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# Banking sector diversity and socioeconomic structure—criteria for matching pairs

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**Summary:** It has been an age-old debate whether the financial structure matters for the real economy's efficiency and therefore for real outcomes. We suppose that varying socioeconomic conditions require appropriately designed corresponding financial sectors. For providing evidence, we firstly determine the specific (quantitative) size and corporate alignments of banking sectors across Europe, based on a sophisticated cluster analysis. Secondly, we develop a coherent system of geographic, social and economic parameters to identify structural patterns within the real economy's sector. In a conclusive synthesis, we link both analytical parts and draw tentative conclusions for possible future policy implications in Europe.

**Zusammenfassung:** Ob die Ausgestaltung des Finanzsektors eines Landes Auswirkungen auf die Effizienz der jeweiligen Realwirtschaft und damit Einfluss auf den realen Output nimmt, ist eine in der Literatur breit diskutierte Fragestellung. Das vorliegende Papier nähert sich der beschriebenen Thematik aus zwei Richtungen: Auf der einen Seite wird eine empirische Klassifikation unterschiedlicher Bankensysteme mittels Clusteranalyse vorgenommen. Auf der anderen Seite erfolgt eine Kategorisierung verschiedener sozioökonomischer Systeme. Eine sich daran anschließende Synthese stellt beides zueinander in Beziehung. Anhand ausgewählter Kriterien werden Aussagen über Interdependenzen und Kongruenz von Bankensystemen und Realwirtschaft getroffen, woraus sich mögliche Implikationen für ordnungspolitische Entscheidungen in der EU ergeben.

→ JEL classification: E00, E02, E60

→ Keywords: European integration, economic integration, banking system structure, socioeconomic structure, Banking Union, banking business models

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## I Introduction

It has been an age-old debate in the respective economic literature whether financial structure matters for the real economy's efficiency and therefore for real outcomes. The financial structure of an economy is the setting of institutions that channel funds from savers to investors by performing the following five main tasks: Lot size transformation, Risk transformation, Maturity transformation, Spatial transformation and Liquidity transformation. A first approach distinguishes between either capital-market- or bank-based-systems. According to i. a. Levine (2002) there is no clear causality between bank- or capital market-based financial systems and economic growth.

Most frequently, e. g. Germany is asserted to be overbanked. In comparison to its neighbors, Germany is supposed to have too many banks that are too small on average and—regarding their businesses—too fragmented. Hence, with the introduction of a Banking Union and Capital Markets Union, consolidation is strongly advised by a broad variety of (European) institutions as well as the introduction of a broad access to institutional capital markets for enterprises (Gischer and Ilchmann 2017).

According to Behr et al. (2013: 3473) the structure of a country's financial system develops and adapts efficiently to meet real economy's requirements. Therefore, an *overbanked* banking sector could be appropriately designed to contribute efficiently to particular financial services demanded by trade and industry. It is likely that the corporate structure determines both size and characteristics of the corresponding financial sector.

To establish matching pairs, our approach is twofold:

In section 2 we derive criteria to categorize relevant features of the financial institution's sector by applying the business model approach established by Ayadi et al. (2016). Based on a sophisticated cluster analysis, we especially determine the specific (quantitative) size and corporate alignments (in terms of retail- or capital market-orientation) of banking sectors for several chosen European countries.

In section 3 we furthermore develop a coherent system of geographic, social and economic parameters that helps to identify structural patterns within the real economy's sector.

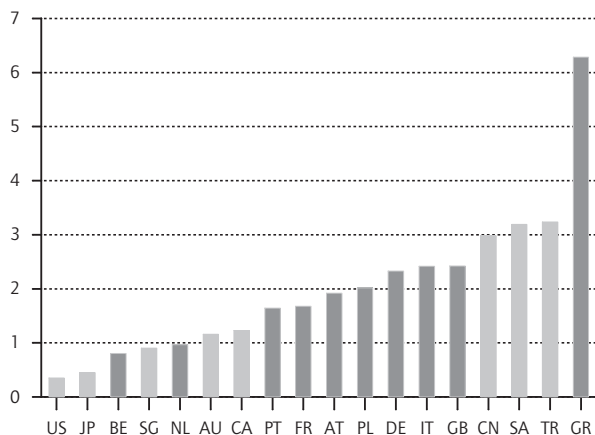
In a subsequent synthesis of the previous analyses, we evaluate specific features of matchings in both sectors. By referring to Germany, France and Italy we examine the design of the associated matching and draw tentative conclusions for possible future policy implications.

## 2 Structural diversity in banking sectors—an approach to identify specific features

For a first impression of varying financial structures across Europe we consider a bank-market ratio—in line with recent literature—defined as total bank assets divided by stock market capitalization and (domestic) private bond market capitalization (Levine 2002, Langfield and Pagano

Figure 1

**Bank-market ratio (2016)**



US = United States, JP = Japan, BE = Belgium, SG =Singapore, NL = Netherlands, AU = Australia, CA = Canada, PT = Portugal, FR = France, AT = Austria, PL = Poland, DE = Germany, IT = Italy, GB = United Kingdom, CN = China, SA = Saudi Arabia, TR = Turkey, GR = Greece.

Source: BIS (2018a), BIS (2018b), World Bank (2018a), own calculations.

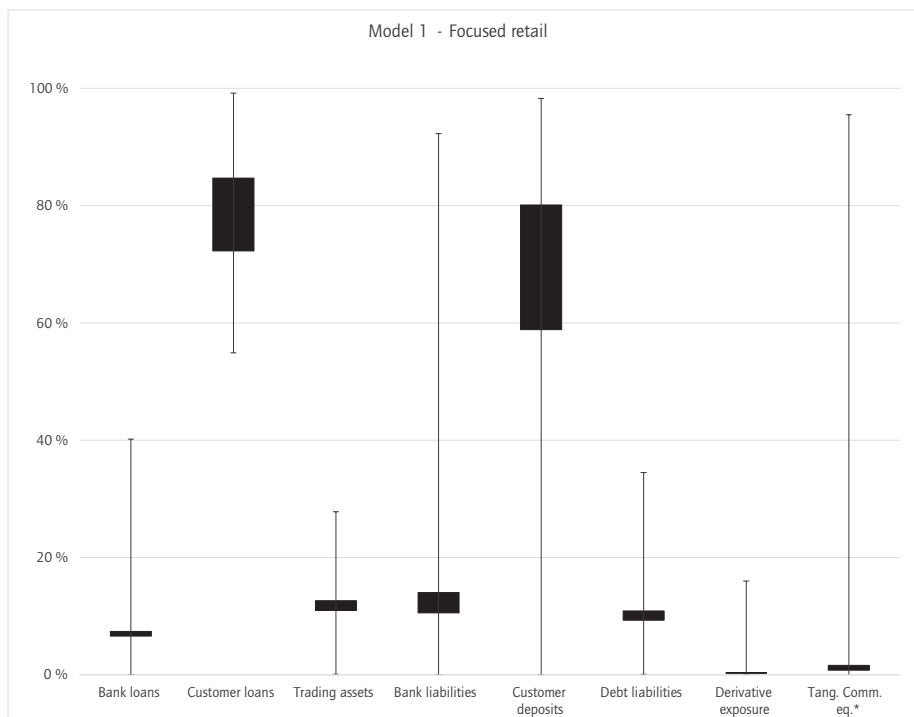
2016). Figure 1 shows bank-market ratios for selected Countries in 2016. Smaller values indicate a more capital market-based financial system and vice versa.

At a first glance it becomes obvious that European countries (solid bars) have predominantly bank-based financial systems. While the size of the banking sector in Austria and Poland is twice the size of the capital markets (bank market-ratio of 2), the bank-market ratio in Germany comes to 2.5 and in Greece even 6.3. In comparison, other major developed (non-European) countries like the USA, Canada or Australia are way more capital market-orientated with bank market-ratios of 0.14, 1.16 and 1.22, respectively. However, that assignment does not enable for any statements regarding the (real) economic success of the respective countries as e. g. the European Union (EU) has an economic growth of 2.4 percent in 2017 on average, the US 2.3 percent, Canada 3.0 percent (World Bank 2018b).

Existing articles follow a variety of ex-post approaches to analyze patterns within the banking sector. Most commonly in Germany it is referred to an ownership-approach to identify the so called three-pillar-structure—private credit institutions, savings banks and cooperatives (Brämer et al. 2010, Gischer and Herz 2016, Gischer and Ilchmann 2017, Schmidt 2018). Furthermore, the USA are supposed to have—historically grown—a rather separated banking system as the Glass-Steagall Act remained in effect between 1933 and 1999 (Lucas 2013). In general existing structures are taken for granted.

To our knowledge there is no existing work from a banking’s business perspective. We regard a banking sector as the collective of each of its individual banks. Moreover, we suppose that banks choose their *business model* (i. e. business activities) consciously and align them with the needs

Figure 2

**Descriptive statistics for the focused retail banking business model**

Source: Ayadi et al. (2016); own calculations.

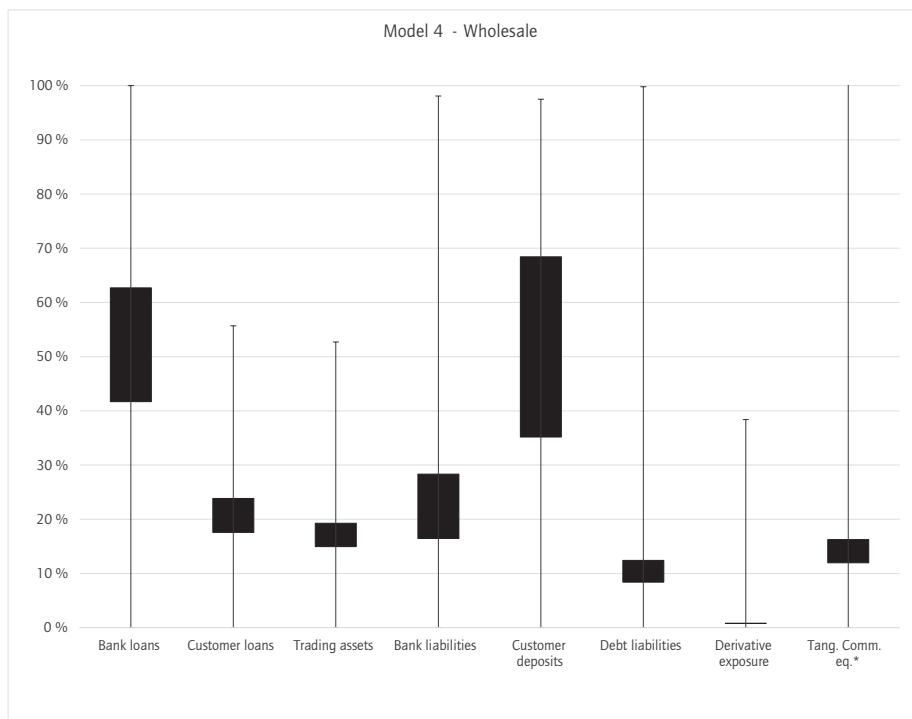
of the real sector. To identify varying business models, we firstly utilize the state of art clustering approach established by Ayadi et al. (2016) as described below. Secondly, we examine chosen countries regarding their banking sector's composition.

Ayadi et al. (2016: 9) account for 13,040 bank-year observations between 2005 and 2014 for 2,542 banks in the European Union and Switzerland, covering more than 95 percent of relevant total assets for the cluster analysis. As business models are consciously chosen, only instruments are used, that a bank is able to control directly. The primary distinction is made “[...] between key banking activities (i. e. retail vs. market or mixed) and the funding strategies (i.e retail vs. market or mixed)” (Ayadi et al. 2016:16). Especially bank loans, customer loans, trading assets, debt liabilities and derivative exposure are taken into account.

Based on Ward's (1973) clustering analysis and Calinski and Harabasz's (1974) pseudo-F index used as stopping rule, five different (and comprehensible) business models are derived—three retail-orientated business models (focused retail, diversified retail I, and diversified retail II) and two rather capital market-orientated business models, namely wholesale and investment. Descriptive statistics of selected models are presented below (Ayadi et al. 2016: 22 f.)

Figure 3

**Descriptive statistics for the wholesale-orientated banking business model**



Source: Ayadi et al. (2016); own calculations.

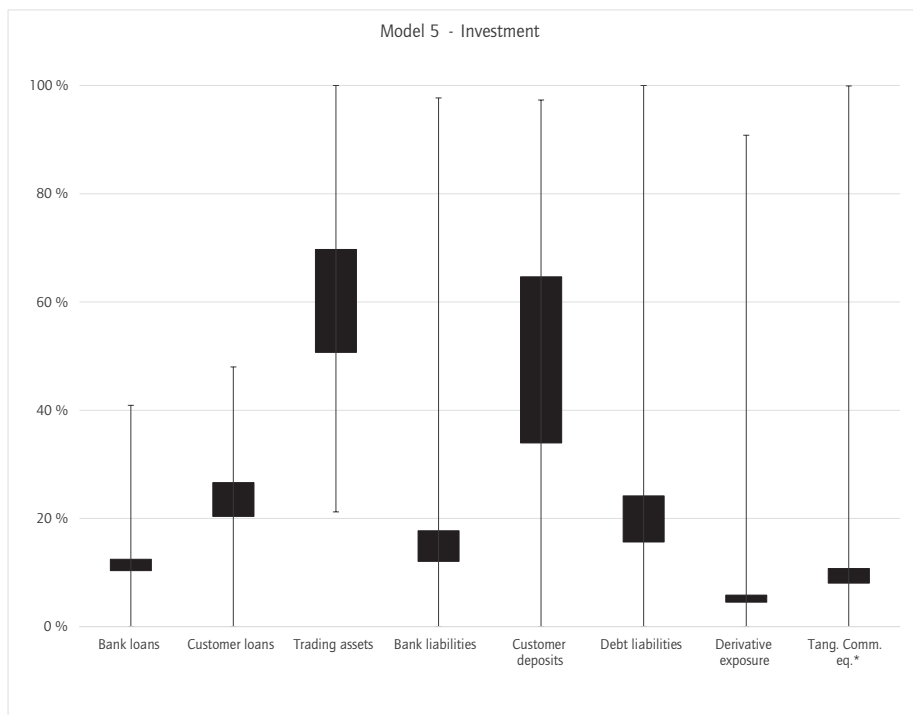
Figure 2 shows a generic example of retail orientated business models. Retail banks are primarily involved in classical financial intermediation businesses. Focused retail banks are most active in lending to customers—customer loans represent 78.5 percent of their total assets—while customer deposits account for 69.5 percent of the total liabilities. Bank loans and trading assets are relatively limited with 7.0 percent and 11.8 percent, respectively. Meanwhile derivative exposure is nearly negligible with 0.3 percent on average. Both rather diversified retail models (type I and II)<sup>1</sup> have, in comparison, relatively higher trading assets with 30.9 percent and 22.6 percent as share of total assets. While the funding of type I is comparable to focused retail with a strong reliance on customer deposits (70.8 percent) type II relies most on debt liabilities with 43.3 percent of total assets.

Wholesale banks, as shown in Figure 3, are strongly involved in interbank market transactions, as bank loans account for 52.2 percent of their total assets on average and bank liabilities for 22.4 percent, respectively. Other funds are primarily used for customer loans (20.7 percent of total assets) and trading (17.1 percent).

1 Without illustration.

Figure 4

### Descriptive statistics for the investment-orientated banking business model



Source: Ayadi et al. (2016); own calculations.

Figure 4 shows rather investment-oriented banks that have substantial trading activities. The derivative exposures and trading assets account for 5.2 percent and 60.2 percent of total assets, respectively. Funding focus is on less stable and less traditional sources, such as debt liabilities with 19.9 percent. Meanwhile customer deposits still play an important role (49.3 percent).

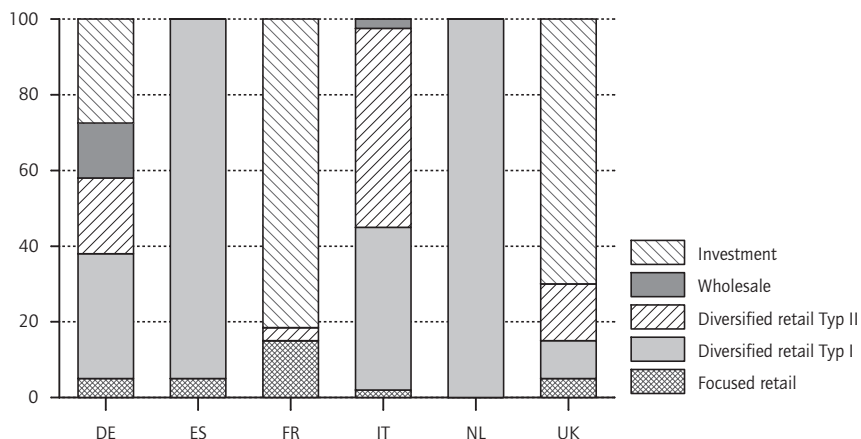
As additional contribution to the relevant area of research, we compile a current dataset<sup>2</sup> covering necessary data for all banks within the European Union. Furthermore, we develop a comprehensive filtering system based on the descriptive statistics of each individual business model. By doing so, we are obtaining an unambiguous assignment of the respective business model for each individual bank. To unveil the structure of the specific banking systems, we finally group the business models country wise and weight them with the corresponding total assets.

For the sake of simplicity, Figure 5 depicts the results for the six largest economies of the EU. At a first glance, a strong heterogeneity of the composition of banking sectors across Europe becomes obvious. Spain, Italy and the Netherlands have a strong reliance on (some type of) retail-oriented

2 The latest data available is obtained from Orbis Bank Focus for the year 2016.

Figure 5

**Banking business models in 2016 (percent of assets)**



DE = Germany, ES = Spain, FR = France, IT = Italy, NL = Netherlands, UK = United Kingdom.

Source: Bureau van Dijk (2018), own calculations.

Table 1

**Quantity and size of banks (2016)**

	Germany	Spain	France	Italy	Netherlands	United Kingdom	Europe
Number	1,632	206	422	546	92	370	6,648
Total Assets (in billion euros)	7,083.6	3,591.2	7,216.0	2,700.4	2,533.0	10,935.8	33,398.8
Average Size (in billion euros)	4.340	17.433	17.099	4.945	27.532	29.556	5.023

Source: ECB (2017), own calculations.

banks, as they account for 95 percent, 97.5 percent and 100 percent of the country’s total banking assets. In contrast, the UK and France have a strong focus on investment banks, as they account for 70 percent and 81.5 percent of total asset, respectively. Wholesale banking, i.e. interbank lending markets, seems negligible across Europe. In terms of business models, Germany has the most balanced banking system of the considered countries, as retail-orientated bank’s and capital market-orientated bank’s assets are nearly equal, with a slight focus on the former (58 percent versus 42 percent). These results are in line with the literature, especially Ayadi et al. (2016).

Table 1 gives an overview over various size indicators for the banking systems of the considered countries. In terms of the total number, Germany has by far the highest number of banks with 1632 institutes (24.5 percent) within the EU. In terms of (consolidated) total assets, the UK has the

biggest banking sector with approx. 11 trillion euros, followed by France and Germany both having total assets of approximately 7 trillion euros. Those three countries account for almost 75 percent of total assets in the EU. While banks in Germany and Italy are rather smallish on average with 4.3 billion euros and 4.9 billion euros of total assets respectively, the Netherlands and UK have large institutes with total assets of approx. 30 billion euros on average.

### 3 Real economies' requirement specifications

One of the most prominent functions of the banking industry is to provide access to financial services for enterprises as well as private households. Consequently, the supply side structure should sufficiently fit to the particular demands of their potential customers. Hence, the links between both sides of the market are characterized by, at least, geographic, social and economic conditions of a country. A major challenge of the European Banking Union (EBU) is to achieve the goals of an unrestricted single market and competitive national subsystems simultaneously. In this section, we try to present a very brief impression of the variety of determining factors throughout the member states of the European Union.

#### 3.1 Geographical considerations

Even at a first glance, the enormous differences in population and geographical size of EU-countries are more than obvious. The banking industry in Malta has to serve 476 thousand people only whereas in Germany 82.8 million inhabitants request financial products. Again, in Malta just 316 km<sup>2</sup> need to be covered while France spreads over 643,5 thousand km<sup>2</sup>. Therefore, it makes sense to distinguish, somewhat analogously to banking regulations, between “significant” and “less significant” countries in the EU. Before we concentrate on the six largest EU-economies, a few additional facts may stress the position that a single or uniform industry structure is not worth striving for even in banking markets.

Although impressive on their own, the total numbers of population and sizes still veil the additional structural characteristics of the entire group. For example, when it comes to compare the member states' constitutional governance not only traditional (or historical) deviations can be observed. Germany, for instance, is organized (by name) as a “federal” republic, while France or Italy are more or less “centrally” governed. The respective repercussions are shown in Figure 6.

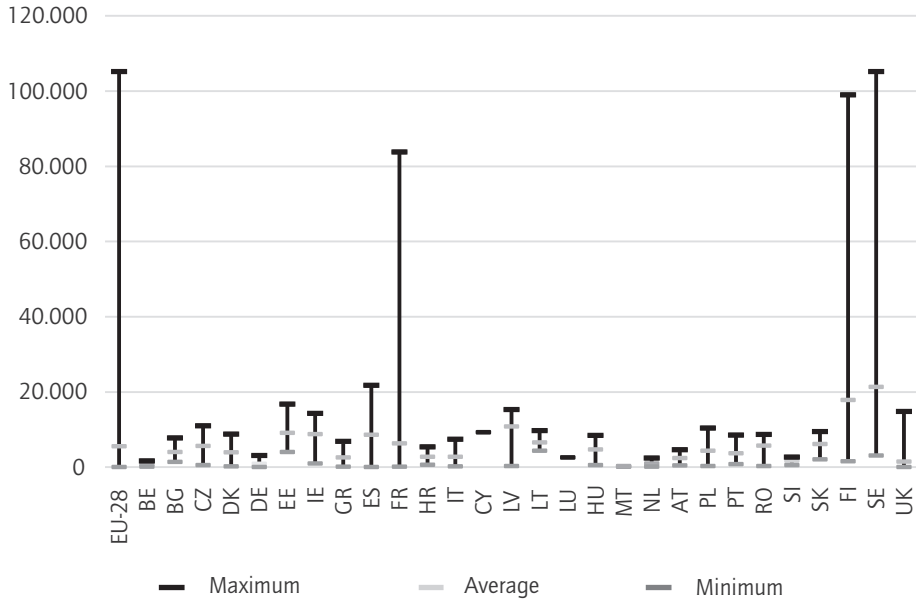
The picture reflects the regional organization of each EU-country on the lowest statistical level.<sup>3</sup> In 2016 Eurostat filed almost 1350 entities, solely 30 percent belonged to Germany. For a small number of states the dispersion in size of NUTS 3 regions is exceptionally huge (e. g. France or Finland), but even in the majority of the remaining countries the range of regional demarcation on the lowest level is significantly larger than in Germany.

3 NUTS stands for „Nomenclature of territorial units for statistics“, level 3 comprises the smallest administrative regions in the particular countries, especially in Germany to districts (“Kreise”). See Eurostat (2018:9ff) for more detailed information.



Figure 6

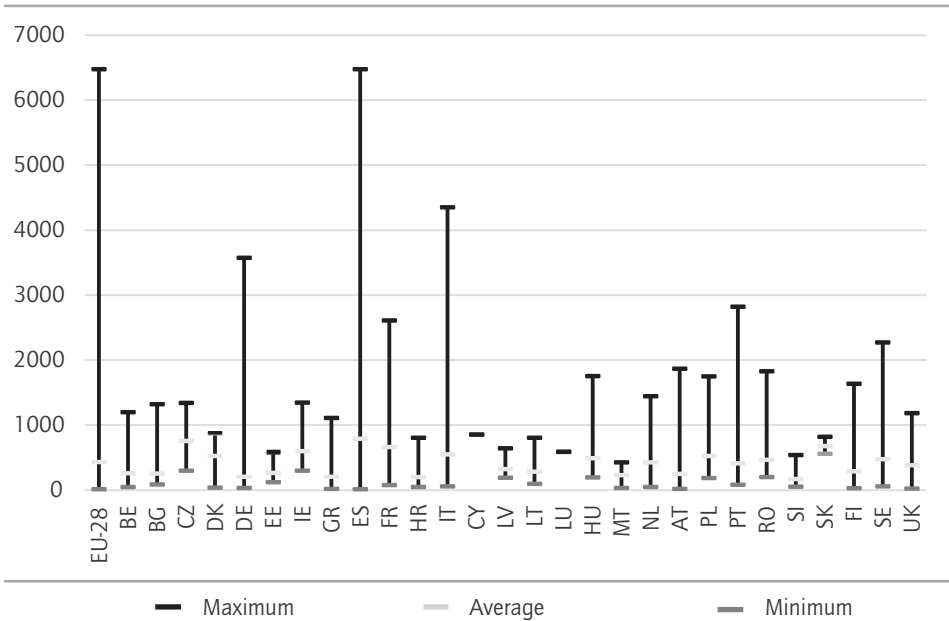
**Size of NUTS 3 regions (in km<sup>2</sup>, 2016)**



Source: Eurostat (2018).

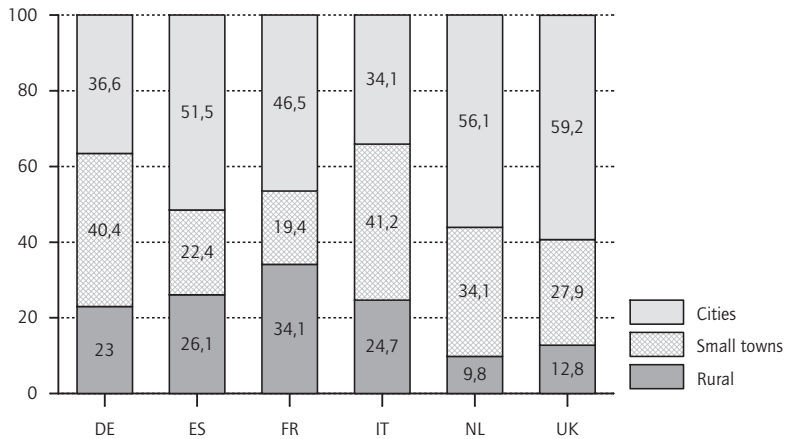
Figure 7

**Population in NUTS 3 regions (in thousands, 2016)**



Source: Eurostat (2018).

Figure 8

**Regional distribution of population (2017)**

DE = Germany, ES = Spain, FR = France, IT = Italy, NL = Netherlands, UK = United Kingdom.

Source: Eurostat (2018).

Due to three rather crowded metropolitan areas (Berlin, Hamburg, and Munich) Germany also features outliers as regards population in NUTS 3 regions (Figure 7). Nevertheless, on average only Belgium and Malta have less inhabitants on this level than Germany.

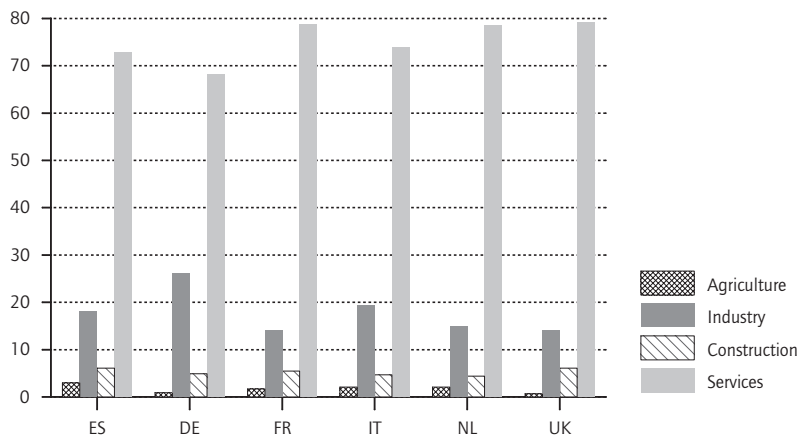
An additional measure for regional disparities is the degree of urbanization (DEGRURB) (Eurostat 2018). Based on data of local administrative units the concept investigates the spatial living conditions across the EU. Figure 8 depicts the results for its six largest economies<sup>4</sup> for which it seems reasonable to assume that they are quite equally developed. Once again, the outcome emphasizes the renunciation from identical regional economic features. In Germany and Italy, the largest share of inhabitants lives in small towns and suburbs while in all other countries the most preferred locations are cities. Only about 10 percent of citizens decide for living in rural areas in the Netherlands and the United Kingdom whereas in Spain and France small towns and suburbs seem to be far less attractive than rural areas.

Even our cursory description reveals considerable regional discrepancies within the group of EU member states. These should be taken into account when decisions about appropriate structures of banking systems are discussed. It seems to be very unlikely that a “one size fits all-rule” could be a sensible approach.

4 This subsample makes up for almost two thirds of the total EU-GDP.

Figure 9

**Share of gross value added by sectors (in percent, 2017)**



ES = Spain, DE = Germany, FR = France, IT = Italy, NL = Netherlands, UK = United Kingdom.

Source: Eurostat (2018).

### 3.2 Aspects of Economic Infrastructure

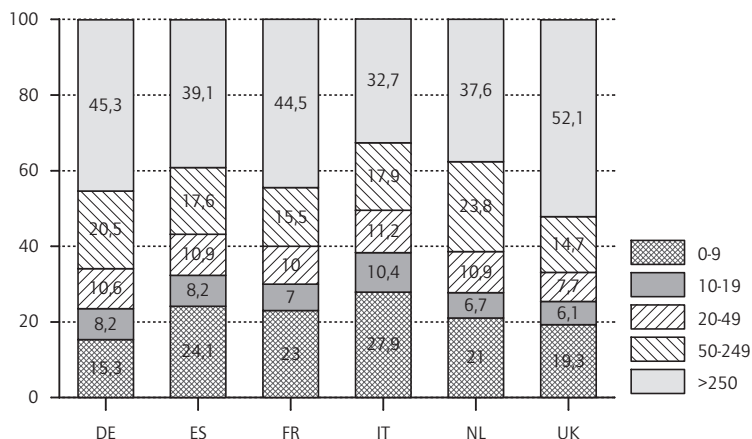
The respective structure of an economy’s banking system not only has to match its regional features, but also should effectively support the particular country’s economic infrastructure. Again, the initial situations are quite different among the EU-28 members. Even between the six largest exponents of the EU significant disparities can be observed.

Unsurprisingly, services dominate the national economies under inspection (Figure 9). Nonetheless, the respective shares differ by rather 10 percentage points between Germany and the United Kingdom. In each country, agriculture is of far least importance, while construction makes up for about 5 percent of total gross value added in the entire sample. Germany’s unique characteristic is represented by its manufacturing industry. Since production facilities most frequently require specific plants and machinery, enterprises from this sector are prominent potential customers of financial intermediaries.

Of course, financial opportunities and restrictions not least depend on firm size. Large, globally operating stock companies are supposed to have direct access to institutional financial markets. They are able to acquire additional equity as well as debt capital with different time to maturity. Supplementary bank loans especially serve as short-term funds for current expenditures. Hence, the size structure of enterprises may have a significant impact on banking firms’ positioning.

Frequently, the number of employees determines an enterprise’s size class. Small and medium sized enterprises (MSE) range up to 249 employees, divided into four sub-classes. Firms with as many as 250 employees are referred to as large enterprises. Figure 10 visualizes the conditions for our country sample.

Figure 10

**Share of gross value added by size class (2016)**

DE = Germany, ES = Spain, FR = France, IT = Italy, NL = Netherlands, UK = United Kingdom.

Source: Eurostat (2018).

Table 2

**Average features of enterprises by size classes (2016)**

Size	GVA	Empl.	GVA	Empl.	GVA	Empl.	GVA	Empl.	GVA	Empl.	GVA	Empl.
Total	0.7	12	0.2	4	0.3	5	0.2	4	0.3	5	0.6	9
0-9	0.1	3	0.0	2	0.1	2	0.1	2	0.1	1	0.1	2
10-19	0.5	13	0.5	13	0.8	16	0.6	13	0.9	18	0.7	14
20-49	1.4	30	1.2	30	2.0	35	1.6	30	2.5	39	1.7	35
50-249	5.6	97	5.5	102	7.4	117	6.4	96	9.8	120	6.9	114
250+	63.9	904	58.2	1,020	99.8	1,364	70.5	957	80.9	1,199	109.7	1,483

GVA = Gross value added in million euro, Empl. = Employees

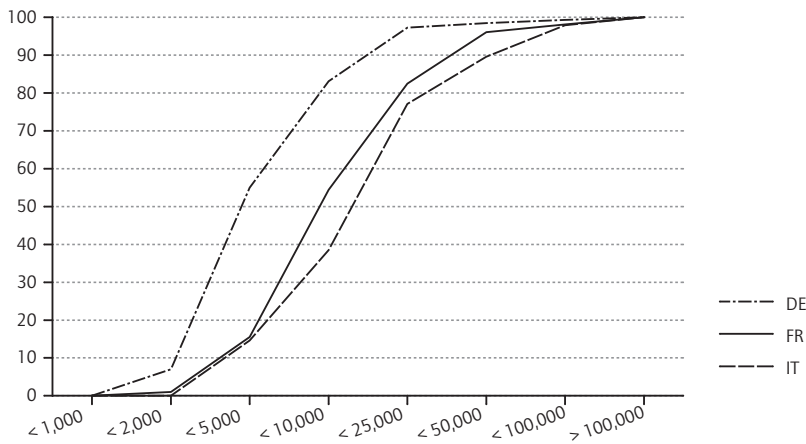
Source: Eurostat (2018), own calculations.

Although the patterns seem to be similar, differences in detail exist. In Germany, the impact of very small enterprises on total Gross value added is the lowest, while in Italy the very large companies add less than one third to total Gross value added. The United Kingdom depends largely on enterprises with more than 250 employees, France and Germany, too, show very productive firms in the highest size class.

Table 2 reveals further insights. The most significant disparities between the six countries arise for the top category of enterprises. In this size class, Germany's firms are rather small although their number (11,762) is almost twice as large as in the UK (6,196). These enterprises are widely spread all over the German landscape; they are very often owner managed and comprise "hidden

Figure 11

**Cumulated frequency distribution of gross value added by size of region (2016)**



Source: Eurostat (2018), own calculations.

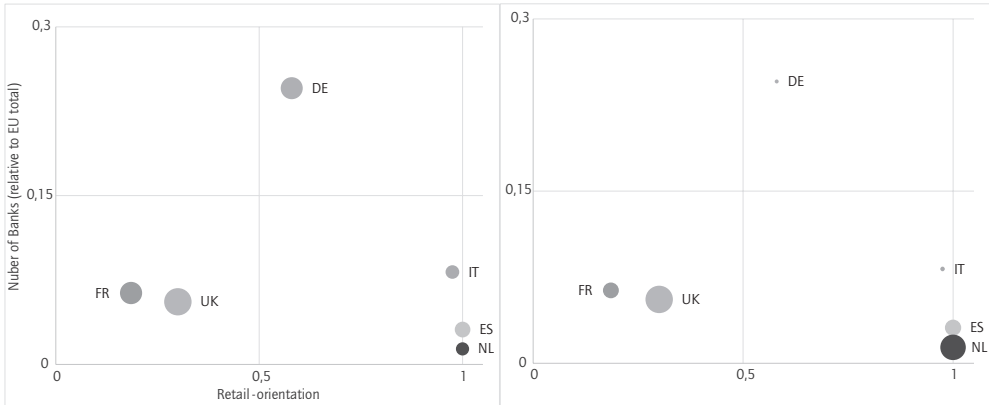
champions” as well as entities closely associated with multinational corporations. The majority of them has no access to institutional financial markets and, therefore, is reliant on effective credit institutions.

Figure 11 combines NUTS 3 regions with local Gross value added, respectively. For sake of simplicity, only three EU-member states are depicted. The principal result fits quite well with our findings so far. We pointed out that especially in Germany significant fractions of Gross value added are produced in rather small and remote regions. In 2016, only less than 20 percent of the total Gross value added are supplied in regions larger than 10,000 km<sup>2</sup>, while in France more than 60 percent and in Italy, nearly 45 percent of total Gross value added originate from regions with a size of at least 10,000 km<sup>2</sup>.

The consequences for a matching banking system are somewhat straightforward: The less centralized a country with respect to population as well as to economic activity, the more dispersed should be the respective banking sector. Hence, the frequently stated “overbanked”-accusation towards Germany does not take into consideration the facts of specific spatial distributions of population and industry.

Figure 12

### Banking system characteristics



Source: Own calculations.

## 4 Synthesis

Figure 12 shows the combined results from the business model analysis and size indicators. While the ordinate depicts the (relative) quantity of banks for each banking system (as percent of number of EU total), the abscissa projects the influence of business models, where “0” implies a fully capital market-orientated banking system and “1” indicates a complete retail-orientation. The size of the dots on the left-hand side reflects the total size of the banking sectors in terms of assets, on the right-hand side the size represents the average size of individual institutes.

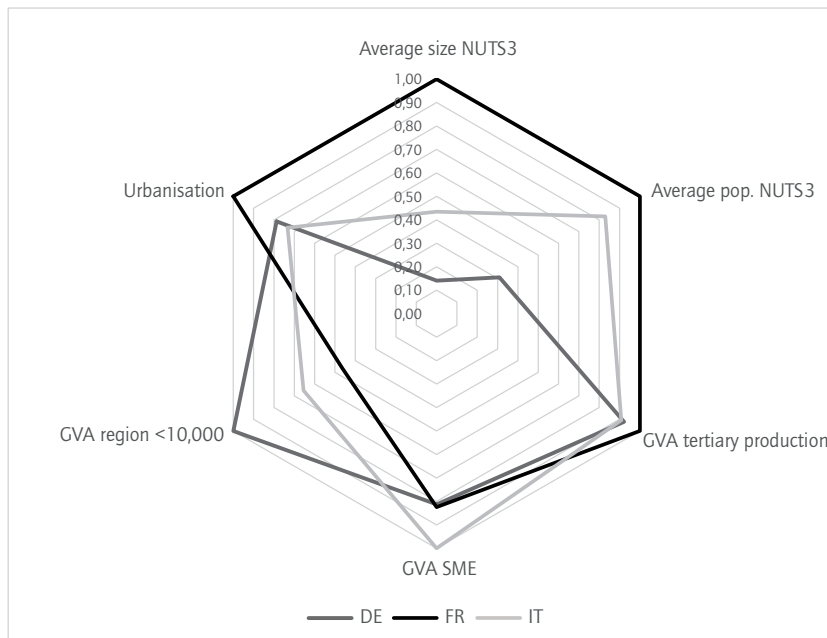
In summary, it can be stated that the UK and France both have large banking systems in terms of total assets with a strong capital market-orientation and rather few and also large institutes. Italy, Spain and the Netherlands have rather small banking systems and a strong focus on retail banking provided by rather few banks. Surprisingly in the Netherlands, institutes are rather small on average. The German banking sector is very different: a large banking sector in terms of total assets combined with a huge absolute number of institutes leads to rather small banks on average. Business models are balanced between retail-orientation and capital market-orientation.

We compare the particular structure of the socioeconomic parameters for the sample of Germany, France, and Italy in a similar way. Figure 13 presents the results. Again, the highest score in each of the characteristics under examination serves as a benchmark (“1.00”) for the manifestation of the compared countries: Since the level of urbanization is the largest in France, Germany and Italy list significantly lower scores. Additionally, France is on top regarding average size as well as average population of the NUTS 3 regions, and Gross value added in the Service industry. Germany exhibits the most productive regions with size of less than 10,000 km<sup>2</sup>, and Italy’s SMEs own a comparatively large share of total Gross value added.

With a deeper look on Figure 13, distinct differences in the shapes of the respective “cobwebs” are obvious. Most prominent dispersions occur when appealing to spatial attributes. Germany

Figure 13

**Socioeconomic characteristics for chosen countries**



Source: Own calculations.

is by far more dependent on rather small, sparsely populated but very productive regions than France or Italy. Hence, it is not very surprising instead almost necessary to have a fitting banking system available. Consequently, German banks are quite numerous but comparatively small and predominantly regionally operating.

France, on the contrary, is much more urbanized and less regionally diversified. Even the NUTS 3 regions are relatively large and densely populated. Nevertheless, major shares of total production are provided by metropolitan centers. Consecutively, French credit institutions are larger on average with a significant focus on investment banking.

Our very brief look on a small sample of national financial markets structures highlights the relevance of socioeconomic conditions for an economy’s effective institutional organization. Furthermore, it provides evidence for the hypothesis, that different socioeconomic conditions require appropriately designed corresponding financial sectors.

Irrespectively of significant progress in establishing a European Banking Union so far, the track of ongoing consolidation and (so-called) harmonization of national financial industries should be seriously reconsidered, as there are valid reasons for existing structures. “United in diversity” is not only the EU’s slogan, but a desirable goal for European policy to achieve with particular emphasis on diversity.

## References

- Ayadi, Rim, Willem De Groen, Ibtihel Sassi, Walid Mathlouthi, Harol Rey and Olivier Aubry (2016): Banking Business Models Monitor 2015 Europe. Centre for European Policy Studies, Brussels.
- BIS (2018a): Summary of debt securities outstanding. <http://stats.bis.org/statx/srs/table/cr> (accessed December 2018).
- BIS (2018b): Consolidated banking statistics (CBS\_PUB). <http://stats.bis.org:8089/sta-tx/srs/table/br?m=S&f=csv> (accessed December 2018).
- Behr, Patrick, Lars Norden and Felix Noth (2013): Financial constraints of private firms and bank lending behavior. *Journal of Banking & Finance*, 37, 3472–3485.
- Brämer, Patrick, Horst Gischer and Toni Richter (2010): Das deutsche Bankensystem im Umfeld der internationalen Finanzkrise, *List Forum für Wirtschafts- und Finanzpolitik*, 36 (4), 318–334.
- Bureau van Dijk (2018): Orbis BankFocus database. <https://banks.bvdinfo.com/version-20181219/home.serv?product=OrbisBanks> (accessed December 2018).
- Calinski, Tadeusz, and Jerzy Harabasz (1974): A dendrite method for cluster analysis. *Communications in Statistics*, 3, No. 1, 1–27.
- ECB (2017): CBD2—Consolidated Banking data. <http://sdw.ecb.europa.eu/browse.do?node=9689685> (accessed December 2018).
- Eurostat (2018): Eurostat regional yearbook. 2018 edition. European Commission, Brussels.
- Gischer, Horst, and Bernhard Herz (2016): Das Geschäftsmodell „Regionalbank“ auf dem amerikanischen Prüfstand. *Credit and Capital Markets: Kredit und Kapital*, 49 (2), 175–191.
- Gischer, Horst, and Christian Ilchmann (2017): CMU—a threat to the German banking sector? *Quarterly Journal of Economic Research*, 86 (1/2017), 81–94.
- Langfield, Sam, and Marco Pagano (2016): Bank bias in Europe: Effects on systemic risk and growth. *Economic Policy*, 31 (85), 51–106.
- Levine, Ross (2002): Bank-Based or Market-Based Financial Systems: Which Is Better? *Journal of Financial Intermediation*, 11, 398–428.
- Lucas, Robert (2013): Glass-Steagall: A Requiem. *American Economic Review*, 103 (3), 43–47.
- Schmidt, Reinhard (2018): Passt das deutsche Dreisäulensystem in eine zunehmend harmonisierte Bankenstruktur für Europa? *Zeitschrift für das gesamte Kreditwesen*, 71, 34–37.
- Ward, Joe (1963): Hierarchical grouping to optimize objective function. *Journal of the American Statistical Association*, 58 (301), 236–244.
- World Bank (2018a): Market capitalization of listed domestic companies. <https://data.worldbank.org/indicator/CM.MKT.LCAP.CD> (accessed December 2018).
- World Bank (2018b): GDP (current US\$). <https://data.worldbank.org/indicator/NY.GDP.MKTP.CD> (accessed December 2018).