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What is the Appropriate Size of the Banking System?

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Abstract

To measure the size of the banking system, a country's banking assets divided by the country's gross domestic product (GDP) is commonly applied as a yardstick. But is the banking assets to GDP ratio an appropriate yardstick? This paper shows that comparing a country's banking sector only by using that country's GDP does not capture the whole story as countries have distinctive financial needs. In particular, countries differ with regard to the number and size of multinational enterprises.

In a cross-country empirical study, we find a statistically significant relationship between the presence of large banks and the presence of multinationals, after controlling for the size of the country. We therefore suggest using an additional yardstick, which compares the size of large banks to the size of multinationals in a country.

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1. Introduction

After the global financial crisis (2007-2009), the size of the banking system has become a hotly debated topic as a substantial number of banks needed to be rescued by the government and received state aid in the form of guarantees, provision of equity, transfer of bad assets or a (partial) nationalisation. The average direct fiscal costs of government bailouts over the period 1970-2011 are about 7 percent of Gross Domestic Product (GDP). The size of the financial sector is an important driver of fiscal costs (Laeven and Valencia, 2012).

This raises the question whether the banking system has become too large and some banks are ‘*too-big-to-fail*’ and even more pressing ‘*too-big-to-save*’. The Financial Stability Board (FSB) has created a list of 29 global systemically important banks (G-SIBs) whose “*distress or disorderly failure, as a result of their size, complexity and systemic interconnectedness, would cause significant disruption to the wider financial system and economic activity*” (FSB, 2011, p. 1). On this list, 17 of the 29 G-SIBs are European banks.

However, being a large international bank is not necessarily troublesome as this allows for ‘risk diversification’ (Dermine and Schoenmaker, 2010). A good example is Spain where small Spanish banks are currently more exposed to the real estate bubble than their larger international counterparts. For example, the troubled Spanish Bank ‘Bankia’ -which is for 45% owned by the Spanish government- generated only 2% of its interest income and commissions and fees in foreign countries, while this is 34% and 39% for Banco Santander and Banco Bilbao Vizcaya Argentaria respectively (see Table 4).

To measure the size of the banking system, a country’s banking assets divided by the country’s GDP is commonly applied as a yardstick. But is the banking assets to GDP ratio an appropriate yardstick? This paper questions the use of GDP and will look at the size of the banking system from an economic perspective. The main contribution of this paper is that we look beyond the banking system itself and investigate a country’s financial needs. In particular, we examine the relationship between the number and size of multinationals and banks in a country.

To elaborate on the size of the banking system, this paper returns to the foundation of the banking sector: that is to serve the real economy. This means that the size should be related to the size of households and firm finance needed. The focus of this study is on the EU-15 (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom) and Switzerland.

This paper is organised as follows. The next section provides a short literature review of previous studies on the relation between financial development and economic growth. The section also examines different yardsticks used to measure the size of the financial sector. The third section relates finance to the economy and uses a bottom-up approach to elaborate on the financial needs of a country, divided into retail, wholesale and trading. Next, section four explores whether the number and

size of a country's multinationals is an explanatory factor of a country's large banks. Section five discusses the too-big-to-save problem of large banks. Finally, section six concludes.

2. Literature Review

There is common agreement that the ultimate purpose of the financial sector should be to serve the real economy. However, there is disagreement about what would be an appropriate yardstick for the size of the financial sector.

2.1 Financial Development and Economic Growth

A country's financial sector is important for real economic activity as the size of an efficient financial sector not only affects the level of output by allocating productive capital more efficiently but may also contribute to economic growth. For example, in the EU-15, the financial system (banks, insurance and pension funds) makes a contribution to the economy of 5.3% of GDP in 2005 (Beck *et al*, 2012). The contribution of the Dutch financial system to GDP is 6.8%.

Goldsmith (1969) was the first one who empirically showed a positive correlation between the size of the financial sector and long-run economic growth. However, at that time the direction of causality was not clear. In the early 1990s King and Levine (1993) revealed in their empirical study -based on 80 countries for the period 1960-1989- that financial depth is a predictor of future rates of economic growth. But also other factors influence this relationship; e.g. institutional factors (Arestis and Demetriades, 1997; Demetriades and Law, 2006) and a competitive banking system (Claessens and Laeven, 2005). For example, Demetriades and Law (2006) show that in low-income countries more finance may not succeed without sound institutions in delivering long-run economic benefits. Levine (2005) provides an excellent and extensive survey about the research of financial development and economic growth. Based on this extensive review, Levine (2005) concludes that a well-developed financial sector is beneficial for growth and that better developed financial systems ease external financing constraints that firms face.

In the aftermath of the financial crisis, the question has been raised whether the financial sector has outgrown the real economy. Beck, Degryse and Kneer (2012) criticise previous studies for neglecting the fact that during the last decades the financial sector has gradually extended its scope beyond traditional intermediation activities. To capture this trend in their study, Beck *et al* (2012) split the activities of the banking sector into intermediation (measured as domestic bank credit) and non-intermediation activities. Non-intermediation activities include derivatives and trading. Moreover, there are important spin-offs coming from professional services, such as legal, accounting and consulting, which contribute to financial sector activity. The financial sector has thus become a growth sector in itself. Based on a sample of 77 countries for the period 1980-2007, the results of their study suggest that intermediation activities increase growth and reduce volatility in the long run, but that no such effect exists for non-intermediation activities.

More broadly, several authors state that more finance is not always better and there might be (negative) side effects when the financial sector becomes too large. These authors indicate that there may be a threshold above which financial development no longer has a positive effect on economic growth and may harm the economy and society as a whole (Arcand, Berkes and Panizza, 2012; Cecchetti, 2012; Bini Smaghi, 2010). For example, when the financial sector grows too large, it might lead to a misallocation of resources and cause costly crises (Arcand *et al*, 2012). Moreover, Easterly, Islam and Stiglitz (2000) show that the relationship between the financial system and growth volatility is nonlinear. As the financial system grows, its risk-enhancing characteristics can result in higher growth volatility.

During the recent years, only a few researchers have studied the non-monotone effect between financial depth and growth using cross-country evidence. Rioja and Valev (2004) examine a panel of 74 countries, which they split into three regions. They find in the low region that improvements in financial markets have an uncertain effect on growth, in the intermediate region this effect is positive and large and in the high region this effect is positive but much smaller.

Arcand, Berkes and Panizza (2012) use a different dataset and examine empirically whether there is a threshold above which financial development no longer has a positive effect on economic growth. They use total credit to the private sector as a proxy to measure financial depth. Their dataset covers the period 1960-2010. The results from the panel regressions suggest that the marginal effect of financial development on economic growth becomes negative when credit to the private sector reaches 80-100% of GDP. However, the threshold at which the marginal effects of financial depth on economic growth become negative seems to differ for the time period used. For example, for the time period 1960-1995 the threshold is 144%, while for the period 1960-2005 and 1960-2010 the threshold is 100% and 90% respectively (Arcand *et al*, 2012). It is difficult to explain why the threshold at which the marginal effect becomes negative has come down over the last 15 years.

Next, Arcand *et al* (2012) find that *“the marginal effect of financial depth becomes negative at 80% of GDP in tranquil periods and 110% of GDP in crisis periods”*. This implies that during crisis periods more credit can be provided to the private sector before the marginal effect becomes negative. This does not seem very sensible. More research is necessary to reveal which factors determine why some countries have a higher or lower threshold at which the marginal effect of financial development on economic growth becomes negative. Nevertheless, the evidence by Arcand *et al* (2012) indicates that the contribution of finance can become negative after some level.

In sum, a well-developed financial sector is beneficial for economic growth and eases external financing constraints that companies faces. But there may also be negative side effects of too much finance. The next subsection discusses different yardsticks that are used to measure the size of the banking sector, the most important sub-sector of the financial sector.

2.2 Yardstick to Measure the Size of the Banking System

There are two main views regarding the size of the banking system. The first view argues that the size of the banking sector should be related to the capacity of the country. This means that, for the government to be able to rescue troubled banks, the size of the sector should not be too large compared to the size of the country. The consequence of this view will be that small countries cannot have a large banking sector.

Two different yardsticks are used for this view. The first yardstick expresses the size of a country's banking sector as a ratio of its value of banking assets to GDP (e.g. World Bank, 2005; Beck, Demirgüç-Kunt and Levine, 2010). The second yardstick puts banks' book value of equity over GDP (e.g. Dermine, 2000; Dermine and Schoenmaker, 2010). Both measures have their advantages and disadvantages. For example while assets to GDP indicates the 'overall' size of a country's banking system, it does not necessarily follow that larger banks are more dangerous than smaller banks. The reason for this is that they may differ in the riskiness of their assets (Dermine and Schoenmaker, 2010). Moreover, larger banks may be better (geographically) diversified. An advantage of the second yardstick – equity (book value) to GDP – is that this is a better measure of relative size and a better indicator for the costs of a rescue package, as under Basel II/III financial institutions should hold sufficient economic capital (of which a large part consists of equity) to cover unexpected losses (Dermine and Schoenmaker, 2010).

The second view, which is based on the follow-the-client principle, states that the banking sector should support its clients (Grosse and Goldberg, 1991; Brimmer and Dahl, 1975). According to this view, the size of the banking sector should be in line with the financial needs of households and firms. As multinationals typically prefer to use a main bank of their home country with which they have a good strategic relationship (KPMG, 2011), this means that home banks should follow their clients abroad to service their business needs fully. The choice for a main bank from the home country is revealed preference of multinationals.

Poelhekke (2011) argues that one under-appreciated benefit of large international banks is their role in facilitating investment in foreign markets. In particular, firms wishing to expand abroad through foreign direct investment may find the services offered by large international banks essential to overcome the market frictions and information asymmetries associated with foreign investment. Poelhekke (2011) provides evidence that the presence of foreign banks subsequently boosts foreign investment by non-financial firms, especially if they originate from the same home market. The international bank thus leads the client (instead of follows).

Next, scale and scope economies can create sources of competitive advantage in the banking sector (see Liikanen *et al* (2012) for an overview). An example of revenue-based economies of scale is corporate banking, for which a large equity base and an international presence are sources of competitive advantage in servicing large international corporate clients. Therefore, countries with relative large multinationals -such as the Netherlands and Switzerland- may also have larger banks because small banks have difficulties catering for multinationals (Dermine and Schoenmaker, 2010).

With regard to this view a possible yardstick is the size of the private sector or private credit by deposit money banks and other financial institutions to GDP (Beck, Degryse, and Kneer, 2012; Beck, Demirgüç-Kunt and Levine, 2010; Beck, Demirgüç-Kunt and Martinez Peria, 2007). Grosse and Goldberg (1991) show empirically that foreign investment in the U.S., foreign trade with the U.S., and the size of the banking sector in the foreign country are positively correlated with that country's bank presence in the U.S. This illustrates that banks indeed follow their domestic clients to provide financial services to these clients in new markets. An overview of the different views and yardsticks that are discussed in this subsection is provided in Table 1.

Table 1: Overview Yardsticks to Measure the Size of the Banking Sector

View	Yardstick	Authors
1. Sector should not be too large compared to the size of the country	a) Total banking assets to GDP	Word Bank (2005); Dermine and Schoenmaker (2010); Beck, Demirgüç-Kunt and Levine (2010)
	b) Book value of equity to GDP	Dermine (2000); Dermine and Schoenmaker (2010)
2. Follow-the-client principle: the financial sector should support its clients	a) Size of the private sector; private credit to GDP	Grosse and Goldberg (1991)
	b) Value added share of the financial sector in GDP	Beck, Degryse, and Kneer (2012); Beck, Demirgüç-Kunt and Levine (2010)

3. Banking Sector

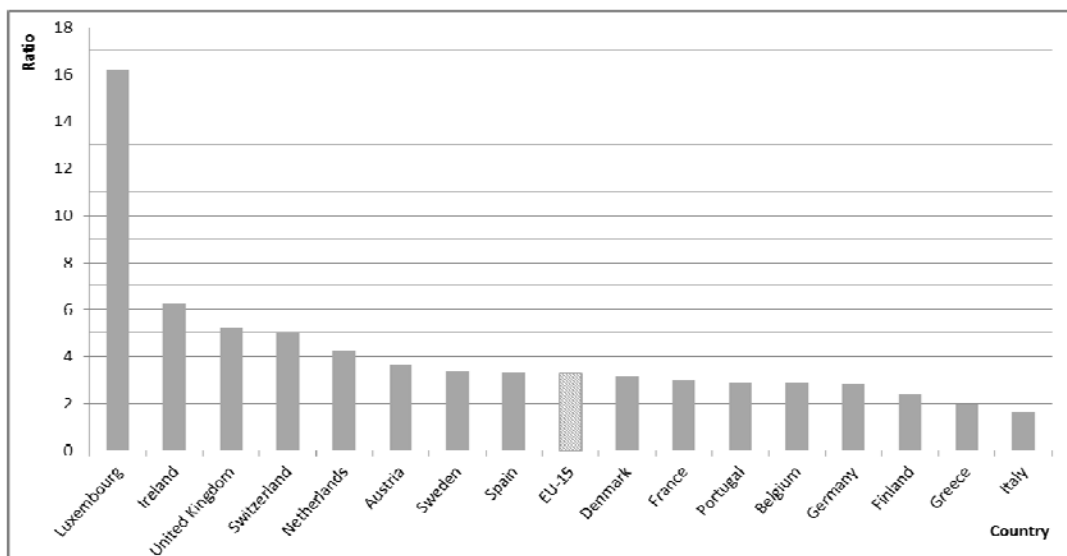
This section relates finance to the economy and uses a bottom-up approach to elaborate on the financial needs of households, industry and government in a country. But the section first examines the size of the banking sector in the EU-15 countries and Switzerland.

3.1 Size of the Banking Sector

The size of the banking sector can be measured by total assets of credit institutions that are reported on a 'residence basis'. This number captures both the domestic assets of local credit institutions and the assets of branches and subsidiaries of foreign credit institutions in a country. Figure 1 shows total assets of credit institutions relative to the country's GDP. GDP accounts for the size of a country's economy. In this figure we see that the total assets of credit institutions to GDP differs considerably between countries, ranging from 1.64 for Italy to 16.19 for Luxembourg. The countries with the highest ratio of total assets of credit institutions to GDP are Luxembourg (16.19) Ireland (6.25) and the United

Kingdom (5.21). The size of the financial sector in the first two countries is probably tax driven, while the UK is a financial centre. The weighted average for the EU-15 is 3.30 times GDP.¹

Figure 1: Total Assets of Credit Institutions to GDP



Note: This figure illustrates for all EU-15 countries and Switzerland the ratio of total assets of credit institutions to the country's GDP. Total assets of credit institutions are reported on a 'residence basis'; i.e. for each country the assets of credit institutions under its jurisdiction are depicted. Thus the figure captures both the domestic assets of local credit institutions and the assets of branches and subsidiaries of foreign credit institutions in a country. Figures are for June 2011.

Source: European Central Bank (ECB) and national central banks, World Economic Outlook Database (IMF)

Figure 1 also illustrates that in all EU-15 countries and Switzerland the total assets of credit institutions are larger than the country's GDP. That means that all countries have a ratio of total assets to GDP larger than 1. A popular explanation is that a ratio larger than 1 illustrates that the banking sector has outgrown the real economy. But that conclusion would be misguided. GDP measures the value added or the 'flow' in a country, while banks' assets in a country relate to the financing of the 'stock' with which a part of the value added is generated. In particular in the industrial sector, the production stock is many times larger than the annual value added generated with this stock. A bank may, for example, finance a production plant, which is written off in say 10 years.

So, we have seen that countries differ with regard to the size of their banking sector. But what do they finance exactly? The next subsection will elaborate on, and compare, the financial needs and uses in various European countries.

¹ As we work with a weighted average (weighted according to GDP), the impact of Luxembourg and Ireland is limited on the overall weighted average of the EU-15.

3.2 Financial Needs

As banks should ultimately serve the real economy, we examine the financial needs and uses of households, firms, and government and how they differ between countries. Table 2 (at the back of this paper) reports total assets, total loans outstanding, and trading of banks in EU-15 countries for the year 2011.² In the ECB statistics, banks are indicated as monetary financial institutions (MFIs). On average, total loans make up 53% of total assets of banks in the EU-15. But there are differences within this group. For example, Greek and Spanish banks hold respectively 65% and 62% of their assets as loans, while this is only 40% for Ireland. The Netherlands is with 56%, just above the EU-15 average.

Next, if we decompose loans in loans to financial institutions, loans to general government, loans to non-financial corporations and loans to households,³ we see that on average in the EU-15 loans consist for 41% of credit to other financial institutions, for 5% of credit to the general government, for 23% of credit to non-financial corporations and for 30% of credit to households (see Table 2). While credit to households and non-financial corporations make up a large fraction of total loans (53%), the Liikanen Report illustrates that its relative importance on the asset side of bank's balance sheets has fallen over time (Liikanen *et al*, 2012).

If we look closer at the division of loans at the country level we see that countries differ in their financial uses (see Table 2). For example while banks in the EU-15 have on average 41% of their loans outstanding with other financial institutions, this figure is much higher for Belgium and Luxembourg: 55% and 80% respectively. Another example is loans to non-financial corporations as percentage of total loans outstanding. While this is on average 23% for the EU-15, this is much higher for Greece and Spain (37% and 38% respectively). The Netherlands is just above the EU-15 average with 27%. Finally, 47% and 51% of the loans goes to households in Sweden and Denmark, which is higher than the average of 30% for the EU-15. The Netherlands is in the middle group with 31%. The question arises whether it is troublesome if a country has more (or less) loans to a particular group? This does not necessarily have to be the case, as the previous discussion illustrates that countries differ in their finance needs and uses.

A study of Beck, Büyükkarabacak, Rioja and Valiev (2008) reveals that socio-economic trends determine credit composition. Beck *et al* (2008) investigate which factors explain cross-country variation in the share of enterprise and household credit. Based on a sample of 45 developing and developed countries for the period 1994 to 2005, they find that only bank lending to enterprises has a positive and significant impact on economic growth. Moreover, they reveal that the share of household credit is higher (a) in countries with a smaller manufacturing sector, (b) in more urban societies and (c) in more market-based financial systems.

² Figures should be interpreted carefully as figures for MFIs in euro area countries relate to euro area residents while figures for non-euro area countries relate to domestic residents.

³ Loans to households consists of (1) consumer credit, (2) lending for house purchase and (3) other lending.

In sum, we can conclude that countries have distinctive financial needs. Therefore, GDP may not be a good measure for the size of a country's financial sector as it only relates to the size of the value added by a country's economy and not to other aspects such as differences in financial needs. As countries differ in their financial needs, and especially with regard to loans provided to non-financial corporations, it may be that countries with a larger private sector also have larger banks as banks finance both industry and trade. For example, multinationals finance a substantial part of their activities centralised, such as credit lines and issuing securities. Multinationals may also use their home banks for their foreign expansion. In the next section we delve deeper into this issue, where we investigate whether countries with more and larger multinationals also have larger banks.

4. Follow-the-Client: Multinational Enterprises

In this section, we investigate which factors explain why some countries have a banking system with larger banks that have a substantial amount of cross-border activities. In line with the follow-the-client principle, it may be that these countries have larger banks due to the fact that they have more and larger global multinationals that these banks serve.

4.1 Consolidated Assets of Banks and Multinationals

To compare the consolidated size of a country's banks and multinationals, we need to find proxies for large banks and multinationals. For the first, we use the consolidated assets of the four largest banks, because smaller banks have difficulties catering for multinationals (Dermine and Schoenmaker, 2010). These largest banks also account for a large part of a country's consolidated banking assets. For the latter, we use the consolidated assets of multinationals of that country in the world top 100 of non-financial transnational companies (TNCs) (UNCTAD, 2011a).⁴ Out of the world's top 100 largest multinationals, 61 are European enterprises and 60 are located in the countries covered by this study (EU-15 and Switzerland). Thus, the top 100 is dominated by European multinationals. UNCTAD also provides the world top 50 of financial TNCs ranked by a *Geographical Spread Index* (UNCTAD, 2011b). It is interesting that European financials also dominate this list: 33 of the 50 companies are from Europe. The top 100 banks ranked by Tier 1 capital in *The Banker* (2011) produces similar results: 40 banks are from Europe.

Table 3 (at the back) gives an overview of the 60 multinationals that are included in this study. The table provides for each multinational its consolidated assets and sales. Moreover, it reports for each multinational international assets and sales. The five largest multinationals -as measured by their consolidated assets in 2011- that are located in one of the countries within the scope of this paper are Royal Dutch Shell plc (€ 263 billion), Volkswagen Group (€ 247 billion), Électricité de France S.A. (€ 229 billion), BP plc (€ 225 billion) and GDF Suez (€ 212 billion).

⁴ UNCTAD ranked these multinationals by their foreign assets and provides a Transnationality Index (TNI) for each multinational, which they calculate as the average of foreign assets to total assets, foreign sales to total sales and foreign employment to total employment.

Looking at foreign assets as a percentage of total assets, we see that multinationals differ in the degree of assets they have in foreign countries. For example, Lafarge (a French multinational in the construction and materials industry) and SABMiller (beverages) have most of their assets in foreign countries; 96% and 88% respectively. By contrast, companies in the automobiles and parts industry - such as Renault, Volkswagen and BMW- have most of their assets in their home country; foreign assets as percentage of total assets are 8%, 15% and 15% respectively for these multinationals.

Table 4 (also in the back) provides an overview of the top-4 banks for each country. This table reports for each bank the consolidated and foreign assets. Only if a country had less than four banks ranked in the top-500 of *The Banker* (2011), fewer banks are reported. The sample covers in total 58 banking groups. The five largest banks -as measured by their consolidated assets in 2011- are Deutsche Bank AG (€ 2,155 billion), HSBC Holding plc (€ 1,961 billion), BNP Paribas SA (€ 1,956 billion), Barclays plc. (€ 1,865 billion) and Royal Bank of Scotland (€ 1,796 billion). The banks covered also differ in the amounts of foreign assets. For example, Banca Monte dei Paschi di Siena and Lloyds Banking Group only have 5% and 10% of their total assets in foreign countries, while this is 80% for Credit Suisse and Nordea

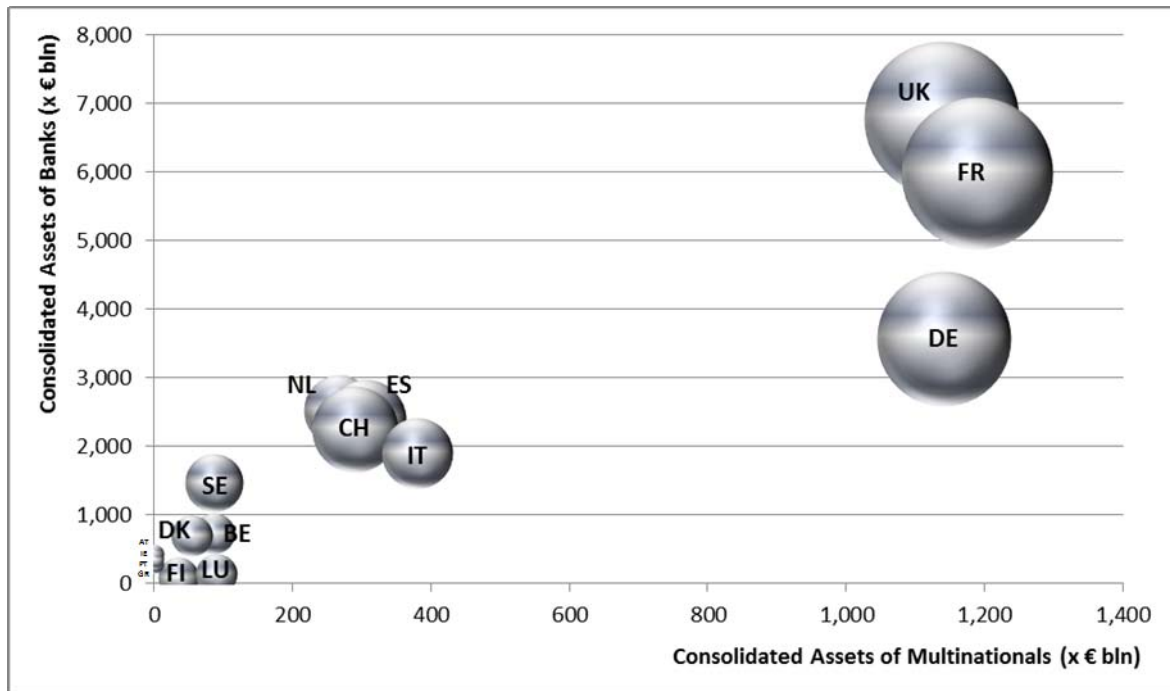
4.2 Country Level Data

To make a comparison at the country level, we calculate the consolidated assets of banks at the country level as the aggregate of the consolidated assets of the four largest banks in each country (an exceptional case are countries that have less than four banks ranked in the top-500 of *The Banker* (2011); these are Belgium, Finland and Luxembourg; see Table 6 in the back). The United Kingdom, France and Germany have the largest amount of consolidated banking assets in absolute values € 6.8 trillion, € 6.0 trillion and € 3.6 trillion respectively. However, if the consolidated assets of a country's banks are expressed as a ratio to GDP, we see that both the Netherlands and Switzerland have relatively very large banks of 4.2 and 4.9 times the country's GDP (see Table 6).

Moreover, we calculate the consolidated assets of multinationals at the country-level as the aggregate of the consolidated assets of the country's multinationals that are ranked in the top 100 of non-financial TNCs (see Table 5). As some multinationals have a dual country nationality -e.g. Royal Dutch Shell (the Netherlands and the United Kingdom)- we include the assets of these multinationals for 50% in the totals of both countries.

Figure 2 shows for each EU-15 country and Switzerland the consolidated assets of banks and multinational enterprises for 2011. The graph illustrates that countries that have larger banks also have larger multinational enterprises. Moreover, the size of the ball indicates the number of multinationals, suggesting that countries with larger banks also have more multinationals. Figure 2 thus suggests that there may be a relationship between the size of a country's multinationals and the size of a country's banks.

Figure 2: Consolidated Assets Banks vs MNEs (2011)



Legend:

AT - Austria	FI - Finland	LU - Luxembourg
BE - Belgium	FR - France	NL - Netherlands
CH - Switzerland	GR - Greece	PT - Portugal
DE - Germany	IE - Ireland	SE - Sweden
DK - Denmark	IT - Italy	UK - United Kingdom
ES - Spain		

Note: The figure shows the consolidated assets of the country's multinationals in the world's top 100 of non-financial TNCs as ranked by foreign assets for 2011 (UNCTAD, 2011a) and compares this with the consolidated assets of the top four banks for each country (in case less banks' of a country are listed in *The Banker's* top 500, the consolidated value is based on less than four banks). The size of the ball indicates the number of the country's multinationals in the world's top 100.

4.3 Research Methodology

To test this relationship statistically, a panel database is constructed for the year 2002-2011 which includes data for the EU-15 and Switzerland. As companies build a stable relationship with their home bank(s), we use the same banks and multinationals throughout this period, based on the selection of banks and multinational in year 2011.

4.3.1 Variables and Data Sources

Dependent variable

The dependent variable is $\ln(\text{Consolidated Assets Banks}_{it})$. This is the natural logarithm of the consolidated assets of banks in country i in year t . Consolidated assets of banks are measured as the aggregate of the consolidated assets (book value) of country i 's top-2 banks for each year (t) in the

period 2002-2011 and are depicted in billions of euros. The data comes from Thomson Reuters (Worldscope – Banks) and banks' annual reports.

Independent variable

The independent variable is $\ln(1 + \text{Consolidated Assets Multinationals}_{it})$, which is the natural logarithm of the consolidated assets of multinationals in country i in year t . Consolidated assets multinationals are the aggregate of the consolidated assets (book value) of country i 's multinational enterprises (MNEs) in the 'world's top-100 of non-financial transnational companies' (UNCTAD, 2011a) and is depicted in billions of euros. Multinationals that had a dual country nationality -e.g. Royal Dutch Shell- are included for 50% in the aggregate of both countries. As some countries do not have multinationals in the top-100 (reported assets are zero), the transformation $\ln(1 + \text{CAM}_{it})$ is used for all countries. The data source is Worldscope – Industrials, Thomson Reuters.

Control variables

This study also controls for a number of factors that may influence the relationship between the size of multinationals and the size of banks in a country. Control variables included in this study are:

a. Gross Domestic Product

The variable GDP is the natural logarithm of country i 's GDP depicted in billions of euros for each year (t) in the period 2002-2011. Data is from the International Monetary Fund (International Financial Statistics).

b. Exports of Goods and Services

Exports of goods and services, is the natural logarithm of country i 's exports of Goods & Services in billions of euros for each year (t) in the period 2002-2011. The data source is World Development Indicators (WDI) from the World Bank.

c. Legal Origin

This control variable refers to the legal-origin of country i : i.e. common-law or civil-law (French-civil-law, German-civil-law and Scandinavian-civil-law). Different binary variables are created; a country is coded as 0 as it has a common-law origin and as 1 as it has a civil-law origin (French, German or Scandinavian). Data are from La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1998).

d. Year-effects

Finally, a number of dummy variables are created to control for year fixed effects.

4.3.2 Research method

Both the dependent and independent variables are continuous. An ordinary least squares (OLS) regression is, therefore, appropriate to test the hypotheses. As the error terms are highly correlated

within a country, clustered standard errors are used to account for the fact that they are not independent and identically distributed (i.i.d.). The full sample comprises 158 observations.⁵

4.4 Results

We first report descriptive statistics for the variables before reporting and discussing the main results.

4.4.1 Descriptive Statistics

Table 7.1 (in the back) provides a complete description of the variables included in this study. The most important variables are the consolidated assets of banks (dependent variable) and the consolidated assets of multinationals (independent variable). The average of consolidated assets of banks is € 1,037 billion, ranging from € 32 billion to € 3,956 billion ($\sigma = 1,001$) and the average of consolidated assets of multinational enterprises is € 249 billion, ranging from € 0 billion to € 1,226 billion ($\sigma = 356$; see Table 7.2 – descriptive statistics).

4.4.2 Scatter Plot and Correlation Matrix

The scatter plot for the variables ‘consolidated assets multinationals’ and ‘consolidated assets banks’ and the plot based on the natural logarithm of both variables indicate that a positive relationship exist between both variables (see Table 7.4). In addition, the correlation matrix (Table 7.3) reveals that this relation is statistically significant ($r = 0.755$, $p < 0.001$).

4.4.3 Results Ordinary Least Squares Regressions

Table 8 reports the results for the different regressions. In the first model -Model 1a- only the dependent variable $\ln(\text{consolidated assets banks}_{it})$ and the independent variable $\ln(1+\text{consolidated assets multinationals}_{it})$ are included. Overall the model makes sense as the analysis of variance is significant ($F_{(1,15)} = 73.640$, $p < 0.001$). In this model the independent variable $\ln(1+\text{consolidated assets multinationals}_{it})$ explains 57 per cent of the variance of the dependent variable $\ln(\text{consolidated assets banks}_{it})$. Model 1a indicates that the coefficient of the variable $\ln(1+\text{consolidated assets multinationals}_{it})$ is positive and statistically significant ($\beta = 0.369$, $p < 0.001$). Assuming that larger multinationals lead to a larger banking sector, the results suggests that when the consolidated assets of multinationals increases with 1%, the consolidated assets of the large banks increase with approximately 0.4%. This coefficient remains relatively stable after controlling for legal origin and fixed year effects in Models 1b and 1c.

But if we control for a country’s gross domestic product in the current year and one year lagged, the coefficient is still statistically significant but decreases to 0.2% (see Table 8, Models 1d and 1e). Thus, an increase of 1% in the country’s consolidated assets of multinationals may lead to an increase of 0.2% in the consolidated assets of its large banks. Moreover, the results indicate that a 1% increase of the country’s GDP increases the consolidated assets of large banks by 0.5%. These results indicate that a change in the size of multinationals or GDP has an economic effect on the size of banks.

⁵ For Luxembourg the first two years of the sample period – 2002 and 2003 – are missing due to limited data availability.

We also control for the country's exports of goods and services (exports of Goods & Services), but these results are not reported. The collinearity statistics in Table 7.3 reveal that there is multicollinearity after introducing both GDP and exports of Goods & Services in the regression.

Table 8: Regression Results

The dependent variable is $\ln(\text{consolidated assets banks}_{it})$ and the independent variable is $\ln(1+\text{consolidated assets multinationals}_{it})$. Moreover Models d and e control for the country's gross domestic product in the current year (t) and one year lagged ($t-1$). The table reports the results for the following ordinary least squares (OLS) regressions:

$$\text{Model 1: } \ln(\text{consolidated assets banks}_{it}) = \alpha + \beta[\ln(1+\text{consolidated assets multinationals}_{it})] + \beta(X_{it}) + \varepsilon_{it}$$

where $\ln(\text{consolidated assets banks}_{it})$ is the natural logarithm of the aggregated assets of the top-2 banks in country i in year t , $\ln(1+\text{consolidated assets multinationals}_{it})$ is the natural logarithm of the aggregated assets of country i 's multinationals in the world's top 100 multinational in year t and X_{it} controls for country i 's gross domestic product, its legal origin, and fixed year effects. The regressions cover the period 2002-2011. Robust standard errors are clustered at the country-level and reported in parentheses.

	<i>Model 1a</i>	<i>Model 1b</i>	<i>Model 1c</i>	<i>Model 1d</i>	<i>Model 1e</i>
Constant	4.950 *** (0.272)	4.654 *** (0.278)	5.197 *** (0.165)	2.655 * (1.058)	2.625 * (0.971)
$\ln(1+\text{Consolidated Assets Multinationals})$	0.369 *** (0.043)	0.362 *** (0.044)	0.361 *** (0.024)	0.216 ** (0.070)	0.214 ** (0.064)
<i>Control variables</i>					
\ln [Gross Domestic Product (t)]				0.479 * (0.202)	
\ln [Gross Domestic Products ($t-1$)]					0.497 * (0.184)
<i>Fixed Effects</i>					
Year	No	Yes	Yes	Yes	Yes
Legal-origin	No	No	Yes	Yes	Yes
N	158	158	158	158	143
R-Square	0.570	0.594	0.717	0.796	0.805
F	73.640	23.570	58.770	137.570	73.330
Prob > F	0.000	0.000	0.000	0.000	0.000

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

It should be noted that one should be careful with interpreting these results, as the direction of causality is not clear from this regression; i.e. do larger multinationals lead to larger banks or is it the other way around. Moreover, the regression is based on a small sample (only sixteen developed countries) limiting the external validity of this study, i.e. the extent to which the results can be generalised beyond the EU-15 and Switzerland.

In sum, this section indicates that the size of a country's multinationals is related to the size of a country's banks. Expressing the size of a country's financial sector to GDP may thus be an incomplete measure as countries a) differ in their financial needs and b) differ in the number and size of multinationals. We therefore suggest to compare the assets of the banking system in a country to the country's GDP and to compare the size of large banks to the size of a country's multinationals.

The following yardsticks to measure the size of the financial sector thus emerge:

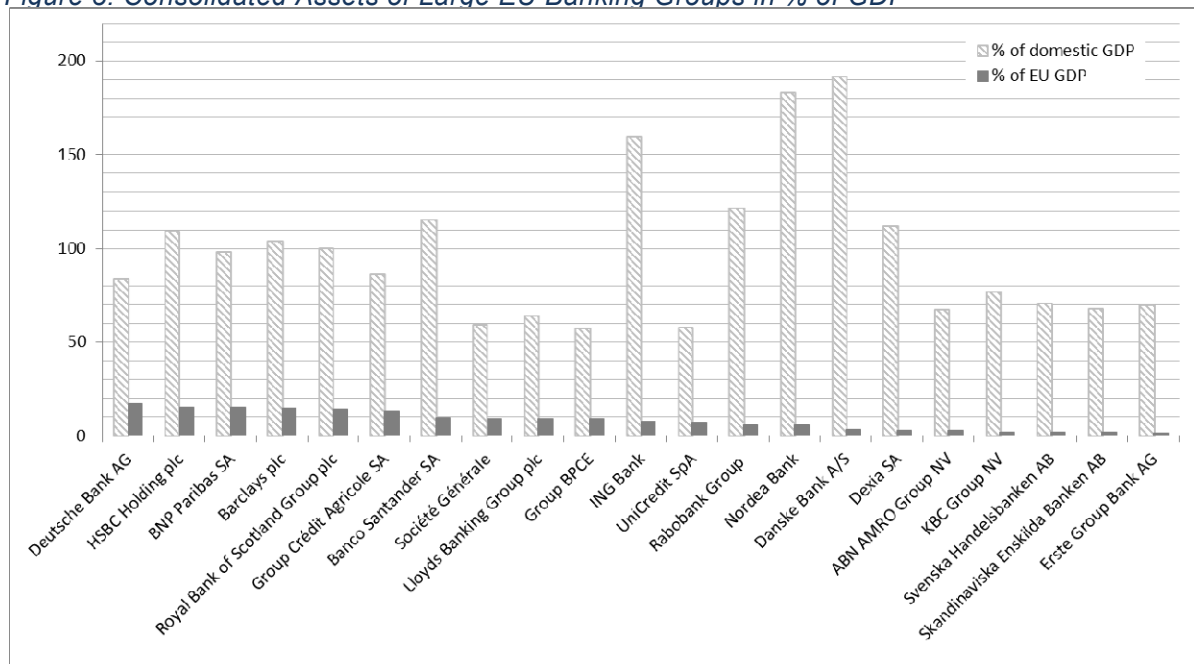
- a. Banking assets in a country / GDP
- b. Consolidated assets of large banks – consolidated assets of multinationals

5. Too-Big-To-Save

The previous section indicates that the size of large (international) banks is related to the size of multinationals. So large banks are useful for multinationals as they fulfil their financial needs. However, this does not affect the fact that large global banks may remain too-big-to-save for their respective home country. With regard to the too-big-to-save doctrine the 'reference point' for determining whether a bank is too-big-to-save plays an important role.

Figure 3 depicts the consolidated assets of large European banking groups as a percentage of both domestic GDP and EU GDP. At the country level, some large banks in small to medium-sized countries are too-big-to-save. Examples are Danske Bank in Denmark (where consolidated assets account for 192% of domestic GDP), Nordea Bank in Sweden (183%) and ING Bank in the Netherlands (159%). While assets of the largest banks do not exceed much beyond 100% of GDP in the large countries, like the UK, Germany, France, Italy and Spain. By contrast, the figure shows that banks are not too-big-to-save anymore at the EU level. The largest bank in this respect is Deutsche Bank whose consolidated assets account for 17.0% of EU GDP, followed by HSBC Holding (15.5%) and BNP Paribas (15.5%). Moreover, as illustrated in the Liikanen Report, the ratio of assets-to-GDP of large EU banks at the European level is similar to the ratios of large banks in the US (Liikanen *et al*, 2012). For example, the largest bank in the US is JP Morgan whose consolidated assets account for 15% of US GDP (Liikanen *et al*, 2012, p. 40).

Figure 3: Consolidated Assets of Large EU Banking Groups in % of GDP



Note: In this figure the consolidated assets of the largest banking groups in the European Union (EU) are depicted relative to the GDP of its home country (domestic GDP) and to the GDP of the EU as a whole. Figures are for 2011.

The too-big-to-safe problem can be solved in two ways. The first is burden sharing among national countries within the EU (Goodhart and Schoenmaker, 2009). As the large banks typically operate cross-border throughout Europe, the burden per country would then be substantially lower than the burden for the home country without such burden sharing (see Dermine and Schoenmaker (2010) for some calculations). The second is the advance to the proposed Banking Union. Supervision and resolution would then be done at the European level. While the Banking Union is in particular aimed at the euro-area countries, the out-countries have the possibility to opt-in. To solve the too-big-to-safe problem, opting-in may be helpful for countries with large banks, like Denmark and Sweden.

Finally, section 4 suggests that large banks are useful to serve multinationals. But that does not imply that a country with multinationals should only have large banks. Liikanen *et al* (2012) stress that it is important that a country's banking system is heterogeneous with banks that differ in activities and size. From a theoretical perspective, Wagner (2011) shows that a heterogeneous banking system is more robust and less vulnerable to systemic risk. If all banks are fully diversified in the same manner, they may be less vulnerable to small shocks at the level of individual banks. But in case of a large shock, all banks would go down in a similar way due to homogeneous portfolios. Heterogeneity can help to mitigate systemic risk.

6. Conclusions

As a yardstick to measure the size of the banking system, a country's banking assets are usually divided by the country's gross domestic product (GDP). But is this an appropriate way to compare the size of the financial sector between countries? This study shows that comparing countries' banking sectors only by using the country's GDP does not capture the whole story as (1) countries have distinctive financial needs, as indicated by credit to financial institutions, the government, non-financial corporations and households, and (2) countries with more and larger multinational enterprises also have larger banks.

Thus GDP may be an incomplete measure as -besides GDP- other factors are important in explaining the size of a country's banks. We therefore argue that an additional yardstick comparing the size of large banks to the size of a country's multinationals may be useful. Countries with one or more large multinationals may thus find it beneficial to have large banks to serve these multinationals. So, the size of banks should also be judged from a wider industry policy perspective.

A final policy issue is that large banks may be too-big-to-save for small countries. The proposed Banking Union may solve that problem, as large banking groups are not too-big-to-save anymore at the European level.

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Table 2: Consolidated Balance Sheet of EU MFI's

	Total Assets	Total Loans	% of Total Assets	Loans to							Trading	% of Total Assets	
				Financial Institutions	% of Total Loans	General Government	% of Total Loans	Non-Financial Corporations	% of Total Loans	Households			% of Total Loans
Austria	1,010.1	609.5	60.3	269.3	44.2	30.9	5.1	165.3	27.1	144.0	23.6	178.2	17.6
Belgium	1,200.8	548.3	45.7	298.8	54.5	26.4	4.8	114.7	20.9	108.5	19.8	264.6	22.0
Denmark	1,144.9	622.7	54.4	146.2	23.5	20.0	3.2	139.5	22.4	316.9	50.9	251.5	22.0
Finland	644.4	286.7	44.5	103.9	36.2	8.5	3.0	64.3	22.4	110.0	38.4	32.4	5.0
France	8,398.7	4,430.0	52.7	2,284.2	51.6	198.2	4.5	878.3	19.8	1,069.2	24.1	1,368.9	16.3
Germany	8,393.3	4,693.3	55.9	1,958.3	41.7	392.4	8.4	906.8	19.3	1,435.8	30.6	1,374.7	16.4
Greece	476.9	308.4	64.7	52.2	16.9	14.2	4.6	114.3	37.1	127.6	41.4	58.8	12.3
Ireland	1,313.5	521.8	39.7	235.5	45.1	72.6	13.9	100.9	19.3	112.7	21.6	236.1	18.0
Italy	4,070.2	2,499.1	61.4	716.4	28.7	259.0	10.4	905.3	36.2	618.6	24.8	952.0	23.4
Luxembourg	1,099.3	467.3	42.5	375.8	80.4	4.4	0.9	53.5	11.4	33.5	7.2	207.6	18.9
Netherlands	2,423.1	1,364.3	56.3	530.6	38.9	51.0	3.7	364.8	26.7	419.3	30.7	382.6	15.8
Portugal	573.3	324.3	56.6	57.1	17.6	9.7	3.0	116.9	36.0	140.6	43.4	162.8	28.4
Spain	3,621.2	2,241.6	61.9	431.3	19.2	89.4	4.0	861.3	38.4	859.7	38.4	766.4	21.2
Sweden	1,140.6	633.0	55.5	112.6	17.8	18.9	3.0	204.2	32.3	297.2	47.0	106.0	9.3
United Kingdom	9,731.5	4,192.7	43.1	2,225.3	53.1	11.7	0.3	544.0	13.0	1,411.8	33.7	781.2	8.0
EU-15	45,241.8	23,743.0	52.5	9,797.5	41.3	1,207.3	5.1	5,534.1	23.3	7,205.4	30.3	7,123.8	15.7

Note: The table reports the consolidated balance sheet of Monetary Financial Institutions (MFIs) in EU-15 countries. Figures should be interpreted carefully as figures for MFIs in euro area countries relate to euro area residents while figures for non-euro area countries relates to domestic residents. 'Loans to households' consists of (1) consumer credit, (2) lending for house purchase and (3) other lending to households. 'Trading' consists of holdings of (1) securities other than shares issued by residents, (2) money market fund shares / units and (3) shares / other equity. Figures are reported for 2011 and are depicted in billions of Euros.

For the EU-15 'total loans' and 'trading' make up respectively 52.5% and 15.7% of total assets. The remaining 31.8% consists of the unreported categories 'fixed assets' (0.7%), 'external assets' (19.9%) and 'remaining assets' (11.2%). For euro area countries 'external assets' consists of holdings of cash in other currencies, holdings of securities issued by non-residents of the euro area, loans to non-residents of the euro area, and gold and receivables from the IMF held by the Eurosystem (ECB, 2012, p. 111). 'Remaining assets' includes for example financial derivative positions subject to on-balance-sheet recording, gross amounts receivable in respect of suspense and transit items, accrued interest receivable on loans, and dividends to be received (ECB, 2012, pp. 85-89). Based on data reported by the Dutch Central Bank we could retrieve that for MFIs in the Netherlands financial derivatives (€ 189.7 billion) account for the largest part – almost 70% – of 'remaining assets' (€ 273.1 billion).

Source: De Nederlandsche Bank (DNB) / European System of Central Banks (ESCB) / European Central Bank (ECB)

Table 3: (Inter)National Assets and Sales of MNEs

Multinational	Home Country	Description	Consolidated Assets in billions of Euros, 2011	Revenues in billions of Euros, 2011	International Assets in billions of Euros, 2011	International Sales in billions of Euros, 2011	Foreign Assets as % of Total Assets	Foreign Sales as % of Total Sales	Trade Home Country		Assets / GDP
									Imports of Goods & Services (in € bn)	Exports of Goods & Services (in € bn)	
Anheuser-Busch InBev SA/NV	Belgium	Beverages	86.27	27.94	82.41	25.11	95.52%	89.90%	306.05	335.91	23.38%
A.P. Moller - Maersk A/S	Denmark	Industrial Transportation	53.78	43.38	24.94	34.88	46.37%	80.41%	116.02	137.76	22.38%
Nokia Oyj	Finland	Technology Hardware & Equipment	34.36	38.66	7.20	38.34	20.95%	99.18%	75.89	80.37	17.93%
Electricité de France S.A. (EDF)	France	Electricity	229.20	65.31	68.62	28.14	29.94%	43.08%	592.09	577.70	11.48%
GDF Suez	France	Gas, Water & Multiutilities	212.03	90.67	59.52	59.52	59.52%	65.64%	592.09	577.70	10.62%
Total SA	France	Oil & Gas Producers	162.28	166.55	71.23	142.07	43.89%	85.30%	592.09	577.70	8.13%
Sanofi SA	France	Pharmaceuticals & Biotechnology	96.53	33.39	68.34	30.28	70.80%	90.70%	592.09	577.70	4.84%
France Telecom S.A.	France	Fixed Line Telecommunications	92.53	45.28	63.40	23.73	68.51%	52.40%	592.09	577.70	4.64%
Renault SA	France	Automobiles & Parts	72.37	42.63	5.43	30.51	7.51%	71.57%	592.09	577.70	3.63%
Vivendi SA	France	Media	54.30	28.81	23.11	12.01	42.57%	41.69%	592.09	577.70	2.72%
Veolia Environnement Vs SA	France	Gas, Water & Multiutilities	49.14	29.26	19.88	18.19	40.45%	62.15%	592.09	577.70	2.46%
Compagnie de Saint-Gobain SA	France	Construction & Materials	45.29	42.12	24.16	30.31	53.35%	71.98%	592.09	577.70	2.27%
Carrefour SA	France	Food & Drug Retailers	47.19	81.27	31.50	46.09	66.76%	56.71%	592.09	577.70	2.36%
Lafarge S.A.	France	Construction & Materials	39.92	15.28	38.45	13.40	96.32%	87.67%	592.09	577.70	2.00%
Schneider Electric SA	France	Electronic & Electrical Equipment	34.44	22.39	18.34	20.43	53.25%	91.25%	592.09	577.70	1.73%
Alstom S.A.	France	Industrial Engineering	28.35	20.92	6.86	12.71	24.20%	60.77%	592.09	577.70	1.42%
Pernod-Ricard SA	France	Beverages	24.24	7.64	35.88	6.89	90.19%	90.19%	592.09	577.70	1.21%
Volkswagen Group	Germany	Automobiles & Parts	247.29	159.34	36.83	124.74	14.89%	78.29%	1,155.06	1,383.78	9.63%
E.ON AG	Germany	Gas, Water & Multiutilities	147.72	112.95	29.44	29.44	26.07%	26.07%	1,155.06	1,383.78	5.75%
Daimler AG	Germany	Automobiles & Parts	145.36	106.54	86.79	86.79	81.46%	81.46%	1,155.06	1,383.78	5.66%
BMW AG	Germany	Automobiles & Parts	121.50	68.82	18.52	55.96	15.24%	81.32%	1,155.06	1,383.78	4.73%
Deutsche Telekom AG	Germany	Mobile Telecommunications	118.09	58.65	89.02	36.03	75.38%	61.43%	1,155.06	1,383.78	4.60%
Siemens AG	Germany	General Industrials	101.04	73.52	26.77	22.99	29.73%	46.76%	1,155.06	1,383.78	3.94%
RWE AG	Germany	Gas, Water & Multiutilities	90.04	49.15	39.84	58.79	65.71%	79.99%	1,155.06	1,383.78	3.51%
BASF SE	Germany	Chemicals	60.63	73.50	13.19	32.94	30.92%	75.97%	1,155.06	1,383.78	2.36%
ThyssenKrupp AG	Germany	General Industrials	42.66	43.36	14.38	36.09	38.60%	68.31%	1,155.06	1,383.78	1.66%
Deutsche Post AG	Germany	Industrial Transportation	37.26	52.83	19.05	12.54	66.74%	90.97%	1,155.06	1,383.78	1.45%
Linde AG	Germany	Chemicals	28.55	13.79	19.05	12.54	66.74%	90.97%	1,155.06	1,383.78	1.11%
Enel SpA	Italy	Electricity	163.79	77.57	46.90	46.90	60.45%	60.45%	478.44	487.84	10.36%
Eni SpA	Italy	Oil & Gas Producers	137.43	109.15	76.33	75.78	55.54%	69.43%	478.44	487.84	8.69%
Fiat SpA	Italy	Automobiles & Parts	78.34	59.56	31.36	50.30	40.03%	84.46%	478.44	487.84	4.96%
Arceormittal	Luxembourg	Industrial Metals & Mining	89.40	67.24	21.16	34.53	23.67%	51.35%	53.88	75.72	212.95%
Royal Dutch Shell plc	The Netherlands / United Kingdom	Oil & Gas Producers	262.89	336.40	128.99	202.25	49.07%	60.12%	450.18	534.47	43.52%
EADS N.V.	The Netherlands	Aerospace & Defence	84.17	49.13	13.59	41.77	16.14%	85.02%	450.18	534.47	13.93%
Unilever plc	The Netherlands / United Kingdom	Food & Beverages	47.35	46.47	34.20	34.20	73.60%	73.60%	450.18	534.47	7.84%
Koninklijke Philips Electronics NV	The Netherlands	General Industrials	27.25	22.58	13.41	21.89	49.19%	96.94%	450.18	534.47	4.51%
Telefonica SA	Spain	Fixed Line Telecommunications	123.21	62.84	45.55	45.55	72.49%	72.49%	329.60	346.92	11.48%
Iberdrola SA	Spain	Electricity	92.36	31.65	47.85	16.36	51.81%	51.81%	329.60	346.92	8.60%
Repsol SA	Spain	Oil & Gas Producers	68.39	61.50	32.47	32.47	52.79%	52.79%	329.60	346.92	6.37%
Ferrovial SA	Spain	Construction & Materials	20.95	7.45	14.05	4.08	67.04%	54.74%	329.60	346.92	1.95%
Vattenfall AB	Sweden	Electricity, gas and water	58.71	20.31	24.32	14.31	41.42%	70.45%	172.04	208.46	14.98%
TeliaSonera AB	Sweden	Mobile Telecommunications	27.58	11.71	14.12	7.66	51.21%	65.45%	172.04	208.46	7.04%

Multinational	Home Country	Description	Consolidated Assets in billions of Euros, 2011	Revenues in billions of Euros, 2011	International Assets in billions of Euros, 2011	International Sales in billions of Euros, 2011	Foreign Assets as % of Total Assets	Foreign Sales as % of Total Sales	Trade Home Country		Assets / GDP
									Imports of Goods & Services (in € bln)	Exports of Goods & Services (in € bln)	
(Continued)											
Nestlé SA	Switzerland	Food Producers	91.68	68.70	49.04	67.23	53.49%	97.85%	192.25	219.12	19.76%
Novartis AG	Switzerland	Pharmaceuticals & Biotechnology	86.02	42.36	36.47	41.75	42.40%	98.56%	192.25	219.12	18.54%
Xstrata plc	Switzerland / United Kingdom	Mining	57.55	25.16	51.97	22.59	90.30%	89.81%	192.25	219.12	12.40%
Roche Holding AG	Switzerland	Pharmaceutical & Biotechnology	48.31	34.94	19.93	32.80	41.26%	93.90%	192.25	219.12	10.41%
Holcim Ltd	Switzerland	Construction & Materials	34.55	17.04	24.95	16.39	72.21%	96.17%	192.25	219.12	7.45%
BP plc	United Kingdom	Oil & Gas Producers	225.05	278.86	126.29	222.56	56.12%	79.81%	615.54	607.45	12.49%
Vodafone Group plc	United Kingdom	Mobile Telecommunications	178.28	54.83	96.20	47.85	53.96%	87.27%	615.54	607.45	9.90%
Rio Tinto plc	United Kingdom	Mining	91.30	45.21	69.47	69.47	76.09%		615.54	607.45	5.07%
Tesco plc	United Kingdom	Food & Drug Retailer	56.35	72.81	18.14	23.77	32.20%	32.65%	615.54	607.45	3.13%
National Grid plc	United Kingdom	Gas, Water & Multiutilities	55.44	16.71		10.50		62.82%	615.54	607.45	3.08%
Anglo American plc	United Kingdom	Mining	55.34	22.71	31.36		56.67%		615.54	607.45	3.07%
BG Group plc	United Kingdom	Oil & Gas Producers	46.74	15.66		12.61		80.52%	615.54	607.45	2.59%
GlaxoSmithKline plc	United Kingdom	Pharmaceuticals & Biotechnology	45.68	32.73	15.81	30.81	34.61%	94.14%	615.54	607.45	2.54%
AstraZeneca plc	United Kingdom	Pharmaceuticals & Biotechnology	39.49	24.94	28.53	23.47	72.25%	94.11%	615.54	607.45	2.19%
British American Tobacco plc	United Kingdom	Tobacco	32.00	18.40		18.25		99.19%	615.54	607.45	1.78%
WPP plc	United Kingdom	Media	29.41	11.98	13.63	10.56	46.35%	88.19%	615.54	607.45	1.63%
SABMiller plc	United Kingdom	Beverages	28.84	11.58	25.20		87.39%		615.54	607.45	1.60%
BAE Systems plc	United Kingdom	Aerospace & Defense	25.92	21.23		16.75		78.90%	615.54	607.45	1.44%

Note: The table reports the consolidated assets and sales of multinational enterprises (MNEs) for the Netherlands, Belgium, Denmark, Finland, France, Germany, Italy, Luxembourg, Spain, Switzerland and UK. Moreover the fraction of MNE's international assets and sales are reported as a percentage of total assets and total sales respectively.

Source: Worldscope / Industrials (Thomson Reuters), International Financial Statistics (IMF), World Development Indicators (World Bank)

Table 4: (Inter)National Assets of Banks

Country - Bank	Assets in billions of Euros, 2011	Gross Domestic Product, nominal in billions of Euros, 2011	Assets / GDP	Foreign Assets as % of Total Assets	Foreign Sales as % of Total Sales
Austria					
Erste Group Bank AG	209.30	300.24	69.71%	58.72%	66.95%
Raiffeisen Bank International Group AG	146.63	300.24	48.84%	63.00%	40.67%
Bank für Arbeit und Wirtschaft - PSK Group (BAWAG/PSK)	41.08	300.24	13.68%	23.67%	
Österreichische Volksbanken AG	41.02	300.24	13.66%		15.47%
Belgium					
Dexia SA *	412.76	368.98	111.87%	89.98%	
KBC Group NV	282.94	368.98	76.68%	36.88%	26.21%
Axa Bank Europe	41.84	368.98	11.34%	34.24%	
Denmark					
Danske Bank A/S	460.39	240.30	191.58%	59.75%	19.21%
Nykredit Realkredit Group	187.36	240.30	77.97%		
Jyske Bank Group A/S	36.35	240.30	15.13%	7.39%	4.14%
Sydbank A/S	20.64	240.30	8.59%	4.66%	3.33%
Finland					
OP-Pohjola Group	92.29	191.57	48.17%	11.21%	
France					
BNP Paribas SA *	1,955.94	1,995.79	98.00%	50.77%	31.20%
Group Crédit Agricole SA *	1,718.51	1,995.79	86.11%	19.11%	19.22%
Société Générale *	1,176.79	1,995.79	58.96%	21.24%	21.92%
Group BPCE * (Banque Populaire and Caisse d'Epargne)	1,138.40	1,995.79	57.04%	19.40%	14.50%
Germany					
Deutsche Bank AG *	2,155.37	2,567.22	83.96%	65.78%	62.17%
Commerzbank AB *	657.61	2,567.22	25.62%	49.19%	12.50%
Bayerische Hypo- und Vereinsbank AG	385.51	2,567.22	15.02%	31.68%	
Landesbank Baden-Württemberg (LBBW Group)	373.06	2,567.22	14.53%	28.40%	
Greece					
National Bank of Greece SA	105.56	215.09	49.08%	11.57%	22.08%
EFG Eurobank Ergasias SA	75.10	215.09	34.91%	21.14%	16.98%
Alpha Bank SA	57.68	215.09	26.82%	17.63%	12.54%
Piraeus Bank Group SA	48.17	215.09	22.40%	0.13%	3.94%
Ireland					
Bank of Ireland	153.50	156.44	98.12%	39.33%	42.13%
Allied Irish Banks plc	132.96	156.44	84.99%	8.02%	4.77%
Irish Life & Permanent Group Holdings plc	71.85	156.44	45.93%	17.67%	
Irish Bank Resolution Corporation Limited	55.54	156.44	35.50%	1.28%	17.08%
Italy					
UniCredit SpA *	914.11	1,580.81	57.83%	59.12%	36.63%
Intesa Sanpaolo SpA	626.90	1,580.81	39.66%	18.20%	10.52%
Banca Monte dei Paschi di Siena SpA	234.03	1,580.81	14.80%	4.94%	
Unione di Banche Italiane Scpa (UBI Banca)	127.45	1,580.81	8.06%	3.64%	
Luxembourg					
European Financial Group (EFG Group) 2010	103.89	41.98	247.47%	98.50%	99.74%
Banque et Caisse d'Epargne l'Etat (BCEE)	39.74	41.98	94.67%		
Netherlands, the					
ING Group NV *	1,270.56	604.02	210.35%	60.87%	70.45%
Rabobank Group	731.67	604.02	121.13%	26.00%	
ABN AMRO Group NV	404.68	604.02	67.00%	19.60%	
SNS Reaal NV	128.21	604.02	21.23%	9.92%	
Portugal					
Caixa Geral de Depositos	120.57	171.02	70.50%	17.55%	30.71%
Banco Espirito Santo Group SA	98.59	171.02	57.65%	21.95%	
Millennium bcp	93.48	171.02	54.66%	27.07%	43.01%
Banco BPI SA	42.06	171.02	24.59%	13.01%	9.08%

Country - Bank	Assets in billions of Euros, 2011	Gross Domestic Product, nominal in billions of Euros, 2011	Assets / GDP	Foreign Assets as % of Total Assets	Foreign Sales as % of Total Sales
Spain					
Banco Santander SA *	1,233.77	1,073.38	114.94%	60.61%	33.95%
Banco Bilbao Vizcaya Argentaria SA (BBVA)	591.36	1,073.38	55.09%	48.66%	39.37%
Bankia Group SA	301.00	1,073.38	28.04%		2.02%
CaixaBank SA	268.16	1,073.38	24.98%	2.00%	2.10%
Sweden					
Nordea Bank*	717.90	391.88	183.19%	79.61%	43.33%
Svenska Handelsbanken AB	275.36	391.88	70.27%	41.98%	20.51%
Skandinaviska Enskilda Banken AB (SEB)	264.96	391.88	67.61%	22.76%	28.11%
Swedbank AB	208.28	391.88	53.15%	13.18%	13.72%
Switzerland					
United Bank of Switzerland AG (UBS) *	1,158.70	463.97	249.74%	68.81%	39.95%
Credit Suisse Group AG *	854.44	463.97	184.16%	80.23%	42.01%
Schweizer Verband der Raiffeisenbanken (Raiffeisen Group)	128.05	463.97	27.60%	3.01%	
Zürcher Kantonalbank	110.07	463.97	23.72%	25.11%	
United Kingdom					
HSBC Holding plc *	1,960.64	1,801.44	108.84%	58.77%	48.67%
Barclays plc *	1,864.68	1,801.44	103.51%	66.59%	38.56%
Royal Bank of Scotland Group plc (RBS) *	1,795.94	1,801.44	99.70%	33.25%	45.82%
Lloyds Banking Group plc *	1,154.35	1,801.44	64.08%	9.80%	5.69%

Note: The table reports the consolidated assets of large banks in the EU-15 and Switzerland. Moreover the fraction of a bank's international assets and sales are reported as a percentage of total assets and total sales respectively. For EFG Group the figures for 2010 are used as those for 2011 were not available yet. * Are G-SIFIs, as indicated in '*Policy Measures to Address Systemically Important Financial Institutions*' by the Financial Stability Board (November 2011).

Source: Worldscope / Banks (Thomson Reuters), International Financial Statistics (IMF), Banks' Annual Reports 2011

Table 5: Consolidated Assets MNEs at Country Level

Country	Number of Multinationals in Top 100	Consolidated Assets in billions of Euros, 2011	Revenues in billions of Euros, 2011	Domestic Assets in billions of Euros, 2011	International Assets in billions of Euros, 2011
Belgium	1	86.27	27.94	3.86	82.41
Denmark	1	53.78	43.38	28.84	24.94
Finland	1	34.36	38.66	27.16	7.20
France	14	1,187.80	691.52	573.43	614.37
Germany	11	1,140.13	812.44	725.63	414.50
Italy	3	379.57	246.28	172.85	206.71
Luxembourg	1	89.40	67.24	68.23	21.16
Netherlands, the	3	266.54	263.14	157.63	108.91
Spain	4	304.90	163.43	117.59	187.31
Sweden	2	86.30	32.02	47.85	38.44
Switzerland	4.5	289.33	175.61	132.96	156.37
United Kingdom	14.5	1,093.74	831.66	436.54	657.20

Country	Domestic Assets as % of Total Assets	Foreign Assets as % of Total Assets	Trade Home Country		Total Assets / GDP
			Imports of Goods & Services (in € bln)	Exports of Goods & Services (in € bln)	
Belgium	4.48%	95.52%	306.05	335.91	23.38%
Denmark	53.63%	46.37%	116.02	137.76	22.38%
Finland	79.05%	20.95%	75.89	80.37	17.93%
France	48.28%	51.72%	592.09	577.70	59.52%
Germany	63.64%	36.36%	1,155.06	1,383.78	44.41%
Italy	45.54%	54.46%	478.44	487.84	24.01%
Luxembourg	76.33%	23.67%	53.88	75.72	212.95%
Netherlands, the	59.14%	40.86%	450.18	534.47	44.13%
Spain	38.57%	61.43%	329.60	346.92	28.41%
Sweden	55.45%	44.55%	172.04	208.46	22.02%
Switzerland	45.95%	54.05%	192.25	219.12	62.36%
United Kingdom	39.76%	60.24%	615.54	607.45	63.12%

Note: The table reports the consolidated assets and sales of multinational enterprises (MNEs) at the country level for the Netherlands, Belgium, Denmark, Finland, France, Germany, Italy, Luxembourg, Spain, Switzerland and UK. Moreover the fractions of MNE's international and domestic assets are reported as a percentage of total assets. For MNEs that have a dual country nationality – e.g. Royal Dutch Shell – the assets and revenues of the MNE are included for 50% in the totals for both countries. If the geographically division of assets was not available the geographically division of sales was used as a proxy to calculate the consolidated international assets for each country.

Table 6: Consolidated Banking Assets at Country Level

Country	Consolidated Assets in billions of Euros, 2011	Gross Domestic Product, nominal in billions of Euros, 2011	Assets / GDP
Austria	438.03	300.24	1.46
Belgium	737.53	368.98	2.00
Denmark	704.74	240.30	2.93
Finland	92.29	191.57	0.48
France	5,989.64	1,995.79	3.00
Germany	3,571.55	2,567.22	1.39
Greece	286.51	215.09	1.33
Ireland	413.85	156.44	2.65
Italy	1,902.48	1,580.81	1.20
Luxembourg	143.63	41.98	3.42
Netherlands, the	2,535.11	604.02	4.20
Portugal	354.70	171.02	2.07
Spain	2,394.28	1,073.38	2.23
Sweden	1,466.50	391.88	3.74
Switzerland	2,251.26	463.97	4.85
United Kingdom	6,775.61	1,801.44	3.76

Note: This table depicts the consolidated assets of the top four banks per country. For countries that had less than four banks listed in *The Banker's* top 500 (The Banker, 2011) -such as Belgium, Finland and Luxembourg- the consolidated value is based on less than four banks. Furthermore, the table relates the consolidated assets to the country's gross domestic product (GDP).

Table 7: Descriptive Statistics & Correlations

7.1 Definition and Source of the Variables

Name	Explanation / Data Source
<i>Country</i>	This are the countries included in this study: all EU-15 countries and Switzerland.
<i>Consolidated Assets Banks_{it}</i>	This variable is the aggregate of the consolidated assets of country <i>i</i> 's top-2 banks for each year (<i>t</i>) in the period 2002-2011. Figures are in billions of euros. Data source: Worldscoop – Banks, Thomson Reuters and the banks' annual reports.
<i>Consolidated Assets Multinationals_{it}</i>	This variable is the aggregate of the consolidated assets of country <i>i</i> 's multinational enterprises (MNEs) in the 'world's top-100 of non-financial transnational companies' (UNCTAD, 2011a). Multinationals that had a dual country nationality – e.g. Royal Dutch Shell (The Netherlands and United Kingdom) – are included for 50% in the aggregate of both countries. Figures are in billions of euros for the period 2002-2011. Data source: Worldscoop – Industrials, Thomson Reuters.
<i>Gross Domestic Product_{it}</i>	The variable gross domestic product, is country <i>i</i> 's GDP depicted in billions of euros for each year (<i>t</i>) in the period 2002-2011. Data source: International Financial Statistics (IFS), International Monetary Fund (IMF).
<i>Exports of Goods and Services_{it}</i>	Exports of goods and services, is country <i>i</i> 's exports of G&S in billions of euros for each year (<i>t</i>) in the period 2002-2011. Data source: World Development Indicators (WDI), The World Bank.
<i>Legal-Origin_i</i>	This variable refers to the legal-origin of country <i>i</i> : i.e. common-law or civil-law (French-civil-law, German-civil-law, and Scandinavian-civil-law). Source: La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1998).
<i>Ln(Consolidated Assets Banks_{it})</i>	This is the natural logarithm of the variable 'consolidated assets of banks _{it} '.
<i>Ln(1 + Consolidated Assets Multinationals_{it})</i>	This is the natural logarithm of the variable 'consolidated assets of multinationals _{it} '. The transformation $\ln(1 + \text{consolidated assets MNEs}_{it})$ is used as four countries do not have MNEs in the world's top-100.
<i>Ln(Gross Domestic Product_{it})</i>	This is the natural logarithm of the variable 'gross domestic product _{it} '.
<i>Ln(Exports of Goods and Services_{it})</i>	This is the natural logarithm of the variable 'exports of goods and services _{it} '.

7.2 Descriptive Statistics

	<i>N</i>	<i>Mean</i>	<i>Median</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Std. Dev.</i>	<i>Skewness</i>	<i>Kurtosis</i>
Consolidated Assets Banks (x € bln)	158	1,037.31	633.39	31.63	3,956.21	1,000.57	1.13	0.51
Consolidated Assets Multinationals (x € bln)	160	249.16	84.31	0.00	1,226.18	356.33	1.54	0.93
Gross Domestic Product (x € bln)	160	688.00	298.86	23.99	2,567.22	714.23	1.14	-0.13
Gross Domestic Product (t-1) (x € bln)	144	679.97	295.16	23.99	2,471.86	707.79	1.14	-0.15
Exports of Goods and Services (x € bln)	160	256.57	164.44	30.28	1,383.78	248.24	2.07	5.13
Exports of Goods and Services (t-1) (x € bln)	144	247.14	157.01	30.28	1,251.63	236.09	1.98	4.55
Ln(Consolidated Assets Banks)	158	6.35	6.45	3.45	8.28	1.22	-0.33	-0.95
Ln(1 + Consolidated Assets Multinationals)	160	3.78	4.45	0.00	7.11	2.49	-0.46	-1.15
Ln[Gross Domestic Product (t)]	160	5.97	5.70	3.18	7.85	1.12	-0.10	-0.38
Ln[Gross Domestic Product (t-1)]	144	5.95	5.69	3.18	7.81	1.12	-0.10	-0.36
Ln[Exports of Goods and Services (t)]	160	5.14	5.10	3.41	7.23	0.92	0.04	-0.79
Ln[Exports of Goods and Services (t-1)]	144	5.11	5.06	3.41	7.13	0.92	0.03	-0.81

7.3 Correlation Matrix

	<i>N</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
1. Ln(Consolidated Assets Banks)	158	1.000				
2. Ln(1 + Consolidated Assets Multinationals)	160	0.755 **	1.000			
3. Ln[Gross Domestic Product (t)]	160	0.808 **	0.691 **	1.000		
4. Ln[Gross Domestic Product (t-1)]	144	0.817 **	0.675 **	0.999 **	1.000	
5. Ln[Exports of Goods and Services (t)]	160	0.866 **	0.763 **	0.880 **	0.877 **	1.000
6. Ln[Exports of Goods and Services (t-1)]	144	0.869 **	0.756 **	0.880 **	0.882 **	0.988 **

Note: ** Correlation is significant at the 0.01% level

7.4 Scatter Plots

