

Originators, Traders, Neutrals, and Traditioners – various banking business models across the globe. Does the business model matter for financial stability?

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Abstract:

The mortgage crisis has revealed that the general knowledge about the activity undertaken by banks is very limited. How should we make the global system safer in the future if we do not know what exactly the banks have been doing? How do we want to regulate the system to avoid such crises if we do not know which banks' strategies have provoked the mortgage crisis? Why were some banks heavily affected by the crisis, while others only slightly felt their consequences. This article raises these issues. It shows that the global banking has increased in complexity and heterogeneity during the recent decades. Banks follow various strategies, which make their characteristics more diverse, and thus unequally distribute risk for the banking sector. We do find that the most risky banking model is when the banks heavily trade in the securitized asset. However the least risky seems to represent banks with the most diversified asset, and engaged in traditional activities.

* Keywords: Bank risk, business models, bank regulation, financial crisis, banking stability

JEL Codes: G21, G15, E58, G32

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1. Introduction

The mortgage crisis has revealed that the general knowledge about the activity undertaken by banks is very limited. The economists and researchers started to point out that supervisory authorities did not have reliable knowledge about the banks' investment, which did not allow them to properly assess the risk in the banking sector. Also, many transactions undertaken by banks before the mortgage crisis were so complex that it was difficult to understand their structure and thus the risk involved in it. Moreover, the interlinkages between the banks were so significant, that the contagion effects quickly spread the crisis over the globe. At the end, many governments were forced to rescue the troubled institutions when their assets declined in value, and the level of capital was quickly deteriorating. Though five years passed, we still do not know what exactly the banks have been doing, and how to regulate the banking sectors to limit a risky investment in the future. Moreover, the mortgage crisis has also shown that its consequences were different for various countries. This further means that the contribution of banks to the crisis, as well as the level of financial distress of domestic banking sectors depended on the strategy banks followed. The Time writes: "Five years after the Lehman Brothers bankruptcy kicked off the largest economic dislocation in the U.S. since the Great Depression, we are still debating what needs to be done to make the financial system safer? We are still trying out to figure out what exactly happened" (September, 16, 2013).

With our study we raise very important issue: what exactly the banks have been doing, and how their activities and characteristics differed between the countries? More specifically, we raise following issues: a) what types of activities banks undertake?, b) do these activities differ between the individual countries?, c) what kind of country's institutional features have contributed to the development of specific banking business models?, and finally, d) which banking business models have resulted in the hit of the financial crisis?

The existing literature trying to explain "*what exactly banks do*" can be distinguished into two pieces: theoretical and empirical studies. The theoretical literature assesses the banks on their entire strategy, i.e. a mix of asset-liability structure, treating all financial characteristics as exogenous. This literature divides banks as commercial, investment, and universal types. The commercial banks represent the traditional model of banking business, as these institutions take the deposits and convert them into loans. The investment banks were thought to deal with capital markets' investment, and products. Finally, the universal banks represent the model, which can boost banks' performance by diversifying the lending activities through capital market involvement. For a very long time, in the banking literature the universal model has appeared as the most beneficial one, and thus was recommended to follow (Diamond, 1991; Rajan, 1992; Stein, 2002). On the other hand, the

empirical literature looks at the individual features of the sample banks examining which of them stimulate the risk in the banking sector. Importantly, these studies do not assess “how” banks achieve these characteristics, but rather the effect of these characteristics on these banks’ behavior. Consequently, we are able to identify implications of the literature shortcomings. First, the increase of banking models in complexity and heterogeneity has caused that regulators have lost an overview of the banking business, and thus of the risk level in the banking sector. For example, Hordahl and King (2008) argue that “the (former) top US investment banks funded roughly half of their assets using repo markets, with additional exposure due to off-balance sheet financing of their customers”. Moreover, the banking business has also increased in heterogeneity much more than it used to be ten years ago. For example, the structure of assets of UBS, BNP Paribas or Barclays Bank, banks which follow the universal banking model is much more diverse now than it used to be several years ago. Relatedly, Gropp and Heider (2009) document that there is huge heterogeneity in the level of banks capital between the banks in various countries, which is not explained by capital requirements, but rather by banks’ specific features. Thus, it is important to know what exactly banks have been doing, and which banking business models have emerged recently. Following this argument the next question arises. We still do not know how various combinations of these new banks’ characteristics translate into capital, liquidity and the risk of these banks. The mortgage crisis has revealed that banks in various countries have distinctly contributed to the financial crisis, and thus were differently affected by it. Consequently, we would like to know which characteristics of banks make the systems more risky and thus more sensitive to the financial distress. Without answering these questions, we will not know how to regulate the banking system to make it safer in the future. Thus, this paper offers an important contribution to the literature on financial crises’ determinants, banks’ behavior, and the shape of future banking regulations. We end up with implications for the regulators.

Our results are promising. Taking as a sample all banking institutions from twenty-five countries, we use the factor model analysis to capture the differences between the banking institutions across the globe. More specifically, the factor model allows us to group the banks according to their similarities, depending on the explanatory power of individual banks’ characteristics, expressed by financial variables. Each factor group represents then an individual banking model. Our results suggest that we can identify four distinct banking business models across the globe: “*originators*”, “*traders*”, “*neutrals*” and “*traditioniers*”. Then grouping banks according to the specific models, as determined in the factor analysis, we regress the banks’ determinants on the model choice. This allows us to determine the characteristics of individual models. Our regression results show that there is a wide heterogeneity in the banking business strategies. We find that banks following the traditional model were smaller in size, less capitalized, but less risky for the financial systems than other models of

banks. Also, the old universal model, despite the large size of the institutions following this model, and its systemic importance, it appears to be less risky due to the diversified balance sheet structure of the banks. The trader and originator models have turned out to be the least risky during the prosperity years, as a result of high profitability of banks following these models and high capital ratios, but they collapsed during the mortgage crisis 2007-2011 to the largest extent, making these institutions financially distressed. Moreover, our regression results also suggest that specific institutional features were responsible for development of individual banking business models. The “originators” tended to appear in more advanced countries, with sufficiently developed capital markets; “traders” were banks coming from small economies with highly competitive markets, probably were forced to search for additional profit opportunities externally. We also find that “neutral model” seems to be driven by the capital regulations rather than financial development. Finally, the banks who decided to follow the traditional banking model were operating in less developed countries, with small saturation of the credit market, and thus exploring great opportunity in this market segment. Finally, we also look at how risky are the particular business models for the financial stability. Taking an experience of mortgage crisis our results reveal that all models except from the traditional one are very risky, i.e. are correlated with our financial distress measures. However our estimations show that the trader model contributes to this risk at most. This is consistent with the observations during the mortgage crisis. Banking falling under this model as UBS, ING, Fortis Bank were hit by the crisis much more than were other banks. Our estimations also show that banking engaging in the traditional model as traditioniers, and diversified neutral model was the least affected by the crisis. The former model even shows a negative correlation with our financial distress indices.

The paper is following organized. The first section is an introduction, the second section analyzes the theoretical and empirical literature on banking business models; the third section analyzes the banking business models that have emerged in the recent decades in the global systems; the fourth section determines the characteristics of these models and assess their implications, and finally section fifth concludes.

2. Literature Review

2.1. Banking business models and the risk in theory

The existing theoretical literature relying on the asset-liability mix, classify banks into three categories: commercial, investment, and universal institutions.

The first banking group relies on traditional banking activities, as collecting the short-term deposits and transforming them into long-term loans. Thus, the asset structure of these banks mainly consists of the granted loans, and the interest income is a main source of banking revenue. Funding the loans through the deposits has also an economic foundation. Because the deposits, mostly of retail nature are unlikely to be withdrawn prematurely due to their public protection, they are held for their liquidity services (Song and Thakor, 2007). Another reason why lending and deposit taking services can be provided within the same banking firm is because both financial services entail the provision of liquidity to bank customers, which in turn improves the institution's own liquidity management (Kashyap, Rajan and Sajan, 2002). The relationship banking constitutes an important part of this banking business model, and allowed these banks to experience considerable interest margins for a very long time. In the recent decades, the innovations and competition from capital markets have reduced these margins, causing the decline interest in these types of activities (Boost, 2000). The traditional banks were believed to be very beneficial for the financial sector due to their monitoring activities (Merton, 1976). Also, recently DeJonghe (2010) and Demirguc-Kunt (2009) find that banks suffer less from financial distress when their business consists from the traditional model.

In turn, the investment banks focus mainly on the fee-income generating activities and non-deposit funding. Especially, these include trading, brokerage, and other investment banking activities. While the investment banks are not allowed to take deposits, their main source of funding is capital market. Especially, repo and commercial papers were the most prevalent (Kalemli-Ozcan et al., 2011). Recently, we have observed the decline of the maturity of these banks' borrowing sources. Financial Crisis Inquiry Commission (2011) claims that US investment banks' use of repo borrowing increased by almost one trillion dollar from 2004 to 2007, of which an increasing part consisted by overnight repos. However Hordahl and King (2008) argue that "the (former) top US investment banks funded roughly half of their assets using repo markets, with additional exposure due to off-balance sheet financing of their customers" (p.39). Wu et al. (2011) document that banks most active in securitization market were often found to have lower solvency risk, higher profitability levels, and were better capitalized. Thus, the investment banking model has been characterized by high proportion of fee and trading income, increased leveraged, but higher profitability ratios (Demirguc-Kunt et al., 2009).

Finally, the universal model allows banks to combine the investment banking with commercial activities. The re-introduction of this model in the US happened by Gramm-Leach-Bliley in 1999, however in many other countries around the world this model was very popular before. The

economic reasoning behind the universal model is that banks gain information on their customers in the provision of one financial service that may prove useful in the provision of other financial services to these same customers. The combination of various types of activities, for instance loan making with securities underwriting, may increase return as well as diversify risks, and improve banks' performance (Diamond, 1991; Rajan, 1992; Stein, 2002). Though, the intuition behind this model to diversify also the funding source, the recent data show that these banks were heavily involved on the US interbank market (McGuire and von Peter, 2009; Fender and McGuire, 2010 a and b). DeYoung and Rogers (1998) document that large amounts of fee-based or non-traditional products and services improved these banks efficiency in the 1980s and 1990s. However DeYoung and Rice (2004) show that non-interest income increases banks' profitability but also the earnings volatility. Similar results find Siroh and Rumble (2006) who find that diversifying income in non-traditional activities improves bank performance. The extent to which a bank can profit from the diversification of various income activities depends on the co-movements of the risky income from these activities. Also, larger institutions become too complex, and too costly to be monitored (Buch et al., 2012). Thus, the empirical results on the impact of diversification on banks' performance present ambiguous results.

The literature provides also some hints, which country's institutional features are responsible for dominance of particular models. This literature shows that in countries with well-developed creditor rights, banking sectors are better developed and banks tend to choose the universal model banking. However in countries with well-developed shareholder rights and capital regulations, investment banking model dominates (Schmidt, 2001). Reladely, Allen et al. (2010) show that countries with sufficiently developed both banking and capital markets experience shorter-term and significantly lower reversal in financial distress caused by financial crisis. The authors also show that this only holds for countries based on capital-market financial system, and does not hold for countries on bank-based model. Similar conclusions reach Reinhart and Rogoff (2009) showing that it takes longer and it is more costly for emerging countries to recover from banking crises due to insufficiently developed capital markets. Beltratti and Stulz (2009) examine how differences in bank corporate governance and country-level regulatory approaches affected bank stock returns in the financial crisis. The main findings are that banks with a board of directors that less shareholder-oriented and banks that are located in countries with stronger capital regulation performed better.

2.2. Banking business models in the empirical literature

In contrary to the theoretical models, the empirical literature tries to classify banks according to banks' characteristics rather than assessing entire business models. Specifically, these studies

investigate which banks' features make the financial system more risky. These studies classify the banks according to the income source, asset structure, funding strategies, and capitalization level. Stiroh (2004, 2006) and Fraser, Madura, and Weigand (2002) find that non-interest income is associated with more volatile bank returns. DeYoung (2010) and Roland (2001) find that fee-based activities are associated with earnings variability, though increased revenues. Recently, Demircug-Kunt and Huinzig (2010) find that bank risk decreases up to the 25th percentile of non-interest income, and then increases. Interestingly, DeJonghe (2010) document that the shift to non-traditional banking activities, which generate commission, trading and other non-interest income, increases banks' tail betas and thus reduces banking system stability. The author shows that interest income is less risky than all other revenue streams. Other indicators of bank specialization in traditional intermediation, such as a higher interest margin or higher loans-to-asset ratio document that traditional banking activities result in lower systemic banking risk. Similar results find Brunnermeier et al. (2010) documenting that higher non-interest income (noncore activities like investment banking, venture capital and trading activities) have a higher contribution to systemic risk than traditional banking (deposit taking and lending).

Another array of studies investigate the relationship between the asset structure and banking fragility. Kohler (2012) in his paper analyzes the impact of loan growth and business models on bank risk in 15 EU countries. The results further indicate that banks with high rates of loan growth are more risky than banks more conservative in their growth strategy. According to Duffie and Gârleanu (2001) securitization itself improves banks' liquidity and has a positive effect on their overall market value. However if securitization is used for financing purposes, this additional funding could fuel riskier lending. Following this, Krahn and Wilde (2006) argue that asset securitization increases the bank's exposure to systematic risk, when originating banks retain the first-loss position of a securitized assets, and invest the rest in additional loan portfolio. Shleifer and Vishny (2011) show that investor sentiment makes profits and balance sheet of banks involved in the securitization process volatile. The authors also show that this risk increases with the bank's leveraged. Relatedly, Cifuentes et al. (2005), and Brunnermeier and Sannikov (2010) show that when the market structure is complete and banks keep similar assets in their balance sheet, the contagion effect driven by the asset price changes increases, and thus the systemic risk in a banking sector. Acharya, Hasan and Saunders (2002) studied the effect of specialization versus diversification of assets on the return and risk of Italian banks over the period 1993-1999. Their results are documenting that a diversification in bank assets does not produce superior performance and/or greater safety for banks.

Other studies analyze the role of source of banks' funding on the banks' fragility. The recent studies have shown that deposit-funded banks were less affected by the mortgage crisis and showed better performance, and were less risky (Shleifer and Vishny, 2010). This is because the retail deposits are typically insured by the government, and their withdrawals in most circumstances are usually predictable at the aggregate level and mostly linked to the depositors' liquidity needs (Song and Thakor, 2007; Ivashina and Scharfstein, 2010; Demirguc-Kunt and Huizinga (2010); Huang and Ratnovski, 2011). In contrary, banks, which relied on the wholesale funding, were more heavily hit by the mortgage crisis. This is because in the liquidity crisis the wholesale market immediately reacts to the bad signals on the market situation. This effect is related to the fact that providers of short-term funding have little incentive to monitor banks and instead may simply withdraw their funds at first negative market signal regarding the client's bank's financial health, triggering immediate funding tensions (Huang and Ratnovski, 2011). Interestingly, recent evidence also shows that when funding from financial market became unavailable, or very expensive, the market valued more positively those institutions more heavily funded via customers' deposits (Beltratti and Stultz, 2011; Demirguc-Kunt et al., 2010). However Allen et al. (2012) document that interbank market is a important source of shock transmission between the countries. Finally, Demirguc-Kunt et al. (2010) find that better capitalized experienced smaller decline in their equity value during the mortgage crisis than less capitalized.

3. What banking business models do exist in the world?

As already argued in the introduction section, we are interested in identifying the existing banking models. We argue that viewing the banking business models as traditional, universal, and investment is too broad and hides many characteristics of these banks. This is because banks differ in a way how they achieve these their performance. Moreover, the recent changes in the financial markets have extended the type and the complexity of the banks' activities making the banking business much more heterogeneous. In order to model the banking business strategies functioning across the globe, we use a factor model approach. Factor analysis allows latent variables, which cannot be observed directly – in our case the banking business model – to be assessed by a set of measures which are observable: reflective indicators (see e.g. Diamantopoulos et al., 2008). In our case the factor model will use the individual financial variables, as described in the empirical section, to group them into one component (i.e. factor), depending on the relative explanatory power of these variables. The differences in the factors' characteristics will show us the differences between banking models. Our analysis covers the years 1995 and 2006 and uses all banking institutions from the OECD countries:

Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Germany, Greece, Hungary, Ireland, Israel, France, Ireland, Italy, Luxembourg, the Netherlands, Mexico, Poland, Portugal, Slovakia, Spain, Switzerland, the United Kingdom, and United States, New Zealand. From a macroeconomic point of view, it is highly representative, as it covers around two-thirds of the total aggregate balance sheet of banks operating in the European Union and United States. Additionally, in order to investigate the differences in the banking strategies within time, we also perform the analysis for various time-periods. We also look at how banks' strategies differ with the banks' size. Table 1 presents the results for factor analysis based on the full sample period, and two time sub-periods as 1999-2006 and 2004-2006, whereas table 2 presents the analysis, depending on the size of the banks.

[Tables 1-2]

The estimation results document that each factor can be explained by distinct banks' characteristics. Interestingly, these factors' loads present the features of individual banking business models, at the same time allowing for capturing the heterogeneity between the banks within a country. The first factor load shows that non-interest income and capital ratio represent almost 60 percent of the bank's characteristics. Since high amount of non-interest income and lower capitalization seems to be representative for banks heavily investing, and involved in the capital market activities, we argue that this model might represent the strategy of such banks as UBS, ING or Fortis banks, which we call a "*trader*" model. The second factor load is mostly explained by the interest revenues and the loan activity, which is the most prevalent for the banks heavily engaged in the traditional activities. Therefore, we call banks following this strategy "*traditioniers*" because they represent the traditional banking model. The factor three is mainly explained by the profitability of a bank. Consistent with the empirical literature, we argue that these characteristics might explain the strategy of banks following the "old-designed" universal model, and which through its economy of scale and scope enable these banks to improve their performance. It is not characterized by the dominance of any income source. Due the diversified nature of these banks' activities, we label these banks as "*neutrals*". Finally, the factor four mainly loads on non-operating income as a main determinant of the business strategy. These banks may refer to the institutions, originating and placing recently popular new financial products as securitization. Therefore, we call these banks "*originators*".

Importantly, the factor model estimations show that the importance of individual banks' characteristics differ between individual sub-periods. Especially, the data seem to suggest that the divergence between the banking activities across the globe occurred at the end of 90s. The banks' determinants explaining the individual factors (banking business models) show the highest

explanatory power in the second sub-period of 1999-2006. However we also find that the importance of specific model characteristics' slightly declined at the eve of the mortgage crisis between 2004-2006. Moreover, the data also suggest that non-interest income was the main driver of banks' performance in the entire sample period, which points toward high risk accumulation in the banking sector before the mortgage crisis. This fact has been mentioned as the main determinant of the mortgage crisis 2007-2011. The importance of the income interest however slightly increased for all sample banks between 2004-2006.

Also, interesting feature of our all sample banks is the dominance of non-operating revenue, which even surpassed the income from other operating transactions. This might point toward high volume of off-balance sheet transactions in the banking sectors during the recent years, as suggested by Hordahl and King (2008). The importance of this income has however slightly decreased in the years before the mortgage crisis, being dominated by other operating income. It might suggest a dominance of the "trader" model in the global banking systems. Finally, the data also show that the larger the bank is, the more non-interest activities it exhibits. Also, consistent with many empirical studies, our data show that the size of a bank translates into a better profitability. In the 90 centile of the global banking assets, the profitability is the main factor explaining a banking business model. This supports the empirical evidence on the positive effects of economy of scale in the banking sector (Siroh and Rumble, 2006).

Table 1: Factor Model Analysis

	(1) 1995-2006					(2) 1999-2006					(3) 2004-2006				
	factor 1	factor 2	factor 3	factor 4	Comm.	factor 1	factor 2	factor 3	factor 4	Comm.	factor 1	factor 2	factor 3	factor 4	Comm.
Logasset	-0.425	-0.196	0.086	-0.151	0.751	-0.408	-0.199	0.095	-0.147	0.763	-0.446	-0.248	0.036	-0.031	0.737
net interest revenue	0.149	0.620	0.046	-0.023	0.591	0.160	0.605	0.057	-0.036	0.604	0.202	0.554	0.134	-0.087	0.627
other operating revenue	0.608	0.000	0.061	-0.088	0.619	0.568	0.024	0.045	-0.100	0.665	0.518	-0.014	0.057	-0.039	0.726
nonoperating revenue	-0.298	-0.239	0.085	0.299	0.757	-0.289	-0.273	0.114	0.297	0.740	-0.134	-0.060	0.225	0.553	0.623
cost to income	0.004	-0.074	-0.497	0.064	0.744	0.012	-0.100	-0.485	0.048	0.752	0.004	-0.071	-0.260	0.590	0.579
net loans	-0.159	0.497	0.040	-0.022	0.725	-0.154	0.484	0.061	0.004	0.738	-0.164	0.456	-0.005	-0.093	0.757
ROE	0.011	0.024	0.553	0.060	0.690	-0.007	0.027	0.540	0.057	0.704	-0.001	0.086	0.604	-0.044	0.626
equity to total assets	0.559	0.047	-0.034	0.006	0.684	0.535	0.045	-0.037	0.001	0.711	0.544	0.053	-0.045	-0.136	0.681

Note: The table displays the rotated factor loadings.

Table 2: Factor Model Analysis

	Centile 50		1995-2006			Centile 75			1995-2006			90 centile		1995-2006	
	Factor 1	Factor 1	Factor 3	Factor 4	Comm.	Factor 1	Factor 2	Factor 3	Factor 4	Comm.	Factor 1	Factor 2	Factor 3	Factor 4	Comm.
logasset	-0.243	-0.050	0.101	0.024	0.912	-0.057	-0.206	-0.109	0.147	0.879	0.641	-0.105	0.053	-0.036	0.574
net interest revenue	0.134	0.702	-0.014	-0.096	0.478	0.728	0.195	-0.040	-0.193	0.389	-0.130	0.902	0.020	-0.145	0.149
other operating revenue	0.656	0.079	0.107	-0.123	0.534	0.425	0.464	0.109	-0.095	0.580	0.325	0.766	0.156	-0.051	0.279
nonoperating revenue	-0.144	-0.232	0.092	0.605	0.549	-0.301	0.044	0.127	0.782	0.279	-0.068	-0.189	0.129	0.752	0.376
cost to income	-0.056	-0.018	-0.262	0.605	0.560	0.029	-0.080	-0.211	0.766	0.361	0.034	-0.079	-0.238	0.749	0.375
net loans	-0.003	0.667	0.019	-0.081	0.547	0.652	0.097	0.023	-0.144	0.536	-0.232	0.665	0.082	-0.249	0.387
ROE	0.084	0.002	0.546	-0.122	0.680	-0.019	0.096	0.486	-0.109	0.742	0.092	0.267	0.539	-0.132	0.613
equity to total assets	0.582	0.094	-0.053	-0.059	0.643	0.342	0.549	0.040	0.042	0.578	-0.251	0.558	0.089	0.099	0.549

Note: The table displays the rotated factor loadings.

4. Banking Business Models and their Characteristics

4.1. Summary statistics

In this section we create the summary statistics for the characteristics of the individual banking models, as defined in the previous section. Therefore, we assign a dummy equals one if the bank belongs to one of the above defined models: traditional, neutral, originator or trader, based on the factors developed in the previous section. Table 3 presents the summary statistics for two sub-periods: the period before the crisis 1995-2006, and period after the hit of the mortgage crisis. The data are grouped by the type of the business models.

[Table 3]

Table 3: Summary Statistics

Business Model	1995-2006					2007-2009				
	Obs.	Mean	Std. Dev.	Min.	Max	Obs.	Mean	Std. Dev.	Min.	Max.
TRADITIONAL MODEL										
logasset	484	4.221	3.490	-2.198	10.517	74	6.208	3.675	-1.634	10.859
equity to total assets	485	12.461	12.991	-55.560	97.980	74	10.353	6.706	0.560	43.600
Tier 1 capital	102	17.272	23.130	5.090	137.200	22	11.568	10.620	5.010	57.510
net interest revenue to average assets	483	3.141	2.878	-6.360	32.590	74	2.923	2.086	-1.390	14.300
other operating income to average assets	483	2.797	9.635	-28.150	197.170	74	2.799	7.266	-1.650	63.190
non-operating income to average assets	447	-0.110	12.438	-195.920	129.760	70	-0.185	0.340	-1.410	0.940
ROA	483	0.775	2.696	-25.320	12.680	74	1.109	1.093	-3.770	4.670
pre-tax profit to asset	84	23.336	50.141	-65.182	241.426	19	42.883	51.469	0.183	154.839
cost to income	478	76.803	61.534	1.020	857.140	74	64.700	19.899	15.980	143.400
net loans to total assets	473	45.282	19.041	-0.020	87.460	74	50.964	25.211	0.000	86.470
banking sector concentration	431	75.208	8.602	58.100	97.643	66	74.596	6.227	65.643	85.525
banking sector development	486	36.756	16.670	12.758	87.380	74	48.409	27.022	16.666	168.537
capital market development	486	31.407	26.597	2.690	112.504	74	47.830	28.639	7.766	112.115
gdp per capita	486	7 013.560	2 954.101	3 107.074	19 859	74	12 975	3 464	9 484	23 716
NEUTRAL MODEL										
asset	713	8.416	2.506	-3.230	14.114	88	9.666	2.670	2.289	14.432
equity to total assets	722	11.440	15.758	0.390	100.000	88	11.337	18.421	-0.460	100.000
Tier 1 capital	267	35.629	138.192	0	1177.1	55	19.840	59.269	4.200	444.780
net interest revenue to average assets	722	1.754	1.535	-4.570	25.130	87	1.559	1.777	-0.500	15.940
other operating income to average assets	722	1.690	3.085	-9.680	40.870	88	1.279	2.209	-1.950	16.080
non-operating income to average assets	608	-0.153	2.681	-36.120	19.250	72	0.274	2.582	-1.030	18.660
ROA	717	1.097	8.281	-46.270	130.930	86	1.351	4.722	-1.210	40.930
pre-tax profit to asset	224	131.737	257.670	-532.381	1 446.916	52	161.466	350.498	-153.974	2 095.301
cost to income	716	77.242	73.278	0.000	982.540	85	65.588	49.325	0.000	323.490
net loans to total assets	714	49.998	26.114	-0.170	99.500	88	52.341	30.929	-0.010	97.870
banking sector concentration	614	61.255	17.119	32.353	100.000	98	58.642	17.789	32.384	94.990
banking sector development to GDP	666	95.919	26.978	30.044	200.988	92	123.624	28.992	95.142	208.142
capital market development do GDP	722	64.533	29.339	13.899	129.067	98	85.421	35.086	27.007	142.827
gdp per capita	722	26 678	9 246	11 461	72 959	98	43 048	13 884	21 845	95 189
TRADER MODEL										
Asset	904	8.205	2.329	2.732	14.463	106	9.457	2.438	3.912	14.955
equity to total assets	908	10.206	12.907	0.030	98.510	106	10.281	15.496	0.050	76.750
Tier 1 capital	79	10.686	5.877	5.900	50.100	17	13.047	6.641	6.400	30.700

net interest revenue to average assets	892	1.570	2.798	-1.220	59.090	103	1.613	3.964	-1.370	38.200
other operating income to average assets	894	2.856	4.267	-40.910	28.310	103	2.214	3.070	-0.750	17.840
non-operating income to average assets	840	-0.340	1.814	-6.340	36.820	94	-0.283	0.922	-4.700	3.450
ROA	911	0.961	1.804	-9.890	21.790	106	1.295	3.731	-1.630	37.020
Pre-tax profit to asset	74	21.521	37.104	-58.812	191.047	16	19.468	48.780	-54.773	152.089
cost to income	888	62.692	33.251	1.030	499.510	101	62.401	52.128	0.270	493.410
net loans to total assets	901	35.339	22.780	0.000	99.860	105	36.563	23.824	0.000	92.090
banking sector concentration	791	62.731	22.028	30.323	93.365	113	62.840	24.687	35.973	94.166
banking sector development	813	119.882	30.749	70.957	162.966	113	140.834	34.747	84.205	189.927
capital market development	903	130.879	74.505	22.075	281.867	113	166.758	97.094	35.468	291.556
gdp per capita	903	41 484	15 555	22 600	90 031	113	65 796	28 634	40 275	118 218

ORGINATOR MODEL

asset	397	8.647	2.112	3.883	13.835	60	9.785	2.212	6.097	14.040
equity to total assets	397	17.210	21.165	0.140	99.960	60	15.382	19.329	-0.100	99.990
Tier 1 capital	176	1 840.242	8 333.781	5.000	6 8726	37	4 856.345	20 685.38	7.100	100 606
net interest revenue to average assets	330	2.099	2.165	-8.890	23.600	55	1.818	1.377	0.000	5.850
other operating income to average assets	321	2.441	9.404	-0.450	119.540	56	1.218	2.846	-2.260	14.980
non-operating income to average assets	208	0.216	3.213	-5.270	20.030	42	0.165	2.251	-2.730	10.390
ROA	390	3.008	11.508	-35.270	107.170	60	2.063	6.197	-4.040	32.610
Pre-tax profit to asset	138	189.844	399.801	-316.235	1 568.920	35	68.614	367.460	-958.652	1 402.288
cost to income	301	59.009	51.498	5.880	764.620	50	68.452	51.418	1.670	351.110
net loans to total assets	372	43.030	24.998	0.000	90.300	56	45.350	32.443	0.000	91.850
banking sector concentration	355	44.482	18.611	20.668	70.418	63	43.324	14.418	28.284	72.885
banking sector development	391	92.293	40.184	46.145	163.754	63	123.143	64.568	59.437	218.376
capital market development	393	115.993	37.640	40.835	179.526	63	110.592	34.733	39.325	141.944
gdp per capita	393	33 859	8 238	18 575	52 500	63	49 449	6 203	35 129	59 665

The data from table 3 suggests that there is a huge variation in the banks' characteristics depending on the banking business models. This is reflected in differences in almost all financial indicators between the group banks. We see that on the one side we have banks with the interest income ratio of 1.6 for traders while on the other we have banks with the ratio of 3.1 for traditioniers. The two other categories, neutrals and originators are placed in the middle with the level of 1.8 and 2.1, respectively. These data seem to be consistent with the theory and existing literature. Banks, which concentrate on the traditional activities earn their income primarily from interest, whereas institutions oriented more toward investment banking profit from other sources of income. Interestingly, there is also a discrepancy between the banks with respect to other income source. The ratio of other operating income is the largest for traders, whereas the lowest for neutrals. Surprisingly, the traditioniers have the ratio of 2.8, which is very comparable to the originator banks. The former might be a result of the change occurring in the global banking business where more and more commercial banks wanting increase their performance, decided to expand their activities into other income sources. The lowest ratio of other operating income is for neutrals, which was probably an effect of restrictions these banks faced to with respect to securitization and trading. We also find that traders and originators were the most efficient institutions, measured by the ratio of cost to total income, which is consistent with the literature documenting that expanding banking income sources into non-traditional activities improves banks' efficiency (DeYoung and Rogers, 1998). Consequently, we also find that these banks were among the most profitable institutions. However our data also suggest that the traditional banks were the least profitable. This evidence might support the literature showing that a decline in the interest margins in the traditional business drives banks' willingness to search for other income sources. We also observe a wide heterogeneity in the capital ratios between the specific banking models. We observe the highest ratio for the originators, whereas the lowest is for the traders. The capital level of other banking groups is in between, however the lowest is for neutrals. The results are consistent with our expectations. The neutral model mostly consists of institutions, which have heavily expanded into foreign markets, however their asset growth strategy has also absorbed a significant capital. The trader banks followed a similar approach, heavily investing their capital in the new placed financial instruments. These results are interesting, but consistent with the existing studies. First, Gropp and Heider (2009) document that there is huge heterogeneity in the level of capital between banks in various countries, which is not explained by the capital requirements, but rather by these banks' specific characteristics. Second, Adrian and Shin (2008, 2009, 2010) document that the investment banks' capital level depends on the banks' activities. For example, the authors show that for the investment banks is highly procyclical and increase with the assets' value during the booming years, whereas during the

downturn it drops. Since originators model was concentrated mostly on the investment banking activities, including the securitization and trading, the capital ratio of these banks would be consistent with these authors' findings. Moreover, Kalemli-Ozcan et al. (2011) show that the large U.S. commercial banks skirted the capital requirements using off-balance sheet investment vehicles. The low capital ratio for traders reflects the strategy of these banks, which was aggressive, and mainly oriented toward international expansion. Gropp et al. (2010) show that excessive asset growth of these banks was associated with the excessive risk-taking. The capital ratio of traditioniers to the large extent reflects the capital requirements, and risk of these banks. Finally, we also observe that the neutrals and orginators were larger in size, followed by the traders. The traditional banks were mostly smaller banks. The data also reveal that traders and orginators come from the richest countries with well-developed but highly competitive financial markets.

The data on the mortgage crisis sub-period also present interesting implications. They show that the largest decline in the income source have experienced orginators and traditional banks. Originators because they profited from developing new products, which were not demanded any more, however the traditioniers were affected possibly because of problems with the funding. Traders and neutrals' income was not hit so much possibly because of diversification effect. However due to the drop in the value of the capital investment as mortgage crisis hit, the profits of trader banks significantly decreased making these banks the most victims of the crisis. The largest drop occurred for orginators, as the data suggest.

4.2. Banking business models and financial stability – correlation analysis

The mortgage crisis has demonstrated that various banks, and countries were differently affected. In order to investigate whether the banking business model matters for the level of bank's financial distress measures, we provide the correlation analysis for the entire sample period of 1995-2009. It shows the link between the banking business models, banks' characteristics, and bank's financial distress. We proxy a financial distress by at least two variables, a bailout dummy and nationalization dummy. The table 4 presents the results.

[Table 4]

Due to brevity of the analysis, our primary interest lies in the effect of banking business model and financial distress. The correlation data support our previous conclusions from the summary statistics, which in turn provide explanations what we have observed in the reality during the mortgage crisis

2007-2011. We see that correlation between the banking business models and financial distress is diverse. More specifically, we find a statistically significant correlation between the traders and originators, however we observe an inverse relationship for traditioniers and neutrals. This evidence supports the empirical studies showing that a traditional model is least risky. Moreover, we also find that the higher the competition of a banking sector, the higher probability of the collapse of a system. This is shown by a correlation coefficient between these two variables.

Table 4: Correlation Matrix

	logasset	equit. to total asset	Tier 1 ratio	net interest inc. to av. asset	other operating income to av. asset	non-operat. inc. to av. asset	ROA	pre-tax profit to asset	cost to inc.	net loans to total asset	banking sector concen.	Trad. Model	Neutral Model	Orginator Model	Trader Model	bail. dummy	nation. dummy
logasset	1.0000																
equity to total asset	-0.2194*	1.0000															
Tier 1 ratio	0.1151*	0.0059	1.0000														
net interest income to average asset	-0.2177*	0.2006*	0.0962*	1.0000													
other operating income to average asset	-0.2035*	0.2960*	-0.0286	-0.0764*	1.0000												
non-operating income to average asset	0.0015	-0.0348	0.5719*	0.1086*	-0.6018*	1.0000											
ROA	0.0609*	0.1147*	0.4857*	0.1087*	0.0482*	0.1764*	1.0000										
pre-tax profit to asset	0.4044*	-0.1082*	0.3174*	0.0641	-0.0363	0.2057*	0.1455*	1.0000									
cost to income	-0.0737*	0.0689*	0.1154*	-0.0106	-0.0056	0.2016*	-0.0452*	0.0043	1.0000								
net loans to total asset	0.0201	-0.1386*	-0.0435	0.2660*	-0.0750*	-0.0264	-0.0306	0.0535	-0.0955*	1.0000							
banking sector concentration	-0.1807*	0.0885*	-0.1341*	0.0919*	0.1012*	-0.0293	-0.0564*	-0.0595	0.0187	0.1482*	1.0000						
Traditional Model	-0.5137*	0.0047	-0.0481	0.2223*	0.0344	0.0042	-0.0373*	-0.1307*	0.0578*	0.0605*	0.3280*	1.0000					
Neutral Model	0.1698*	-0.0247	-0.0913*	-0.0688*	-0.0778*	0.0064	-0.0172	0.0819*	0.0838*	0.1857*	-0.0220	-0.3120*	1.0000				
Orginator Model	0.1529*	0.1392*	0.1708*	0.0093	-0.0079	0.0222	0.1084*	0.1178*	-0.0599*	0.0054	-0.3779*	-0.2155*	-0.2768*	1.0000			
Trader Model	0.1495*	-0.0874*	-0.0417	-0.1275*	0.0506*	-0.0234	-0.0356	-0.1292*	-0.0860*	-0.2292*	0.0415*	-0.3680*	-0.4727*	-0.3265*	1.0000		
bailout dummy	0.3892*	-0.0639*	0.3945*	-0.0460*	-0.0579*	0.0484*	0.1506*	0.4428*	0.0213	-0.0066	-0.1465*	-0.1364*	-0.1362*	0.1045*	0.1613*	1.0000	
nationalization dummy	0.3070*	-0.1039*	0.4797*	-0.0388*	-0.0542*	0.0572*	0.1553*	0.4057*	0.0237	0.0221	-0.1378*	-0.1129*	-0.0990*	0.0963*	0.1130*	0.8278*	1.0000

*shows the significance level at least at five percent

5. Empirical Section

5.1. Model

We investigate the determinants of various banking business models originated across the globe as well as the impact of the business models on financial sector distress. To this end, we evaluate the following specification:

$$R_{i,c} = \beta_0 + \beta_1 * X_{i,c}$$

where $(R_{i,c})$ is a business model a bank in a specific country has been assigned to, and $X_{i,c}$ is a set of banking control variables including bank capital, asset structure, profitability, and income structure, and country's control variables as banking sector concentration, financial development, gdp per capita, banking sector regulations, and level of market discipline. We average the data between the period of 1995-2007. However in order to analyze the effect of individual banking business models on bank's financial distress, we profit from the data on the mortgage crisis by running the regressions over the sample period of 2007-2009. The data on the balance sheet come from Bureau van Dijk/IFCA's. The data on country's characteristics come from the World Bank Development Indicators Database.

5.2. Control variables

Following the empirical literature, in order to distinguish the banking business models across the globe and investigate their consequences on the financial stability, we create four groups of regressors accounting for: bank capital, asset structure, profitability, income structure and asset size. Consistent with the theoretical models we argue that banking business models vary with respect to these characteristics.

More specifically, we define bank capital as a ratio of the *equity to total asset*. The literature documents that the level of bank's capitalization is an important determinant of financial distress during a crisis. Following these studies, banks that engaged in excessive expansion of their activities, as well as excessive trading and lending will be more affected by the financial crisis, than more conservative banks. Hence, we expect that *traders* and *neutrals* will have lower capital ratio, whereas

traditioniers and *originators* will exhibit higher ratio. The better capitalization position of the latter banks mainly resulted from the off-balance sheet strategy the banks used (Wu et al., 2011).

We include the asset structure measured as proportion of *loan activity in the bank's assets*. Brunmeier et al. (2010) document that investment activities, as compared to the traditional ones, make the banks more exposed to the systemic risk accompanying the financial crisis. Thus, these banks involved in investment activities are more affected by the financial crisis. In addition, DeJonghe (2010) show that this especially applies to the banks involved in trading activities. However Kohler (2009) shows that if traditional banking is associated with the excessive credit growth and international expansion, the banks are more exposed to the systemic risk and more likely to experience distress during financial crisis. Following this evidence, we argue that *originators* and *traders* will be the most affected by the financial distress, whereas the *traditionals* and *neutrals* the least.

DeJonghe (2010) documents that the shift of banks to non-traditional banking activities, which generate commission, trading, and other non-interest income increases banks' tail betas and thus reduces banking system stability. Following DeYoung and Rice (2003) we include *income interest to average assets* as a control for the size of banking traditional activities; *other operating income to average asset* and *non-operating income to average asset* as proxies for bank's involvement in a non-traditional activities. We expect that originators and traders will be the most affected by the crisis due to their heavily involvement in trading and securitization, whereas the neutrals and tradioniers the least due to their limited participation in these activities.

We also include the profitability ratio measured as *return on asset (ROA)*. We argue that banks' activities more linked to the capital markets improve their profitability due to higher margins, however increase also the financial distress during the market downturn (Shleifer and Vishny, 2011; DeJonghe, 2010). Following these studies we argue that *originators* and *traders* will be the most exposed to this risk, however *traditioniers* and *neutrals* the least. In addition, we also control for the bank's efficiency measured as cost to income. These studies document that less efficient banks are more willing to take on additional risk, and thus are more exposed to the distress risk during the market downturn.

We also control for the asset size. Following the existing literature documenting that larger banks are more willing to take on additional risk as a result of moral hazard behavior, we expect that

originators, traders and *neutrals* will be exposed the most to the risk, and thus more severely hit by financial crisis.

Finally, we also include country's variables. We control for the banking sector *concentration ratio* measured as the ratio of the banking asset of three largest institutions to total banking asset in a sector consistent with the hypothesis supported by the recent evidence that more concentrated banking sectors are less affected by the financial crisis due to possibility of more careful monitoring of banks' activities (Beck et al., 2011). Moreover, we also include the *gdp per capita* to control for the country's level of development. In addition, in the further sections where we investigate the determinants of individual banking models and their roots we also control for banking sector and capital market size, quality of capital regulations and market transparency. We expect that countries regulations more favorable to the capital markets support their development, and thus encourage banks to engage in trading and other investment activities.

5.3. What characterize specific business models?

In the first part of the analysis we have grouped the banking business models based on common features of our sample banks. We have noticed that we can clearly distinguish four banking business models. In order to investigate the characteristics of these banking business models we assign each banking group a dummy of one if a bank belongs to a specific model, and zero otherwise. We then estimate the probit model to estimate the probability that banks exhibiting specific characteristics will be placed into a particular category. The set of the financial variables used in the regression is the same as in the previous sections. Additionally, we also control for the characteristics of countries the bank has originated. Table 5 presents the results for the probit model for the entire period and country sample, whereas table 6 presents the regression results for the sample excluding Luxemburg. We argue that Luxemburg is a financial center and represents a mixture of business models the banks follow. Therefore, it is difficult to assign specific category for the banks in this country.

[Tables 5-6]

Table 5: Regression results on the determinants of specific banking business models using entire sample

Variable	1995-2006				1999-2004				2004-2006			
	Traditional Model	Neutral Model	Originator Model	Trader Model	Traditional Model	Neutral Model	Originator Model	Trader Model	Traditional Model	Neutral Model	Originator Model	Trader Model
Size	-0.398*** (0.045)	0.115*** (0.033)	0.028 (0.042)	0.092*** (0.029)	-0.416*** (0.052)	0.114*** (0.036)	0.031 (0.039)	0.093*** (0.030)	-0.362*** (0.048)	0.152*** (0.039)	-0.046 (0.048)	0.085*** (0.033)
Interest Income	0.160** (0.068)	-0.082* (0.047)	0.103 (0.083)	-0.081 (0.061)	0.130 (0.087)	-0.114** (0.051)	0.151* (0.090)	-0.070 (0.062)	0.231** (0.092)	-0.012 (0.047)	0.083 (0.081)	-0.117 (0.090)
Other operating income	-0.050** (0.026)	-0.050 (0.036)	0.011 (0.039)	0.066*** (0.024)	-0.054 (0.040)	-0.075** (0.032)	0.046 (0.040)	0.076*** (0.029)	-0.057** (0.022)	-0.023 (0.035)	0.026 (0.068)	0.051* (0.027)
Non-operating income	0.098 (0.063)	-0.015 (0.040)	0.188** (0.092)	-0.034 (0.036)	0.080 (0.092)	-0.080* (0.045)	0.308** (0.127)	-0.014 (0.034)	0.137 (0.090)	-0.002 (0.050)	0.328*** (0.115)	-0.049 (0.049)
Efficiency	-0.002 (0.002)	0.006*** (0.002)	-0.012** (0.006)	-0.004*** (0.002)	-0.003 (0.002)	0.005*** (0.002)	-0.010* (0.006)	-0.004** (0.002)	0.000 (0.003)	0.006** (0.002)	-0.021** (0.008)	0.005* (0.003)
Activity	-0.006 (0.004)	0.011*** (0.004)	0.007 (0.006)	-0.013*** (0.004)	-0.008* (0.005)	0.012*** (0.004)	0.004 (0.007)	-0.013*** (0.004)	-0.004 (0.004)	0.010** (0.004)	0.005 (0.006)	-0.011*** (0.004)
Profitability	-0.054 (0.049)	0.012 (0.026)	-0.160* (0.087)	0.003 (0.012)	-0.014 (0.051)	0.007 (0.014)	-0.102 (0.069)	0.001 (0.010)	-0.109 (0.092)	0.006 (0.024)	-0.302*** (0.103)	0.011 (0.020)
Capital ratio	-0.036*** (0.011)	0.021** (0.008)	0.023*** (0.007)	-0.011 (0.009)	-0.036*** (0.013)	0.020** (0.010)	0.024*** (0.008)	-0.012 (0.010)	-0.046*** (0.013)	0.022** (0.009)	0.007 (0.010)	-0.008 (0.009)
Concentration	0.044*** (0.005)	0.000 (0.004)	-0.063*** (0.010)	0.005 (0.004)	0.048*** (0.006)	0.003 (0.004)	-0.064*** (0.012)	0.003 (0.004)	0.035*** (0.006)	-0.005 (0.004)	-0.062*** (0.010)	0.010** (0.005)
Constant	-0.378 (0.412)	-2.312*** (0.493)	1.656** (0.652)	-0.351 (0.442)	-0.266 (0.484)	-2.607*** (0.563)	1.968** (0.769)	-0.427 (0.469)	0.042 (0.492)	-2.630 (0.600)	3.391*** (0.902)	-0.712 (0.541)
Number of obs.	1780	1780	1780	1780	1071	1071	1071	1071	0.446	0.116	0.394	0.122
R	0.504	0.111	0.452	0.129	0.517	0.131	0.491	0.130	617	617	617	617

Table 6: Regression results on the determinants of specific banking business models excluding Luxemburg

Variable	1995-2006				1999-2004				2004-2006			
	Traditional Model	Neutral Model	Orginator Model	Trader Model	Traditional Model	Neutral Model	Orginator Model	Trader Model	Traditional Model	Neutral Model	Orginator Model	Trader Model
Size	-0.395*** (0.046)	0.097*** (0.031)	-0.007 (0.041)	0.137*** (0.031)	-0.408*** (0.051)	0.097*** (0.034)	0.006 (0.039)	0.132*** (0.032)	-0.372*** (0.050)	0.133*** (0.036)	-0.077* (0.046)	0.134*** (0.036)
Interest Income	0.152** (0.067)	-0.119** (0.052)	0.042 (0.083)	-0.022 (0.057)	0.123 (0.085)	-0.169*** (0.057)	0.093 (0.094)	-0.008 (0.060)	0.214** (0.085)	-0.036 (0.049)	0.018 (0.097)	-0.060 (0.079)
Other operating income	-0.051 (0.025)	-0.058* (0.035)	0.001 (0.038)	0.083*** (0.025)	-0.054 (0.039)	-0.087*** (0.032)	0.035 (0.041)	0.101*** (0.028)	-0.059*** (0.023)	-0.027 (0.035)	0.024 (0.062)	0.057** (0.028)
Non-operating income	0.086 (0.062)	-0.024 (0.034)	0.153* (0.093)	-0.004 (0.042)	0.070 (0.090)	-0.105* (0.062)	0.265** (0.126)	0.032 (0.052)	0.115 (0.086)	-0.010 (0.048)	0.305** (0.131)	-0.050 (0.052)
Efficiency	-0.002 (0.002)	0.004** (0.002)	-0.015** (0.007)	-0.002 (0.001)	-0.003 (0.002)	0.003** (0.002)	-0.013** (0.006)	-0.001 (0.001)	0.001 (0.003)	0.004* (0.002)	-0.024*** (0.009)	-0.001 (0.002)
Activity	-0.007* (0.004)	0.007* (0.004)	0.003 (0.006)	-0.008** (0.004)	-0.010** (0.005)	0.009** (0.005)	0.001 (0.008)	-0.008* (0.005)	-0.006 (0.004)	0.008* (0.004)	0.002 (0.007)	-0.008* (0.004)
Profitability	-0.055 (0.048)	0.016 (0.022)	-0.124 (0.086)	-0.007 (0.013)	-0.014 (0.048)	0.005 (0.013)	-0.090 (0.059)	-0.008 (0.010)	-0.098 (0.086)	0.016 (0.027)	-0.282** (0.119)	-0.005 (0.020)
Capital ratio	-0.039*** (0.011)	0.016** (0.007)	0.013 (0.008)	-0.001 (0.007)	-0.037*** (0.014)	0.016* (0.009)	0.016* (0.009)	-0.003 (0.008)	-0.052*** (0.014)	0.017* (0.009)	-0.004 (0.011)	0.003 (0.009)
Concentration	0.038*** (0.005)	-0.004 (0.004)	-0.065*** (0.009)	0.014*** (0.005)	0.042 (0.006)	-0.000 (0.004)	-0.065*** (0.010)	0.012*** (0.005)	0.029*** (0.006)	-0.007 (0.004)	-0.064*** (0.009)	0.134*** (0.036)
Constant	0.207 (0.475)	-1.421*** (0.501)	2.719*** (0.772)	-2.210*** (0.519)	0.264 (0.555)	-1.722*** (0.576)	2.841*** (0.869)	-2.205*** (0.555)	0.761 (0.563)	-1.921*** (0.601)	4.322*** (0.998)	-2.511*** (0.649)
Number of obs.	1546	1546	1546	1546	926	926	926	926	549	549	549	549
R	0.479	0.104	0.488	0.136	0.490	0.126	0.522	0.133	0.433	0.102	0.442	0.143

The regression results seem to confirm our analyses from the previous subsections. They show that there is a wide heterogeneity in the business models between the countries. More specifically, the data show that the *traditioniers* tend to be smaller banks. This is not surprising since these are mainly credit subsidiaries of the larger banking groups located in less developed countries. These countries tend to also exhibit higher market concentration, as suggested by the banking concentration variable. The main interest of these banks has been in credit growth due to a still weak saturation of this segment in the developing markets. Thus their income source was mainly dominated by the interest income. Interestingly, the estimations show that these banks were also less capitalized. This is probably the result of excessive credit supply, which happened in many developing countries before the mortgage crisis 2007-2011.

In turn, the neutrals were larger in size. This is because these institutions have grown excessively in size by expanding their activities into foreign markets in the recent decades. We also notice that these banks were better capitalized. Interestingly, none of the income source is statistical significant, which might suggest that they tried to diversify their income, without specific biased toward any direction. This diversification effect might also be a result of existing domestic regulations, which prohibited these banks from aggressive investment in capital markets' products. However, the results also suggest that these banks were less efficient, which might support the evidence by Buch et al. (2011) that larger in size institutions are less efficient due to costly monitoring activities.

Different picture of banks' features present the banking group labeled *originators*. The estimation results show that the strategy of these banks was mainly non-traditional nature. This is supported by the significant and positive coefficient of non-operating income. Surprisingly, we observe a negative coefficient of the profitability ratio, though in the summary statistics we find that the ROA is one of the largest among all banking groups. This might indicate a high competition between the originators banks within a country. Accordingly, we find a concentration variable highly statistical significant and negative, which might indeed suggest that this business models originated in a highly competitive banking markets. We also find a highly significant coefficient of capital ratio. As suggested by Adrian and Shin (2008, 2009, 2010) the capital ratio of these banks is very cyclical, and boosts during a period of economic expansion. The other financial ratios appear as non-significant in the regression, which might point toward heterogeneity between these banking groups.

According to our expectation, we find that the activity of traders concentrated on the non-interest income. This is not surprising since traders were heavily involved in trading the securitized assets.

The traditional loan activity constituted a small portion of these banks' asset. This is also why we observe a negative coefficient of the loan activity. Our regression results also suggest that these banks were larger in size. Taking into consideration that most of these banks stemmed from small economies, the saturation of markets and high competition forced these banks to search for alternative income sources. Interestingly, we do not see any significant changes in the banks' characteristics over the sample sub-periods. This might suggest that over the analyzed periods these banks consequently realized their strategies.

Table 6 presents the results after excluding Luxemburg from our sample. The estimation results do not change significantly, as compared to the previous ones. For some models the coefficients become statistical significant. This is especially the case for the neutrals, where we observe that the coefficients for income sources exhibit a negative sign and become significant. The results show that these institutions probably were more conservative in generating their income, at the same time trying to achieve income diversification. Interestingly, we also find that coefficient for the asset size becomes highly statistical significant for the traders. This confirms that traders aggressively pursued their strategies, quickly increasing its size. Therefore, most of the traders became the systemic important banks, as the mortgage crisis has revealed.

5.4. Do countries' characteristics matter for the banking business models?

An interesting question is what country characteristics have contributed to the origination of the specific banking business models. Therefore, we include the country variables, which capture the differences in the institutional structure between various countries. Table 7 presents the results for the regression after controlling for the size of the stock market and banking sector. Other regressors remain the same, as in the previous analysis.

[Table 7]

Table 7: Banking Business Models and Country's Institutional Structure

	Traditional Model	Neutral Model	Originator Model	Trader Model
Size	-0.707*** 0.131	0.133** 0.054	-0.031 0.047	0.137*** 0.031
Income Interest	0.268** 0.114	-0.114* 0.063	-0.050 0.061	0.059** 0.028
Other Operating Income	0.002 0.104	-0.010 0.020	-0.128*** 0.038	0.039*** 0.014
Non-operating Income	0.082 0.085	-0.005 0.023	0.068** 0.033	0.001 0.015
Efficiency	-0.002 0.007	0.003** 0.001	-0.022*** 0.006	0.000 0.001
Activity	-0.032*** 0.012	0.010** 0.005	-0.011*** 0.002	-0.009*** 0.003
Profitability	0.013*** 0.004	-0.002 0.002	-0.014*** 0.002	-0.001 0.002
Capital	-0.041*** 0.015	0.023*** 0.008	-0.004 0.005	-0.020*** 0.006
Concentration	0.065*** 0.017	-0.003 0.013	-0.080*** 0.020	0.013 0.016
Banking Sector Size	-0.060*** 0.013	-0.002 0.002	-0.020*** 0.006	0.022** 0.010
Capital Market Size	-0.055*** 0.017	-0.006 0.004	0.024*** 0.006	0.006 0.005
Constant	6.786*** 1.749	-1.482 1.061	4.224*** 0.859	-5.374*** 1.339
N	1642	1642	1642	1780
R	0.916	0.190	0.711	0.523

The inclusion of the institutional country's variables improves the statistical significance of our coefficients, and thus the R-square for the regressions. This finding is consistent with the theoretical literature, which argues that specific institutional features have contributed to development of specific business models. More specifically, our regression results show that banks, which decided to follow traditional model of banking stemmed from smaller and financially less developed countries. The coefficients for banking and capital market size are statistically significant and exhibit a negative sign. Our analysis shows that originators tended to develop in countries with a more important capital markets relative to the banking sector. This institutional feature incentivized them to develop products demanded by the investors, and thus profit from high-margin products directly linked to the capital markets. The traders on the other hand originated in countries with larger banking sectors, as compared to the capital markets. However highly competitive banking markets and saturation of these markets have forced these banks to search for alternative sources of income. Finally, we do not notice the statistical significance of the size indicators for the neutral banking model. It seems to suggest that probably the regulations in the banking business rather than the size of the financial systems has driven these banks to follow such a strategy.

5.5. The effect of various banking business models on financial sector stability

One of the most interesting research questions is why we have observed distinct effect of mortgage crisis on the financial distress of individual institutions and domestic banking sectors and what banks' characteristics have intensified the negative consequences of the crisis. In order to answer this question we run the regressions of already identified banking business models on our financial distress measures. Unfortunately, due to various unique characteristics of our banks, as capital ratio cyclicity, it is very difficult to find the perfect measures of financial distress. Thus, in our regression we use four different proxies for this effect: the bailout dummy of one if a bank has experienced a bailout or was nationalized during the financial downturn of 2007-2011, and zero otherwise. Alternatively, we also use the Tier 1 capital ratio, and profitability index measured as pre-tax profits to total asset. Table 8 presents the regression results.

[Table 8]

Table 8: Banking Business Models and Financial Distress

Time period 2006-2009	Bailoutdummy	Nationalizati on dummy	Tier 1 ratio	Pretaxprofit/ asset
Size	0.935** (0.377)	0.492** (0.213)	-1.871*** (0.633)	7.263 (15.446)
Income Interest (one-year lag)	0.284 (0.238)	0.190 (0.164)	-1.504 (0.695)	-54.790* (31.217)
Other Operating Income (one-year lag)	-0.717** (0.321)	-0.710** (0.313)	1.647 (1.633)	10.402* (5.298)
Non-operating Income (one-year lag)	-0.051 (0.160)	0.070 (0.096)	-4.307 (4.323)	-13.721 (10.207)
Efficiency (one-year lag)	0.003 (0.006)	-0.002 (0.005)	-0.014 (0.041)	1.471** (0.651)
Activity (one-year lag)	-0.006 (0.010)	0.007 (0.010)	-0.093 (0.091)	3.402*** (1.115)
Capital (one-year lag)	-0.022 (0.055)	-0.048 (0.049)	-0.130 (0.299)	-5.170* (3.025)
Concentration	-0.018* (0.106)	-0.014 (0.013)	-0.057 (0.072)	1.816 (1.567)
gdp per capita	-0.000** (0.000)	-0.000** (0.000)	-0.000* (0.000)	0.006*** (0.002)
Neutral Model	2.686** (1.088)	3.128** (0.897)	8.386** (4.147)	-77.117 (84.500)
Orginator Model	3.113*** (1.180)	3.980*** (1.197)	12.622** (5.041)	-225.471*** (80.485)
Trader Model	4.843***	4.251***	10.171*	-384.111**

	(1.116)	(0.925)	(5.271)	(157.284)
Constant	-14.076 (5.277)	-9.095*** (3.343)	36.873*** (12.733)	-331.498 (201.951)
N	0.725	0.486	0.483	0.299
R	259	259	110	94

The estimation results present very interesting implications. Consistent with our expectations and empirical literature, we find that neutral, originator and trader models are the most risky for the countries. However, the results also suggest that the economic effect of these models is diverse. The most risky seems to be a trader model, while the neutral model is less risky among three risky models. The traditional model is the least risky among all models, exhibiting even negative correlation with our financial distress measures. We also find that the larger the bank is, the more risky it is. This is also consistent with the existing studies, showing that banks tend to grow in size to become systemic important institutions, and thus being able to follow more risky strategies. Differently than in other studies, we do not find a negative correlation of financial distress indices and other operating income variable. This might be because of the heterogeneity of activities the banks render in generating this ratio. Thus, our results seem to reveal that the type of banking activities is more important determinants of banking sector stability than the ratios themselves, in contrary to the empirical literature.

6. Conclusions

The aim of our study was to identify the banking business models through discovering the banks recent activities, which have emerged in the global word recently. We also try to investigate the characteristics of these banking business models. Our results present interesting conclusions. First, we do support the recent observations of economists on the increased complexity and heterogeneity in the banking business. Our results show that we can observe at least four banking business models across the globe. Second, we also find that these banking business models differed in many respect, as: capital ratios, profitability, income source, and asset structure. This partly seems to explain why different banks had distinct contribution to the global crisis, and consequently were differently hit by it. Third, we also find that mainly institutional structure of a country is responsible for the development of specific business model. And finally, we find that the most risky models are those, which do not diversify their balance sheet structure. Though the non-interest income source makes a

bank more vulnerable to financial distress during the downturn, it is not the most significant determinant.