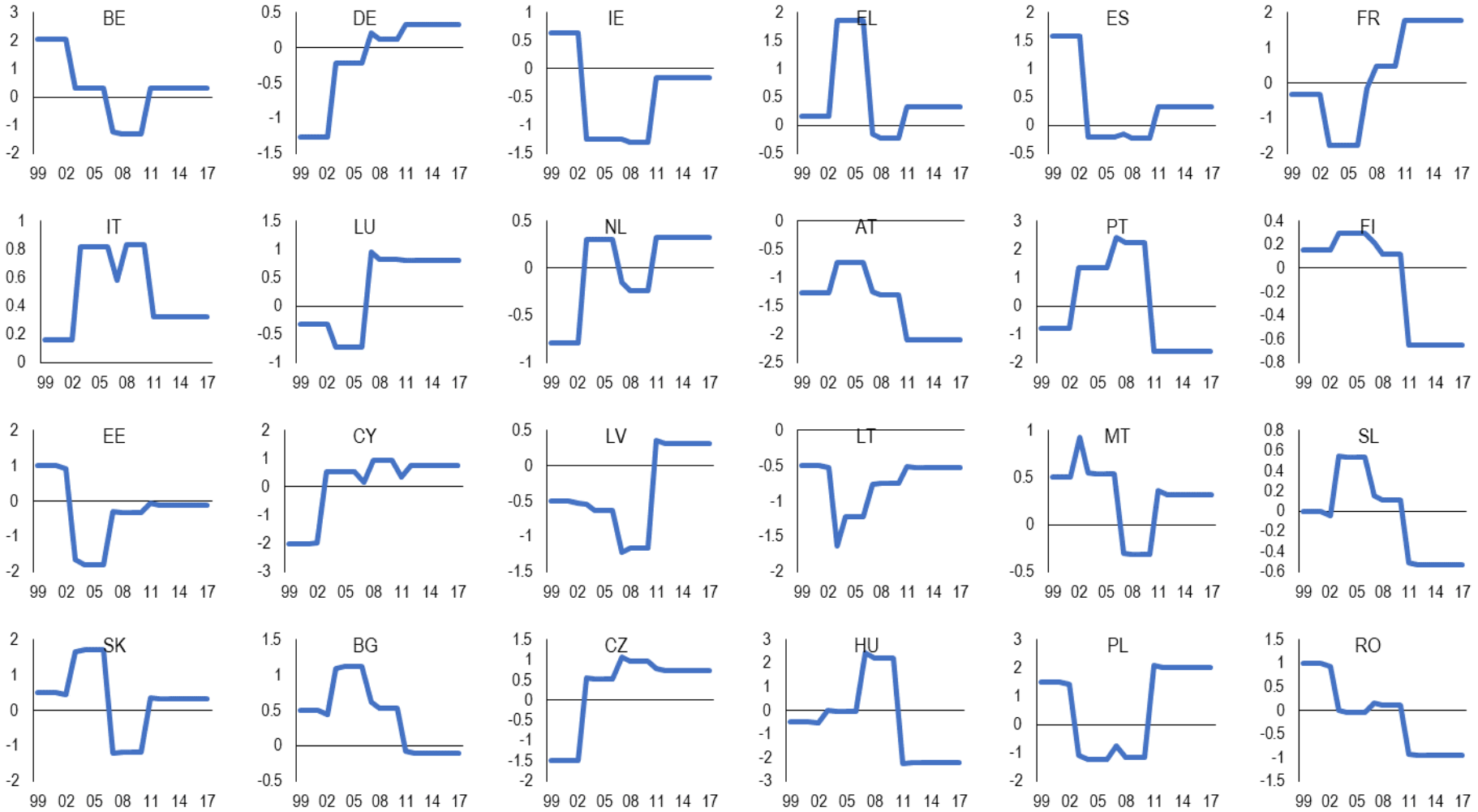
The following table describes the data used in the empirical exercises through the paper. The data on financial sector development are taken from the ECB/Eurosystem database (Macroeconomic and sectoral statistics –> Euro area accounts). Macroeconomic data are taken from Eurostat. All series are seasonally adjusted, where applicable, and run from 2004 to 2017 (this applies to the data in levels). I work with data in quarterly frequency. All variables are transformed to be approximately stationary. In particular, Tcode shows the stationarity transformation for each variable (z_t): Tcode=1 – no transformation (levels) and Tcode=5 – annual change of logarithmic values $x_t = 100(\log z_t - \log z_{t-4})$.

Variable	Mnemonics	Mean	Std. Dev.	Min	Max	Units	Source	Description	Tcode
Shadow banking (broad measure)	sb_broad	3.44	6.49	-17.59	34.24	total assets, mil. EUR	ECB/Eurosystem	The sum of financial corporations other than MFIs (FVCs, IFs, MMFs, and OFIs).	5
Shadow banking loans	sb_narrow	2.94	7.79	-22.05	56.22	total assets, mil. EUR	ECB/Eurosystem	The sum of loans granted by OFIs and IFs.	5
Other financial intermediaries	ofi	3.47	6.84	-16.11	33.67	total assets, mil. EUR	ECB/Eurosystem	Other financial intermediaries.	5
Investment funds	if	4.47	12.74	-55.24	118.92	total assets, mil. EUR	ECB/Eurosystem	Investment funds.	5
Traditional banking	mfi	2.41	4.44	-16.72	20.42	total assets, mil. EUR	ECB/Eurosystem	Monetary financial institutions.	5
Institutional cash pools	icpf	3.94	5.16	-27.91	38.83	total assets, mil. EUR	ECB/Eurosystem	Insurance companies and pension funds	5
Real short-term interest rate	ir_r	-0.18	1.76	-9.18	8.16	percentages	Eurostat	Difference between 3-month inter-bank rate (EURIBOR) and inflation rate (year-over-year growth rates of HICP)	1
Real GDP	gdp_r	0.85	1.79	-8.37	10.63	mil. EUR	Eurostat	Real gross domestic product deflated by the GDP deflator	5
Term spread	spread	1.84	2.45	-7.72	24.71	percentages	Eurostat	Difference between 10Y government bond yields and 3M EURIBOR	1
Capital regulation	reg	4.52E-10	0.99	-2.68	2.71	z-score normalized	Barth et al. (2013)	Scaled indices of securities activities, insurance activities, real estate activities, overall restriction on banking activities, overall capital stringency, initial capital stringency, official supervisory power, and financial statement transparency.	1
Financial development index	fd	0.01	2.21	-6.05	9.85	index	Svirydzenka (2016)	Financial development index	5

Note: For countries that adopted the euro as their national currency during the estimation period, I use their historical inter-bank rates until the adoption date and EURIBOR afterwards. This concerns: CY – 2008, LV – 2014, LT – 2015, MT – 2008, SL – 2007, SK – 2009. Hungary has data missing from its inter-bank rate time series during these periods: 2004q2–2005q1, 2006q1–2006q2, 2009q1, 2012q4–2013q1. The missing data were interpolated by a simple linear trend. The data on Slovak GDP and its main components were drawn from the database of the national bank (NBS). There are no Estonian sovereign debt securities that comply with the definition of long-term interest rates for convergence purposes and no suitable proxy indicator has been identified.

Figure A1: Capital Regulation Indexes

The figures depict the z-score scaled index for each country. Since I use the mean and std. dev. for EU countries as a benchmark, positive/negative values imply that capital regulation stringency is below/above the average EU level.



Source: Barth et al. (2013), own computation

A.1 Normalization Procedure

The z-score normalized index is computed as follows:

$$reg_{it}^{norm} = \frac{reg_{it} - \bar{E}\left(reg_{EU,t}\right)}{std\left(reg_{EU,t}\right)}, \tag{A1}$$

where i denotes the individual country and EU the whole sample. My reference group of countries consists of EU countries. This means I can derive a metric that not only captures the regulatory and supervisory state in the given country, but also reflects the state in the rest of the system (thus capturing possible cross-country regulatory arbitrage). The mean and standard deviation are computed at each point in time:

$$std\left(reg_{EU,t}\right) = \sqrt{\frac{1}{(n-1)}\sum_{i=1}^{n}\left(reg_i - \bar{E}\left(reg_i\right)\right)^2}, \tag{A2}$$

$$E\left(reg_{EU,t}\right) = \frac{1}{n}\sum_{i=1}^{n} reg_i . \tag{A3}$$

Table A4: Panel Unit Root Tests (Full Sample, 2004–2017)

Variable	Im-Pesaran-Shin		Fisher-ADF		Fisher-PP	
	level	diff	level	diff	level	diff
sb_broad	2.22	-6.97***	43.21	136.32***	44.14	110.87***
sb_narrow	1.45	-5.95***	44.18	121.18***	45.86	121.55***
ofi	0.09	-6.17***	63.03*	125.36***	63.97*	108.03***
if	6.56	-8.16***	24.65	155.33***	19.71	127.72***
mfi	-1.34*	-4.44***	67.89**	92.72***	73.30**	80.62***
icpf	6.21	-7.02***	28.66	137.55***	39.09	101.59***
ir_r	-7.30***	-14.06***	148.52***	288.31***	56.84*	230.52***
gdp_r	3.56	-13.51***	28.59	279.15***	22.74	480.72***
spread	-3.16***	-16.43***	70.05***	345.42***	50.38	433.69***
reg	-14.29***	-34.65***	315.11***	845.34***	51.22	116.48***
fd	-31.95***	-59.99***	734.12***	1067.33***	95.53***	139.68***

Note: Null hypotheses of the tests: the series has a unit root; ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Appendix B: Additional Regression Results

While the GMM estimator employed in the main text is extensively used in the literature, it may produce biased estimates in panels where the time period (T) is relatively large compared to the sample size (N). Roodman (2009) shows that the substantial number of instruments produced in such a panel may render the GMM estimator invalid even though the individual instruments may be valid. Some studies also show that using the instrumental variables technique to avoid bias often leads to poor small-sample properties (Kiviet, 1995; Bun and Windmeijer, 2010). Given that the shadow banking sample has a large number of periods (T=52) relative to the number of individuals (N=24 for the full sample), I perform two robustness checks to verify the results shown in the main text.[14] First, I estimate the panel regression model using the system-GMM estimator augmented with principal component analysis in order to reduce the number of instruments generated (see, for example, Mehrhoff, 2009). Second, I use a simple least square dummy variable (LSDV) estimator and a bootstrap-based bias-corrected LSDV estimator as proposed by De Vos et al. (2015). The results for different samples (the full sample and the old and new member countries) are shown in **Tables B1** to **B3**.

Generally, the estimated parameters across various model specifications do not exhibit any significant differences in terms of signs. Taken as such, the results of the robustness exercise lend additional support to the results reported in the main text. There are a few cases where I record a lower level of statistical significance, but they can be easily explained. For instance, in **Table B1**, which shows the estimates for the full balanced sample of 24 EU countries, I record a statistically insignificant relationship between shadow banking growth (broad measure) and traditional banking growth (contrary to the results reported in the main text). This is because two of the shadow banking entity categories (OFIs and IFs) evolve in the opposite direction to traditional banking. As was shown in the main text, OFIs are complements to traditional banking, while IFs are substitutes, the first being positively signed and the other negatively.

[14] Similarly to what is done in Malovaná et al. (2017) and Malovaná (2017).

Table B1: Shadow Banking Growth Determinants (Full Sample; T=52, N=24)

Dependent variable	Shadow banking growth (broad)			Shadow loans			OFIs			IFs		
	1a	2a	3a	1b	2b	3b	1c	2c	3c	1d	2d	3d
	Simple LSDV	Corrected LSDV	System-GMM	Simple LSDV	Corrected LSDV	System-GMM	Simple LSDV	Corrected LSDV	System-GMM	Simple LSDV	Corrected LSDV	System-GMM
Lagged dependent variable	0.212***	0.823***	0.490***	0.748***	0.789***	0.297***	0.769***	0.815***	0.419***	0.688***	0.733***	0.455***
	(0.039)	(0.018)	(0.031)	(0.018)	(0.019)	(0.031)	(0.017)	(0.019)	(0.029)	(0.020)	(0.025)	(0.028)
Real GDP	0.329***	0.309***	0.331***	0.574***	0.492***	1.378***	0.320***	0.293***	0.511***	0.277*	0.444**	0.191**
	(0.077)	(0.065)	(0.079)	(0.079)	(0.088)	(0.098)	(0.065)	(0.067)	(0.078)	(0.159)	(0.196)	(0.079)
Traditional banking growth	0.112*	0.031	0.032	0.096***	0.063*	0.349***	0.095***	0.060**	0.219***	-0.088	0.050	-0.189**
	(0.052)	(0.023)	(0.023)	(0.033)	(0.034)	(0.034)	(0.027)	(0.027)	(0.027)	(0.059)	(0.064)	(0.059)
Institutional cash pools	0.208***	0.072***	0.169***	0.086***	0.078***	0.157***	0.088***	0.054**	0.123***	0.329***	0.159***	0.371***
	(0.033)	(0.023)	(0.019)	(0.027)	(0.028)	(0.025)	(0.023)	(0.025)	(0.019)	(0.052)	(0.060)	(0.050)
Real short-term interest rate	-0.118	-0.191	-0.044	-0.170**	-0.176*	-0.246	-0.145**	-0.216***	-0.170*	0.270	0.158	0.210
	(0.096)	(0.153)	(0.052)	(0.080)	(0.093)	(0.125)	(0.065)	(0.062)	(0.056)	(0.147)	(0.172)	(0.145)
Term spread	0.108	0.005	0.111*	-0.146*	-0.099	-0.086	0.129*	0.143**	0.193***	0.194	0.192	0.083***
	(0.089)	(0.058)	(0.063)	(0.076)	(0.083)	(0.054)	(0.061)	(0.064)	(0.063)	(0.136)	(0.171)	(0.014)
Capital regulation	0.334*	0.112***	0.607*	0.378**	0.249***	0.558*	1.072***	1.058***	1.026***	1.179***	1.074***	1.748*
	(0.179)	(0.025)	(0.207)	(0.149)	(0.069)	(0.281)	(0.122)	(0.146)	(0.505)	(0.275)	(0.335)	(0.752)
Financial development	1.174***	1.135***	1.324***	-0.056	0.002	0.125	1.054***	1.039***	1.026***	2.673***	2.437***	4.498***
	(0.173)	(0.348)	(0.107)	(0.060)	(0.079)	(0.102)	(0.250)	(0.254)	(0.129)	(0.113)	(0.425)	(0.265)
Crisis dummy	-0.511***	-1.366***	-1.553	1.159***	0.943**	1.431*	-1.072**	1.123***	-2.363***	0.354	0.366	0.640
	(0.148)	(0.289)	(0.973)	(0.370)	(0.404)	(0.678)	(0.401)	(0.334)	(0.927)	(0.278)	(0.751)	(2.305)
AR(2)			0.184			0.226			0.148			0.218
Hansen			0.298			0.345			0.271			0.451
PCA components			45			45			45			45
KMO			0.615			0.703			0.708			0.702
No. of obs.	1224	1224	1224	1224	1224	1224	1224	1224	1224			1224

Note: This table presents the estimates of equation (1) using the simple LSDV estimator (1a, 1b, 1c, and 1d), the bias-corrected LSDV estimator (2a, 2b, 2c, and 2d), and the system-GMM estimator augmented with principal component analysis on instruments (3a, 3b, 3c, and 3d). Estimation period: 2004–2017. Robust standard errors are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively. AR(2) reports p-values for the test of the null hypothesis that the errors in the first difference regression exhibit no second-order serial correlation. Hansen reports p-values for the test of the null hypothesis that the instruments used are valid. PCA components show the number of principal components generated. KMO denotes the Kaiser-Meyer-Olkin measures of sampling adequacy. For the model estimated by the LSDV estimator, 300 iterations are produced and 250 are used for the final inference.

Table B2: Shadow Banking Growth Determinants: Old Member Countries (T=52, N=12)

Dependent variable	Shadow banking growth (broad)			Shadow loans			OFIs			IFs		
	1a	2a	3a	1b	2b	3b	1c	2c	3c	1d	2d	3d
	Simple LSDV	Corrected LSDV	System-GMM	Simple LSDV	Corrected LSDV	System-GMM	Simple LSDV	Corrected LSDV	System-GMM	Simple LSDV	Corrected LSDV	System-GMM
Lagged dependent variable	0.750***	0.856***	0.371***	0.769***	0.826***	0.505***	0.778***	0.838***	0.484***	0.731***	0.831***	0.546***
	(0.023)	(0.029)	(0.032)	(0.026)	(0.029)	(0.042)	(0.023)	(0.026)	(0.043)	(0.026)	(0.032)	(0.031)
Real GDP	0.112**	0.126***	0.154*	0.111	0.134	0.127**	0.193*	0.152*	0.145*	-0.053	0.098	0.001
	(0.040)	(0.024)	(0.080)	(0.125)	(0.116)	(0.059)	(0.085)	(0.071)	(0.069)	(0.162)	(0.230)	(0.175)
Traditional banking growth	-0.025	-0.043	-0.058	0.021	-0.020	0.085**	0.091**	0.099**	0.092**	-0.177***	-0.114**	-0.208***
	(0.025)	(0.027)	(0.043)	(0.041)	(0.042)	(0.040)	(0.035)	(0.035)	(0.035)	(0.052)	(0.052)	(0.049)
Institutional cash pools	0.395***	0.175***	0.484***	0.120*	0.125*	0.385***	0.308***	0.187***	0.329***	0.436***	0.432***	0.569***
	(0.040)	(0.045)	(0.038)	(0.063)	(0.070)	(0.085)	(0.053)	(0.061)	(0.063)	(0.080)	(0.111)	(0.094)
Real short-term interest rate	0.020	-0.082	0.403	0.126	0.078	0.080	0.205*	0.146*	0.369***	-0.103	-0.035	-0.049
	(0.075)	(0.081)	(0.235)	(0.117)	(0.142)	(0.103)	(0.100)	(0.071)	(0.094)	(0.148)	(0.139)	(0.130)
Term spread	0.135***	0.115**	0.071*	-0.152*	-0.143	-0.382***	0.007	0.047	0.090*	-0.282	-0.305**	-0.111
	(0.051)	(0.054)	(0.036)	(0.083)	(0.090)	(0.071)	(0.068)	(0.078)	(0.052)	(0.204)	(0.124)	(0.079)
Capital regulation	1.095***	1.066***	1.253**	1.301**	1.269***	1.069**	1.183***	1.115***	1.804***	-0.103	-0.148	-0.791**
	(0.122)	(0.160)	(0.534)	(0.498)	(0.275)	(0.426)	(0.165)	(0.211)	(0.486)	(0.248)	(0.297)	(0.398)
Financial development	1.120***	1.179***	1.124***	-0.079	-0.026	-0.435	1.117***	1.201***	1.090***	1.570***	1.639***	2.005***
	(0.263)	(0.262)	(0.122)	(0.101)	(0.113)	(0.306)	(0.284)	(0.299)	(0.187)	(0.333)	(0.167)	(0.273)
Crisis dummy	-1.506**	-1.218***	-1.409**	0.726	0.535	0.236	-2.408***	-2.490***	-2.165***	1.325**	1.287**	1.419**
	(0.257)	(0.295)	(0.522)	(0.417)	(0.428)	(0.298)	(0.347)	(0.361)	(0.751)	(0.520)	(0.578)	(0.493)
AR(2)			0.227			0.362			0.280			
Hansen			0.358			0.523			0.486			
PCA components			45			45			45			
KMO			0.619			0.609			0.614			
No. of obs.	612	612	612	612	612	612	612	612	612	612	612	612

Note: This table presents the estimates of equation (1) using the simple LSDV estimator (1a, 1b, 1c, and 1d), the bias-corrected LSDV estimator (2a, 2b, 2c, and 2d), and the system-GMM estimator augmented with principal component analysis on instruments (3a, 3b, 3c, and 3d). Estimation period: 2004–2017. Robust standard errors are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively. AR(2) reports p-values for the test of the null hypothesis that the errors in the first difference regression exhibit no second-order serial correlation. Hansen reports p-values for the test of the null hypothesis that the instruments used are valid. PCA components show the number of principal components generated. KMO denotes the Kaiser-Meyer-Olkin measures of sampling adequacy. For the model estimated by the LSDV estimator, 300 iterations are produced and 250 are used for the final inference.

Table B3: Shadow Banking Growth Determinants: New Member Countries (T=52, N=12)

Dependent variable	Shadow banking growth (broad)			Shadow loans			OFIs			IFs		
	1a	2a	3a	1b	2b	3b	1c	2c	3c	1d	2d	3d
	Simple LSDV	Corrected LSDV	System-GMM	Simple LSDV	Corrected LSDV	System-GMM	Simple LSDV	Corrected LSDV	System-GMM	Simple LSDV	Corrected LSDV	System-GMM
Lagged dependent variable	0.751***	0.788***	0.501***	0.711***	0.761***	0.358***	0.734***	0.768***	0.448***	0.647***	0.658***	0.554***
	(0.025)	(0.026)	(0.043)	(0.026)	(0.029)	(0.041)	(0.026)	(0.027)	(0.044)	(0.031)	(0.043)	(0.135)
Real GDP	0.482***	0.282***	0.537***	0.728***	0.410***	1.576***	0.494***	0.278***	0.785***	0.724***	0.319	0.241
	(0.089)	(0.094)	(0.109)	(0.112)	(0.126)	(0.143)	(0.090)	(0.079)	(0.107)	(0.260)	(0.327)	(1.362)
Traditional banking growth	0.085**	0.112**	0.156	0.128**	0.125*	0.319***	0.156***	0.141***	0.347***	0.103	0.109	0.064
	(0.042)	(0.044)	(0.091)	(0.055)	(0.067)	(0.055)	(0.044)	(0.038)	(0.046)	(0.113)	(0.122)	(0.194)
Institutional cash pools	0.094***	0.056**	0.172**	0.094***	0.092**	0.162***	0.047*	0.040	0.106*	0.305***	0.170**	1.534***
	(0.027)	(0.027)	(0.025)	(0.034)	(0.038)	(0.032)	(0.028)	(0.026)	(0.026)	(0.073)	(0.073)	(0.461)
Real short-term interest rate	-0.100	-0.243***	-0.098	0.277**	0.204*	0.516***	-0.187**	-0.229**	-0.327***	0.264	0.242	0.267
	(0.087)	(0.090)	(0.077)	(0.114)	(0.115)	(0.134)	(0.091)	(0.093)	(0.079)	(0.236)	(0.266)	(0.210)
Term spread	0.002	-0.175	-0.048	-0.247*	-0.261*	-0.461***	-0.094	-0.128	-0.379	1.505***	0.561*	1.424***
	(0.110)	(0.115)	(0.105)	(0.144)	(0.149)	(0.108)	(0.114)	(0.120)	(0.208)	(0.287)	(0.322)	(0.466)
Capital regulation	0.295*	0.176	0.462	1.092***	1.017***	1.902**	0.634	0.535	1.523**	0.448	0.091	1.192
	(0.174)	(0.164)	(0.477)	(0.224)	(0.259)	(0.637)	(0.578)	(0.490)	(0.481)	(0.473)	(0.522)	(1.054)
Financial development	-0.010	-0.031	0.272	-0.090	0.037	-0.393*	-0.080	0.001	-0.455***	0.540***	0.336*	2.965***
	(0.065)	(0.064)	(0.250)	(0.083)	(0.110)	(0.213)	(0.067)	(0.060)	(0.151)	(0.176)	(0.178)	(0.365)
Crisis dummy	0.509	0.813	1.145	2.788***	2.669***	5.963***	1.846***	1.774**	3.285**	-1.983	-0.533	-2.139**
	(0.569)	(0.596)	(1.429)	(0.525)	(0.815)	(1.713)	(0.582)	(0.622)	(1.323)	(1.540)	(1.733)	(0.998)
AR(2)			0.202			0.165			0.165			0.218
Hansen			0.405			0.283			0.273			0.451
PCA components			45			45			45			45
KMO			0.615			0.596			0.603			0.802
No. of obs.	612	612	612	612	612	612	612	612	612	612	612	612

Note: This table presents the estimates of equation (1) using the simple LSDV estimator (1a, 1b, 1c, and 1d), the bias-corrected LSDV estimator (2a, 2b, 2c, and 2d), and the system-GMM estimator augmented with principal component analysis on instruments (3a, 3b, 3c, and 3d). Estimation period: 2004–2017. Robust standard errors are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively. AR(2) reports p-values for the test of the null hypothesis that the errors in the first difference regression exhibit no second-order serial correlation. Hansen reports p-values for the test of the null hypothesis that the instruments used are valid. PCA components show the number of principal components generated. KMO denotes the Kaiser-Meyer-Olkin measures of sampling adequacy. For the model estimated by the LSDV estimator, 300 iterations are produced and 250 are used for the final inference.

Appendix C: Fixed Effects Single-threshold Model

Equation (2) from the main text is first estimated via the OLS estimator. Given γ, the OLS estimator of β is as follows:

$$\hat{\beta} = \left\{ X^*(\gamma)' X^*(\gamma) \right\}^{-1} \left\{ X^*(\gamma)' y^* \right\}, \tag{C1}$$

where y^* and X^* are within-group deviations. Note that if γ is known or is set arbitrarily, the model is no different from the ordinary linear model. However, in this case, the γ value is unknown and needs to be estimated. To estimate γ, I restrict the range to the interval $(\underline{\gamma}, \overline{\gamma})$, which are quantiles of the threshold variable i_{it} (the nominal interest rate). γ is set as the value that minimizes the residual sum of squares (RSS):

$$\hat{\gamma} = \arg\min_{\gamma} S_1(\gamma), \tag{C2}$$

Hansen (1999) shows that $\hat{\gamma}$ is a consistent estimator for γ and also suggests computing a confidence interval using the no-rejection region method, which is based on an LR statistic:

$$LR_1(\gamma) = \frac{\left\{ LR_1(\gamma) - LR_1(\hat{\gamma}) \right\}}{\hat{\sigma}^2} \xrightarrow{\Pr} \xi, \tag{C3}$$

$$\Pr(x < \xi) = \left(1 - e^{\frac{-x}{2}} \right)^2, \tag{C4}$$

The threshold effect is based on simple hypothesis testing. The null and the alternative are:

$$H_0 : \beta_1 = \beta_2 \text{ and } H_1 : \beta_1 \neq \beta_2, \tag{C5}$$

In another words, I test whether the estimated coefficients are the same in each regime. To test the statistical significance of the threshold effect, I use the F statistic:

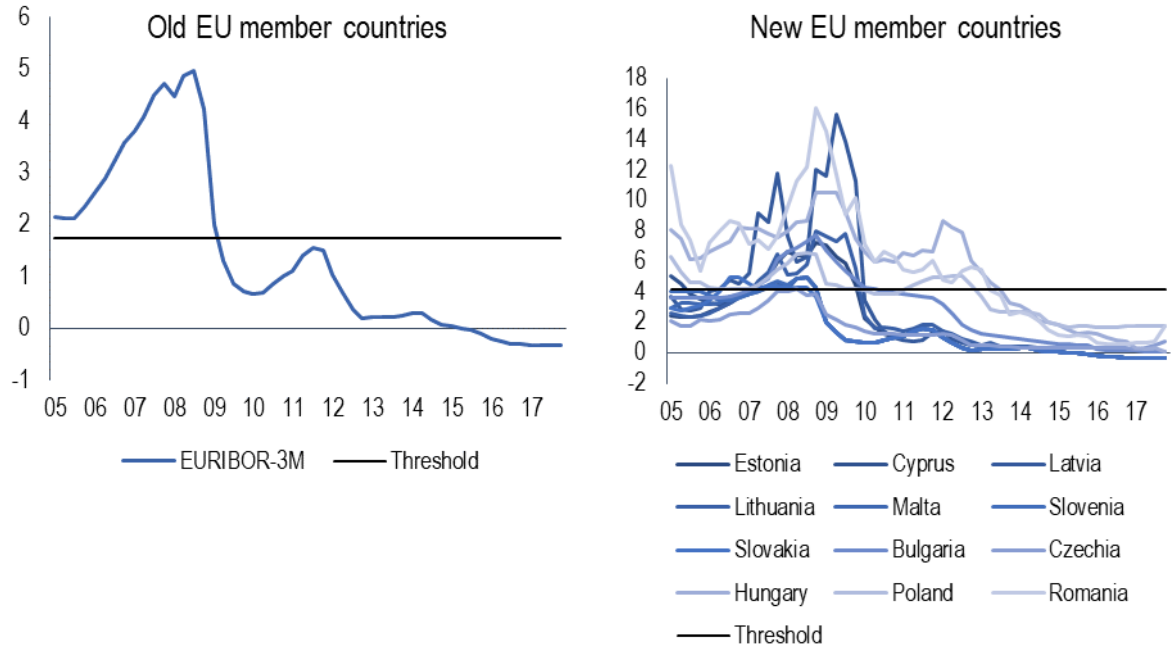
$$F_1 = \frac{(S_0 - S_1)}{\hat{\sigma}^2}, \tag{C6}$$

where S_0 is the RSS of the linear model. For the bootstrap design of the test, refer to Hansen (1996). Once $\hat{\gamma}$ is estimated, the slope coefficients can be estimated using the GMM estimator for the previously used instruments and the previous estimated threshold level $\hat{\gamma}$:

$$Var(\varepsilon_i) = \sigma^2 I_T \Rightarrow Var(\varepsilon_i^*) = \sigma^2 I_{T-1}, \tag{C7}$$

where $\varepsilon_{it}^* = \sqrt{\frac{T-t}{T-t+1}} \left[\varepsilon_{it} - \frac{1}{T-t} \left(\varepsilon_{i(t+1)} + \ldots + \varepsilon_{iT} \right) \right]$.

Figure C1: 3M Inter-Bank Rates and Estimated Threshold Values (in %)



Appendix D: Additional Results

Table D1: Interest Rate Threshold and Shadow Banking Determinants: OMCs vs. NMCs

	Panel A: old member countries (OMCs)				Panel B: new member countries (NMCs)			
Dependent variable	Shadow banking	Shadow loans	OFIs	IFs	Shadow banking	Shadow loans	OFIs	IFs
Real short-term interest rate	threshold estimate $\hat{\gamma}$ 1.73 [1.48; 1.95]				threshold estimate $\hat{\gamma}$ 6.52 [6.08; 6.89]			
$\hat{\beta}_1$ (above threshold)	0.305* (0.163)	2.678*** (0.525)	0.979*** (0.317)	0.101 (0.221)	1.136** (0.502)	1.388* (0.840)	1.232** (0.496)	-1.028* (0.597)
$\hat{\beta}_2$ (below threshold)	-0.991*** (0.227)	-0.058 (0.190)	-1.107*** (0.391)	1.352*** (0.325)	-0.479*** (0.138)	-1.050*** (0.164)	-0.765*** (0.137)	1.984*** (0.341)
Regime-independent controls								
Real GDP	0.612*** (0.121)	-0.013 (0.188)	0.159 (0.171)	0.805*** (0.224)	0.832*** (0.129)	0.878*** (0.155)	0.452*** (0.127)	0.273 (0.089)
Traditional banking growth	0.430** (0.041)	0.107* (0.062)	0.263*** (0.058)	-0.352*** (0.076)	0.325*** (0.064)	0.487*** (0.077)	0.485*** (0.063)	0.049 (0.045)
Institutional cash pools	0.818*** (0.066)	0.264*** (0.100)	0.765*** (0.093)	0.792*** (0.122)	0.283*** (0.042)	0.209*** (0.050)	0.179*** (0.042)	0.597*** (0.094)
Term spread	0.055 (0.022)	-0.019 (0.023)	-0.037 (0.106)	0.117 (0.050)	-0.055 (0.066)	-0.013 (0.099)	-0.108* (0.164)	0.100 (0.368)
Capital regulation	1.113* (0.198)	1.077*** (0.297)	0.322 (0.278)	-0.377 (0.365)	0.417 (0.271)	0.588* (0.326)	0.368 (0.268)	-0.049 (0.609)
Financial development	0.474*** (0.101)	-0.512*** (0.152)	0.323** (0.143)	1.729*** (0.186)	-0.113 (0.101)	-0.239** (0.121)	-0.173* (0.099)	0.547** (0.225)
Constant	0.695* (0.365)	3.980*** (0.486)	0.352 (0.510)	0.408 (0.659)	2.419*** (0.513)	1.959*** (0.614)	2.780*** (0.507)	6.915*** (1.166)
F-statistic	49.99***	52.48***	59.54***	52.41***	68.12***	64.25***	57.51***	69.12***
R^2	0.398	0.163	0.263	0.365	0.386	0.411	0.392	0.319
No. of instruments	157	157	157	157	157	157	157	157
No. of countries	12	12	12	12	12	12	12	12
No. of obs.	624	624	624	624	624	624	624	624

Note: This table reports the results for the dynamic panel threshold estimation. Following Hansen (1999), each regime contains at least 5% of all the observations. The first row indicates the threshold estimate, with 95% confidence intervals in brackets (see Figure B1 for a visual presentation). Robust standard errors are in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively. F-statistic reports values for the test of the null hypothesis that the number of thresholds employed is valid.

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Czech National Bank
Economic Research Division
Na Příkopě 28, 115 03 Praha 1
Czech Republic
phone: +420 2 244 12 321
fax: +420 2 244 12 329
http://www.cnb.cz
e-mail: research@cnb.cz
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