Effect of Institutional and Cultural factors on Shadow Banking

Krishnan Dandapani, Professor of Finance, FIU
Edward Lawrence, Professor of Finance and FIBA Chair, FIU
Wenjun Zue, Assistant Professor, Sanghai University, China

Abstract: In this paper, we investigate the development of shadow banking and its determinants in 27 countries across globe. Shadow banking has grown rapidly prior to Basil II and Basil III implementation but its growth has slowed down since 2010. Money transacted through Shadow banking is much larger in developed world countries as compared to the developing countries. We find that in most countries shadow banking competes with traditional commercial banking. The high profitability and low capital requirement of traditional commercial banking are significantly negatively related with shadow banking. We find that money involved in shadow banking is larger in the countries with the higher financial freedom but is smaller in the countries with lower law level, lower individualism and higher uncertainty avoidance.
Keywords: Shadow banking; Global investigation; Law and culture

1. Introduction

The current global banking system features components of equal importance, traditional banks and the so-called “shadow banks”. Shadow banking system (SBS) is the collection of financial intermediaries that provide services similar to traditional commercial banks, but whose members are not subject to regulatory oversight, and operates “in the shadows”. While precise definitions vary, entities included in the SBS are hedge funds, money market funds, repurchase agreement (repo) markets, structured investment vehicles (SIV), and other non-bank financial institutions. Shadow banks also refer to unregulated activities by regulated institutions. Investment banks and commercial banks may conduct a significant portion of their business in the SBS, but are not typically classified as shadow banking institutions. Investment bank’s core activities are subject to regulation and monitoring, but it is common practice for investment banks to conduct transactions in ways that don’t show up on their conventional balance sheet; therefore, not visible to regulators and central banks.

Shadow banking institutions serve as intermediaries between investors and borrowers, providing credit and capital for investors, institutional investors, and corporations, profiting from fees and/or from the arbitrage in interest rates by maturity transformation. However, as SBS are not subject to traditional bank regulation, they lack access to central bank funding or safety nets such as deposit insurance and debt guarantees.

Shadow banking system has grown tremendously over the last decade. In a report Bloomberg estimated total SBS to about $67 trillion at the end of 2012. They represent about 25% - 30% of the entire global financial system according to the Financial Stability Board (FSB). An important driving force in the growth of shadow banking is regulatory arbitrage, a practice of capitalizing on loopholes in regulatory systems in order to circumvent unfavorable regulation. By exploiting these loopholes firms bypass capital requirements and achieve higher effective leverage than regulation permits. Another important reason driving the growth of shadow banking is their ability to channel capital from the money markets, short-term, toward the refinancing of securitized loans, longer term, greatly increasing the leverage on these loans.

The rapid growth of shadow banks throughout the globe influences the economic growth and financial stability of countries. In 2012, Financial Stability Board in USA, defined shadow banks as credit intermediation involving entities and activities outside the regular banking system and this definition was subsequently modified in 2014 to include entities and activities fully or partially outside the regular banking system, or non-bank credit intermediation. Shadow banks create “safe” collateral to reduce counterparty risk, facilitate financial transactions, and satisfy the global demand for liquidity and hedging, which cannot be satisfied by commercial banks (Caballero, 2010; Lysandrou, 2012; Claessens et al., 2013). Shadow banks provide a valuable alternative to bank funding and help support real economic activity. They are a good source of diversification of credit supply from the banking system and provide healthy competition for banks.

The growth in SBS is due to the erosion of the advantage of commercial banking because of the reserve requirement (Mishkin, 1995; Adrian and Ashcraft, 2012), deposit rate ceilings (Adrian and Shin, 2009), tightened financial regulation (Ratnovski, 2013) and high investment returns of shadow banking. Besides, some researchers also document the significant impact of institutions (see La Porta, et al., 1997; La Portal, et al., 1998; Beck and Levine, 2004) and culture (see Stulz and Williamson, 2003; Harper, 2003; Kwok and Tadesse, 2006) on the financial market development in different countries.

In this paper we explore the development of shadow banking and its determinants worldwide. For our analysis we collect shadow banking data of 27 countries during 2002 to 2016. We notice that shadow banking is much larger in the developed countries as compared to developing countries. For developed world countries shadow banking growth is higher prior to the Basil II and Basil III implementation in 2010. However, shadow banking in the emerging countries grows rapidly after 2010. We find that shadow banking competes with traditional commercial banking in the products and services it offers. We find that higher profitability and low capital reserve requirement of traditional banking is inversely related to the amount of money vested in shadow banking. Financial freedom significantly drives the development of shadow banking. Our investigation of the impact of country's law and order and cultural factors reveals that shadow banking grows in the countries with higher law level, high individualism and low uncertainty avoidance. We also find that countries with more economic openness have a larger shadow banking business. Our results are robust for both narrow and broad measure of shadow banking.

The remainder of this paper is as follows. Section 2 is literature review. Section 3 describes methodology, including regression models and data. Section 4 discusses empirical results. Section 5 is conclusion.

2. Literature review

2.1 The competitions from commercial banks

Researchers have investigated the reasons for the development of shadow banking from the traditional commercial banking. Edwards and Mishkin (1995) and Ratnovski (2013) report that the rise of shadow banking partly stems from the erosion of commercial banks' informational and transactions cost advantages over shadow banks, which provided investors more options to purchase products from shadow banks. The erosion of commercial banks' efficiency may be due to the increased capital reserve requirement since the reserve requirement imposes a disadvantage on banks that spurs the growth of money-market mutual funds and other alternatives to bank deposits (Kanatas and Greenbaum, 1982; Pennacchi, 1988; Duca, 1992; Claessens et al., 2013). Furthermore, Rixen (2013) shows that the strict regulation on commercial banking leads to the credit growth of shadow banking. Harris et al. (2014) find that the high minimum capital requirement negatively affects bank profitability and investments. Besides, Adrian and Ashcraft (2012) document that the international shadow bank regulatory arbitrage would grow in the future in response to the tightened financial regulation. They suggest that the increased regulation drives the innovation in the

shadow banks.

Gorton and Metrick (2010) investigate reasons for the rise of shadow banking and find that innovations and regulatory changes erode the competitive advantage of commercial banks over shadow banking. The demand for collateral for financial transactions gives impetus to the development of securitization and the use of repos as a money-like instrument. Compared with commercial banking, shadow banking is not subject to the capital reserve requirement and has the unrestricted possibilities for leveraged investments (Adrian and Shin, 2009). Besides, the deposit rate ceilings prevent commercial banks from offering interest rates in line with the market interest rates. This consideration induces investors to shift funds from commercial banks to other nonbanking institutions, such as hedge funds, pension funds, mutual funds and other institutional investors and encourages banks to tighten their credit standards (Duca et al., 2012).

To meet the competition from shadow banking, commercial banks engage in the regulatory arbitrage of Basel capital requirements by setting up the asset-backed commercial paper (ABCP) and the repurchase agreement (Acharya et al., 2013). Górnicka (2016) shows that commercial banks are more profitable to use the special purpose vehicles (SPV) in the high levels of the minimum capital requirement. It suggests that commercial banks find it advantageous to shift the increasing amounts of these activities off their balance sheets in order to conserve capital and boost profits if the costs rise out of the regulatory constraints on their on-balance sheet activities.

2.2 Law and culture

La Porta, et al. (1997) and La Portal, et al. (1998) report the importance of the law and order in a country on its financial markets and the roles of investor protection and private property rights enforcement on the financial development. Beck et al., (2003) postulate that in countries where legal systems enforce private property rights, support private contractual arrangements and protect the legal rights of investors, savers are more willing to finance firms and financial markets thrive. Beck and Levine (2004) emphasize the importance of private property rights and investor protection in a country's ability to adapt to new financial developments. Pistor (2013) reports that the stronger law, legal institution and regulation provide powerful incentives for market participants to have more financial innovation. She also highlights how law and regulation incentivize the contractual innovation and change the structure of financial markets and institutions. Awrey (2015) documents that strong laws and legal institutions do not help generate credible commitments and thereby promote financial development.

Houston et al. (2010) report that more effective law enforcement reduces credit risk by providing more protection to banks when the loan contract is defaulted, thus encourages banks to take more risks and make more loans.

North (1991) regards legal institutions as "formal institutions" while culture is regarded as "informal institutions" of a nation and encompasses people's customary beliefs and values (also see Guiso, et al., 2006). Hofstede (2010) defines that culture is the collective programming of the mind that distinguishes the members of one group or category of people from another. Licht, et al., (2005) suggest that investor legal rights are stronger in nations high on the Hofstede's individualism dimension and low on his uncertainty avoidance dimension. Stulz and Williamson (2003) think culture influences financial choices because culture determines the predominant values in a country and influence its institutions and resource allocation. Harper (2003) identifies obedience as less risk-taking behavior or risk-averse transactions, which has a negative and detrimental impact on the financial development. Besides, Kwok and Tadesse (2006) think that risk-taking encompasses unknown outcomes and find managers from high uncertainty avoidance cultures tend to be less tolerant towards ambiguity and negatively related to risk-taking. Kanagaretnam et al. (2014) establish that banks in high uncertainty avoidance societies tend to take less risk. Mourouzidou-Damtsa et al. (2017) find that a positive association between the cultural values of individualism and domestic bank risk-taking behavior. Haq et al. (2018) document that banks are more leveraged in the countries high on individualism and low in uncertainty avoidance since they tend to take on more risk and uncertainty.

3. Methodology

3.1 Regression model

In line with the literature above, we select and explore the determinants of shadow banking development, including the competition of commercial banks, financial regulation, law and culture. The regression model is shown as:

$$SHADOW_{it} = \beta_0 + \beta_1 PROFIT_{it} + \beta_2 CAP_{it} + \beta_3 FREEDOM_{it} + \beta_4 GROWTH_{it} + \beta_5 LAW_{it} + \beta_6 INDIVIDUAL_{it} + \beta_7 UNCERTAINTY_{it} + \varphi_i + \theta_t + u_{it} \quad (1)$$

where *SHADOW* is the shadow banking. We use the shadow bank asset over GDP (Shadow bank/GDP) and the shadow bank asset over financial system asset (Shadow bank/financial system) to measure it, respectively. *PROFIT* is bank profitability to proxy the performance and competition of commercial banks. *CAP* is the capital reserve requirement. *FREEDOM* is financial freedom. *GROWTH* is GDP growth. *LAW* is law level. *INDIVIDUAL* means the score of individualism and *UNCERTAINTY* is the score

of uncertainty avoidance. φ_i is the specific-country fixed effect for developed countries and emerging countries. θ_t is the specific-year effect. The variables used in this paper and theirs expected effects on the shadow banks are shown in Table 1[1].

Insert Table 1 Here

Specifically, in Table 1, bank profitability is negatively related with shadow banking since the high profitability of commercial banking means commercial banks have a better business performance or a larger monopoly power. It would leave space for shadow banking to develop. The capital reserve requirement is positively related with shadow banking since the high capital requirement on traditional banking would decrease its capacity to supply credit and hurt its competiveness. Furthermore, the relationship of financial freedom and shadow banking is positive because less regulation would promote the banking development. GDP growth is expected to have a significant and positive effect on the shadow banking. Besides, Law would have a significant and positive effect on the shadow banking since good law would offer good investor protection and private property rights enforcement. It is beneficial for the development of shadow banking. Regarding the culture, individualism legitimizes the vigorous pursuit of personal interests and risk-taking behavior. It would encourage financial innovation. Uncertainty avoidance is expected to be negatively related with shadow banking since uncertainty avoidance cultures tend to be less tolerant towards ambiguity and negatively related to risk-taking.

3.2 Data source and description

In this paper, we collect the data of shadow banking asset in 27 countries from the Global Shadow Banking Monitoring Report (2017). The sample period is from 2002 to 2016. There are broad and narrow measures for the shadow banking asset. The broad measure of shadow banks is comprised of all the financial institutions that are not classified as banks, insurance corporations, pension funds, public financial institutions,

[1] Since commercial banks also engage in the regulatory arbitrage of Basel capital requirements to raise profits and compete with shadow banks by asset-backed commercial paper (ABCP) and the repurchase agreement, we use non-interest income over total income of commercial banks to measure the bank non-interest business. However, the regression results report that bank non-interest business is not significant to affect shadow banking. The reasons might refer to strict business regulations on the commercial banks in some countries. Therefore, we do not add this variable in the regression models.

central banks, or financial auxiliaries[2]. The narrow definition includes the non-bank financial entity types that authorities have assessed as being involved in credit intermediation that may pose financial stability risks, based on the FSB's methodology and classification guidance. Regarding that the sample period in the broad measure of shadow banking (2002-2016) is much than the narrow measure of shadow bank (2010-2016), we use the broad measure of shadow banking in our main regressions.

In terms of the competition of traditional commercial banks and financial regulation, bank profitability (*PROFIT*) is measured by bank return on equity before tax and capital reserve requirement (*CAP*) is measured by the bank regulatory capital to risk-weighted assets. These two variables are collected from Global Financial Development Database (GFDD). We collect the financial freedom (*FREEDOM*) from Heritage Foundation (2017). In line with Heritage Foundation (2017), financial freedom is a measure of the independence from government control and interference in the financial sector. In an ideal banking and financing environment, a minimum level of government interference exists. Independent central bank supervision and regulation of financial institutions are limited to enforcing contractual obligations and preventing fraud. Credit is allocated on market terms and the government does not own financial institutions.

With respective in the law and culture, we collect law (*LAW*) from Political Risk Services (PRS). Law is measured by law and order form a single component, but its two elements are assessed separately, with each element being scored from zero to three points. To assess the Law element, the strength and impartiality of the legal system are considered, while the Order element is an assessment of popular observance of the law. Thus, a high law level in this paper means that a country can enjoy a high rating in terms of its judicial system and observance of the law.[3]. We also collect two culture dimensions from Hofstede et al. (2010), including individualism (*INDIVIDUAL*) and uncertainty avoidance (*UNCERTAINTY*). Individualism shows a preference for individuals to take care of only themselves, make decisions based on individual needs and emphasis on individual initiative and achievement. The Uncertainty avoidance expresses the degree to which the members of a society feel uncomfortable and anxious with uncertainty and ambiguity.

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[2] Netherlands, Switzerland and United Kingdom combine other financial intermediaries (OFIs) and financial auxiliaries together and do not measure other financial intermediaries separately.

[3] Sine the data of law provided by Political Risk Services (PRS) is time variant compared to the time-invariant law data from La Portal, et al. (1998), we use the law data provided by Political Risk Services (PRS).

Panel A in Figure 1 shows the trend of cross-sectional average shadow banking from 2002 to 2016, which is measured by shadow bank asset over GDP. We observe that shadow banking keeps growing rapidly before the US subprime mortgage crisis (2008-2009) and diminishes greatly in the US subprime mortgage crisis. After US subprime mortgage crisis, shadow banking slowly increases. One of the reasons we expect is the implement of Basil II and Basil III. Furthermore, we find shadow banking in the advanced countries is much larger than the emerging countries. However, the shadow banking in the emerging countries grows faster than the advanced countries, especially after financial crisis. Panel B in Figure 1 shows the trend of shadow banking from 2002 to 2016, which is measured by shadow bank asset over financial system asset. We find the very similar results, that is, shadow banking grows before the US subprime mortgage crisis. In the US subprime mortgage crisis, shadow banking diminishes but keeps increasing after US subprime mortgage crisis. In addition, we argue that shadow banking in the emerging countries grows much faster than the developed countries.

Insert Figure 1 Here

Insert Figure 2 Here

Panel A in Figure 2 shows time-series average shadow banking in 27 countries measured by shadow bank asset over financial system asset. It is evident that shadow banking in these 27 countries has a huge difference in size. Canada (2.345), Ireland (12.115), Netherlands (6.355) and United Kingdom (2.618) have larger shadow banking. Argentina (0.044), Russia (0.119) and Saudi Arabia (0.046) have smaller shadow banking. Besides, we apply shadow bank asset over financial system asset to measure shadow banking in Panel B of Figure 2. The results report that Canada (0.452), Ireland (0.617) and Netherlands (0.532) have the larger shadow banking while Argentina (0.059), Singapore (0.058) and Hong Kong (0.058) have the smaller shadow banking. The details of shadow banking would be found in Table 2.

Table 2 shows the statistics of shadow banking and its explanatory variables. Hong Kong (0.210), Saudi Arabia (0.191) and Turkey (0.189) have the largest bank profitability while Italy (0.020), Japan (0.016) and Germany (0.016) rank the lowest. With respect of capital reserve requirement, Indonesia (0.193), Saudi Arabia (0.186) and Turkey (0.202) have the largest ratio but China (0.108), Spain (0.124) and Italy (0.121) have the lowest. Hong Kong (0.900), United Kingdom (0.853) and Netherlands (0.847) have the highest the level of financial freedom while Russia (0.340), Saudi

Arabia (0.433) and China (0.300) have the lowest level. During 2002 to 2016, China (0.096), India (0.074) and Turkey (0.058) experience the highest economic growth.

In terms of law and culture, Canada (0.057), Indonesia (0.060) and Netherlands (0.060) have the highest law level. The law level in Brazil (0.020), Mexico (0.022), Argentina (0.023) and South Africa (0.023) is the lowest. In individualism, Belgium (0.818), United Kingdom (0.890) and United States (0.910) have the highest level of individualism while Indonesia (0.140) and South Korea (0.180) have the lowest level. Japan (0.920) and Russia (0.950) have the highest level of uncertainty avoidance but Singapore (0.080), China (0.300) and Germany (0.290) rank the lowest.

Table 2 also lists the average of these variables for the developed and emerging countries separately. The developed countries have the larger shadow banking than the emerging countries. The bank profitability and capital reserve requirement in the emerging countries are larger than the developed countries. Though GDP growth in the emerging countries is higher than the developed countries, financial freedom and law level are much lower in the emerging countries. The score of individualism in the developed countries is higher than emerging countries. However, the score of uncertainty avoidance has not the significant difference in two types of countries.

Insert Table 2 Here

Insert Table 3 Here

Table 3 shows the results of the panel Granger causality tests. In Panel A, shadow banking is measured by shadow bank asset over GDP. We find that bank profitability, capital reserve requirement and GDP growth are Granger cause of shadow banking but the effect of financial freedom is not significant at the significant level of 5%. In Panel B, shadow banking is measured by shadow bank asset over financial system asset. Bank profitability, capital reserve requirement and financial freedom are Granger cause of shadow banking but the effect of GDP growth is not significant at the significant level of 10%. On the other hand, it is evident that shadow banking is also Granger cause of bank profitability, capital reserve requirement, and economic growth in both Panel A and Panel B at the significant level of 5 %. It means that the development of shadow banking also reversely affects commercial banking and economic growth.

4. Empirical Results

4.1 Basic results

In this section, we use the panel regression models to investigate the determinants of the shadow banking. In Panel A of Table 4, shadow banking is measured by shadow bank asset over GDP. We find bank profitability negatively affects shadow banking in Model 1 and Model 2, which means that bank profitability would impede the shadow bank development. Capital reserve requirement has a significant positive relationship with shadow banking in Model 1 and Model 2 since high capital reserve requirement would decrease credit supply and hurt the competitiveness of commercial bank over shadow bank. The conclusions support the conclusions from Kanatas and Greenbaum (1982), Duca (1992), Edwards and Mishkin (1995), Ratnovski (2013). It is evident that financial freedom significantly increases shadow banking. It shows that shadow banking tends to develop well in the situation with less financial regulation. However, the effect of GDP growth is not significant. With respective to law and culture in Model 2, law is positively related with shadow banking. It shows that a good law environment would promote the shadow banking development because of investor protection and financial innovation (see La Porta, et al., 1997; La Portal, et al., 1998; Pistor, 2013). High individualism is significantly and positively related with shadow banking. It suggests that high individualism tends to result in more financial innovation and investors with high individualism tend to purchase the more risky products of shadow banking. On the contrary, uncertainty avoidance is significantly and negatively associated with shadow banking since shadow banking is regarded as more risks and uncertainty than the traditional commercial banking. The findings are consistent to Kwok and Tadesse (2006) and Mourouzidou-Damtsa et al. (2017).

In Panel B in Table 4, we use shadow bank asset over financial system asset to measure shadow banking. We also observe that banking profitability also significantly reduces shadow banking in Model 3 and Model 4. The role of capital reserve requirement keeps its positive effect on the shadow banking but its effect is not significant in Model 3. Financial freedom, law and individualism keep their significant and expected effects on the shadow banking but the effect of uncertainty avoidance is not significant in Model 4.

Insert Table 4 Here

4.2 Results of the nonlinear panel regression models

The new Basel II and Basel III are implemented after 2010 and it increases minimum capital requirements, supervisory review and market discipline. We expect that new Basel II and Basel III regulate more on the commercial banks and drive

traditional banking business to shadow banks. Therefore, we set a time dummy variable (*POST*=1) for the implement of Basel II and Basel III from 2010 to 2016 and explore the nonlinear effects of our interested explanatory variables after 2010. Panel A of Table 5 shows that bank profitability significantly reduces shadow banking, which is measured by shadow bank asset over GDP. Capital reserve requirement and financial freedom significantly increase shadow banking but the effect of GDP growth is not significant in Model 1 and Model 2. Law, individualism and uncertainty avoidance keep their expected effects in Model 1 and Model 2. Regarding the interaction effect part in Model 4, we find the coefficient of bank profitability interacting with time dummy variable (*POST*) is -4.752. It means that the negative effect of bank profitability increases 4.752 after 2010. Meanwhile, the interaction effect of capital reserve requirement with time dummy variable is 27.201. It means that the effect of capital reserve requirement increases 27.201 after 2010. Interestingly, the coefficient of market freedom interacting with time dummy variable is -4.785. It means that more market freedom is decrease shadow banking because of higher market regulation in new Basel II and Basel III. Besides, the interaction effect of uncertainty avoidance with time dummy variable is -2.105 and other interaction variables are not significant.

In Panel B in Table 5, we also use shadow bank asset over financial system asset to measure shadow banking. The regression results report very similar results as Panel A. Bank profitability significantly reduces shadow banking and financial freedom significantly increases shadow banking size but the effect of capital reserve requirement is not significant. Law and individualism have the expected and significant effect on the shadow banking. In term of the interaction effect, it is evident that the coefficient of capital reserve requirement interacting with time dummy variable is 1.275 and the coefficient of financial freedom interacting with time dummy variable is -0.241. The results show the capital requirement plays a larger effect on shadow banking after Basel II and Basel III implement. The effect of market freedom also diminishes after 2010. Besides, the coefficient of uncertainty avoidance interacting with time dummy variable is -0.092 while the other interaction variables are not significant.

Insert Table 5 Here

4.3 More control variables in economic and financial openness

Since the trade and financial openness is documented to have an effect on the financial development (see Rajan and Zingales, 2003; Baltagi, et al., 2009) and global

flow of funds and current account deficit is expected to affect funding and lending positions associated with banking sector and shadow banking (e.g. Shin, 2012; Errico, 2014), we add three proxies of economic and financial openness in the regression models to investigate their roles on the shadow banking, including Chinn-Ito financial openness index (Chinn and Ito, 2006), trade openness and foreign direct investment level. Chinn-Ito financial openness index aims to measure a country's degree of capital account openness. Trade openness is the sum of exports and imports of goods and services over GDP. Foreign direct investment level is the sum of net outflows of investment and net inflows of investment from the reporting economy to the rest of the world, and is divided by GDP. Since these three variables have high correlations with each other, we add them one at a time into the regression (1).

Again, we use the shadow bank asset over GDP and shadow bank asset over financial system asset to measure shadow banking in Panel A and Panel B, respectively. Table 6 reports that bank profitability is significantly and negatively related with shadow banking and capital reserve requirement is significantly and positively related with shadow banking. The effect of financial freedom is not significant in Panel A except Model 1 but is significant in Panel B. Regarding law, individualism and uncertainty avoidance, it is evident that the effect of law and individualism is significant in Panel A and Panel B. Uncertainty avoidance has a significantly negative impact on the shadow banking in Panel A but is not significant in Panel B. In terms of three proxies to measure economic and financial openness, we observe that trade openness and foreign direct investment level are all significantly and positively related with shadow banking in Panel A and the effects of financial openness and trade openness are significant in Panel B. Overall, we think that the countries with economic and financial openness have larger shadow banking activities because the countries with economic and financial openness have more international capital flow borrowing or lending by the domestic intermediation sectors.

Insert Table 6 Here

4.4 Narrow measure for shadow banking

In this section, we apply the narrow definition of shadow banks and measure shadow banking by shadow bank asset over GDP and shadow bank asset over financial system asset, respectively. In Panel A of Table 7, we use shadow bank asset over GDP to measure shadow banking. The regression results show that bank profitability has a significant and positive effect on shadow banking in Model 1 and Model 2. Capital

reserve requirement is also significantly and negatively related with shadow banking. The effect of financial freedom is not significant on the shadow banking while GDP growth would significantly increase shadow banking. In terms of law and culture, the results report that law and individualism are significantly and positively related with shadow banking. Furthermore, in Panel B, shadow banking is measured by shadow bank asset over financial system asset. We also observe that the effects of bank profitability, capital reserve requirement and individualism are significant and keep their expected effects but other variables are not significant. Overall, these findings support that the effect of the competition of commercial banking, financial freedom, law and culture on the development of shadow banking is very robust.

Insert Table 7 Here

5. Conclusions

In this paper, we investigate the shadow banking development and its determinants in the 27 countries. The results show that shadow banking grows faster prior to the new Basil II and Basil III implement but grows slowly after 2010 especially for the developed countries. Shadow banking in the developed countries is much larger than developing countries. Regarding the determinants of shadow banking, we demonstrate a competition relationship with commercial banking and shadow banking. High profitability of commercial banks and low capital requirement reduce shadow banking. Furthermore, higher financial freedom is significantly and positively related with shadow banking. Higher individualism and low uncertainty avoidance are positively related with the development of shadow banking.

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Table 1 Variables and their expected impacts on the shadow banking

Variables	Meanings	Expected effects on the shadow banks
PFOFIT	Bank profitability	-
CAP	Capital reserve requirement	+
GROWTH	GDP growth	+
FREEDOM	Financial freedom	+
LAW	Law level	+
INDIVIDUAL	Individualism	+
UNCERTAINTY	Uncertainty avoidance	-

Table 2 Descriptive statistics of shadow banking and its explanatory variables in 27 countries

Country	Shadow bank/GDP	Shadow bank/finance	*PROFIT*	*CAPITAL*	*FREEDOM*	*GROWTH*	*LAW*	*INDIVIDUAL*	*UNCERTAINTY*
Developed countries									
Australia	0.382	0.118	0.137	0.135	0.623	0.031	0.040	0.680	0.685
Belgium	1.257	0.235	0.112	0.137	0.801	0.022	0.052	0.818	0.731
Canada	2.345	0.452	0.121	0.143	0.760	0.020	0.057	0.800	0.480
France	0.762	0.138	0.079	0.131	0.627	0.011	0.049	0.710	0.860
Germany	0.658	0.134	0.016	0.152	0.587	0.012	0.050	0.670	0.650
Hong Kong	0.552	0.058	0.210	0.159	0.900	0.038	0.049	0.250	0.290
Ireland	12.115	0.617	-0.058	0.164	0.813	0.047	0.060	0.700	0.350
Italy	0.548	0.276	0.020	0.121	0.620	0.000	0.039	0.760	0.750
Japan	0.722	0.118	0.016	0.132	0.480	0.008	0.050	0.460	0.920
Netherlands	6.355	0.532	0.071	0.145	0.847	0.012	0.060	0.800	0.530
South Korea	0.869	0.221	0.098	0.131	0.627	0.039	0.049	0.180	0.850
Singapore	0.488	0.058	0.128	0.163	0.653	0.056	0.051	0.200	0.080
Spain	0.815	0.201	0.075	0.124	0.740	0.014	0.049	0.510	0.860
Switzerland	2.092	0.259	0.041	0.151	0.813	0.018	0.050	0.680	0.580
United Kingdom	2.618	0.242	0.085	0.154	0.853	0.017	0.054	0.890	0.350
United States	1.506	0.326	0.092	0.137	0.787	0.019	0.050	0.910	0.460
Average	2.172	0.244	0.077	0.143	0.716	0.023	0.051	0.607	0.598
Emerging countries									
Argentina	0.044	0.059	0.128	0.159	0.347	0.031	0.023	0.460	0.860
Brazil	0.400	0.199	0.164	0.175	0.513	0.025	0.020	0.380	0.760
Chile	0.575	0.222	0.176	0.134	0.700	0.040	0.048	0.230	0.860

China	0.252	0.070	0.171	0.108	0.300	0.096	0.041	0.200	0.300
India	0.163	0.121	0.147	0.129	0.353	0.074	0.041	0.480	0.400
Indonesia	0.067	0.078	0.181	0.193	0.413	0.054	0.028	0.140	0.480
Mexico	0.161	0.162	0.131	0.154	0.633	0.022	0.022	0.300	0.820
Russia	0.119	0.100	0.108	0.158	0.340	0.035	0.037	0.390	0.950
Saudi Arabia	0.046	0.027	0.191	0.186	0.433	0.042	0.050	NA	NA
South Africa	0.533	0.158	0.168	0.140	0.593	0.029	0.023	NA	NA
Turkey	0.068	0.082	0.189	0.202	0.520	0.058	0.039	0.370	0.850
Mean	0.221	0.116	0.159	0.158	0.468	0.046	0.034	0.328	0.698
Diff. sig.	0.024	0.007	0.003	0.094	0.000	0.005	0.000	0.000	0.257

Note: The unit of shadow bank size (OFIs) is billion. Shadow bank/GDP means shadow bank asset over GDP and shadow bank/finance means shadow bank asset over financial system asset. Table 2 also provides the averages of the variables in the developing countries and emerging countries and their significance level in difference.

Table 3: Results of the panel Granger causality tests

	Panel A: Shadow bank/GDP		Panel B: Shadow bank/ financial system	
Null Hypothesis:	F-Statistic	Prob.	F-Statistic	Prob.
PROFIT does not Granger cause *SHADOW*	4.871	0.008	4.894	0.008
SHADOW does not Granger cause *PROFIT*	9.412	0.000	3.874	0.022
CAP does not Granger cause *SHADOW*	3.144	0.044	7.594	0.001
SHADOW does not Granger cause *CAP*	19.757	0.000	2.910	0.056
FREEDOM does not Granger cause *SHADOW*	1.186	0.307	2.417	0.091
SHADOW does not Granger cause *FREEDOM*	2.078	0.127	10.353	0.000
GROWTH does not Granger cause *SHADOW*	6.879	0.001	0.511	0.601
SHADOW does not Granger cause *GROWTH*	5.934	0.003	9.672	0.000

Note: The lag length number is set as 2. Shadow bank/GDP in Panel A means shadow bank asset over GDP and shadow bank/finance in Panel B means shadow bank asset over financial system asset.

Table 4: Results of the panel regression models

	Panel A: Shadow bank/GDP		Panel B: Shadow bank/financial system	
	Model 1	Model 2	Model 3	Model 4
Constant	-3.990***,	-5.970***,	-0.071	-0.299***,
	(0.974)	(1.440)	(0.065)	(0.084)
PROFIT	-6.846***,	-6.425***,	-0.259***,	-0.191***,
	(1.351)	(1.110)	(0.054)	(0.044)
CAP	18.106***,	22.081***,	0.330	0.695**
	(5.119)	(5.493)	(0.276)	(0.290)
FREEDOM	3.359***,	1.349**	0.307***,	0.212***,
	(0.476)	(0.532)	(0.037)	(0.037)
GROWTH	9.180	0.178	-0.099	-0.009
	(6.547)	(9.395)	(0.432)	(0.492)
LAW		83.794***,		3.446***
		(15.323)		(1.128)
INDIVIDUAL		2.437***,		0.284***,
		(0.434)		(0.032)
UNCERTAINTY		-1.430***,		0.006
		(0.500)		(0.028)
R-squared	0.379	0.512	0.313	0.457
Obs	383	353	381	351

Note: The dependent variable shadow bank/GDP in Panel A means shadow bank asset over GDP and the dependant variable shadow bank/finance in Panel B means shadow bank asset over financial system asset. ***, ** and * show the significance at the level of 1%, 5 % and 10%, respectively. White standard error is provided in parentheses.

Table 5: Results of the nonlinear panel regression models

	Panel A: Shadow bank/GDP		Panel B: Shadow bank/financial system	
	Model 1	Model 2	Model 3	Model 4
Constant	-5.464***	-5.224***	-0.280***	-0.273***
	(1.137)	(1.085)	(0.068)	(0.068)
PROFIT	-3.817***	-3.824**	-0.132**	-0.126**
	(1.461)	(1.585)	(0.056)	(0.061)
CAP	14.377***	10.326***	0.397	0.247
	(4.198)	(3.659)	(0.250)	(0.243)
FREEDOM	2.250***	2.852***	0.263***	0.282***
	(0.513)	(0.488)	(0.039)	(0.042)
GROWTH	-1.997	-1.228	-0.145	-0.070
	(3.514)	(3.436)	(0.226)	(0.235)
LAW	85.605***	75.289***	3.660***	2.900**
	(14.038)	(11.885)	(1.092)	(1.240)
INDIVIDUAL	2.251***	1.897***	0.275***	0.295***
	(0.351)	(0.366)	(0.029)	(0.039)
UNCERTAINTY	-1.230***	-0.221	0.014	0.058**
	(0.372)	(0.415)	(0.023)	(0.028)
*PROFIT*POST*	-5.359***	-4.752**	-0.096	-0.076
	(2.012)	(2.012)	(0.085)	(0.088)
*CAP*POST*	20.353***	27.201***	0.967***	1.275***
	(5.340)	(6.813)	(0.326)	(0.382)
*FREEDOM *POST*	-3.498***	-4.785***	-0.186***	-0.241***
	(1.007)	(1.306)	(0.068)	(0.084)
*GROWTH*POST*	3.778	-0.759	0.304	-0.028
	(8.524)	(10.207)	(0.456)	(0.553)
*LAW*POST*		21.636		1.814
		(19.856)		(1.395)
*INDIVIDUAL*POST*		0.418		-0.051
		(0.707)		(0.058)
*UNCERTAINTY*POST*		-2.105***		-0.092**
		(0.673)		(0.042)
R-squared	0.556	0.572	0.478	0.487
Obs	353	353	351	351

Note: The dependent variable shadow bank/GDP in Panel A means shadow bank asset over GDP and the dependant variable shadow bank/finance in Panel B means shadow bank asset over financial system asset. ***, ** and * show the significance at the level of 1%, 5 % and 10%, respectively. White standard error is provided in parentheses. We do not use year-fixed effect in the regression models here.

Table 6: Results of the panel regression models with economic and financial openness

	Panel A: Shadow bank/GDP			Panel B: Shadow bank/financial system		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	-6.131***	-6.287***	-4.431***	-0.324***	-0.296***	-0.236***
	(1.447)	(1.444)	(0.937)	(0.081)	(0.085)	(0.070)
PROFIT	-6.234***	-6.369***	-6.054***	-0.162***	-0.192***	-0.176***
	(1.145)	(1.078)	(1.107)	(0.046)	(0.044)	(0.045)
CAP	21.537***	19.654***	16.799***	0.610**	0.713**	0.465*
	(5.292)	(5.257)	(4.432)	(0.266)	(0.288)	(0.251)
FREEDOM	1.007*	0.888	-0.254	0.159***	0.216***	0.146***
	(0.555)	(0.569)	(0.520)	(0.040)	(0.039)	(0.038)
GROWTH	1.128	-0.313	-5.185	0.139	-0.006	-0.230
	(9.535)	(9.378)	(5.424)	(0.473)	(0.494)	(0.329)
LAW	83.115***	83.969***	73.436***	3.338***	3.443***	3.041***
	(15.174)	(15.093)	(13.085)	(1.081)	(1.131)	(1.093)
INDIVIDUAL	2.615***	3.558***	3.306***	0.311***	0.275***	0.320***
	(0.501)	(0.595)	(0.444)	(0.038)	(0.039)	(0.033)
UNCERTAINTY	-1.529***	-0.871*	-0.970**	-0.010	0.002	0.026
	(0.485)	(0.491)	(0.433)	(0.029)	(0.029)	(0.026)
OPEN	0.826			0.129***		
	(0.565)			(0.040)		
TRADE		0.420***			-0.003	
		(0.133)			0.009	
FDI			4.388***			0.184***
			(0.764)			(0.041)
R-squared	0.515	0.522	0.623	0.473	0.457	0.500
Obs	353	353	351	351	351	349

Note: The dependent variable shadow bank/GDP in Panel A means shadow bank asset over GDP and the dependant variable shadow bank/finance in Panel B means shadow bank asset over financial system asset. ***, ** and * show the significance at the level of 1%, 5 % and 10%, respectively. White standard error is provided in parentheses.

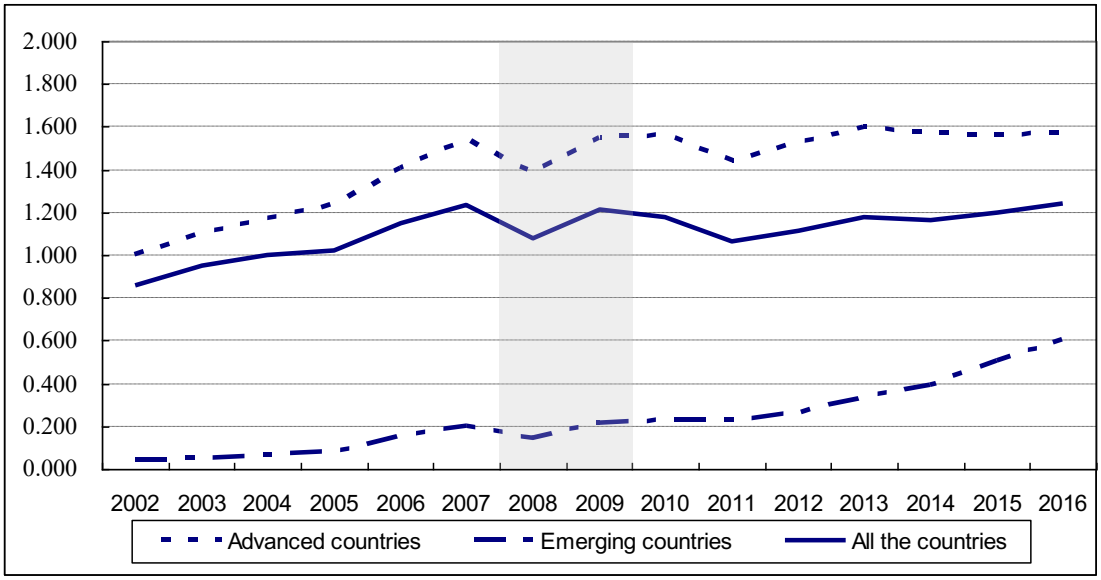
Table 7: Results of panel regression models by the narrow measure on shadow banking

	Panel A: Shadow bank/GDP		Panel B: Shadow bank/financial system	
	Model 1	Model 2	Model 3	Model 4
Constant	-2.613**	-4.050***	0.005	-0.072
	(1.042)	(1.374)	(0.063)	(0.080)
PROFIT	-6.847***	-6.327***	-0.271***	-0.249***
	(1.092)	(0.903)	(0.053)	(0.045)
CAP	20.413***	24.125***	0.529	0.694*
	(6.797)	(7.079)	(0.386)	(0.409)
FREEDOM	-0.132	-1.046	-0.004	-0.026
	(0.532)	(0.668)	(0.032)	(0.040)
GROWTH	10.580**	5.734	0.445	0.564
	(4.604)	(6.749)	(0.315)	(0.352)
LAW		50.520***		0.585
		(18.738)		(1.102)
INDIVIDUAL		0.857**		0.115***
		(0.336)		(0.025)
UNCERTAINTY		-0.471		-0.005
		(0.408)		(0.025)
R-squared	0.449	0.523	0.203	0.307
Obs	186	172	186	172

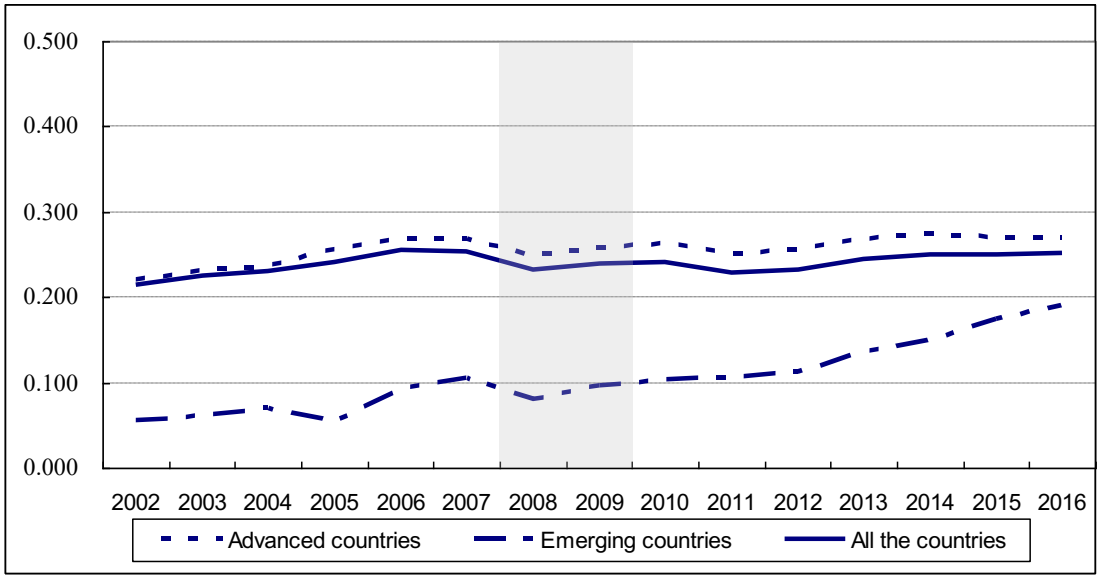
Note: The dependent variable shadow bank/GDP in Panel A means shadow bank asset over GDP and the dependant variable shadow bank/finance in Panel B means shadow bank asset over financial system asset. ***, ** and * show the significance at the level of 1%, 5 % and 10%, respectively. White standard error is provided in parentheses.

Figure 1: Trend of cross-sectional average shadow banking from 2002 to 2016

Panel A The trend of cross-sectional average shadow banking from 2002 to 2016 measured by shadow bank asset over GDP



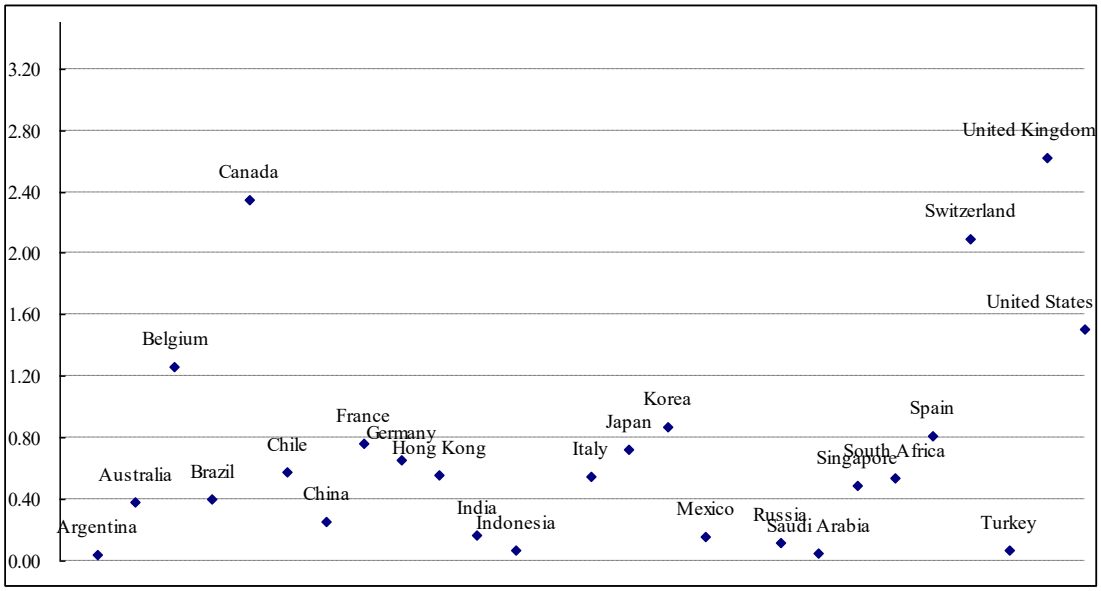
Panel B The trend of cross-sectional average shadow banking from 2002 to 2016 measured by shadow bank asset over financial system asset



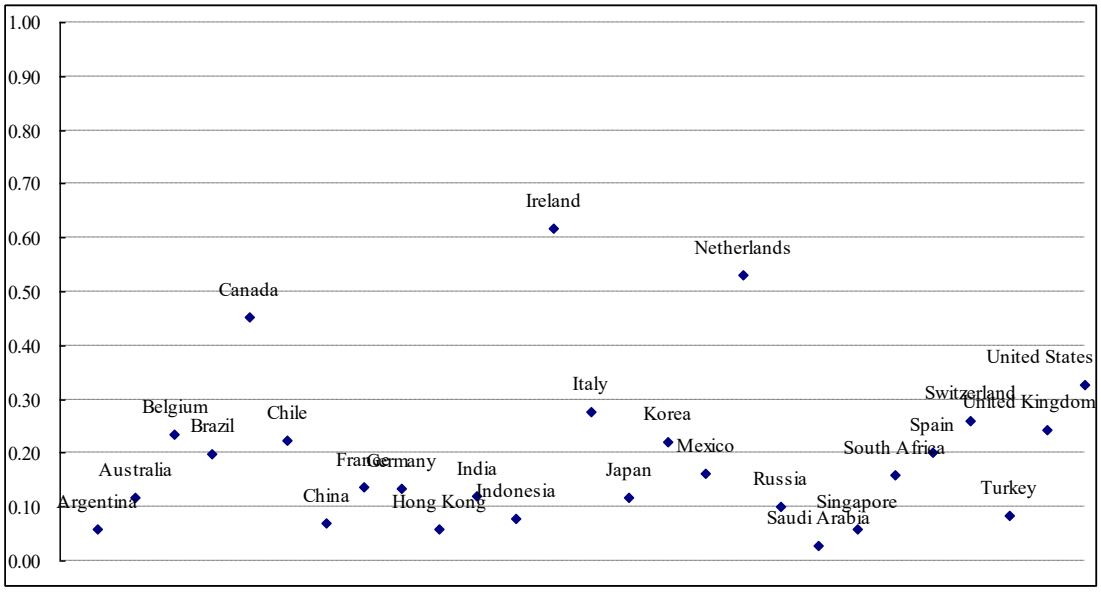
Note: We calculate the average shadow banking for all the countries, advanced countries and emerging countries each year from 2002 to 2016. The shaded part shows the US subprime mortgage crisis (2008-2009). In Panel A, shadow banking is measured by shadow bank asset over GDP. In Panel B, shadow banking is measured by shadow bank asset over financial system asset.

Figure 2: Time-series average shadow banking in the 27 countries measured by shadow bank asset over GDP

Panel A The time-series average shadow banking in the 27 countries measured by shadow bank asset over GDP



Panel B The time-series average shadow banking in the 27 countries measured by shadow bank asset over financial system asset



Note: We calculate the time-series average shadow banking by using 27 countries data from 2002 to 2016. In Panel A, shadow banking is measured by shadow bank asset over GDP. Since the shadow banking in Ireland (12.115) and Netherlands (6.355) is much larger than the other countries, we can not draw these two countries in Panel A in Figure 2. In Panel B, shadow banking is measured by shadow bank asset over financial system asset.