FINANCIAL SECTOR STRUCTURE AND ECONOMIC GROWTH: A FRESH LOOK WITH A FOCUS ON DENMARK

DISCUSSION PAPER

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This research was prepared by the author to encourage a debate about the future direction of the Danish financial sector. It is based on the information available to the author at the time it was completed in May 2016.

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Abstract

Economists consider a well-functioning financial sector to be of first order importance for a modern (capitalist) economy. However, in the aftermath of the financial crisis a debate about the future role of the financial sector emerged and many commentators have called into question whether the financial sector actually creates value for the wider society. This research, which is part of a broad research project "Nordic Finance and the Good Society", aims to contribute to this debate by studying the role of the financial sector structure for economic development of an economy.

Therefore, it proceeds in five steps. *First*, it provides some reflections on the financial sector and the existing literature studying financial sector structure and its association with economic development. *Second*, it presents stylized firm-level evidence on capital structure choice and firm behavior. It is argued that over time equity financing (bank credit) becomes more (less) important for the corporate sector in developed economies. *Third*, it reports novel country-level evidence on the link between financial sector structure and economic growth in developed economies. The results suggest that the capital market – and in particular the stock market – is beneficial for economic growth in these countries. Simultaneously, the analysis suggests that caution is warranted with high levels of private credit volume as they seem to be detrimental to economic development. *Fourth*, it provides cross-country comparison of various measures of financial sector structure. Thereby, it pays special attention to the Danish financial sector, which is found to be relatively large but skewed towards debt and credit. Moreover, the Danish bond market, while relatively large, seems dominated by banks and corporates seem virtually absent. *Finally*, it concludes by arguing for more capital market-based financing solutions and discusses selected challenges for the future direction of the Danish financial sector.

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"Finance, despite its flaws and excesses, is a force that potentially can help us create a better, more prosperous, and more equitable society. In fact, finance has been central to the rise of prosperous market economies in the modern age—indeed this rise would be unimaginable without it [...] finance remains an essential social institution, necessary for managing the risks that enable society to transform creative impulses into vital products and services, from improved surgical protocols to advanced manufacturing technologies to sophisticated scientific research enterprises to entire public welfare systems.

[...] The essential challenge for leaders to contemplate in coming to terms with the future of finance is to understand that it can be used to help broaden prosperity across an increasingly wide range of social classes and that its products can be made easier for people to use and better integrated into the economy."

Robert Shiller, Finance and the Good Society. PUP Princeton and Oxford, 2012

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"Access to finance is a central issue for both innovative entrepreneurs and policy makers."

OECD Science, Technology and Industry Outlook 2012

"Resilient, transparent and smooth-functioning financial systems and capital markets contribute to financial stability, job growth and poverty alleviation."

World Bank Group [http://www.worldbank.org/en/topic/financialsector]

"[A]n efficient financial system is more important than hard work to an economy's success."

Mishkin, NBER Working Paper 11891

"Promoting a return to growth and competitiveness of European economies has been the central focus of the European Commission's work since the onset of the crisis. In order to achieve this, public finances have to be put on a surer footing and a more stable and responsible financial sector must be at the service of the real economy."

European Commission President Barroso, Europe 2020: Europe's growth strategy, June 2012

1 Management summary

This research is part of the research project "Nordic Finance and the Good Society" initiated by the Center for Corporate Governance at Copenhagen Business School (Denmark). It aims to contribute to the debate about the future direction of the Danish financial sector, and whether (and how) it can create value for the wider society.

In the aftermath of the recent financial crisis, commentators around the world started to question whether the financial sector actually creates such value. Relatedly, regulators became increasingly concerned about misbehavior in the financial sector and thus tightened the legal framework to restrict actors' room for maneuver (e.g. the International regulatory framework for banks, also known as *Basel III*). However, faced with plummeting economic activity, governments around the world acknowledged that providing financing to the corporate sector is of first-order importance when it comes to enhancing an economy's competitiveness and started various initiatives. The Capital Markets Union (CMU) initiative of the European Commission, which is a key pillar of Investment Plan within the "Jobs, Growth and Investment" priority, is a prominent example in this regard.[1]

This research provides an analysis of the economic role of the financial sector (and its actors) for economic development. In brief, its key results are as follows[2]:

(1) Interested in the question whether the financial sector can generate value for society, it is important to identify possible "*channels*" and to define "*value*". With respect to *channels* it is argued that the financial sector may add value to society through (at least) three different channels. First, directly by generating gross value added (GVA). Second, by providing financing to the corporate sector and enabling the corporate sector to generate GVA. Third, by providing investment opportunities to private households, which in turn allow households to re-allocate and thus to optimize their consumption streams. Regarding *value*, the research adopts a relatively conservative approach and

[1] For details on the CMU see the press release of the European Commission from September 30th, 2015 (http://europa.eu/rapid/press-release_IP-15-5731_en.htm, accessed May 1st, 2016).

[2] Much of the research disregards public sector activities, public sector firms and public financing activities.

measures value in terms of economic development proxied by gross domestic product (GDP). Economic stability and firm growth are alternative measures used in the analysis.

(2) Economists consider entrepreneurial activities to be of first order importance for economic development free market economies. With plummeting growth rates in many developed economies in recent years, the quest for economic growth – and thus support for entrepreneurial activities – became a timely topic. Beside human capital and entrepreneurial talent, these activities require funding and are – by their very nature – risky. Accepting the fundamental principle that higher expected returns require higher risk-taking, the provision of (risk) capital and the associated allocation of risk becomes an important issue – for regulators but also society as a whole.

(3) A review of the existing literature suggests that an efficient financial sector structure improves capital allocation and risk sharing. In effect, it may provide ground for a prospering economy and thus may add value to society. To establish this link, the early literature has examined country-level data and found that there is a significant positive correlation between financial sector development and economic growth. Findings from recent country-level studies that apply more advanced econometric methods suggest that this correlation is causal indeed. Analyses using firm-level data support the view that financial sector development may fuel economic growth.

(4) Furthermore, the literature has provided evidence suggesting that market-based financing alternatives become more important with economic development. Relatedly, however, there are emerging concerns that there can be “too much of finance”.

(5) When it comes to financing the corporate sector, the financial sector provides – broadly speaking – two categories of financing instruments to enterprises: debt and equity. While both provide capital to firms, their economics with respect to risk sharing and bearing, but also with respect to dealing with moral hazard problems, are fundamentally different. Both, debt and equity, may be provided directly by the capital market, or indirectly by financial intermediaries.

However, for debt instruments the latter case is more important. Specifically, banks play an important role here.

(6) An in-depth analysis of corporate capital structures with a focus on non-financial firms in Europe and the US reveals an increasing importance of equity financing in recent years. Also, it suggests that in the aftermath of the financial crisis, parts of the corporate sector operate with zero or negative net debt, in other words, began to act as net lenders. Moreover, there is some evidence that bank loans (and similar debt instruments) became less important, but market-based debt financing gained momentum.

(7) Further analyses suggest that firms face increasing uncertainty in product as well as in capital markets. Moreover, the asset structure has changed, with intangible assets gaining ground. This all suggests that long-term financing becomes more important and provides some rationale for the changes in capital structures discussed before. Finally, it is shown that firms engaged in innovation are more heavily financed by equity, and that more equity financing positively correlates with future firm growth. Overall, these findings make a strong case for initiatives aiming to encourage and stimulate (i) market-based debt financing and (ii) equity financing.

(8) Additional analysis at the country-level supports this view. Examining OECD countries, a positive correlation between financial sector size and economic development is documented. Thereby, financial sector size is measured as the aggregate of three parts: amount of credit to the private sector, size of the private bond market and market capitalization of the stock market.

(9) However, in further analyses, which differentiate between the three different categories, account for unobserved country heterogeneity, and concentrate on the dynamics of economic development, only measures of capital market size, and specifically the measure for stock market size, remain consistently correlated with economic growth. Advanced econometric tests even suggest that the observed correlation is likely to be causal, indicating that stock market size positively impacts economic growth. Also, stock market is positively correlated with measures of economic stability. In effect, these results strongly

advocate initiatives promoting market-based bond and equity financing for the corporate sector.

(10) In contrast, the analysis provides evidence that caution is warranted with respect to private credit volume. For OECD countries private credit volume is (consistently) negatively associated with economic growth and negatively with measures of economic stability.

(11) Examining the development of financial sectors across countries, it is documented that over the last 20 years financial sectors have expanded in most countries of the world. However, there is substantial cross-country variation. The Danish financial sector is comparable large when measured in the aggregate, i.e. by the sum of the following three parts: amount of credit to the private sector, size of the private bond market and capitalization of the stock market. Over the last ten years, the financial sector amounted to 273 percent of GDP for the average OECD country and to some 329 percent for the average EU15 country, while the Danish financial sector amounted to 463 percent of GDP. In other words, according to these measures the Danish financial sector is 41 percent larger than its average EU15 peer and 70 percent larger than its average OECD peer.

(12) The large financial sector size is explained by a relatively high private credit volume (194 percent of GDP in Denmark, compared to 136 percent within the EU15 and 116 percent within the OECD) and a relatively large bond market (204 percent of GDP, compared to 122 percent within the EU15 and 89 percent within the OECD). Thereby, the private credit volume in Denmark is skewed towards residential loans (and mortgages) that amount to 106 percent of GDP compared to 53 percent for the average EU15 country.

(13) With respect to the bond market it is documented that while the (relative) size of the Danish bond market has more than doubled over the last twenty years, it is dominated by banks. Corporates, in contrast, seem virtually absent. Indeed some 99 percent of the bond market are attributable to financial institutions, leaving only marginal stakes for the corporate sector.

(14) A different picture emerges, when it comes to studying the Danish stock market. While it has grown over the years in terms of size, the size is still below

average in the cross-country comparison. This pattern becomes particularly pronounced, once one takes into account the dominant role Novo Nordisk plays in the Danish stock market. Also, the use of the stock market, measured by the number of listed firms normalized for population or the proportion of listed firms among all enterprises, has decreased over time. Limited IPO activity and substantial delisting activities among previously listed Danish firms may rationalize this pattern.

(15) Overall, the previous analysis makes a strong case for promoting capital market-oriented financing solutions in developed economies. Additional analyses regarding Danish firms' (perceived) lack of financing as well as the development of the Danish corporate sector accentuate that the arguments put forward also apply to Denmark.

(16) As a result, there are a couple of challenges for market participants and regulators when it comes to decide about the future direction of the Danish financial sector. With respect to the stock market, the various actors must aim to ensure that the benefits of being listed, are not outweighed by the cost of going public, i.e. the cost of the IPO process in case the firm is not yet listed, and the cost of being public. To positively influence the listing decision of firms, the market must provide the appropriate infrastructure (trading facilities, equity research, broker services) to ensure a sustainable level of liquidity. Relatedly, regulators might want to carefully reconsider taxation of corporate profits and capital income. Traditional corporate tax codes penalize equity financing, which however is one of the major ingredients for corporate innovation. Also, high capital income taxation will translate into a high cost of capital for firms and thus low levels of corporate investments. Both arguments apply to the Danish tax code.

(17) Beyond initiatives directly aiming at promoting the stock market, there are also other issues that warrant attention. *First*, a healthy corporate bond market may allow (some) firms to reduce their cost of capital. Thereby, the various actors (exchanges, investment banks, and investors) should carefully look at the experience and lessons learnt from other countries. *Second*, with high levels of private credit volume in Denmark, it seems advisable to carefully monitor the

aggregate private credit volume and – again – to promote capital market oriented financing of firms.

2 Motivation and structure

As early as Adam Smith in 1776 and Joseph Schumpeter in 1911 economists have argued that financial intermediaries and the financial sector may provide valuable services to society (see Smith, 1776 and Schumpeter, 1934). Levine (1997) and others have identified various channels through which this may materialize, among others the mobilization of savings and re-allocation of capital, or the facilitation of the trading, the diversification and the management of risks.

In line with these theoretical arguments, many economists consider a functioning financial sector a prerequisite for a modern (capitalist) economy. And indeed, the recent situation in Greece with closed banks and tight capital controls seems to make a strong case in this regard. Similar situations have been observed around the world, e.g. in Cyprus in 2013, in Argentina in 2002 or in Sweden back in 1992/93. However, in the aftermath of the financial crisis, a debate about the future role of the financial sector emerged. Thereby, many commentators have called into question whether the financial sector (as it is today) actually creates value for the wider society. This research aims to contribute to this debate by encouraging a constructive dialogue about the future direction of the (Danish) financial sector.

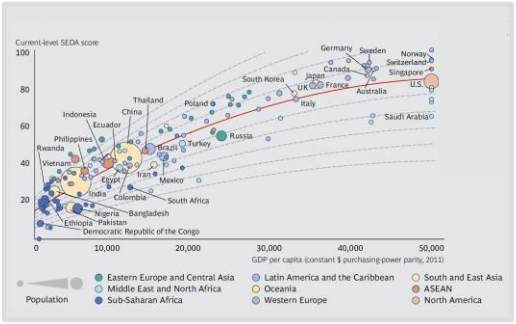
A key issue in this respect is the question, how to measure 'value for society'. The traditional approach of economists is to measure the level (or growth) of economic development (see the discussion in Costanza et al., 2009). Thereby, economic development is generally measured by the level of GDP per capita. The idea is that higher levels of GDP will allow the society to spend more on consumption, investment, or savings. However, recently this approach came under pressure and several alternative approaches have been proposed.[3] For instance, Beal et al. (2015) have constructed a Sustainable Economic Development Assessment (SEDA) Score, which aggregates 10 dimensions, and that aims to represent the three fundamentals economics, investment, and sustainability. While such measures consider a wide range of fundamental measures, it is interesting to note that for many of these measures there is substantial correlation between the traditional measure of economic

[3] See for instance Beal et al. (2015) and the discussion in Schokkaert & Decancq (2013), Costanza et al. (2009) or European Commission (2009).

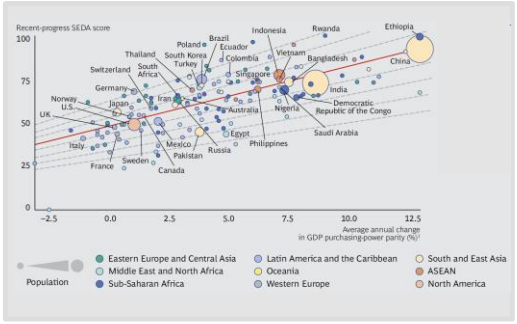
development (GDP per capita) and the novel measure that aims to measure development in a more comprehensive way. Figure 1 illustrates this for the SEDA score developed by Beal et al. (2015).

Rationalizing GDP to measure the contribution of the financial sector

Panel A: Economic development



Panel B: Economic growth



Notes: The figure illustrates the relation between traditional measures of economic development (measured by GDP per capita) and economic growth (measured by growth in GDP per capita) and more advanced measured of 'value to society' (as measured by the SEDA score developed by BEAL et al., 2015). The SEDA (Sustainable Economic Development Assessment) scores aggregate 10 dimensions, which represent the fundamentals economics, investment, and sustainability. For more details see Beal et al. (2015).

Source: Own illustration. Graphs are from Beal et al. (2015)

Figure 1: GDP versus Sustainable Economic Development Assessment (SEDA) Score

Moreover, when it comes to an empirical (time-series) analysis, most of the novel comprehensive measures share a common shortcoming: The lack of a methodologically consistently measured time series for a reasonable set of countries (see the discussion in Costanza et al., 2009). As a result, this research takes a relatively conservative (or traditional) approach and proxies 'value' in terms of *economic development* as measured by the level of GDP per capita.[4]

So, how can the financial sector contribute to economic development (and thus create value for the wider society)? Aiming to add to this debate, this research starts by acknowledging that in free market economies entrepreneurial business activities are

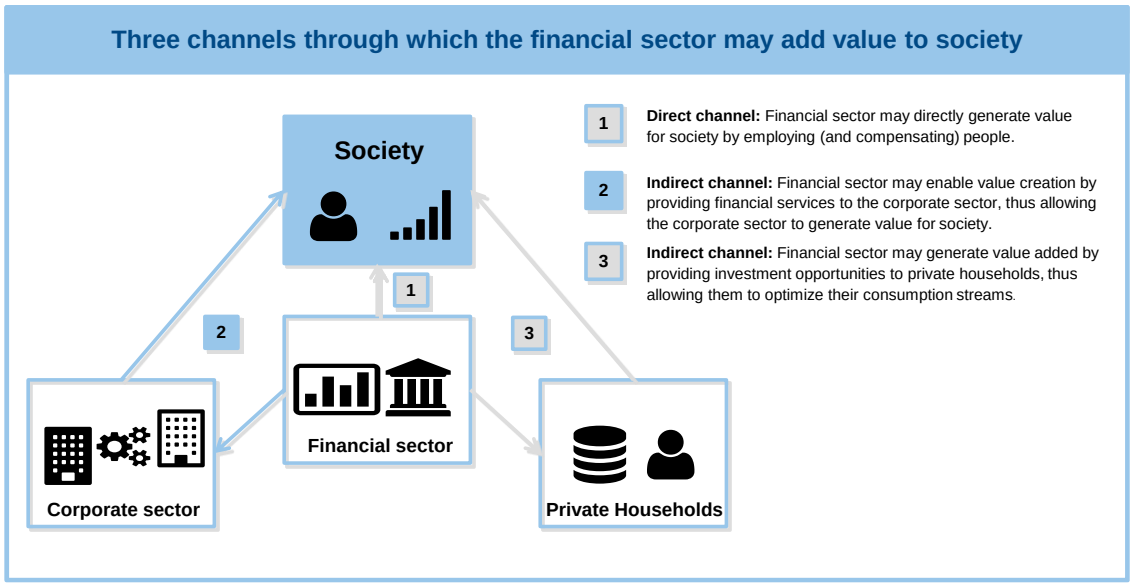
[4] While this approach certainly has its limitations, it also has its merits. First, it allows to examine questions of interest over longer time spans. Second, it allows to compare countries in a (methodologically) consistent way.

the source of any country's economic growth.[5] These activities require funding, for which, however, they can only promise risky returns. Thus, the provision of capital funds and the associated allocation of risk becomes a relevant issue – for regulators but also society as a whole.

With this in mind, the basic premise adopted in this research is the observation that the financial sector has great potential to create value for society beyond its *direct* value contribution. More specifically, the financial sector may create value *indirectly* by providing financing to the corporate sector and providing investment opportunities to private households. Figure 2 illustrates this idea by differentiating between direct and indirect channels.

- On the one hand, the financial sector may *directly* add value for society by (among others) offering jobs and compensating its employees.
- On the other hand, as the financial sector may serve two types of customers – the corporate sector as well as private households – there are two *indirect* channels.
    - With respect to the corporate sector, the financial sector may enable value creation (for society) by providing financial services to the corporate sector and thus allowing the corporate sector to generate value for society.
    - With respect to private households, it may generate value by providing investment opportunities and thus allowing private households to re-allocate and optimize their consumption streams.

[5] Indeed, with plummeting growth rates in many developed economies in recent years, the quest for economic growth became a timely topic, with the Europe 2020 strategy as the European Commission's response.



Notes: The figure illustrates three channels through which the financial sector may add value to society. It, intentionally, ignores the government sector and the possibility that the financial sector may provide potentially value-creating services to the government sector.

Source: Own illustration.

Figure 2: How the financial sector may contribute to society

Acknowledging that entrepreneurial activities are pivotal to economic growth, the research will focus on the first indirect channel (channel 2 in Figure 2), i.e. financing for the corporate sector. Thereby, two issues become important:

(i) What kind of financing is provided to the (private) corporate sector? Broadly speaking the financial sector provides two categories of instruments to private firms: debt and equity. Both, debt and equity, may be provided directly via the capital market, or indirectly through financial intermediaries. However, for debt instruments the latter case is empirically more relevant, in particular in Europe (e.g., Kaserer & Rapp, 2014). Specifically, banks play an important role here.

While both are financial claims sold by the firm to potential investors and thus provide capital to the firm, their contract designs are fundamentally different.[6] This has a variety of implications for the economics of the two types of instruments, e.g. for tax treatment, regarding risk sharing and bearing, but also with respect to dealing with moral hazard problems.

[6] Cf. the discussion in every standard corporate finance textbook, e.g. Brealey et al. (2013).

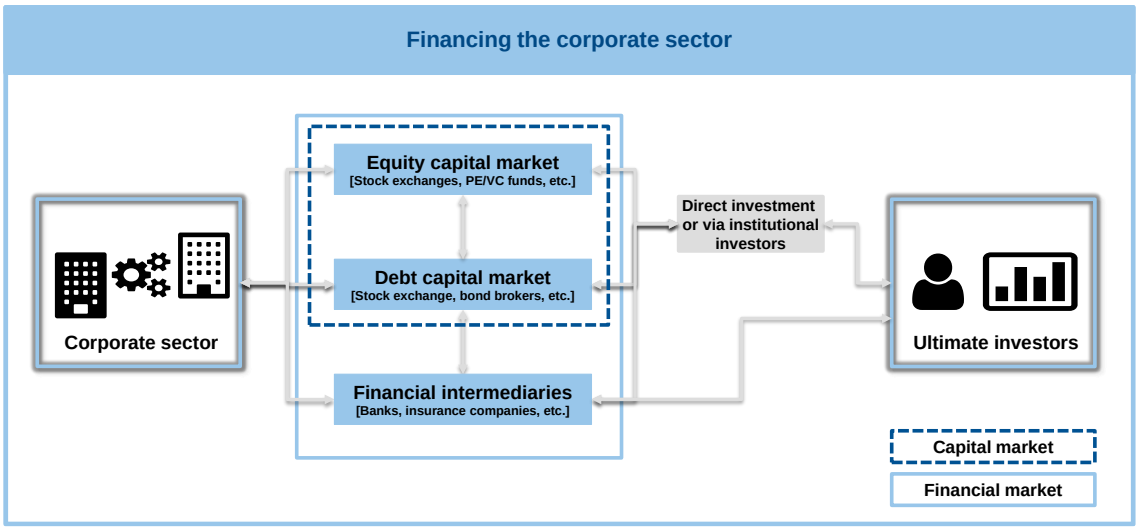
(ii) Who provides the financing through which channels? In free market economies private households are the main providers of financial funds, which are either supplied directly through savings or indirectly through the pension system. These financial funds will finance the government and the public sector, but most importantly, they will finance the private corporate sector. Thereby, financing of the corporate sector may realize through different channels[7]:

- *public capital markets* with regulated trading of standardized securities,
- *private capital markets* with limited regulation offering financing solutions to private companies, and
- *depository and lending institutions accepting deposits from the public and/or* engage in relationship lending with the corporate sector.

Regarding capital markets, private households must decide on whether they want to invest directly in the (public) market, or indirectly by providing capital to institutional investors, which then invest on behalf of private investors.

Figure 3 illustrates the channels through which private households can provide capital to the corporate sector. To clarify the wording used subsequently, Figure 4 provides an overview of the most important definitions used in below.

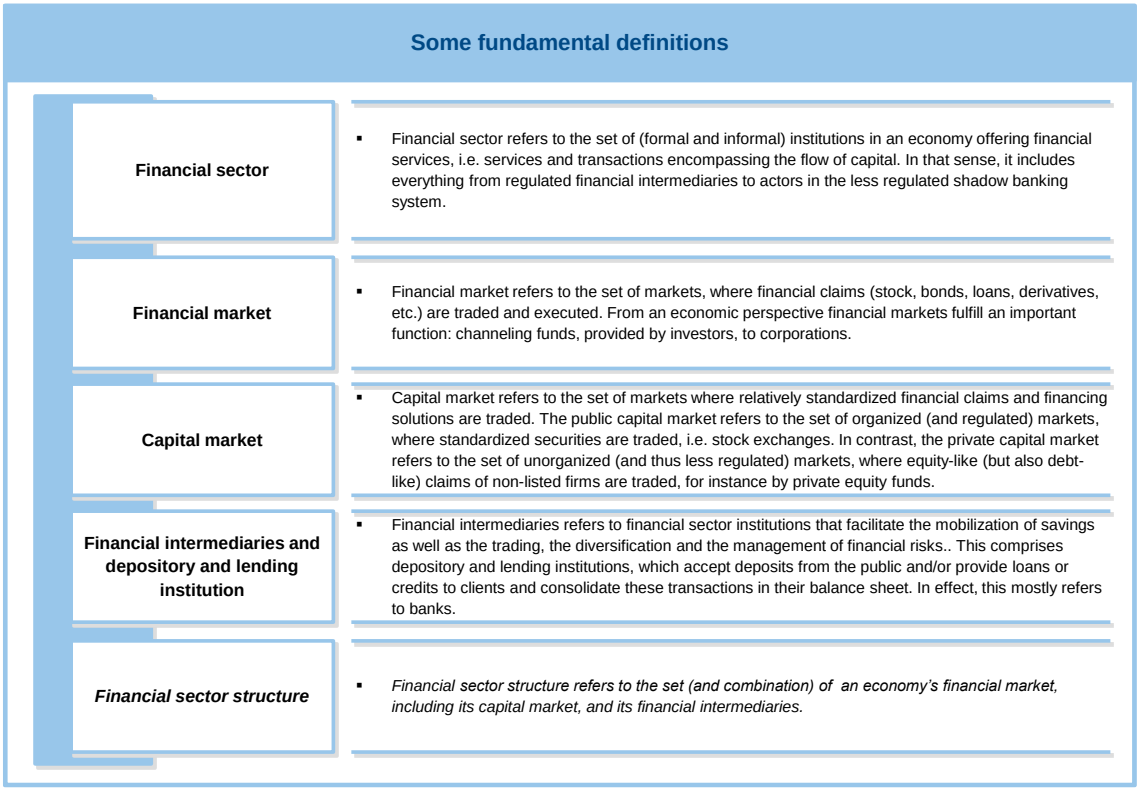
[7] This research does not discuss corporate sector financing provided by public authorities. Also, it concentrates on aggregate levels and thus mainly ignores intra-sector financing, i.e. inter-firm financing.



Notes: The figure illustrates the channels through which ultimate investors (e.g. private households) may provide capital to the corporate sector. From the perspective of the corporate sector, capital is provided by the financial market, which consists of the public and the private capital market and depository and lending institutions. The latter accept deposits from the public and/or provide loans to the corporate sector. From the perspective of (ultimate) investors, there is the decision on whether to invest in the financial market directly, or to provide capital to institutional investors and mandating them to invest in the financial market.

Source: Own representation.

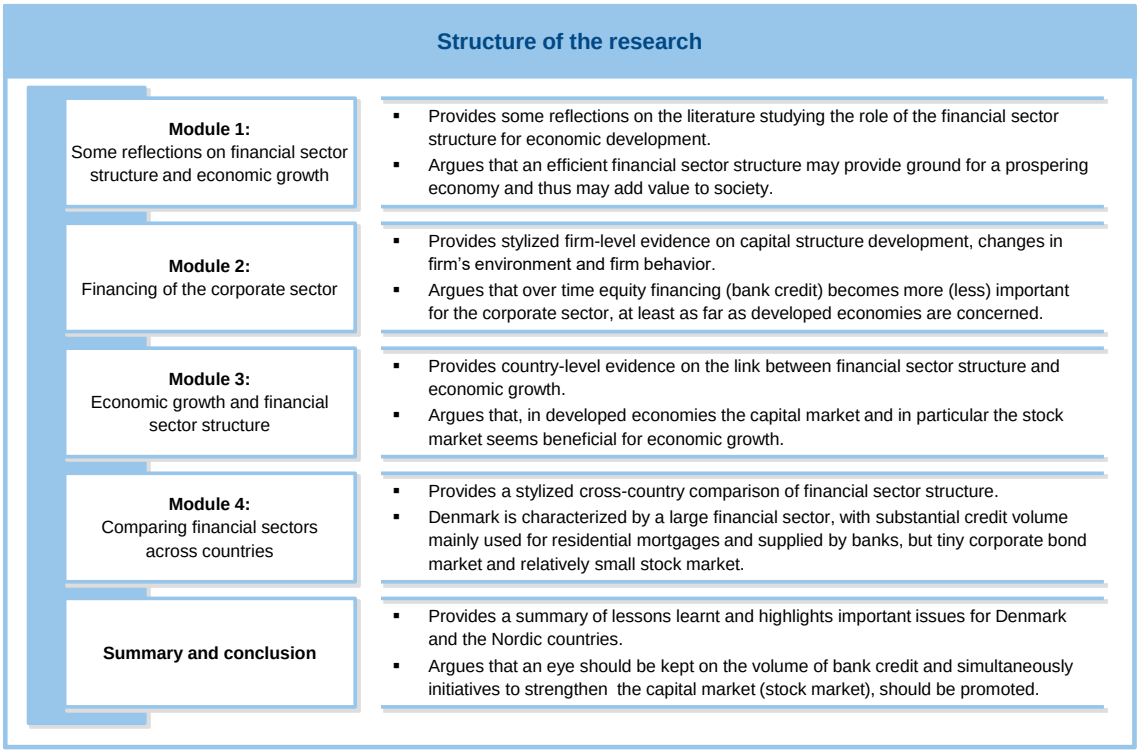
Figure 3: Financing the corporate sector



Notes: The figure reports some fundamental definitions
Source: Own representation.

Figure 4: Some fundamental definitions

Structure of the research: The plan for the research is as illustrated in Figure 5. Next, Module 1 will provide some reflections on financial sector structure and economic growth by reviewing the academic literature. Module 2 will provide stylized firm-level evidence on capital structure development, changes in firm's environment and firm behavior. Next, Module 3 will take a macroeconomic view and provide novel country-level evidence on the link between financial sector structure and economic growth. Module 4 will add stylized cross-country comparison of financial sector structure. Finally, a Conclusion will summarize and discuss challenges for market participants and regulators when it comes to decide about the future direction of the Danish financial sector.



Notes: The figure illustrates the structure of the research.

Source: Own representation.

Figure 5: Structure of the research

3 Module 1: A review of the literature

This part of the research will briefly review the existing literature on the value-contribution of the financial sector and will provide the foundation for the remaining research.[8] Specifically, it will concentrate on the *finance-growth nexus* and discuss the question whether the financial sector and its actors may contribute to economic growth. Thereby, as discussed previously, financial sector refers to the set of (formal and informal) institutions in an economy offering financial services, i.e. services and transactions encompassing the flow of capital.

There are two strands of literature dealing with the issue of interest. On the one hand, a theoretical literature that is interested in understanding the variety of channels through which the financial sector may fuel economic activities.[9] On the other hand, a literature that is interested in the empirical structure of the finance-growth relationship. This empirical literature was particularly active within the last years. The key issue here is the question about causality in the finance-growth nexus. While the early empirical literature was successful in establishing a positive correlation between finance and economic development, more recent studies support the view that financial sector development positively impacts economic development. These more recent studies, however, also suggest that there are non-linearities in the relation of interest. Specifically, caution seems warranted with respect to the development of private credit and the (non-)banking sector. However, the overall evidence supports the "finance matters" view suggesting that financial sector development is of first-order importance for economic development.

The Module proceeds in four steps. In a first step, arguments for the relevance of the financial sector. Next, the early empirical macroeconomic literature is revisited, before the question about the direction of causation in the finance-growth nexus is discussed. Finally, a fourth part discusses non-linearities and the "too much finance" hypothesis.

[8] This review borrows from Beck et al. (2015). Note that a complete review of the literature is beyond the scope of this research. Extensive reviews of the literature are found in Valickova et al. (2015), Aizenman et al. (2015), Asongu (2015), Barajas et al. (2013), Beck (2012), Ang (2008), Demirgüç-Kunt & Levine (2008), and Levine (2005).

[9] For a discussion of the roles of financial services for the economy see the discussion in World Economic Forum (2014, 2013) and relatedly Werner (2015), Allen & Carletti (2012), Pennacchi (2012), Dewatripont et al. (2010), Matthews & Thompson (2005) and the references therein.

3.1 The relevance of the financial sector

Economists as well as politicians have acknowledged the relevance of the financial sector for the economy since centuries. In 1776, Adam Smith argued that money may reduce the cost of economic transactions and thus may facilitate specialization and innovation (cf. Adam Smith, 1776). Relatedly, Alexander Hamilton, one of the Founding Fathers of the United States, noted in 1781 that "[m]ost commercial nations have found it necessary to institute banks and they have proved to be the happiest engines, that ever were invented for advancing trade." (cf. Hamilton, 1781). In the early years of the 20th century, Joseph Schumpeter added arguing that financial intermediaries are essential to economic development, as they channel savings to those entrepreneurs with highest economic prospects (cf. Schumpeter, 1911).

Later, economists aimed to support these qualitative arguments by empirical and theoretical analyses. The (still active) theoretical literature argues that information processing as well as transaction costs may rationalize the emergence of a financial sector. The idea is that the primary purpose of the financial sector is to provide cost-efficient ways to (re)allocate resources across space (states of the world) and time. The value contribution may then stem from various different functions of the financial sector (Levine, 1997): (i) Mobilization of savings, (ii) allocation of resources (capital and information), (iii) facilitation of trading, hedging, diversification, and pooling of risks, (iv) monitoring of managers and the exercise of corporate control, and (v) facilitation of the exchange of goods and services. Clearly, each of these functions may contribute to economic development.[10]

3.2 The finance-growth correlation

Starting from these theoretical thoughts, the early empirical macroeconomic literature aimed to examine the association between financial sector and economic development. Goldstein (1969) was probably among the first to empirically study this relationship, finding a positive relation between financial sector development and economic development. King & Levine (1993a,b) extend the analysis documenting a positive correlation between the development of the banking sector and a country's

[10] See the discussion in Demirgüç-Kunt & Levine (2008) and Levine (2005, 1997).

economic activity, even after controlling for country characteristics that are plausible determinants of economic development.

A challenge to these empirical studies is the measurement of financial sector development. For instance, Beck et al. (2014) find only intermediation activities to correlate positively with economic development, expansion of the financial sector along other dimensions seems irrelevant for economic growth. But with the notable exception of Ram (1999), who uses liquid liabilities (to GDP) as a measure for financial sector development, most studies support the fundamental view of a positive association between finance and growth.

Atje & Jovanovic (1993), Levine & Zervos (1998), and Rousseau & Wachtel (2000) extend the analysis of Goldstein (1969) and King & Levine (1993a,b) by examining the role of the stock market. All three studies find a positive correlation between stock market development and the level of economic activity. In a recent contribution, Demirgüç-Kunt et al. (2013) document that the relative importance of the banking sector versus the capital markets is a matter of the level of economic development, with markets becoming more important as countries develop. Finally, in a recent IMF analysis focusing, Sahay et al. (2015) document that generally financial development increases a country's resilience.

3.3 Finance-growth causation?

A fundamental issue within the finance-growth nexus discussion is the question about causality. Essentially, there are three competing views. First, there is the "finance follows" view. Under this view, demand for financial arrangements, which determines financial sector development, is simply a function of economic development. In other words, economic development determines financial sector development. A prominent proponent of this view is Robinson (1952). Second, there is the "finance is unimportant" view, which argues that the financial sector is (at best) of only marginal relevance for economic development (e.g. Lucas, 1988). Finally, there is the "finance matters" view. Under this view, financial sector development is of first-order importance for economic development (e.g. Miller, 1998).

Thus, the more recent macroeconomic literature aims to examine the direction of causality within the previously documented correlation between financial sector

development and economic activity. Thereby, authors rely on instrument variable-designs using lagged variables or historical facts to identify causality. Using such empirical designs, Levine et al. (2000) and Beck et al. (2000) provide evidence advocating that financial sector development affects economic development. Using a related econometric design, Rousseau & Wachtel (2000) and Shen & Lee (2006) document that stock market development affects the level of economic activity. As a result, Almarzoqi et al. (2015, p. 3) assert "it is therefore widely accepted that financial institutions positively influence economic development and growth" and Valickova et al. (2015) conclude, based on a meta-analysis of the existing empirical literature, that stock markets outperform other financial intermediaries, when it comes to supporting economic growth.[11]

In a parallel literature stream, scholars focus on micro-level analyses aiming to examine whether more developed financial sector structure (i.e. deeper financial markets and more market financing) may fuel entrepreneurship and thus allow firms with innovative and asset-light business models to grow faster. In an early contribution, Rajan and Zingales (1998) examine industry-level data and document that countries with higher levels of financial development allow industries, for which US peers depend more on external financing, to grow faster. Also using industry-level data, Wurgler (2000) provides evidence in line with the view that more developed financial sectors improve capital allocation. Relatedly, Claessens & Leaven (2003) and Beck et al. (2008) document that financial structure development may be particularly useful for small firms and firms with asset-light business models.[12] Using direct firm-level data, Ayyagari et al. (2011) provide evidence suggesting that financial sector development facilitates firm innovation. In sum, these studies support and complement the previously discussed macroeconomic analyses suggesting a positive causal effect of financial sector development on economic development.

[11] Valickova et al. (2015) also discuss a potential publication bias and conclude that there is limited evidence that results of published studies systematically overestimate the finance-growth association.

[12] Measuring the size of the domestic credit market, Aizenman et al. (2015) document that in developing economies not all industries benefit from financial deepening.

3.4 Too much finance?

However, in the aftermath of the recent financial crisis, some observers have become skeptical about two issues: First, the question whether there can be "too much finance" and second, the effect of (an unbalanced) financial sector structure on economic stability. Yet, there has been a long tradition in studying non-linearities within the finance-growth nexus. Deidda & Fattouh (2002), Rioja & Valev (2004a,b) and Demirgüç-Kunt et al. (2013) provide evidence suggesting that the level of economic development affects the finance-growth association. For instance, the results of Deidda & Fattouh (2002) suggest that financial sector development is important for economic growth only in high-developed economies. Rousseau & Wachtel (2011) find evidence suggesting that the finance-growth relation weakens since the 90s of the last century. Thereby, Rousseau & Wachtel (2011) measured financial sector development by liquid liabilities or credit to the private sector (both standardized by GDP). The analysis in Demirgüç-Kunt et al. (2013) advocates a more differentiated view, where in high-developed economies capital markets are important, but banks are in less developed economies. Relatedly, Shen & Lee (2006) find evidence suggesting that while stock markets propel economic growth, banking development has zero, if not negative, effect on economic development.

Directly addressing the "too much finance" hypotheses, Sahay et al. (2015) provide evidence for a bell-shaped finance-growth relation. Relatedly, Law & Singh (2013) and Arcand et al. (2015) provide evidence of an inverse U-shaped relation between banking development, and in particular private credit volume (normalized by GPD), and economic development. In other words, beyond sustainable levels bank sector development may jeopardize economic growth. Examining the European experience Pagano et al. (2014) and Langfiled & Pagano (2015) add to that view and argue that there might be "too much banking", specifically non-bank activities, in Europe.

4 Module 2: Financing of the corporate sector

This part of the research will provide stylized facts about the corporate sector in Europe. Specifically, it will focus on the financing of the corporate sector.[13] As outlined above, the corporate sector may be an important source of value creation for society. To fulfill this promise the corporate sector needs access to finance. Most importantly access to capital in order to acquire resources such as labor, intangibles (such as patents), machinery, and raw material to support existing operations, innovation and growth.[14]

Firms may tap financial resources in various ways, initially broken down into two categories: equity or debt. While both provide capital to a firm and thus enable the firm to acquire useful resources, their economics are very different.[15] Consider "debt" for instance. Debt involves borrowing money that has to be repaid (incl. interest) within a pre-specified time period. Thereby, the lender has limited upside potential but faces downside risk. The problem of the downside risk is amplified by the fact that in case the firm fails to repay the debt, the firm is likely to face bankruptcy costs (directly by costs of lawyers as well as indirectly in product markets). As a result, potential lenders will look for relatively safe investments and ask for covenants and/or collaterals. In contrast, "equity" involves raising money at the expense of selling interests in the firm. This means, that suppliers of equity finance participate in the upside and thus will find it easier to provide finance to risky projects. As a result, a cost-benefit analysis of financing alternatives is likely to be sensitive to (among others) the level of (exogenous) uncertainty faced by the firm, the risk of its business model, as well as the level of its collaterals in the balance sheet. On the aggregate this means

[13] This Module borrows from Kaserer & Rapp (2014). Bessler et al. (2011), Frank & Goyal (2009, 2008), Parsons & Titman (2008), and Myers (2003) review selected aspects of the academic literature. Cotei & Farhat (2011) and Fan et al. (2008) provide international comparisons of capital structure choice. Bessler et al. (2012) and Marks et al. (2005) deal with issues of financing corporate growth.

[14] From a more general perspective, access to finance may also comprise access to risk management opportunities. See Bartram et al. (2009) for international firm-level evidence on the use of financial derivatives in the corporate sector and Campello et al (2011) for a discussion of real and financial consequences.

[15] There is a long academic debate about the optimal mix of financing for firms. The seminal works of Modigliani and Miller (1958) and Jensen and Meckling (1976) and others have provided grounds for a structured debate that is reviewed in the papers cited above.

that with increasing levels of uncertainty in product and capital markets and a corporate sector increasingly relying on more intangible business models with decreasing levels of collaterals needed to support these business models, equity financing is *ceteris paribus* likely to gain in importance for the corporate sector.

In the light of the above, the subsequent analysis proceeds in three steps. First, selected stylized facts about the development in the firms' economic environment are presented. Specifically, various measures of uncertainty as well as the (in)tangibility of the average model are studied. Second, patterns and trends in capital structure and in particular debt-equity choice are highlighted. Finally, some firm-level insights into the relation between firm financing and firm behavior are presented. While the analysis mainly concerned with European firms, US firms will generally be considered a reference point, as the market-oriented US system is widely considered the benchmark model when it comes to financial systems.

In sum, this module provides stylized evidence that (at least parts of) the corporate sector faces increasing risks and simultaneously has declining ownership of collaterals. Accordingly, an analysis of the debt-equity choice reveals that equity gains in importance in the balance sheet of firms. In contrast, leverage declines and in particular, leverage due to bank loans. Moreover, it is shown that the level of equity within a firm's balance sheet is positively correlated with its research and development activities and also with its future sales growth. As a result, this part of the research argues that (1) a healthy financial sector is vital for a prospering private sector and (2) that changes in the private sector may require changes in the financial sector structure.

4.1 Fundamental developments

In capitalist economies, firms do not operate under exogenously fixed conditions, but in markets, where market outcomes reflect demand and supply. The latter two are exposed to market trends as well as external shocks and thus market outcomes and firms' optimal responses to market outcomes may change over time. Accordingly, any in-depth analysis of firm behavior should start with an analysis of the environment firms are operating in. Examining European listed firms, two stylized patterns are

highlighted below. First, firms seem to face increasing uncertainty. Second, firms seem to adjust their business models over time.

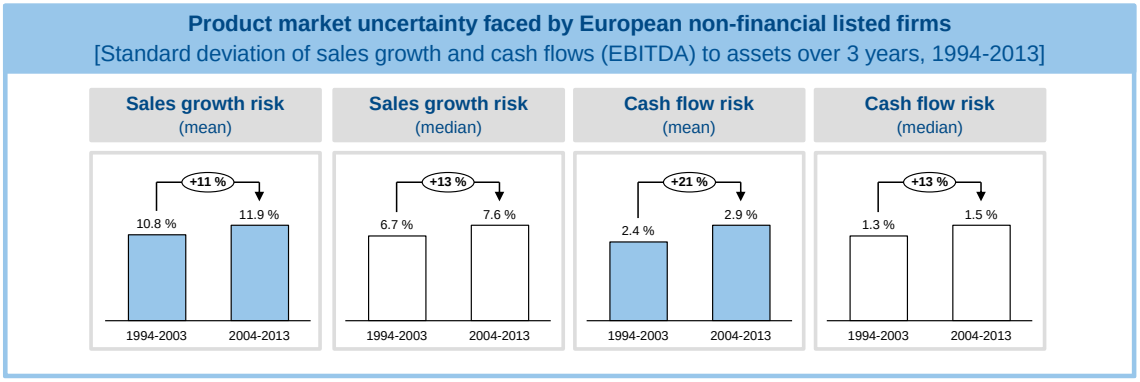
There is evidence in the literature that in many countries firms face increasing operating and cash flow risks (e.g. Bates et al. (2009) for the US or Killi & Rapp (2016) for Germany). Partially this might be explained by changing macroeconomic risks (competition), partially by a changing industry composition in these countries.[16] Also, there is some evidence that uncertainty in capital market has increased over time (CFA Institute, 2012 and Finnegan, 2011). Moreover, with globalization and increasing competition innovation becomes more important for the corporate sector. However, innovation is inherently risky resulting in less collateralizable assets and again increasing operating risk. The subsequent analysis illustrates these developments and provides additional evidence.

Regarding product market uncertainty, Figure 6 documents that sales and cash flows have become more unstable over time. Specifically, examining the mean firm and comparing the 1994-2003 period to the more recent 2004-2013 period, the 3-year standard deviation of real sales has increased by 11 percent. This corresponds to a 1 percent increase each year. The 3-year standard deviation of cash flows has increased by 21 percent, which corresponds to an increase of 2 percent per year.

Relatedly, uncertainty in capital market has increased. Figure 7 reports the distribution of weekly returns in the US stock market. The figure highlights that extreme events, i.e. weeks with returns below minus 3 percent or even below minus 5 percent, became more likely recently.[17] Technically speaking, the standard deviation of weekly return increased (by about one third, when comparing the three time periods examined in Figure 7) and skewness became smaller over time.

[16] Irvine & Pontiff (2009) and Gaspar& Massa (2006) provide evidence that (product market) competition is associated with increasing uncertainty, both in terms of cash flow uncertainty as well as in terms of valuation uncertainty.

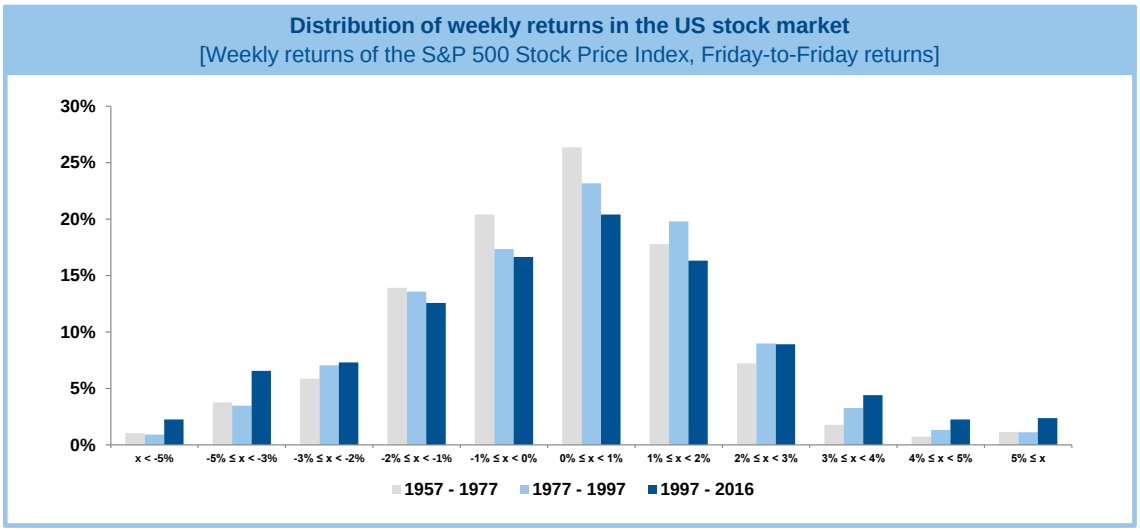
[17] The US stock market is examined here, as US stock markets have a long history, which is well documented in terms of data availability. Similar pattern are found in other countries (e.g. Rapp & Killi (2016) for Germany).



Notes: The figure illustrates the development of product market uncertainty for the corporate sector over time. Sales growth risk is defined as the standard deviation of changes in current sales versus previous year's sales calculated over three years. Thereby, sales are measured in real terms, i.e. deflated, to account for inflation. Cash flow risk is defined as the standard deviation of EBITDA to total assets calculated over three years. The sample consists of European non-financial listed firms, where Europe covers Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, Switzerland, and United Kingdom. The analysis covers the 1994-2013 period (data permitting) with a total of 39,764 individual firm-year observations.

Source: Own analysis. Data from Thomson Reuters Datastream/Worldscope Fundamentals.

Figure 6: Product market uncertainty faced by non-financial firms



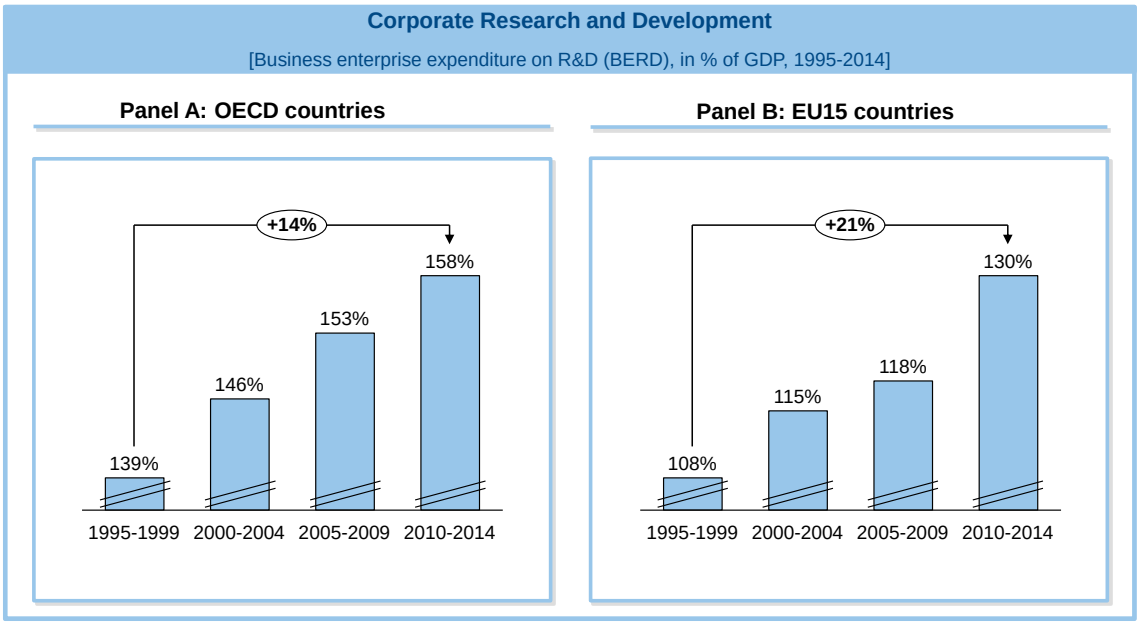
Notes: The figure illustrates the distribution of weekly returns, measured from Friday to Friday, from Jan 1957 to Mid of March 2016.

Source: Own analysis. Data from S&P Dow Jones Indices LLC as provided by St Louis Fed.

Figure 7: Distribution of weekly returns in the US stock market

Second, with globalization firms in developed economies face increasing competition. To sustain the market position, a natural response would be to invest in innovation. And indeed, corporate research and development expenditures have increased over the last twenty years as illustrated by Figure 8. Standardized by GDP Business enterprise expenditure on research and development (BERD) have grown by some 0.9

percent per year in OECD countries and by some 1.3 percent per year in EU15 countries.[18]



Notes: The figure illustrates the development corporate research and development expenditures as a percentage of GDP for two country clusters. Panel A reports data for OECD member countries, and Panel B for EU15 countries covering covers Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and United Kingdom. 5-year averages (data permitting) are reported to smooth temporary effects.

Source: Own analysis. Data from OECD Main Science and Technology Indicators (https://stats.oecd.org/).

Figure 8: Corporate research and development expenditures

Finally, with increasing research and development and changing industry composition the asset structure of firms has changed.[19] Figure 9 reports two dimensions of a firm's asset structure, the fraction of fixed assets (to net assets) and the fraction of intangible assets (to net assets) over the last 20 years.[20] While the fixed assets ratio declined over time, intangible assets gained momentum. For European firms, the proportion of

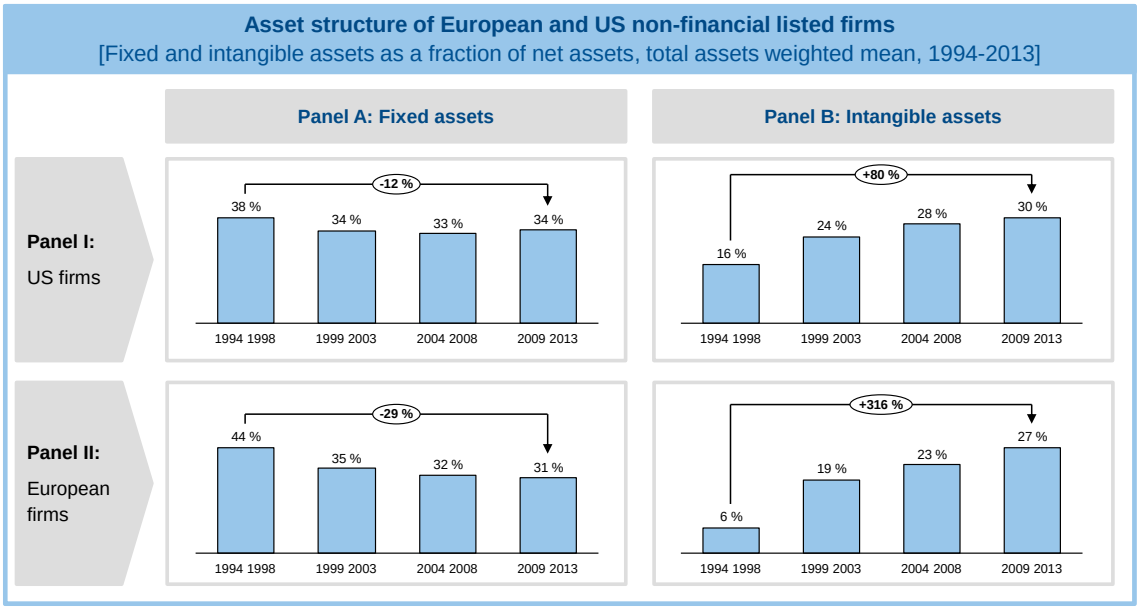
[18] These figures are calculated based on the data reported in Figure 8. Comparing four 5-year averages the growth period is 15 years. 1.3 percent compounded for 15 years yields 21.3 percent.

[19] This has been noted before as for instance described in Fox (2015). Kachaner & Whybrew (2014) provide a comprehensive industry-level analysis of firms' asset ownership strategies and find a negative correlation between asset intensity and return on asset measures for many industries.

[20] Note that the numbers reported in the figure are conservative estimates as they refer to book values. In market values, as reported by Fox (2015) and many others, intangible assets have become even more important. Fu et al. (2015) provide a detailed analysis of fixed assets and the investment behavior of firms.

intangible assets in the balance sheet increased from 6 percent in the early 1994-1998 period by more than 300 percent to 27 percent in more recent years.

In sum, these patterns suggest that firms face increasing risk and simultaneously own (relatively) less fixed assets that might be useful as collaterals for providers of debt capital. Therefore, one might expect some structural changes in the financing of firms. This is examined in the next Section.



Notes: The figure illustrates the development of the asset structure in the corporate sector over time. Panel I reports figures for US firms, Panel II figures for European firms. Panel A reports the fixed assets ratio, defined as (book value of) fixed assets to (book value of) net assets, where net assets are total assets less cash and short term investments. Panel B reports the intangible assets ratio, defined as (book value of) intangible assets to (book value of) net assets. The sample consists of non-financial listed firms from the US and Europe, where Europe covers Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, Switzerland, and United Kingdom. The analysis covers the 1994-2013 period (data permitting) with a total of 174,151 individual firm-year observations.

Source: Own analysis. Data from Thomson Reuters Datastream/Worldscope Fundamentals.

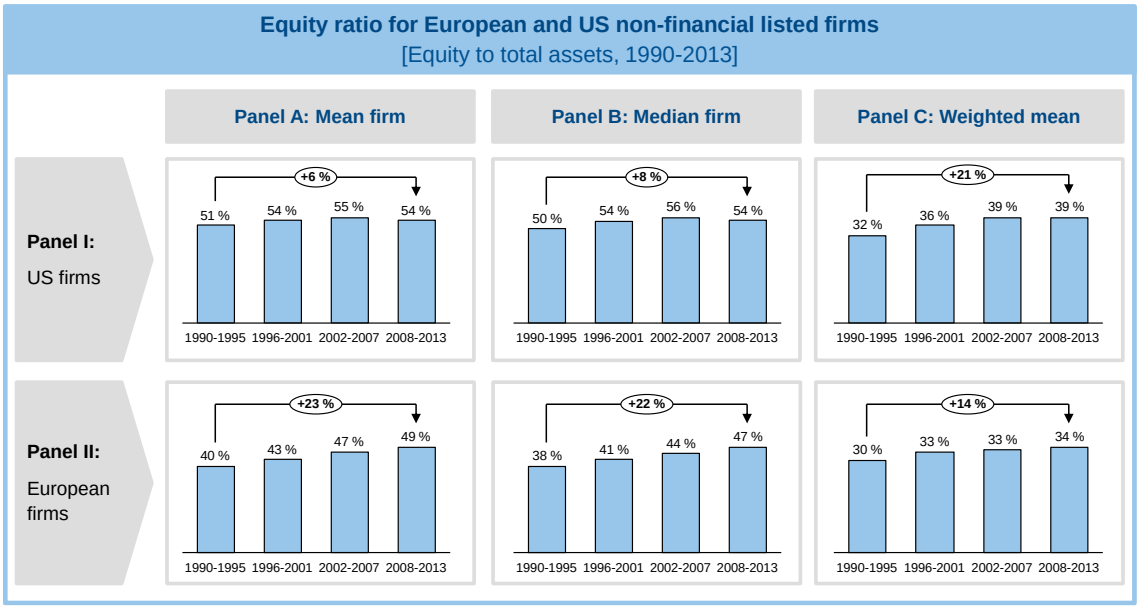
Figure 9: Asset structure of non-financial firms

4.2 Financing of firms

This part of the research examines financing of the corporate sector. Specifically, capital structure – and in particular the debt-equity choice – of firms is examined. This is done on the firm-level, as well as in the aggregate. In a final step, the type of debt, whether supplied by banks or the market, is examined.

It has been noted that (i) firms are faced with increasing uncertainty and have less collateralizable assets and (ii) suppliers of equity might find it easier to provide finance

to risky projects. Thus, one might hypothesize that the importance of equity finance should have increased over time. Figure 10 illustrates the importance of equity for non-financial listed firms in the US and Europe over time by examining the mean firm, the median firm, as well as the representative firm. The latter is characterized by the size weighted sample mean.



Notes: The figure illustrates the importance of equity financing in the corporate sector over time. Panel I reports figures for US firms, Panel II figures for European firms. Equity ratio is defined as equity to total assets. Panel A, B, and C report mean, median, and total assets-weighted values, respectively. The sample consists of non-financial listed firms from the US and Europe, where Europe covers Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, Switzerland, and United Kingdom. The analysis covers the 1990-2013 period (data permitting) with a total of 194,178 individual firm-year observations.

Source: Own analysis. Data from Thomson Reuters Datastream/Worldscope Fundamentals.

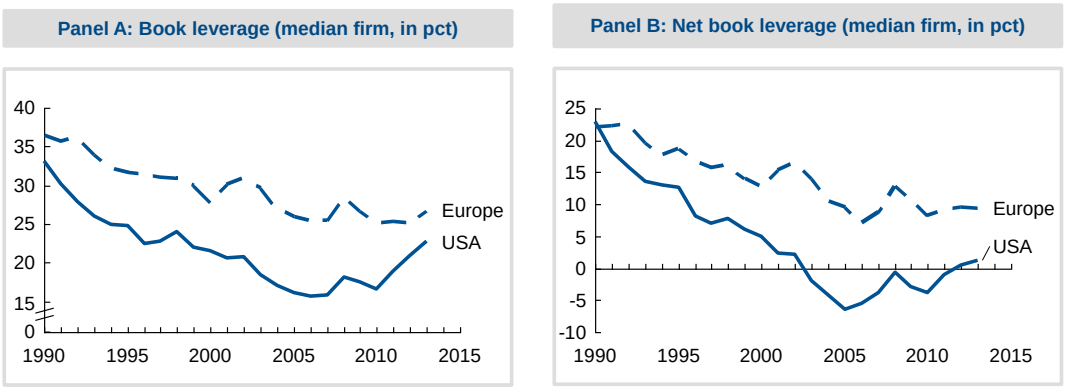
Figure 10: Importance of equity financing for non-financial firms

Two patterns emerge. First, compared to their US counterparts, European firms have generally lower equity ratios in their balance sheet. This is consistent with the previously discussed benchmark view on the US financial system. Second, along the time line firms tend to have increased their equity ratio over time. Thereby, the documented increase for European companies is substantial: Comparing the early 1990-1995 period to the most recent period, the equity ratio for the mean and the median firm increased by more than 20 percent. For the representative firm the

increase is found to be 14 percent, which suggests that the increase was larger for smaller firms.[21]

Figure 11 studies the debt-equity choice of non-financial listed firms from a different angle. Examining (net) book leverage for the median firm in Europe and the US, it documents a declining importance of debt financing. Indeed, the analysis of net book leverage suggests that parts of the corporate sector actually switched sides becoming in effect a net lender. This is consistent with a widely observed pattern over the last years.[22]

Leverage of non-financial listed firms in Europe and the US
[Total debt and total debt less cash and short term investments to total capital, 1992-2013]



Notes: The figure illustrates the importance of leverage in the corporate sector over time. Panel A (Panel B) reports book leverage (net book leverage) for the median non-financial listed firm in the US and in Europe, where Europe covers Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, Switzerland, and United Kingdom. Book leverage is defined as total debt to total capital. Net book leverage is total debt less cash and short-term investments deflated by total capital. Total capital is the sum of total debt plus equity. The analysis covers the 1990-2013 period (data permitting) with a total of 193,510 individual firm-year observations.

Source: Own analysis. Data from Thomson Reuters Datastream/Worldscope Fundamentals.

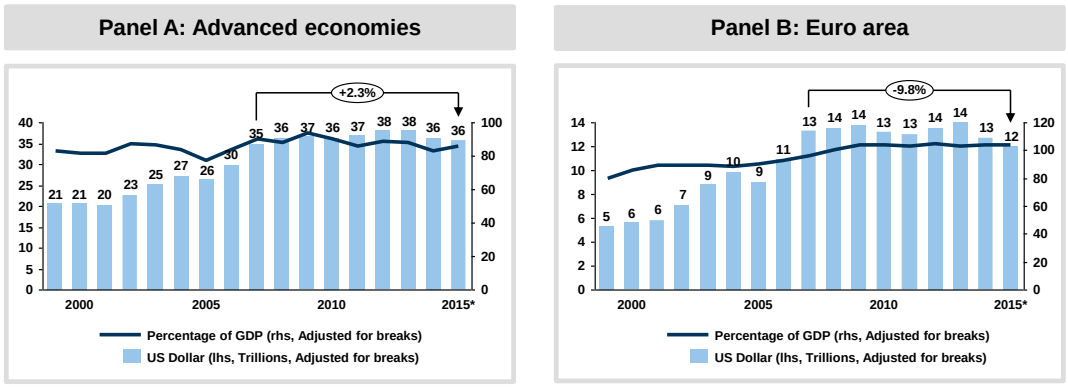
Figure 11: Leverage of non-financial firms

[21] Using the BACH (Bank for the Accounts of Companies Harmonized) database maintained by the French National Bank, unreported analyses reveal similar patterns for unlisted firms in many European countries. See also the analysis in Kaserer & Rapp (2014).

[22] See Bates et al. (2009) for an analysis of US firms documenting a secular increase in cash holdings. Killi & Rapp 2016) study German firms and find similar results. One concern with the analysis in Figure 11 might be that it ends in 2014 (the early state of the current zero-interest phase). However, the Figure aims to document a long term trend, which will not be affected by one year. Moreover, Figure 12 illustrates that there is no significant change in the debt to non-financial institutions time series in 2015.

The decline in corporate leverage should also be observable in the aggregate. Accordingly, Figure 12 reports aggregate figures on debt provided to non-financial corporations as reported by the Bank of International Settlement (BIS). The figure illustrates that since the financial crises the total use of debt by non-financial corporations in advanced economies has been relatively stable and even decreased slightly in Europe. In contrast, there has been continuous (net) issuing activity of shares as Figure 13 reports (with the exception of 2002 and 2008 for the corporate sector).

Debt to non-financial corporations
[Debt to non-financial corporations, year end market values, 1999-2015]



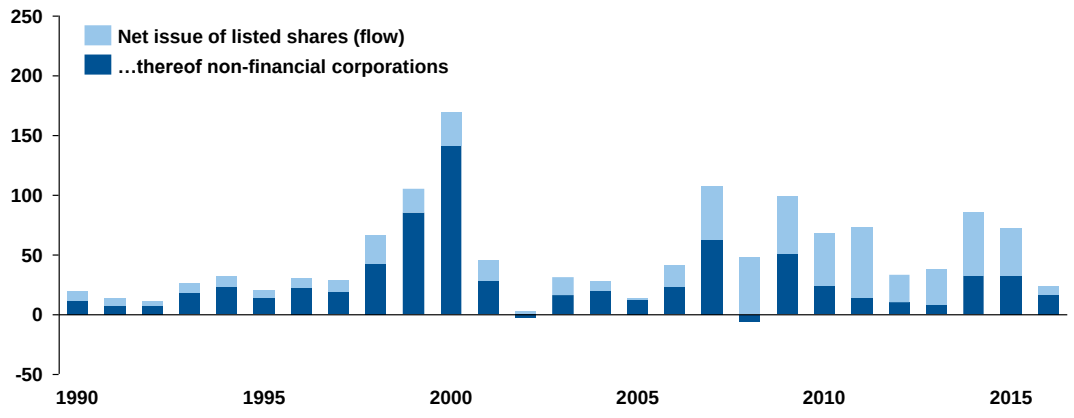
Notes: The figure illustrates the development of aggregate credit borrowed by non-financial corporations. Panel A reports values for advanced economies, Panel B values for the Euro area. Bars report aggregate market values in trillions of USD and refer to the y-axis on the left hand side. The solid line reports aggregate market values as a percentage of gross domestic product (GDP) and refers to the y-axis on the left hand side. Values refer to the end of the year with the exception of 2015, where due to data availability issues the data refers to end of September. The analysis is based on the BIS time series Q:5R:N:A:M:770:A, Q:5R:N:A:M:USD:A, Q:XM:N:A:M:770:A, and Q:XM:N:A:M:USD:A. The former two are only available since 1999.

Source: Own analysis. Data from the Bank of International Settlement (BIS), Long series on total credit to the non-financial sectors (available at http://www.bis.org/statistics/totcredit.htm; accessed April 2016)

Figure 12: Debt to non-financial corporations

Overall, the evidence suggests a shift in the capital structure of non-financial companies with equity gaining importance at the expense of debt financing. Thereby, another trend warrants notice. Figure 14 examines the use of bank debt for non-financial European firms with access to the capital market. In particular, Panel B of the figure is striking. Examining firms with market debt, i.e. firms with access to the bond market, the figure suggest that these firms seem to substitute bank loans by market debt.

Net issue of listed shares by Euro area residents
[Total economy and non-financial corporations, 1990-2016Jan, in Billions EUR]



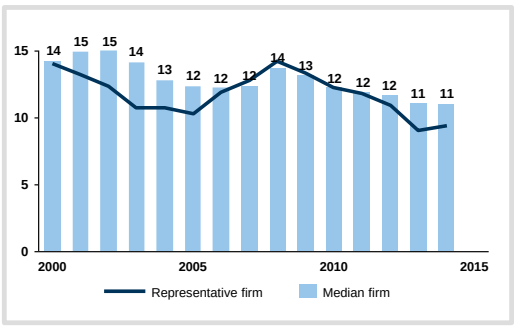
Notes: The figure illustrates the net equity issuance activity of Euro area issuers. Thereby, it differentiates between non-financial corporations and other issuers. Flow numbers aggregate monthly data. 2016 data is only available until January. Thus, 2016 data are flows for January multiplied by 12.

Source: Own analysis. Data from ECB (2016), Statistics Bulletin, March 2016 and https://sdw.ecb.europa.eu

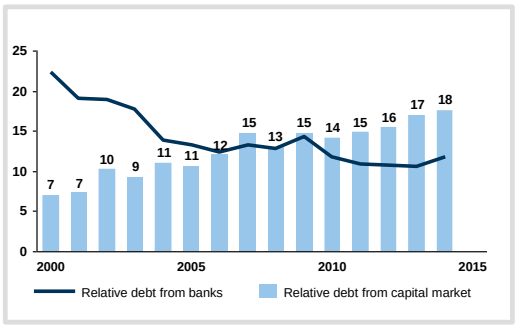
Figure 13: Net issuance of shares

Use of bank loans and market-based debt by non-financial European firms
[Bank loans and market debt use of European non-financial capital market-oriented firms, 2000-2014]

Panel A: Bank loans
[Firms with bank loans]



Panel B: Relative debt
[Firms with market-based debt, median firm]



Notes: The figure illustrates the use of bank loans and market-based debt in the European corporate sector over time. Panel A reports bank debt leverage for the median and the representative European non-financial capital market oriented firm with bank loans. Bank debt leverage is defined as bank loans to total assets, both measured in book values. Panel B reports the relative bank debt leverage and the relative market debt leverage for the median European non-financial capital market oriented firm with market debt. Relative bank (market) debt leverage is defined as bank loans (bonds and similar instruments) to total debt, all measured in book values. Europe is defined as Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, Switzerland, and United Kingdom. The analysis covers the 2000-2014 period (data permitting) with a total of 50,414individual firm-year observations.

Source: Own analysis. Data from Bureau van Dijk OSIRIS.

Figure 14: Use of bank loans and market-based debt

4.3 Financing and firm behaviour

In a third step, some firm-level insights into the relation between firm financing and firm behavior are presented. Therefore, the association between (i) R&D intensity and equity financing and the (ii) equity financing and future firm growth will be discussed.

4.3.1 R&D intensity and equity financing

First, the association between R&D intensity and equity financing will be examined. Therefore, correlation analysis of the following type will be used

$$EF_{it} = \alpha + \beta_1 \times RDI_{it} + \beta_1 \times X_{it} + \varepsilon_{it} \quad (1)$$

where EF measures a firm's equity financing in period t, RDI proxies its R&D intensity, and X represents a set of control variables. Specifically, EF is the firm's equity ratio as defined above and RDI is defined as research and development expenses as reported by the firm (or zero) normalized by sales of the firm. Moreover, X involves firm size (measured by the log of real total assets, i.e. total assets adjusted for inflation), Tobin's Q (measured by market capitalization plus total debt to total capital), return on assets (measured by EBITDA to total assets), fixed assets ratio (measured by fixed assets to net assets), and a dividend payer dummy indicating whether the firm pays a dividend, as well as country-, industry,- and year-fixed effects.

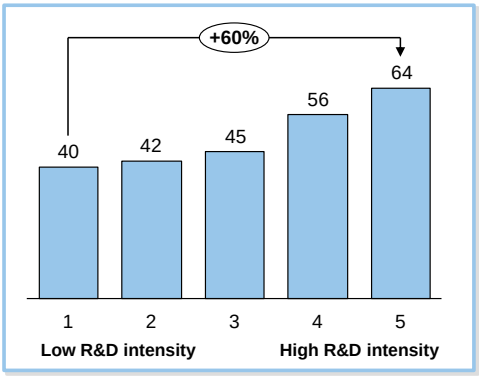
The results are presented in Figure 15. Panel A illustrates the univariate association and documents that firms with high R&D intensity have more equity in their balance sheet.

Panel B reports results of the multivariate analysis. The pattern is similar to the one documented in Panel A. Column I suggests that even after controlling for industry effects, year effects, country location, and firm characteristics R&D intensity is positively associated with equity financing. Column II adds that when comparing firms with and without reported R&D expenses, the former have higher equity ratio in their capital structure. Finally, Column III reports results of a non-linear specification. While the analysis finds the association to be inverse U-shaped, the implicit maximum is at 36 percent of sales, which is at the very right tail of the distribution of firms' R&D intensity.

R&D intensity and equity financing of European non-financial listed firms

[Correlation between R&D intensity, defined as R&D expenses over sales, and equity financing, 1990-2013]

Panel A: Univariate relation



Panel B: Multivariate correlation

Column	I	II	III
Method	OLS	OLS	OLS
Standard errors		firm-level clustered	
Dependent variable		Equity ratio	
R&D intensity	0.279***	0.374***	0.925***
	[6.71]	[11.05]	[12.22]
R&D intensity^2			-1.308***
			[-8.77]
R&D (dummy)		0.027***	0.010**
		[6.02]	[2.02]
Firm size	-0.033***	-0.036***	-0.035***
	[-18.47]	[-34.22]	[-34.01]
Fixed assets ratio	-0.128***	-0.098***	-0.095***
	[-5.63]	[-9.61]	[-9.34]
Firm controls	*yes*	*yes*	*yes*
Fixed effects	*Y,I,C*	*Y,I,C*	*Y,I,C*
Nbr of obs	22,676	83,783	83,783
Adj. R^2	0.28	0.24	0.24

Notes: The figure illustrates the association between R&D intensity and equity financing in the corporate sector. R&D intensity is defined as research & development expenses normalized by sales. Equity ratio is defined as equity to total assets. Panel A illustrates graphically the univariate correlation by R&D intensity and equity financing for firms reporting research & development expenses. Panel B reports multivariate correlations obtained as the result of three multivariate OLS regression specifications. R&D is a dummy variable indicating whether research & development expenses are reported by the firm, otherwise research & development expenses are defined to be zero. In Panel B Column I reports results for the subset of firms reporting research & development expenses. Column II and III are estimated on all firms, but include the R&D (dummy). Reported firm controls are firm size (measured by the log of real total assets, i.e. total assets adjusted for inflation) and fixed assets ratio (measured by fixed assets to net assets). Additional unreported firm controls are Tobin's Q (measured by market capitalization plus total debt to total capital), return on assets (measured by EBITDA to total assets), and a dividend payer dummy indicating whether the firm pays a dividend. Furthermore, in all three specifications fixed effects for time, industry (based on 2-digit SIC codes) and country location are included. The table reports OLS coefficients and t-statistics that allow for heteroscedasticity and correlation across observations of any given firm. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. The sample consists of European non-financial listed firms reporting according to international accepted accounting standards (IAS or US-GAAP), where Europe covers Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, Switzerland, and United Kingdom. The analysis covers the 2000-2013 period (data permitting) with a total of 32,537 individual firm-year observations and some 36.7% of them reporting research & development expenses.

Source: Own analysis. Data from Thomson Reuters Datastream/Worldscope Fundamentals

Figure 15: R&D intensity and equity financing by non-financial firms

There are two additional points worth noting, when looking at the results presented in Figure 15. First, the coefficient of firm size is significantly negative suggesting that smaller firms have more equity in their capital structure. Second, the coefficient of fixed assets is – as expected – negative and significant.

4.3.2 Equity financing and future firm growth

To examine the association between equity financing and future sales growth correlation analysis of the following type will be used

$$FSG_{it,t+\Delta} = \alpha + \beta_1 \times EF_{it} + \beta_1 \times X_{it} + \varepsilon_{it} \quad (2)$$

where $FSG_{it,t+\Delta}$ measures a firm's sales growth from period t to period $t+\Delta$, EF is the firm's equity ratio in period t, and X represents a set of control variables in period t. Future sales growth is calculated over 3 years and over 5 years and X comprises firm size (measured by the log of real total assets, i.e. total assets adjusted for inflation),

Tobin's Q (measured by market capitalization plus total debt to total capital), return on assets (measured by EBITDA to total assets), fixed assets ratio (measured by fixed assets to net assets), R&D intensity (measured by research and development expenses to sales, if the firm reports research and development expenses, otherwise zero), R&D dummy (measuring whether a firm reports research and development expenses), a dividend payer dummy indicating whether the firm pays a dividend, and year fixed effects controlling for common fluctuations over time.

Figure 16 reports the results. Thereby, while Column I examines cross-sectional variation, Column II – V rely on firm-level (within) variation. Still, a consistent picture emerges from that analysis: Future sales growth is positively correlated with the current level of equity in the balance sheet.

Equity ratio and future sales growth of non-financial European listed firms
[Regression analyses explaining future sales growth in pct]

Column	I	II	III	IV	V
Method	OLS	FFE	FFE	FFE	FFE
Standard errors			firm-level clustered		
Dependent variable		Sales growth (3 years)			(5 years)
Equity ratio	1.719***	2.420***		2.086***	5.799***
	[14.93]	[11.38]		[8.67]	[4.66]
Low equity ratio			2.322***		
			[12.93]		
High equity ratio			1.898***		
			[14.67]		
Equity ratio x Tobins Q				0.123**	
				[2.50]	
Firm controls	*yes*	*yes*	*yes*	*yes*	*yes*
Fixed effects	*Y,I,C*	*Y,F*	*Y,F*	*Y,F*	*Y,F*
Nbr of obs	58,685	58,687	58,685	58,687	46,202
Adj. R^2	0.10	0.12	0.10	0.12	0.07

Notes: The figure reports results of OLS regressions examining the association between equity financing and future sales growth in the corporate sector. Future sales growth is generally measured over next 3 years. Equity ratio is defined as equity to total assets. Column I reports results of a simple cross-sectional correlation analysis. Column II reports corresponding firm-level correlations. Column III differentiates between low and high equity ratios and Column IV allows the correlation to be sensitive to growth opportunities perceived by the market. Finally, Column IV extends the analysis by measuring future sales growth over 5 years. Unreported firm controls are firm size (measured by the log of real total assets, i.e. total assets adjusted for inflation), Tobin's Q (measured by market capitalization plus total debt to total capital), return on assets (measured by EBITDA to total assets), fixed assets ratio (measured by fixed assets to net assets), R&D intensity (measured by research and development expenses to sales, if the firm reports research and development expenses, otherwise zero), R&D dummy (measuring whether a firm reports research and development expenses), and a dividend payer dummy indicating whether the firm pays a dividend. Fixed time effects are included in all specifications. In Column I fixed industry and country location effects are also present. The table reports OLS coefficients and t-statistics that allow for heteroscedasticity and correlation across observations of any given firm. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.
The sample consists of European non-financial listed firms, where Europe covers Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, Switzerland, and United Kingdom. The analysis covers the 1990-2013 period (data permitting) with a total of 58,685 individual firm-year observations.

Source: Own analysis. Data from Thomson Reuters Datastream/Worldscope Fundamentals

Figure 16: Equity financing and future sales growth by non-financial firms

This finding is consistent with the findings of Aivaziana et al. (2005) documenting a (causal) negative impact of financial leverage on the firms' investment decisions for Canadian publicly traded companies. Column IV is of particular interest: interacting equity ratio with a commonly accepted proxy for growth opportunities (Tobins Q) suggest that firms find it easier to translate existing growth opportunities into real sales growth, when they have higher levels of equity in their balance sheet.

5 Module 3: Economic growth and financial sector structure

This part of the research will focus on the question whether there is an association between financial sector structure and economic growth.[23] Economies need to enable entrepreneurial activities for sustainable growth. Beside human capital and entrepreneurial talent, such activities require initial funding. However, they are inherently venturous and thus their returns are risky.[24] As the financial sector, and in particular the stock market, may facilitate risk sharing within the economy, one might argue that a developed and healthy financial sector can fuel economic activity and thus economic growth.[25]

To support these arguments, this section provides an empirical analysis of the association of interest for OECD countries. Borrowing the methodology from the existing literature, it proceeds in four steps. First, it provides a descriptive analysis of pooled cross-county correlations. Second, it examines within-country correlations. Third, it applies advanced econometric methods to further investigate the association. Finally, complementary analyses addressing the "too much finance" concerns are provided.

As a result, it is shown that there is a strong correlation between financial sector development and economic development. Thereby, financial sector development is measured as the aggregate of three parts: domestic credit to the private sector, size of the private bond market and market capitalization of listed domestic companies. When the analysis allows to differentiate between credit volume, bond and stock market and takes into account unobserved country heterogeneity, only stock market size is consistently positively correlated with economic growth. This holds, even when advanced econometric methods are applied. The advanced econometric tests even suggest that the observed correlation is causal, i.e. indicate that stock market size

[23] This Module borrows parts of its structure from Kaserer & Rapp (2014) and the data and much of the analysis from Rapp & Udoieva (2016).

[24] Entrepreneurial activities frequently require initial funding from outsiders to produce returns. This will open a channel for external participation in the economic returns, as the entrepreneurs will have to share parts of their profits with the providers of capital. However, as the activities are – by their very nature – inherently venturous, the returns entrepreneurs may promise to capital providers are ex-ante uncertain.

[25] See the discussion in Section 3.

positively impacts economic growth. Also, stock market is shown to be negatively correlated with measures of economic instability. In effect, the evidence strongly supports a "stock market matters" view under which the stock market is of first-order importance for economic development in OECD countries.

In contrast, the analysis provides evidence suggesting that caution is warranted with respect to private credit. For OECD countries private credit volume is (consistently) negatively associated with economic growth and positively with measures of economic instability. Overall, the results of the analysis thus strongly advocate to promote market-based bond and equity financing for the corporate sector.

5.1 Methodology and measurement issues

To examine the association(s) of interest the correlation analysis of the following type will be used

$$y_{it} = \alpha + \beta_1 \times FSDM_{it} + \beta_1 \times X_{it} + \varepsilon_{it}, \quad (3)$$

where y measures a country's economic development, $FSDM$ proxies its financial sector development, and X represents a set of macroeconomic and other control variables.[26] Thereby, a country's economic development is assessed by two measures, both relying on the economy's gross domestic product (GDP). First, the *level* of economic development is measured by the logarithm of real GDP per capita. Thereby, to allow for cross-country comparison, real GDP is expressed in constant USD. Second, the *dynamics* of economic development is studied by examining the change in level of economic development expressed in constant local currency. In additional tests, y will be replaced by two measures of economic stability, the volatility of economic development and a measure of financial stability (Z-score).[27]

[26] This follows Sahay et al. (2015), Barajas et al. (2013), Demingüç-Kunt et al. (2013), Čihák et al. (2013), Beck & Levine (2004), Rousseau & Wachtel (2000), Levine & Zervos (1998) and many others.

[27] The Z-score is a commonly used measure of financial stability. It aims to measure the solvency risk in the banking system by comparing aggregate buffers (capitalization and returns) with risk (volatility of returns). While, generally considered a firm- or bank-level measure, the recent macro literature also uses it on country level (e.g. Sahay et al., 2015).

Financial sector development is gauged by the size of different parts of the financial sector that are important for the provision of financing to the corporate sector.[28] Specifically, the analysis considers the private credit volume, as well as the depth of the bond market and the stock market. Figure 17 provides an overview of the different financial sector development proxies used in the analysis.[29] Moreover, following Demingüç-Kunt et al. (2013) and many others, macroeconomic controls are initial level of economic development, inflation, educational attainment, openness of trade, and government size. Finally, the analysis will follow the established approach in the literature and examine 5-year country averages for all the variables to eliminate effects of business cycles and preserve a long-run perspective (e.g. Demirgüç-Kunt et al., 2013).

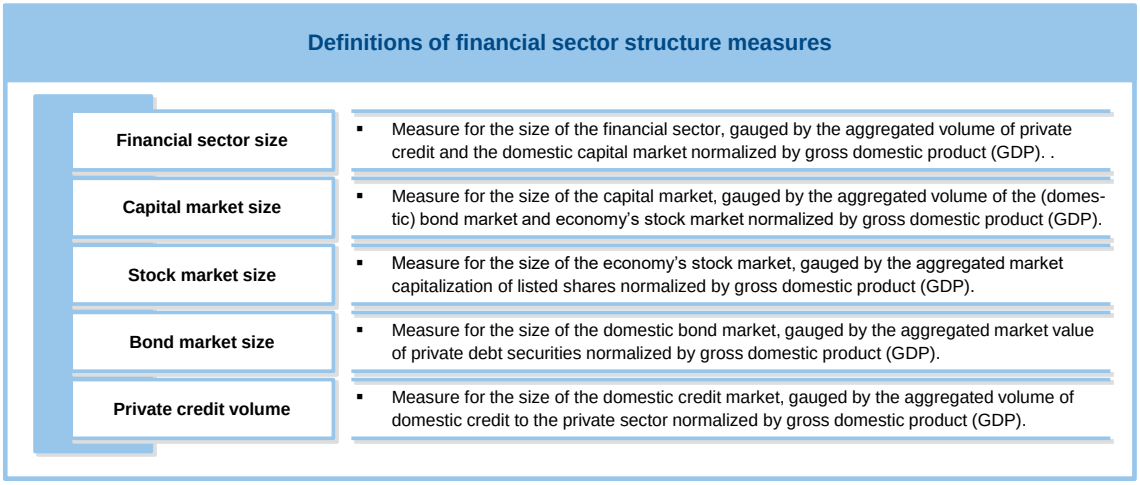
Interested in the association between financial sector structure and economic growth, it is important to note that results of Demingüç-Kunt et al. (2013) and others suggest that the association of interest might be sensitive to a county's level of economic development. Accordingly, the sample of countries examined below is restricted to relatively developed countries. Specifically, the analysis will concentrate on OECD member countries[30] (with the exception of Chile and New Zealand for data availability

[28] The aim of the analysis is to focus on parts of the financial sector that are important for the provision of financing to the corporate sector. These measures may not reflect the size of the shadow banking system. Sahay et al. (2015) document that the shadow banking system has increased substantially in size over the last 30 years (even after standardization by GDP), while private sector credit (standardized by GDP) remained relatively stable. Also, the analysis does not consider VC/PE markets, due to data limitations. However, they are relatively small. According to figures from the European Private Equity and Venture Capital Association total annual investments are below 0.6 percent of GDP in Europe with an average slightly above 0.3 percent (cf. EVCA, 2015). Even assuming an average investment phase of eight years this adds up to less than cumulated 3 percent of GDP.

[29] The literature has established various measures for financial sector development (see the discussion in Čihák et al., 2012, 2013). The analysis presented here is concerned about the size of the financial sector and uses commonly accepted empirical proxies (e.g. Demingüç-Kunt et al., 2013). To complement the analysis and to account for the argument that – beyond size – liquidity might be important, (e.g. Levine & Zervos, 1998; Rousseau & Wachtel, 2000; Beck & Levine, 2004) unreported robustness tests replace stock market size by a liquidity-oriented measure (defined as stocks traded to GDP, cf. Rousseau & Wachtel, 2000; Čihák et al., 2013). These tests confirm the results reported below.

[30] The Organization for Economic Cooperation and Development (OECD) comprises 34 countries with market economies. According to the OECD "[t]oday, OECD member countries account for 63 percent of world GDP, three-quarters of world trade, 95 percent of world official development assistance, over half of the world's energy consumption, and 18 percent of the world's population." (http://usoecd.usmission.gov/mission/overview.html; accessed May 1st, 2016).

reasons).[31] To gain additional insights and to complement the analysis, a number of additional (unreported) robustness tests have been conducted, which for instance consider different sample compositions (e.g., a sample which covers only EU15 countries with the exception of Luxembourg[32] or a sample that ignores Japan) or different variable definitions (e.g., analyses using annual data, instead of 5-year averages). All these tests support the findings presented below.



Notes: The figure reports the definition of financial sector development proxies. The data used in the analysis comes from various sources and is explained in the Appendix.

Source: Own representation.

Figure 17: Definitions of financial sector structure proxies

5.2 Pooled cross-country correlation

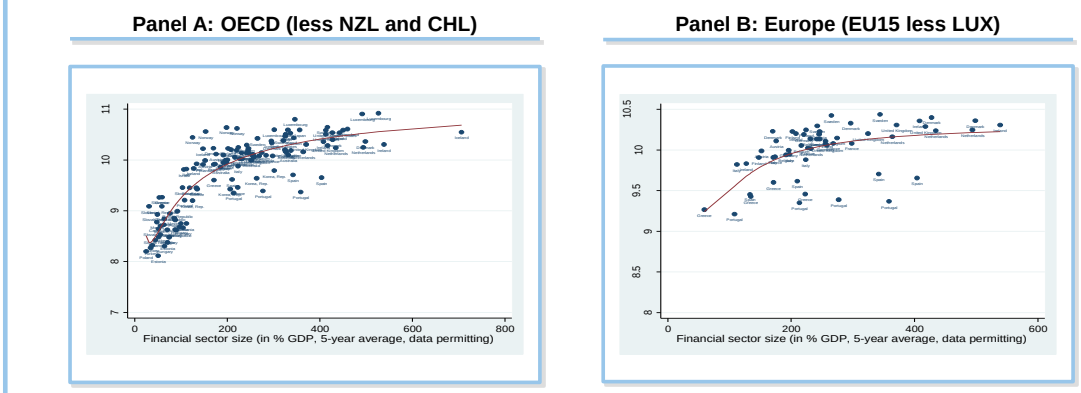
There is a large body of empirical evidence suggesting that an economy's output is positively associated with the size and structure of its financial sector. For instance, Kaserer & Rapp (2014) document for a sample of European countries that economic development (as measured by GDP per capita in 2000-USD) is positively correlated

[31] Data for the analysis is drawn from the World Bank Open Data, BIS statistics, the Global Financial Development Dataset, and selected data points as detailed in the Data Appendix. Data of interest is available for most of these countries from 1994-2013.

[32] The EU15 countries are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and United Kingdom. Luxembourg is not part of the sample examined here, as its population is below 1 million (cf. Rousseau & Wachtel, 2002). The number of observations for the European sample is, however, limited. Thus, to ensure reasonable statistical power, economic relevance of tests is always estimated based on coefficients obtained from the OECD sample.

with various measures of financial sector development (mostly size of the financial sector). Figure 18 borrows from their analysis and plots the univariate association between financial sector development and economic development for the group of OECD countries as well as the most developed European countries. The figure supports the hypothesis claiming a positive relationship between financial sector development and economic output. However, consistent with findings of Arcand et al. (2015) and Demingüç-Kunt et al. (2013), the figure also provides indicative evidence that marginal returns from financial deepening are lower at higher levels of financial sector development.

Univariate association between financial sector development and the level of economic development
[Financial sector size versus logarithm of real GDP per capita in 2000-USD, 5-year country averages]



Notes: The figure illustrates the association between a country's financial sector development and its level of economic development for OECD sample (Panel A) and European sample (Panel B) over the 1994-2013 period (data permitting). Financial sector development is measured by financial sector size defined as an aggregate volume of stock and private bond market, and the volume of private credit normalized by GDP. Stock market size is measured by market capitalization of listed domestic companies, bond market size by private debt securities outstanding, and private credit volume is domestic credit to private sector. The level of economic development is assessed by the logarithm of real GDP per capita in 2000-USD. Dots represent 5-year country averages to eliminate effects of business cycles and preserve a long-run perspective. The red line represents a fractional-polynomial prediction plot based on these 5-year country averages. Panel A is estimated based on the OECD sample without New Zealand and Chile. New Zealand is excluded due to the missing data on domestic debt securities, while Chile is excluded due to the short time series (less than six consecutive years of available information). Panel B reports the results for the subset of EU15 economies, excluding Luxembourg.

Source: Own analysis. Data from World Bank Open Data, BIS statistics, Global Financial Development Dataset, and selected data points as detailed in the Data Appendix.

Figure 18: Univariate association between financial sector development and the level of economic development

However, univariate analysis as reported in Figure 18 is limited in its ability to deliver unbiased estimates due to the well-known *omitted-variable bias*. Thus, in the following multivariate regression analysis is applied to control for several characteristics that are believed to be reasonable determinants of economic output. In line with Demingüç-Kunt et al. (2013) and others, the macroeconomic conditioning set consists of the

initial level of real GDP per capita to control for convergence, inflation and government size as proxies for macroeconomic stability, educational attainment as a measure of human capital accumulation, and trade openness. Further, fixed time effects are included to filter out the effect of changing macroeconomic conditions.

The results of the pooled cross-country OLS estimation are reported in Figure 19. Thereby, financial sector development is measured along the five dimensions defined in Figure 17: Financial sector size, capital market size, private credit volume, bond market size, and stock market size. Economic development is again assessed by the logarithm of real GDP per capita in 2000-USD. While Panel A reports results for the OECD sample, Panel B documents results for the European sample.

Multivariate association between financial sector development and the level of economic development

[Measures of financial sector development versus logarithm of real GDP per capita, OECD and European countries, 5-year country averages]

Panel A: OECD (less NZL and CHL)

Column	I	II	III
Method	OLS	OLS	OLS
Standard errors	country-level clustered		
Dependent variable	Economic development		
Financial sector size	0.3380***		
	(4.765)		
Capital market size		0.3212***	
		(3.218)	
Private credit volume		0.3707**	0.3762**
		(2.500)	(2.480)
Bond market size			0.2073***
			(3.057)
Stock market size			0.5082***
			(3.600)
Macroeconomic controls	*yes*	*yes*	*yes*
Fixed effects	*Y*	*Y*	*Y*
Nbr of obs	128	128	128
Adj. R^2	0.68	0.68	0.69

Panel B: Europe (EU15 less LUX)

Column	I	II	III
Method	OLS	OLS	OLS
Standard errors	country-level clustered		
Dependent variable	Economic development		
Financial sector size	0.0338		
	(1.506)		
Capital market size		0.0661**	
		(2.542)	
Private credit volume		-0.0107	0.0006
		(-0.246)	(0.014)
Bond market size			0.0458
			(0.980)
Stock market size			0.0812**
			(2.422)
Macroeconomic controls	*yes*	*yes*	*yes*
Fixed effects	*Y*	*Y*	*Y*
Nbr of obs	56	56	56
Adj. R^2	0.94	0.94	0.94

Notes: The figure reports results from a multivariate analysis of the association between a country's financial sector development and its level of economic development. Panel A reports multivariate correlations obtained as the result of three multivariate OLS specifications. Panel B reports economic effects. Financial sector development is measured along five dimensions. Financial sector size is defined as the aggregate of private credit volume and capital market size. Private credit volume is a measure for the size of the domestic credit market and gauged by the aggregated volume of domestic credit to the private sector normalized by gross domestic product (GDP). Capital market size gauges capital market depth and is defined as the sum of bond market size and stock market size, which in turn are defined as the GDP-normalized volume of outstanding private debt securities and the market capitalization of listed stock, respectively. Economic development is assessed by the logarithm of real GDP per capita in 2000-USD. Following Demingüç-Kunt et al. (2013) the specifications allow for five (unreported) macroeconomic controls: initial real GDP per capita level (measured by the logarithm of real GDP per capita in 2000-USD at the beginning of the sample period), inflation (measured by the logarithm of (1+annual change in consumer price index)), educational attainment (measured by the logarithm of (1+average years of schooling for population aged 25 and over)), government size (measured by the logarithm of GDP-normalized government consumption), and openness of trade (measured by the logarithm of the GDP-normalized sum of exports and imports). Furthermore, year fixed effects are included in all specifications. The data represents 5-year country averages to eliminate effects of business cycles and preserve a long-run perspective. The table reports OLS coefficients and t-statistics in parentheses. The latter allow for heteroskedasticity and correlation across observations of any given country. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Panel B graphically illustrates the economic relevance of estimated correlations. The economic relevance in panel B is computed as the standard deviation of the left hand side variable multiplied by the estimated coefficient and divided by the standard deviation of the corresponding right hand side variable. The sample consists of OECD economies except for New Zealand excluded due to the missing data on domestic debt securities and Chile excluded due to the short time series (less than six consecutive years of available information). The analysis covers the 1994-2013 period (data permitting) with a total of 128 (56) observations in Panel A (Panel B).

Source: Own analysis. Data from World Bank Open Data, BIS statistics, Global Financial Development Dataset, and selected data points as detailed in the Data Appendix.

Figure 19: Multivariate association between financial sector development and the level of economic development

In the OECD sample (Panel A) financial sector size as well as all its separate components correlates significantly with economic development. The association is also economically meaningful: a one standard deviation increase in either private credit volume or stock market size corresponds to some 30 percent of a standard deviation increase in economic development, which means more than 20 percent increase in level of economic development. While these are impressive numbers[33], they should not be overrated as their source may be the cross-country variation.

Concentrating on Europe, Panel B illustrates a very similar pattern.[34] However, two things stand out. First, consistent with the picture Figure 18 the cross-sectional coefficients are smaller. Paired with the smaller sample size significance levels are lower. Second, the coefficient for private credit volume is virtually zero. Put differently, in the cross-section the volume of private credit European countries is uninformative for the level of their economic development.

The reported coefficients in Figure 18 refer to the level of economic development and rely heavily on cross-country variation. An in-depth analysis, however, should take into account (probably unobserved) cross-country heterogeneity and simultaneously focus on the dynamics of the economic development. This is the aim of the next Section.

5.3 Within-country correlation

Having examined the cross-country correlation between financial sector development and the level of economic development, the next step is to study the dynamics of economic development. Simultaneously, the analysis is modified to account for unobserved heterogeneity between countries. Effectively, a country-fixed effects analysis is applied to explore within-country variation in dependent and independent variables.

[33] For instance, consider the case of Denmark with an average stock market capitalization of some 63 percent of GDP (over the 2009-2013 period). The analysis suggests that a ceteris paribus increase in stock market size by one standard deviation to 84 percent of GDP might be associated with an increase of real GDP per capita by some 25 percent (and vice versa).

[34] Note, that the Adj. R^2, which is a "measure of fit", is relatively high in Panel B as the initial level of GDP is one of the right hand side variables and the number of countries is limited.

Figure 20 reports and illustrates the results. Again, financial sector size is measured using the five variables discussed above. The dynamics of economic development is assessed based on growth in real GDP denominated in local currency. Interestingly, after accounting for unobserved country heterogeneity, financial sector size becomes insignificant and thus uninformative for economic development measured by economic *growth* (Column I). The rationale is found in Column II and III: While private credit volume correlates negatively with economic growth, the third component of financial sector development, i.e. stock market size, is positively associated with growth. In other words, focusing the dynamics of economic development and taking into account country-level heterogeneity, it is only stock market size that is significantly positively correlated with output development, i.e. economic growth. This within-correlation between stock market size and economic growth is also found to be significantly positive when examining the European subsample.

Again, the economic relevance of the correlation reported in Figure 20 is substantial. Consider, for instance, Denmark with an average stock market capitalization of some 63 percent of GDP over the 2009-2013 period. The analysis suggests that a ceteris paribus increase in stock market size by one (within) standard deviation to 84 percent of GDP might be associated with an increase of real GDP per capita of 0.53 percent per year.

It is worth noting here, that the within-correlation between private credit volume and economic growth is negative (and significant) for the OECD sample. Relatedly, the within-correlation in the European sample is also found to be negative. These findings, which add to Law & Singh (2013) and Arcand et al. (2015) discussed above, suggest that caution is warranted with respect to the private credit volume in developed economies.

While the analysis of the within-variation in Figure 20 provides a much more insightful analysis of the finance-growth nexus, the results still cannot provide reliable inference regarding causality due to endogeneity concerns. The standard econometric approach to eliminate endogeneity concerns is to apply instrumental variable estimations. This is the aim of the next Section.

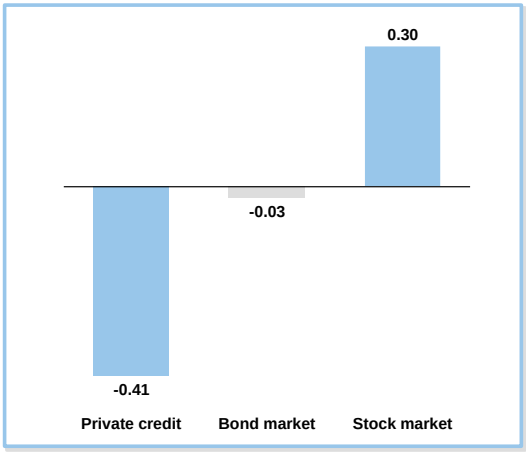
Country-fixed effects correlation between financial sector development and economic growth

[Measures of financial sector development versus log-growth of real GDP per capita in LCU, OECD countries, 5-year country averages]

Panel A: Regression analysis

Column	I	II	III
Method	OLS	OLS	OLS
Standard errors	country-level clustered		
Dependent variable	Economic growth		
Financial sector size	-0.4857		
	(-1.070)		
Capital market size		0.6650	
		(1.185)	
Private credit volume		-2.7785***	-2.5585***
		(-3.282)	(-3.783)
Bond market size			-0.1151
			(-0.205)
Stock market size			2.7535**
			(2.684)
Macroeconomic controls	*yes*	*yes*	*yes*
Fixed effects	*Y,C*	*Y,C*	*Y,C*
Nbr of obs	128	128	128
Adj. R^2	0.58	0.63	0.67

Panel B: Economic relevance



Notes: The figure reports results from a multivariate analysis of the association between a country's financial sector development and its economic growth that takes into account unobserved heterogeneity across countries. Panel A reports multivariate within-country correlations obtained as the result of three multivariate OLS specifications. Panel B reports economic effects. Financial sector development is measured along five dimensions. Financial sector size is defined as the aggregate of private credit volume and capital market size. Private credit volume is a measure for the size of the domestic credit market and gauged by the aggregated volume of domestic credit to the private sector normalized by gross domestic product (GDP). Capital market size gauges capital market depth and is defined as the sum of bond market size and stock market size, which in turn are defined as the GDP-normalized volume of outstanding private debt securities and the market capitalization of listed stock, respectively. Economic growth is assessed by the change in the level of economic development expressed in constant local currency. Following Demingüç-Kunt et al. (2013) the specifications allow for four (unreported) macroeconomic controls: inflation (measured by the logarithm of (1+annual change in consumer price index)), educational attainment (measured by the logarithm of (1+average years of schooling for population aged 25 and over)), government size (measured by the logarithm of GDP-normalized government consumption), and openness of trade (measured by the logarithm of the GDP-normalized sum of exports and imports). Furthermore, fixed effects for time (Y) and country location (C) are included in all specifications. The data represents 5-year country averages to eliminate effects of business cycles and preserve a long-run perspective. The table reports OLS coefficients and t-statistics in parentheses. The latter allow for heteroskedasticity and correlation across observations of any given country. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Panel B graphically illustrates the economic relevance of estimated correlations. The economic relevance in panel B is computed as the within-country standard deviation of the left hand side variable multiplied by the estimated coefficient and divided by the within-country standard deviation of the corresponding right hand side variable. The sample consists of OECD economies except for New Zealand excluded due to the missing data on domestic debt securities and Chile excluded due to the short time series (less than six consecutive years of available information). The analysis covers the 1994-2013 period (data permitting) with a total of 128 observations.

Source: Own analysis. Data from World Bank Open Data, BIS statistics, Global Financial Development Dataset, and selected data points as detailed in the Data Appendix.

Figure 20: Country-fixed effects correlation between financial sector development and economic growth

5.4 Beyond correlation

Next, the analysis aims to address endogeneity concerns beyond unobserved cross-country heterogeneity. The idea is to apply an instrument variable approach. However, as good outside instruments in the finance-growth context are hard to find, difference and system GMM – generally considered to be the second best choice (Sahay et al., 2015; Beck & Levine, 2004; Beck et al., 2000 and others) – will also be applied.

Figure 21 reports findings from such instrument variable regressions. Specifically, Column I to III report the second stage regression of a 2SLS instrument variable regression approach. Thereby, measures of financial sector development are treated as endogenous variables. Thus, they are instrumented in the (unreported) first stage

regression by selected variables that are considered exogenous to the relation of interest. Thereby, a variable may classify as an instrument, whenever it directly affects financial sector structure but is not directly related to economic growth. Depending on the specification, various instruments are used. For instance, a dummy variable indicating an English law origin of the country is used as an instrument. Also, the number of listed firms, the logarithm of the age of the prime stock exchange, the age of the country's first corporate governance code, the number of codes for listed companies, and the proportion of pension funds' assets invested into loans, bonds and stocks are used as instruments. Additionally, Column IV and V of Figure 21 report results from dynamic panel analysis, specifically two first difference GMM (DGMM) specifications. Again, these specifications treat measures of financial sector development (as well as macroeconomic controls) as endogenous variables.

The results from Column I suggest that over all OECD countries financial sector size positively affects economic growth. However, according to Column II this is mainly due to the capital market. Indeed, according to Column III the bond and the stock market affect economic growth positively, while private credit volume seems to dampen economic growth. These findings are confirmed by the dynamic panel analysis in Column IV and V. Overall, the analysis confirms the previous within-county correlation results and suggests that private credit might be detrimental to economic development, while capital market size – and in particular stock market size – seems to fuel economic activity.

Financial sector development and economic growth in OECD countries revisited

[Measures of financial development size versus log-growth of real GDP per capita in LCU, OECD countries, 5-year country averages]

Column	I	II	III	IV	V
Method	2SLS (Instrument Variable Approach)			DGMM	
Standard errors	country-level clustered			Windmeijer-corrected robust	
Dependent variable	Economic growth				
Financial sector size	1.7086**				
	(2.103)				
Capital market size		2.0559**		2.8297	
		(2.495)		(1.495)	
Private credit volume		-1.4595	-2.2180**	-4.5836	-5.4242**
		(-1.510)	(-2.097)	(-1.598)	(-2.269)
Bond market size			2.0025*		2.9913*
			(1.793)		(1.757)
Stock market size			3.2628**		3.9942**
			(2.251)		(2.062)
Macroeconomic controls	*yes*	*yes*	*yes*	*yes*	*yes*
Fixed effects	*Y*	*Y*	*Y*	*Y*	*Y*
Nbr of obs	70	70	66	96	96
Nbr of countries	24	24	24	32	32
hansenp	--	--	--	0.94	0.88
ar2p	--	--	--	0.55	0.57

Notes: The figure reports results from an advanced econometric analysis of the association between a country's financial sector development and its dynamic economic development measured by economic growth. Specifically, it reports second-step estimation results from three instrumental variable (IV) specifications (Column I – III) and two first difference GMM (DGMM) specification (Column IV – V). Financial sector development is measured along five dimensions. Financial sector size is defined as the aggregate of private credit volume and capital market size. Private credit volume is a measure for the size of the domestic credit market and gauged by the aggregated volume of domestic credit to the private sector normalized by gross domestic product (GDP). Capital market size gauges capital market depth and is defined as the sum of bond market size and stock market size, which in turn are defined as the GDP-normalized volume of outstanding private debt securities and the market capitalization of listed stock, respectively. Economic growth is assessed by the change in the level of economic development expressed in constant local currency. Following Sahay et al. (2015) the specifications allow for three (unreported) macroeconomic controls: initial real GDP per capita level (measured by the logarithm of real GDP per capita in 2000-USD at the beginning of the sample period), educational attainment (measured by the logarithm of (1+average years of schooling for population aged 25 and over)), and government size (measured by the logarithm of GDP-normalized government consumption). Furthermore, fixed effects for time (Y) are included in all specifications. In Column I to III measures of financial sector development are considered endogenous and thus instrumented in the (unreported) first stage regression. Instruments used are: English law origin, the number of listed firms, the logarithm of the age of the first stock exchange, the age of the country's first corporate governance code, the number of codes, and the proportion of pension funds' assets invested into loans, bonds and stocks. The data represents 5-year country averages to eliminate effects of business cycles and preserve a long-run perspective. The table reports GMM coefficients and t-statistics with Windmeijer correction for finite samples in parentheses that allows for heteroskedasticity. For the GMM specifications in Column IV and V it also reports p-values for Hansen test and Arellano-Bond test AR(2) test. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. The sample consists of OECD economies except for New Zealand excluded due to the missing data on domestic debt securities and Chile excluded due to the short time series (less than six consecutive years of available information). The analysis covers the 1994-2013 period (data permitting).

Source: Own analysis. Data from World Bank Open Data, BIS statistics, Global Financial Development Dataset, and selected data points as detailed in the Data Appendix.

Figure 21: Financial sector development and economic growth in OECD countries revisited (IV and GMM specification)

5.5 Is the financial sector too large in developed economies?

Recent findings reported in the finance and growth literature suggest that the established finance-growth nexus might be non-linear.[35] One way to approach the non-linearity issue, is to estimate quadratic versions of equation (3). An alternative, is to replace the left hand side variable in equation (3) by measures of economic (in)stability and to examine whether financial deepening comes for the cost of economic vulnerability. Both approaches are pursued below.

[35] See the discussion in Section 3.

Figure 22 revisits the multivariate correlations analysis between financial sector size and economic growth using quadratic specifications.

Financial sector development and economic growth revisited (non-linear specification)

[Measures of financial sector development versus log-growth of real GDP per capita in LCU, various samples, 5-year country averages]

Panel A: Regression analysis

Column	I	II
Method	OLS	DGMM
Standard errors	country-level clustered	robust, Windmeijer
Dependent variable	Economic growth	
Private credit volume	-5.9268***	-10.8479
	(-3.275)	(-1.496)
Private credit volume *squared*	1.4031**	3.1968
	(2.385)	(1.180)
Bond market size	-1.9111	-0.3338
	(-1.462)	(-0.087)
Bond market size *squared*	0.4375*	-0.1474
	(1.876)	(-0.227)
Stock market size	5.1681***	6.3208
	(3.498)	(1.317)
Stock market size *squared*	-1.4467**	-1.1618
	(-2.080)	(-0.450)
Macroeconomic controls	*yes*	*no*
Fixed effects	*Y,C*	*Y*
Nbr of obs	128	96
Adj. R^2	0.71	---
Hansen p	---	0.14
m2-statistics	---	0.29

Panel B: Threshold analysis

Column	I
Method	OLS
Sample	OECD
Dependent variable	Economic growth
Private credit volume	U-Shaped
coefficient for quadratic term =	1.4031
coefficient for linear term =	-5.9268
Minimum =	**211%**
Bond market size	U-Shaped
coefficient for quadratic term =	0.4375
coefficient for linear term =	-1.9111
Minimum =	**218%**
Stock market size	inverse U-Shaped
coefficient for quadratic term =	-1.4467
coefficient for linear term =	5.1681
Maximum =	**179%**

Notes: The figure reports results from a non-linear analysis of the association between a country's financial sector development and its economic growth. Panel A reports results of a multivariate OLS specification with country-fixed effects (Column I) and a first difference GMM (DGMM) specification (Column II). Panel B illustrates the estimated quadratic relationships in Column I by determining the implicit thresholds (minima/maxima). Financial sector development is measured along three dimensions. Private credit volume is a measure for the size of the domestic credit market and gauged by the aggregated volume of domestic credit to the private sector normalized by gross domestic product (GDP). Bond and stock market size are proxied by the GDP-normalized volume of outstanding private debt securities and the market capitalization of listed stock, respectively. Economic growth is assessed by the change in the level of economic development expressed in constant local currency. Column I follows Demingüç-Kunt et al. (2013) and allows for four (unreported) macroeconomic controls: initial real GDP per capita level (measured by the logarithm of real GDP per capita in 2000-USD at the beginning of the sample period), inflation (measured by the logarithm of (1+annual change in consumer price index)), educational attainment (measured by the logarithm of (1+average years of schooling for population aged 25 and over)), government size (measured by the logarithm of GDP-normalized government consumption), and openness of trade (measured by the logarithm of the GDP-normalized sum of exports and imports). Furthermore, fixed effects for time (Y) and country location (C) are included. Column II follows Following Sahay et al. (2015) and allows for three (unreported) macroeconomic controls: initial real GDP per capita level, educational attainment, and government size. Furthermore, fixed effects for time (Y) are included. The data represents 5-year country averages to eliminate effects of business cycles and preserve a long-run perspective. The tables report OLS coefficients and t-statistics (in parentheses) that allow for heteroskedasticity and correlation across observations of any given country, except for specification II , which reports SGMM coefficients and t-statistics with Windmeijer correction for finite samples. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. The sample in Panel A consists of OECD economies except for New Zealand excluded due to the missing data on domestic debt securities and Chile excluded due to the short time series (less than six consecutive years of available information). The sample in Panel B consists of EU15 economies including Switzerland but excluding Luxembourg. The analysis covers the 1994-2013 period (data permitting).

Source: Own analysis. Data from World Bank Open Data, BIS statistics, Global Financial Development Dataset, and selected data points as detailed in the Data Appendix.

Figure 22: Financial sector development and economic growth revisited (non-linear specification)

The results provide limited evidence for quadratic effects. Specifically, while Column I, estimating within-correlations, suggest that some of the associations may be non-linear, their maxima/minima are far on the right hand side of the empirical distribution of the financial sector measures (beyond the 95% quantile for each of them). Moreover, considering Column II there is no evidence for a quadratic effect.

Specifically, there is no evidence of a "too much stock market effect", as the coefficient of the quadratic term of stock market size in Column II has a very low t-value.

Figure 23 adds to that analysis by examining the within-correlation of the five measures of financial sector size with measures of economic risk. Panel A is concerned with GDP growth uncertainty. The analysis shows a non-linear association between financial sector size and economic instability. The U-shaped relation has its minimum at some 350 percent of GDP, which corresponds to the average EU15 country.[36] This finding is consistent with the "too much finance" view. However, differentiating between the different parts of the financial sector, Column A.III (and A.IV) suggests that it is mainly private credit volume that contributes to uncertainty. Indeed, Column A.IV suggests an inverse U-shaped relation for private credit volume with a maximum in 230 percent of GDP, which is above the 99 percent quantile of the empirical distribution of private credit volume.[37] In contrast, Column A.II suggests a U-shaped relation for capital market size with a minimum in some 260 percent, which corresponds to the 90 percent quantile of the distribution. Relatedly, Column A.IV suggest U-shaped relations for bond and stock market size, both with minima that beyond the 90 percent quantile of the corresponding distribution.

Panel B is concerned with the fragility of the banking sector as measured by the Z-score. The Z-score is a commonly used measure of financial stability. It aims to measure the solvency risk in the banking system by comparing aggregate buffers (capitalization and returns) with risk (volatility of returns). To ensure comparability of the analysis, the regressions in Panel B correlate the negative Z-score with measures of financial sector development, as in the standard version high values of Z-score are considered a signal of a healthy banking sector. Column B.1 suggests that the association between financial sector size and bank sector fragility is inverse-U-shaped peaking at some 450 percent of GDP, which is beyond the 90 percent quantile of the distribution. Columns B.II and B.III add to that documenting that it is mainly private credit volume that is positively correlated with the risk proxy. Moreover, specification

[36] See the discussion in Section 6.

[37] Quadratic associations with minimum/maximum outside the 10-to-90 percent quantile have limited power to predict the "optimal" values.

B.III suggests that bond market and stock market size are negatively correlated with bank sector risk.[38]

Financial sector development and economic risk

[Economic risk measured by 5-year GDP growth volatility (Panel A) and 5-year average Z-score (Panel B), OECD countries]

Panel A: GDP growth volatility

Column	A.I	A.II	A.III	A.IV
Method	OLS	OLS	OLS	OLS
Standard errors		country-level clustered		
Dependent variable		GDP growth volatility		
Financial sector size	-0.8596			
	(-1.642)			
Financial sector size *squared*	0.1168**			
	(2.092)			
Capital market size		-2.2753**		
		(-2.729)		
Capital market size *squared*		0.4391***		
		(3.163)		
Private credit volume		2.6648	0.5214	2.3304
		(1.553)	(1.172)	(1.363)
Private credit volume *squared*		-0.8762		-0.5015
		(-1.501)		(-0.882)
Bond market size			0.1422	-1.4948*
			(0.491)	(-1.836)
Bond market size *squared*				0.3851**
				(2.255)
Stock market size			-1.1304*	-4.2580***
			(-1.767)	(-3.049)
Stock market size *squared*				1.4311***
				(2.841)
Macroeconomic controls	*yes*	*yes*	*yes*	*yes*
Fixed effects	*Y,C*	*Y,C*	*Y,C*	*Y,C*
Nbr of obs	126	126	126	126
Adj. R^2	0.49	0.53	0.49	0.53

Panel B: Negative Z-score

Column	B.I	B.II	B.III	B.IV
Method	OLS	OLS	OLS	OLS
Standard errors		country-level clustered		
Dependent variable		Negative Z-score		
Financial sector size	4.9651			
	(0.839)			
Financial sector size *squared*	-0.5539			
	(-1.008)			
Capital market size		0.0361		
		(0.007)		
Capital market size *squared*		-0.5781		
		(-0.722)		
Private credit volume		17.8179**	8.9512**	16.4198*
		(2.078)	(2.187)	(1.861)
Private credit volume *squared*		-2.9782		-2.9857
		(-0.974)		(-0.878)
Bond market size			-3.9367	-0.3879
			(-1.327)	(-0.062)
Bond market size *squared*				-0.6740
				(-0.539)
Stock market size			-2.7300	-1.7668
			(-1.320)	(-0.275)
Stock market size *squared*				-0.0022
				(-0.001)
Macroeconomic controls	*yes*	*yes*	*yes*	*yes*
Fixed effects	*Y,C*	*Y,C*	*Y,C*	*Y,C*
Nbr of obs	96	96	96	96
Adj. R^2	0.12	0.18	0.17	0.16

Notes: The figure reports results from a multivariate analysis of the association between financial sector development and economic risk that takes into account unobserved heterogeneity across countries. In Panel A the dependent variable is the volatility of economic growth, where the latter is defined as the change in the level of economic development expressed in constant local currency. In Panel B the dependent variable is the *negative* Z-score. The Z-score is a commonly used measure of financial stability that aims to measure the solvency risk in the banking system by comparing aggregate buffers (capitalization and returns) with risk (volatility of returns). Financial sector development is measured along five dimensions. Financial sector size is defined as the aggregate of private credit volume and capital market size. Private credit volume is a measure for the size of the domestic credit market and gauged by the aggregated volume of domestic credit to the private sector normalized by gross domestic product (GDP). Capital market size gauges capital market depth and is defined as the sum of bond market size and stock market size, which in turn are defined as the GDP-normalized volume of outstanding private debt securities and the market capitalization of listed stock, respectively. Following Demingüç-Kunt et al. (2013) the specifications allow for four (unreported) macroeconomic controls: inflation (measured by the logarithm of (1+annual change in consumer price index)), educational attainment (measured by the logarithm of (1+average years of schooling for population aged 25 and over)), government size (measured by the logarithm of GDP-normalized government consumption), and openness of trade (measured by the logarithm of the GDP-normalized sum of exports and imports). Panel A also controls for the level of real GDP per capita (measured by the logarithm of real GDP per capita in 2000-USD). Furthermore, fixed effects for time (Y) and country location (C) are included in all specifications. The data represents 5-year country averages to eliminate effects of business cycles and preserve a long-run perspective. The tables report OLS coefficients and t-statistics (in parentheses) that allow for heteroskedasticity and correlation across observations of any given country. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. The sample consists of OECD economies except for New Zealand excluded due to the missing data on domestic debt securities and Chile excluded due to the short time series (less than six consecutive years of available information). The analysis covers the 1994-2013 period (data permitting).

Source: Own analysis. Data from World Bank Open Data, BIS statistics, Global Financial Development Dataset, and selected data points as detailed in the Data Appendix.

Figure 23: Country-fixed effects correlation between financial sector development and economic risk

The picture that emerges from Figure 23 suggests that within developed economies excessive volumes of private credit are positively correlated with measures of

[38] An explanation for this result might be seen in the fact, that a developed stock market may facilitate equity issuances of financial institutions and thus increase their stability as measured by the Z-score.

economic instability. In contrast, deep capital markets – and in particular deep stock markets – are positively correlated with measures of economic stability.

To summarize, the starting point of previous analysis was the hypothesis that by facilitating risk sharing within the economy a developed and healthy financial sector can fuel economic activity and thus economic growth. The findings of the analysis provide supportive evidence for that hypothesis and suggest that developed capital markets – and in particular a deep stock market – may be beneficial for advanced economies, both in terms of economic development as well as in terms of economic stability.

6 Module 4: Comparing financial sectors across countries

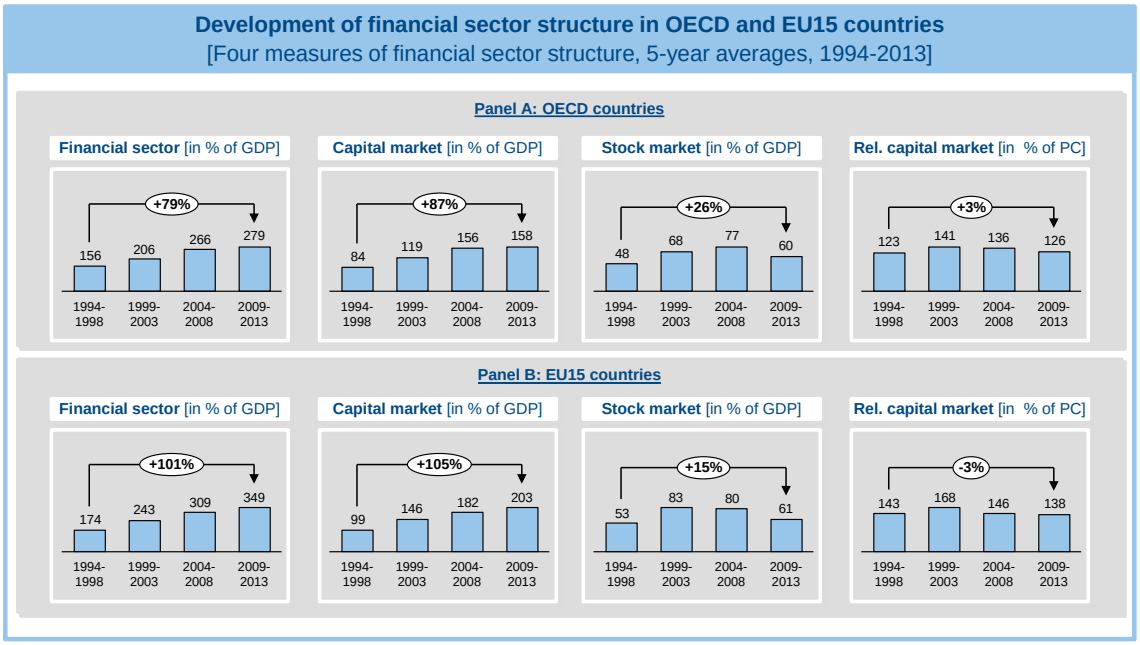
This part of the research will provide a comparative analysis of the Nordic financial sector. Drawing on the previous analysis of financial sector structure and economic growth, it is mainly concerned with the five dimensions of financial sector structure detailed in Figure 17: Financial sector size, capital market size, private credit volume, bond market size and stock market size. Comparing these measures for Nordic countries with selected OECD countries, it aims to identify (plausible) deficits in the Nordic financial sector. Thereby, special attention is paid to the Danish financial sector.

As a result, it is shown that the financial sector has expanded in developed economies substantially over the last 20 years. Comparing private credit volume and capital markets, growth rates are fairly similar. The stock market lags behind. Comparing the Nordic financial sector with its European or OECD counterparts, it is documented that Nordic financial sector is fairly average. However, the Danish financial sector stands out here. First, it is relatively large, even larger than its US counterpart. The reasons for that are found in the size of the market for debt instruments: Private credit volume as well as the bond market are relatively large and banks seem to play a dominant role in both markets. In contrast, the Danish stock market is (at best) of only average size, but with negative momentum.

The analysis proceeds in several steps. First, looking at OECD and EU 15 countries over the 1994-2013 period general trends in the development of financial sector structure will be documented. Second, cross-country comparisons are reported. Finally, the Danish financial sector is examined in more detail. Throughout, multi-year country averages are reported to smooth temporary effects, in particular fluctuations in stock market valuation, and to take a long-run perspective.[39]

[39] Data for the analysis is drawn from the World Bank Open Data, BIS statistics, the Global Financial Development Dataset, and selected data points as detailed in the Data Appendix. Data of interest is available for most of these countries from 1994-2013.

Financial sector development: In a first step, Figure 24 documents for OECD as well as for EU15 countries the development in financial sector structure along four measures. Three trends stand out. First, in OECD as well as in EU15 countries, the financial sector has expanded substantially over the years. In Europe its relative size has doubled. Second, the capital market – aggregating bond and stock market – has also grown substantially. As a result, the relative capital market size, defined as the ratio of capital market size to private credit volume, remained relatively constant. Third, the stock market lags behind. Growth of the stock market could not keep up with growth of other parts of the financial sector, neither in OECD nor in EU15 countries



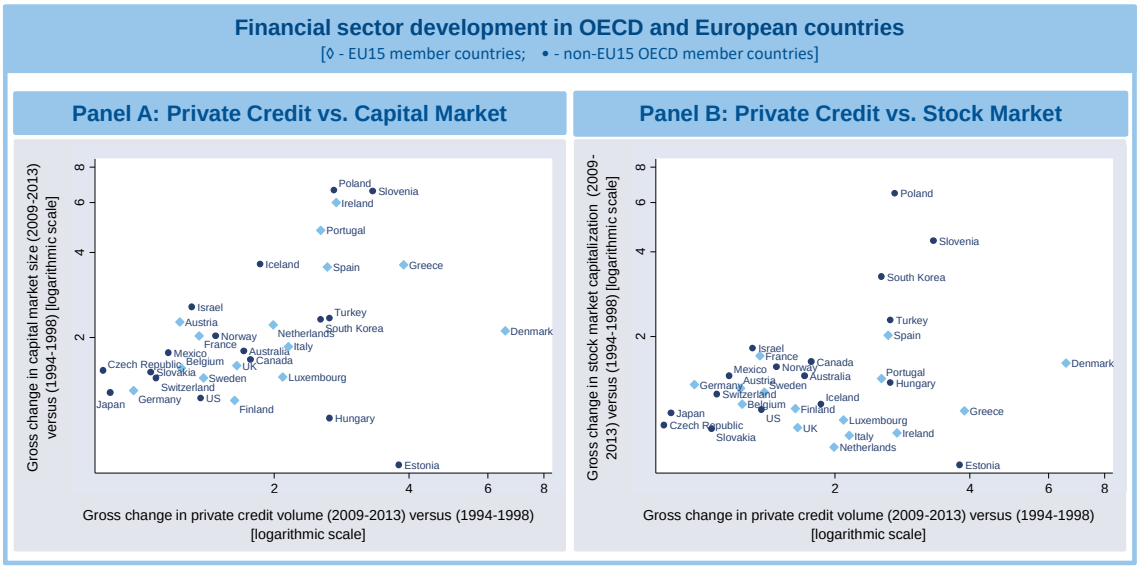
Notes: The figure reports developments in OECD and EU15 countries over the 1994-2013 period along four measures of financial sector structure. Financial sector refers to financial sector size defined as the aggregate of private credit volume and capital market capitalization normalized by gross domestic product (GDP). Capital market refers to capital market size, which is the GDP-normalized sum of outstanding private debt securities and the market capitalization of listed domestic companies. Stock market refers to stock market size, which is assessed by the GDP-normalized market capitalization of listed domestic companies To smooth temporary effects, in particular fluctuations in stock market valuation, 5-year averages (data permitting) are reported. New Zealand is excluded from the OECD aggregate because of missing data on domestic debt securities.

Source: Own analysis. Data from World Bank Open Data, BIS statistics, Global Financial Development Dataset, and selected data points as detailed in the Data Appendix.

Figure 24: Development of financial sector structure

While the previous figure documents some commonality in the development of financial structures, a closer look reveals substantial cross-country variation. Figure 25 illustrates this for OECD- and EU15-countries. Interestingly, Denmark displays the highest growth in private credit volume, while only having average growth rates for its

capital market and its stock market. This pattern will be examined in more detail in a cross-country perspective below.



Notes: The figure illustrates the changes in financial sector structure in OECD and EU15 countries over the years 1994-2013 (data permitting). Panel A plots the gross change in capital market size against the gross change in private credit volume, while Panel B plots the gross change in stock market capitalization against the gross change in private credit volume. The gross change is defined as the average value of a particular financial indicator over 2009-2013 deflated by its average value over 1994-1998. Private credit volume is a measure for the size of the domestic credit market and gauged by the aggregated volume of domestic credit to the private sector normalized by gross domestic product (GDP). Capital market size gauges capital market depth and is defined as the sum of bond market size and stock market size, which in turn are defined as the GDP-normalized volume of outstanding private debt securities and the market capitalization of listed stock, respectively Both graphs use logarithmic scale.

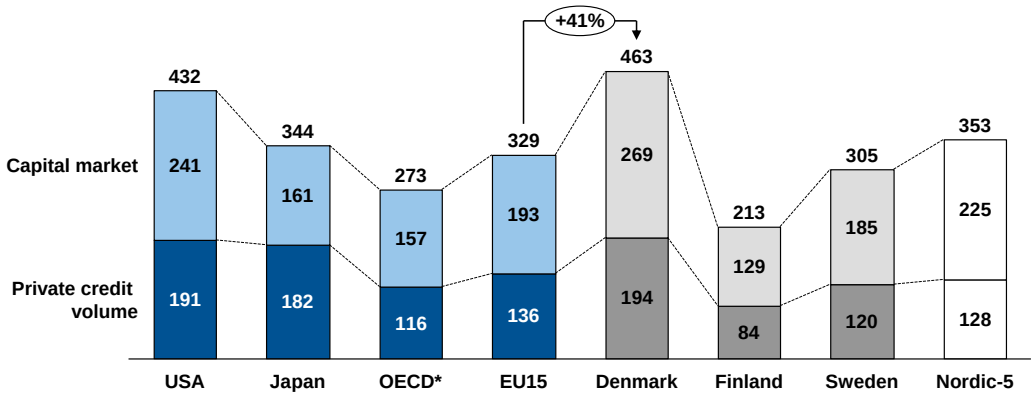
Source: Own analysis. Data from World Bank Open Data, BIS statistics, Global Financial Development Dataset, and selected data points as detailed in the Data Appendix.

Figure 25: Financial sector development across countries

Financial sector size across countries: Figure 26 compares financial sector size across countries. Thereby, it differentiates between private credit volume and capital market size. Two facts are worth noting. First, within the Nordic-3 (Denmark, Finland, and Sweden) countries Denmark has the largest financial sector (as measured here), Sweden the second largest, and Finland the third largest. While Sweden is at par with other European countries, the size of the Finnish financial sector is below average. In contrast, the size of the Danish financial sector is above average, even larger than its US counterpart. These observations apply to the aggregate as well as to each of the components reported in Figure 26, private credit volume and capital market size. Both will be examined in more detail below.

Financial sector size

[Financial sector size defined as the sum of private credit volume, bond and stock market size, in % of GDP, 2004-2013]



Notes: The figure reports the size of the financial sector in selected countries and country clusters. Financial sector size is defined as the aggregate of private credit volume and capital market capitalization normalized by gross domestic product (GDP). Capital market capitalization is the sum of outstanding private debt securities and the market capitalization of listed domestic companies. To smooth temporary effects, in particular fluctuations in stock market valuation, and to take a long-run perspective 10-year averages over the 2004-2013 period (data permitting) are reported. New Zealand is excluded from the OECD aggregate because of missing data on domestic debt securities. Nordic-5 refers to the five Nordic countries (Denmark, Finland, Iceland, Norway, and Sweden).

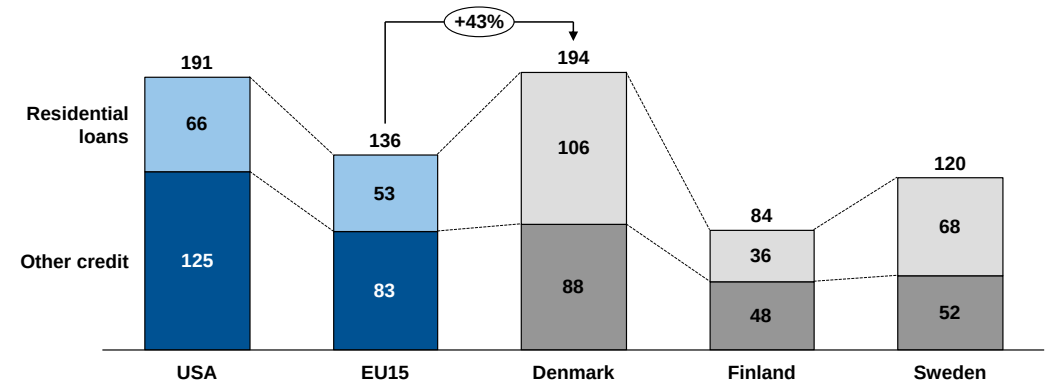
Source: Own analysis. Data from World Bank Open Data, BIS statistics, Global Financial Development Dataset, and selected data points as detailed in the Data Appendix.

Figure 26: Financial sector size

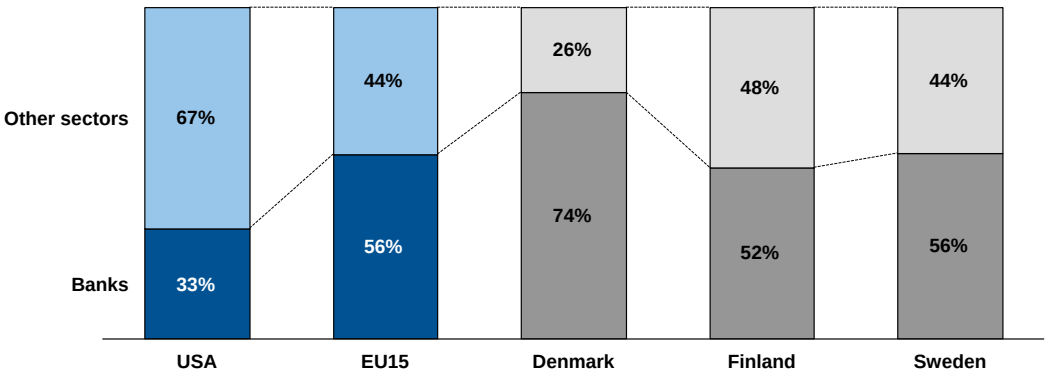
Private credit volume: Figure 27 compares private credit volume across countries. Panel A documents the composition of private credit volume by differentiating residential loans and other credit. Two facts are important to note here. On the one hand, Denmark clearly stands out here. The aggregate credit volume is higher than in the US and 43 percent higher than in the average EU15 country. Thereby, the size is strongly driven by the relative volume of residential loans, which is higher than in the US and twice the relative volume in the average EU15 country. In fact, in Denmark the ratio between residential loans and other credit is larger than one, while in the reported peers it is smaller than one. On the other hand, Finland and Sweden lag behind Denmark, the US, as well as the average EU15 country. However, the relative distribution between residential loans and other credit is more in line with the US and the average EU15 country. Panel B reports the provision of credit by differentiating between banks and other sectors. Again, Denmark stands out here with a ratio of three to one. This suggests that banks are the dominant provider of credit to the private sector in Denmark, while in other countries (e.g. Finland and Sweden) the situation seems to be more balanced. Some caution is warranted with this pattern. AS has been noted before, there is emerging evidence provided by scholars that too much

banking might be detrimental to economic development (e.g. Pagano et al., 2014 and Langfiled & Pagano, 2015).

Panel A: Size and composition of domestic private credit volume
[Size and composition of domestic credit to private sector in % of GDP, 2004-2013]



Panel B: Provision of credit
[Relative importance of bank and other credit for private non-financial sector in % of total, 2004-2013]

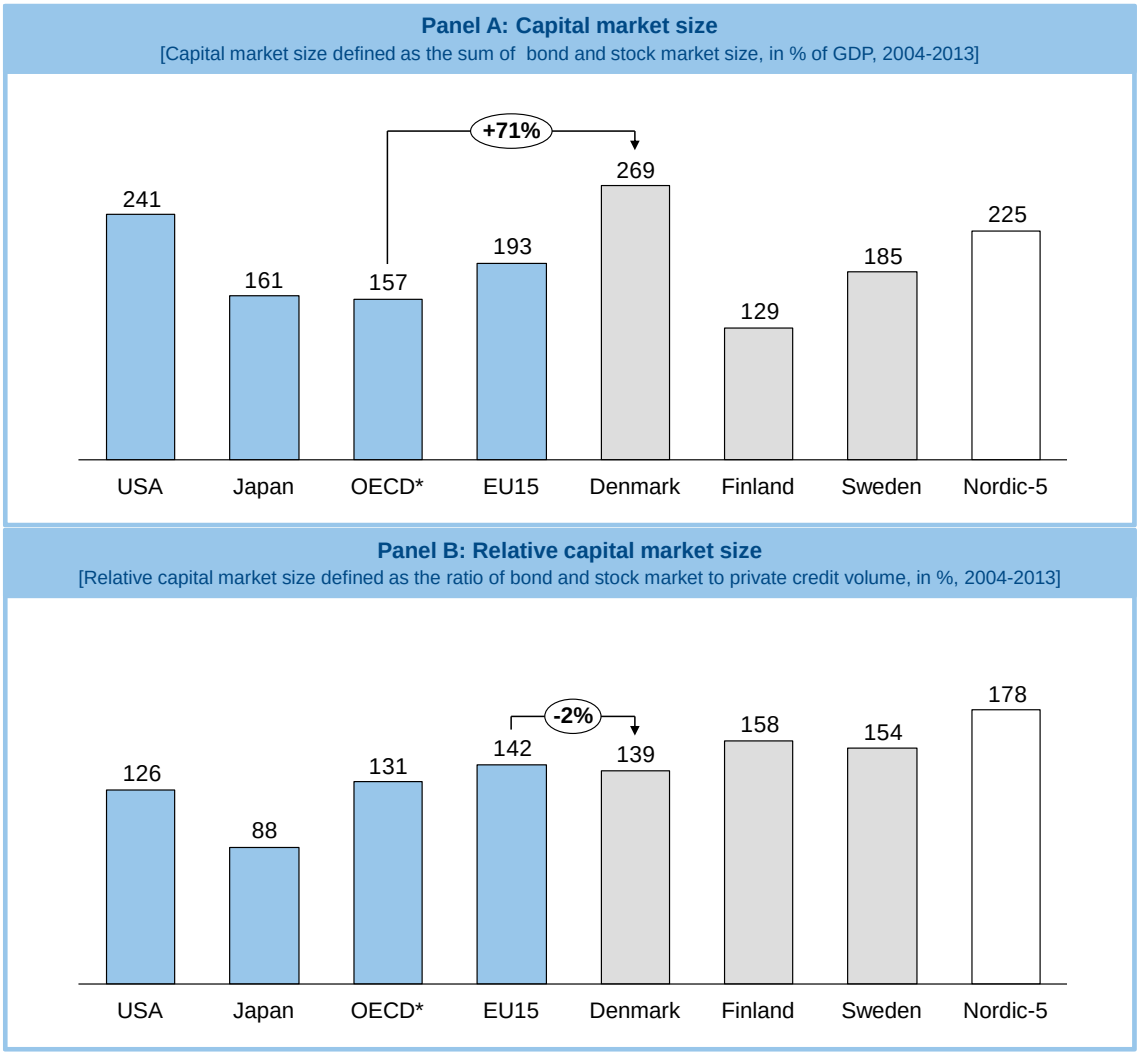


Notes: The figure reports the size and composition of the private credit volume (in % of GDP) in selected countries and country clusters in Panel A and the provision of credit by banks and other sectors to the non-financial sector in Panel B. To smooth temporary effects, in particular fluctuations in stock market valuation, and to take a long-run perspective 10-year averages over the 2004-2013 period (data permitting) are reported.

Source: Own analysis. Data from World Bank Open Data, BIS statistics, Global Financial Development Dataset, and selected data points as detailed in the Data Appendix.

Figure 27: Private credit volume

Capital market size: Figure 28 compares three measures of capital market size across countries. Panel A documents the size of capital market relative to GDP. While capital markets of Finland and Sweden are of average size, the Danish capital market is relatively large. While it is only 12 percent larger than its US counterpart, it is 40 percent larger than the average EU15 capital market and even 71 percent larger than the average market in an OECD country.



Notes: The figure reports two measures of capital market size for selected countries and country clusters. In Panel A capital market size is defined as the sum of bond and stock market capitalization normalized by gross domestic product (GDP). Relative capital market size, reported in Panel B, is defined as capital market size standardized by private credit volume. To smooth temporary effects, in particular fluctuations in stock market valuation, and to take a long-run perspective 10-year averages over the 2004-2013 period (data permitting) are reported. New Zealand is excluded from the OECD aggregate because of missing data on domestic debt securities. Nordic-5 refers to the five Nordic countries (Denmark, Finland, Iceland, Norway, and Sweden).

Source: Own analysis. Data from World Bank Open Data, BIS statistics, Global Financial Development Dataset, and selected data points as detailed in the Data Appendix.

Figure 28: Capital market size

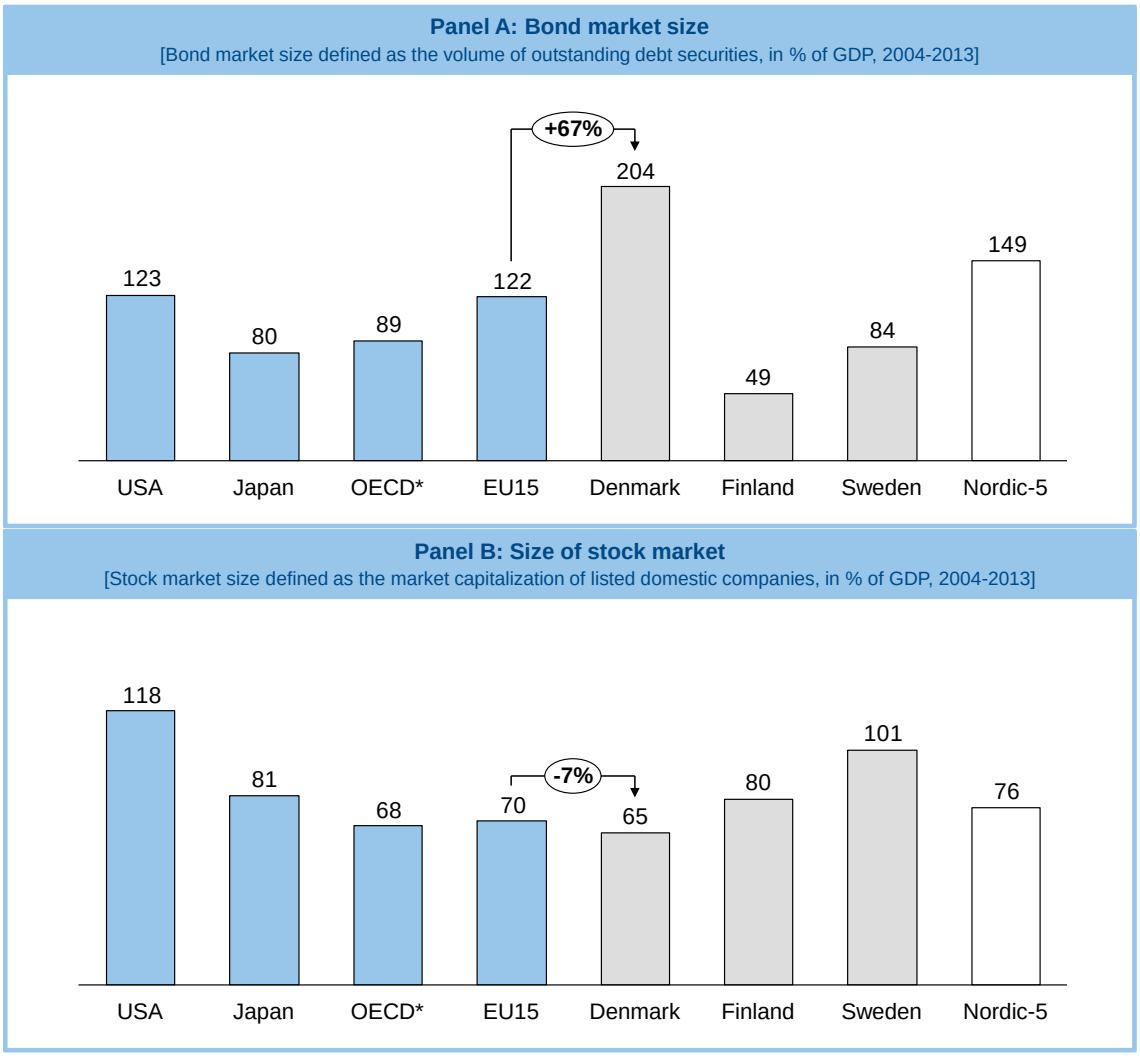
In contrast, the Finnish and Swedish capital market seems to be of average size (with Finland somehow lagging behind). Looking at the numbers for the Nordic sample (Nordic-5) it is worth noting that these numbers are to be treated with some caution, as they are somehow skewed by Island having a relatively large bond market.

Panel B of Figure 28 documents the relative capital market size. Interestingly, the relative capital market size is remarkably homogenous across countries. Specifically,

given its private credit volume, the relative size of the Danish capital market is on par with its peers.

Adding to this analysis, Figure 29 reports measures of bond and stock market size for selected countries and country clusters. Regarding the bond market, reported in Panel A, Denmark is ahead of all reported peers. With a volume of two times GDP, it is of more than twice the size of its average OECD counterpart and even two thirds ahead of the US and the average EU15 country. However, the picture changes when it comes to the stock market, which is reported in Panel B. The Danish stock market is only of below-average size. Indeed, with a total market capitalization of 65 percent of GDP over the 2004-2013 period, the Danish stock market is only marginally more than half of the size of the US market, and also lags behind the average OECD and EU15 country. Also, the Finnish and the Swedish market (marginally) excel the Danish stock market.

Taken together, Figure 29 suggests that the Danish capital market might be somehow unbalanced: While the bond market is comparably large, the stock market is of below-average size. This striking pattern deserves for some in-depth analysis, which is provided below.



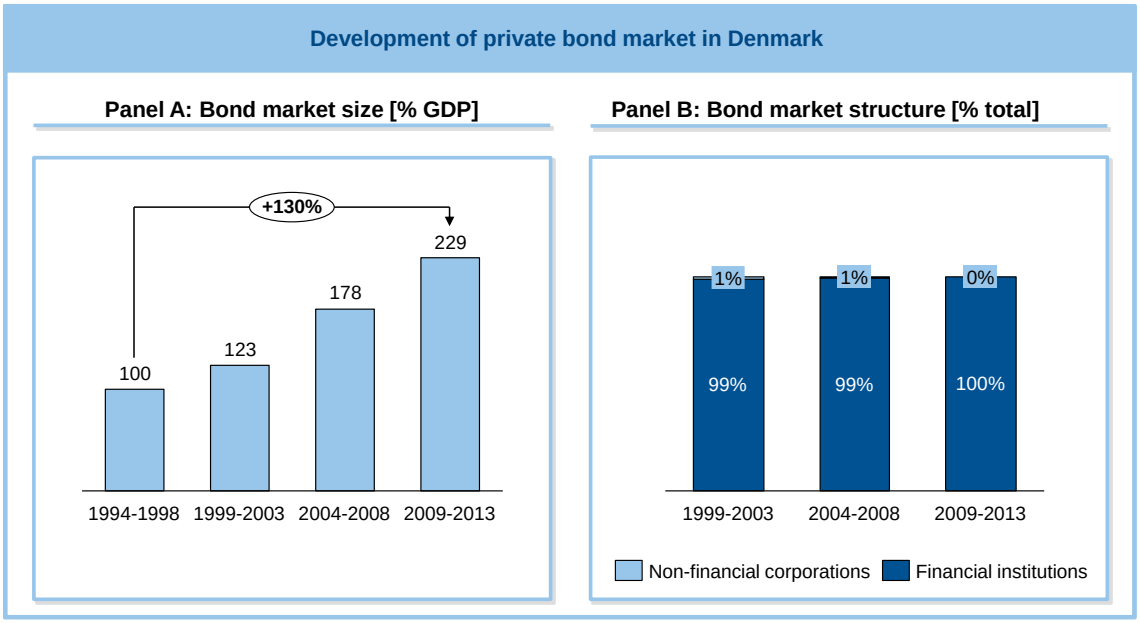
Notes: The figure reports measures of bond and stock market size for selected countries and country clusters. In Panel A bond market size is defined as the volume of traded debt securities normalized by gross domestic product (GDP). Stock market size, reported in Panel B, is defined as the aggregate market capitalization of listed domestic companies normalized by GDP. To smooth temporary effects, in particular fluctuations in stock market valuation, and to take a long-run perspective 10-year averages over the 2004-2013 period (data permitting) are reported. New Zealand is excluded from the OECD aggregate because of missing data on domestic debt securities. Nordic-5 refers to the five Nordic countries (Denmark, Finland, Iceland, Norway, and Sweden).

Source: Own analysis. Data from World Bank Open Data, BIS statistics, Global Financial Development Dataset, and selected data points as detailed in the Data Appendix.

Figure 29: Bond and stock market size

Danish bond market: Figure 30 documents the development of the Danish bond market over the 1994-2013 period along two dimensions. Panel A documents a substantial growth in the bond market over the last 20 years. While during the mid-90s of the last century the average volume was at par with GDP, the market more than doubled over the years. Thereby, non-financial corporations are basically absent from this market. As documented in Panel B, the market predominantly consists of bonds issued by financial institutions and referring to the data provided by the Danmarks

Statistik the volume (in nominal value) of VP-registered bonds issued by non-financial corporations was below 8bn DKK at the end of 2015. Taken together, the data suggests that the unmatched Danish bond market reflects the above-average Danish private credit volume, which is mainly supplied by banks (and used for residential mortgages), but is exclusive when it comes to non-financial corporations.

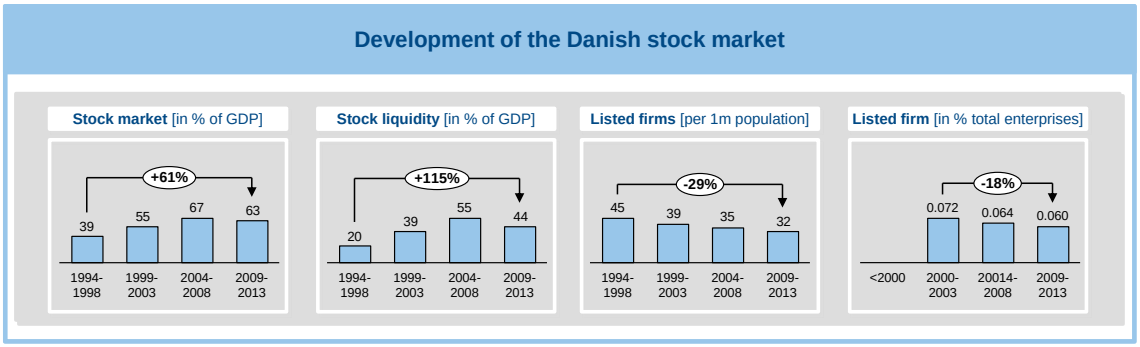


Notes: The figure documents the development of the Danish bond market over the 1994-2013 period along two dimensions. While Panel A reports bond market size measured by the GDP-normalized volume of private debt securities outstanding, Panel B documents the users of the bond market differentiating between financial institutions and non-financial corporations. To smooth temporary effects and to allow for comparison with the other analyses, 5-year averages (data permitting) are reported.

Source: Own analysis. Data from World Bank Open Data, BIS statistics, Global Financial Development Dataset, and selected data points as detailed in the Data Appendix.

Figure 30: Danish bond market

Danish stock market: Figure 31 documents the overall development of the Danish stock market over the 1994-2013 period along four dimensions. While stock market size and liquidity have increased over the last 20 years, the use of the stock market by the non-financial corporate sector – as measured by the number of listed firms per 1m population and the proportion of listed firms – has declined. This seems inconsistent and contradictory at a first glance.



Notes: The figure documents the development of the Danish stock market over the 1994-2013 period along four dimensions. While stock market and stock liquidity refers to market depth, listed firms per 1 m population and listed firms in % total enterprises refers to the use of the stock market. The stock market panel reports the development of GDP-normalized market capitalization of listed domestic companies. The stock liquidity panel reports the development of the value of traded market capitalization normalized by GDP. The third panel reports the development of listed firms per 1 million of population and the fourth panel the proportion of enterprises that are listed at the stock market. To smooth temporary effects and to allow for comparison with the other analyses, 5-year averages (data permitting) are reported.

Source: Own analysis. Data from World Bank Open Data, BIS statistics, Global Financial Development Dataset, and selected data points as detailed in the Data Appendix.

Figure 31: Development of the Danish stock market

However, it has been noted that equity has become more important for the non-financial sector. In other words, the average listed firms (*ceteris paribus*) uses more equity in these days. Moreover, the average firm size of listed (non-financial) firms has grown over the last years. This is illustrated in Figure 32, which examines the development of non-financial firms' balance sheet size over time. The figure documents a substantial increase in firms' (deflated) balance sheet size over the years: While in the cross-section the increase is some 0.7 percent per year, the firm-level growth is estimated to be as high as 6.6 percent per year. These results provide a first (macro-level) rational for the "less firms but larger market" pattern observed in the Danish stock market.

A second rational is found on a more micro-level by examining the market capitalization of a particular Danish firm: Novo Nordisk. As illustrated in Figure 33 market capitalization of that company has increased by more than 10.000 percent over the last 25 years to some 825 billion DKK (end of 2015) and accounts now for some one third of the overall stock market capitalization (end of 2015). This not only rationalizes the "less firms but larger market" pattern discussed above, but also suggests to carefully re-evaluate the numbers reported in Panel B of Figure 29. Over the 2004-2013 period Novo Nordisk on average accounted for some one fifth of total stock market capitalization. Thus, without Novo Nordisk the Danish stock market would be substantially weaker in an international comparison.

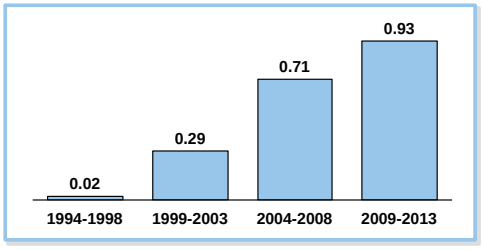
Firm size of listed non-financial firms

[Time trend in firms size as measured by deflated total assets, Europe, 1994-2013]

Panel A: Regression analysis

Column	I	II	III	IV
Dependent variable	Firm size	Firm size	Firm size	Firm size (w1)
Method	OLS	FFE	FFE	FFE
Standard errors		firm-level clustered		
Time trend	0.007***	0.063***	0.065***	0.064***
	[2.83]	[43.86]	[45.55]	[45.81]
Firm controls	*no*	*no*	*yes*	*yes*
Fixed effects	*I,C*	*F*	*F*	*F*
Nbr of obs	82,973	82,985	80,555	80,555
Adj. R^2	0.21	0.17	0.20	0.20

Panel B: Illustration of year dummy coefficients



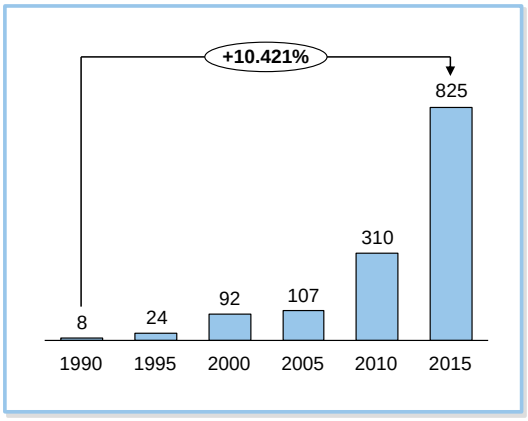
Notes: The figure reports results of OLS regressions examining the time trend in firm size of European non-financial listed firms over the 1994-2013 period. Firm size is measured by the logarithm of real assets, i.e. total assets adjusted for inflation. Panel A results of four specifications regressing firm size on a variable time trend. Time trend is a variable that measures the effective year, i.e. is calculated as the year minus 1994 (the initial year of the analysis). Column I reports results of a simple cross-sectional correlation analysis with fixed country and industry effects. Column II-IV report results of firm-fixed effects regressions. While Column II recognizes only the time trend variable, Column III also allows for firm characteristics. Finally, Column IV explains a version of the firm size variable that is winsorized on an annual basis on the 1%-level. Unreported firm controls are equity ratio (measured by equity over total assets), return on assets (measured by EBITDA to total assets), and fixed assets ratio (measured by fixed assets to net assets).The table in Panel A reports OLS coefficients and t-statistics that allow for heteroscedasticity and correlation across observations of any given firm. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Panel B illustrates the time series behavior of year dummy coefficients of a firm fixed effects regression explaining the firm size variable by time fixed effects. The sample consists of European non-financial listed firms, where Europe covers Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, Switzerland, and United Kingdom. The analysis covers the 1990-2013 period (data permitting) with a total of 58,685 individual firm-year observations.

Source: Own analysis. Data from Thomson Reuters Datastream/Worldscope Fundamentals

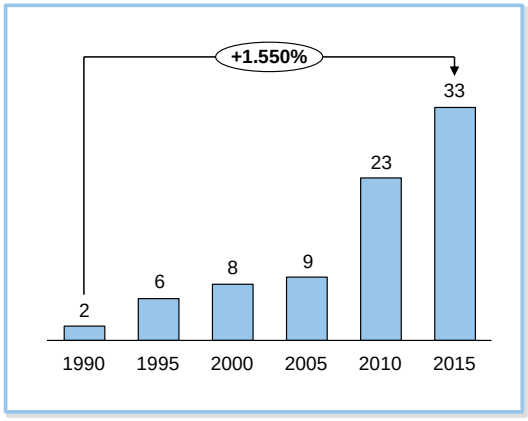
Figure 32: Time trend in firm size of non-financial European listed firms

Development of Novo Nordisk's stock market capitalization

Panel A: Market capitalization in bill DKK



Panel B: Relative market capitalization in % of total stock market



Notes: The figure documents the development of Novo Nordisk's market capitalization, both in absolute as well as in relative terms for the years 1990 to 2015. Panel A reports end-of-year values. Panel B reports end-of-year ratios.

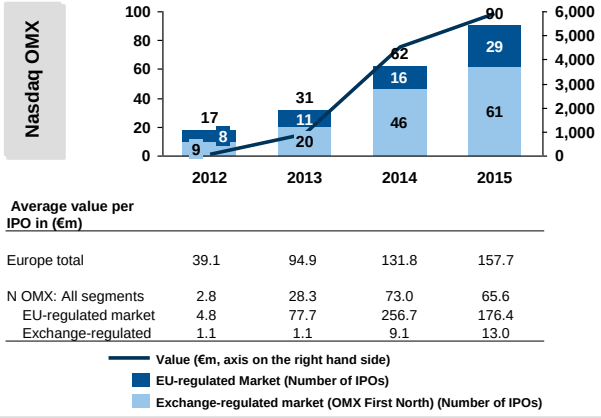
Source: Own analysis. Data from Thomson Reuters Datastream/Worldscope Fundamentals and World Bank Open Data.

Figure 33: Development of Novo Nordisk's stock market capitalization

While the previous two figures can help to explain the rise in stock market size, the decrease in the use of the stock market is also worth noting. Indeed, IPO activity was tiny in Denmark over the last years. Figure 34 documents IPO activity at Nordic OMX and finds some four IPOS for Denmark in 2014 and 2015 together. Relatedly, a recent study by Bessler (2015) finds only 96 IPOs over the 1990-2015 in Denmark. In parallel, there have been a number of delistings. The study by Bessler (2015) finds more than 170 delistings in Denmark since 2000.[40]

IPO activity in (Northern) Europe
[Number of IPOs and IPO volume from 2012-2015]

Panel A: IPO activity in Europe and at Nasdaq OMX
[Number of IPOs and IPO Volume in €m, 2012-2015]



Average value per IPO in (€m)	2012	2013	2014	2015
Europe total	39.1	94.9	131.8	157.7
N OMX: All segments	2.8	28.3	73.0	65.6
EU-regulated market	4.8	77.7	256.7	176.4
Exchange-regulated	1.1	1.1	9.1	13.0

Value (€m, axis on the right hand side)
EU-regulated Market (Number of IPOs)
Exchange-regulated market (OMX First North) (Number of IPOs)

Panel B: European IPO activity
[Number of IPOs per country, 2015]

Notes: The figure illustrates IPO activity at Nasdaq OMX and Europe. Panel A reports the number of IPOs and the volume of IPOs at Nasdaq OMX and in total Europe as reported by PWC IPO Watch Europe. Panel B reports the distribution of (the number of) IPOs in 2015 across Europe.

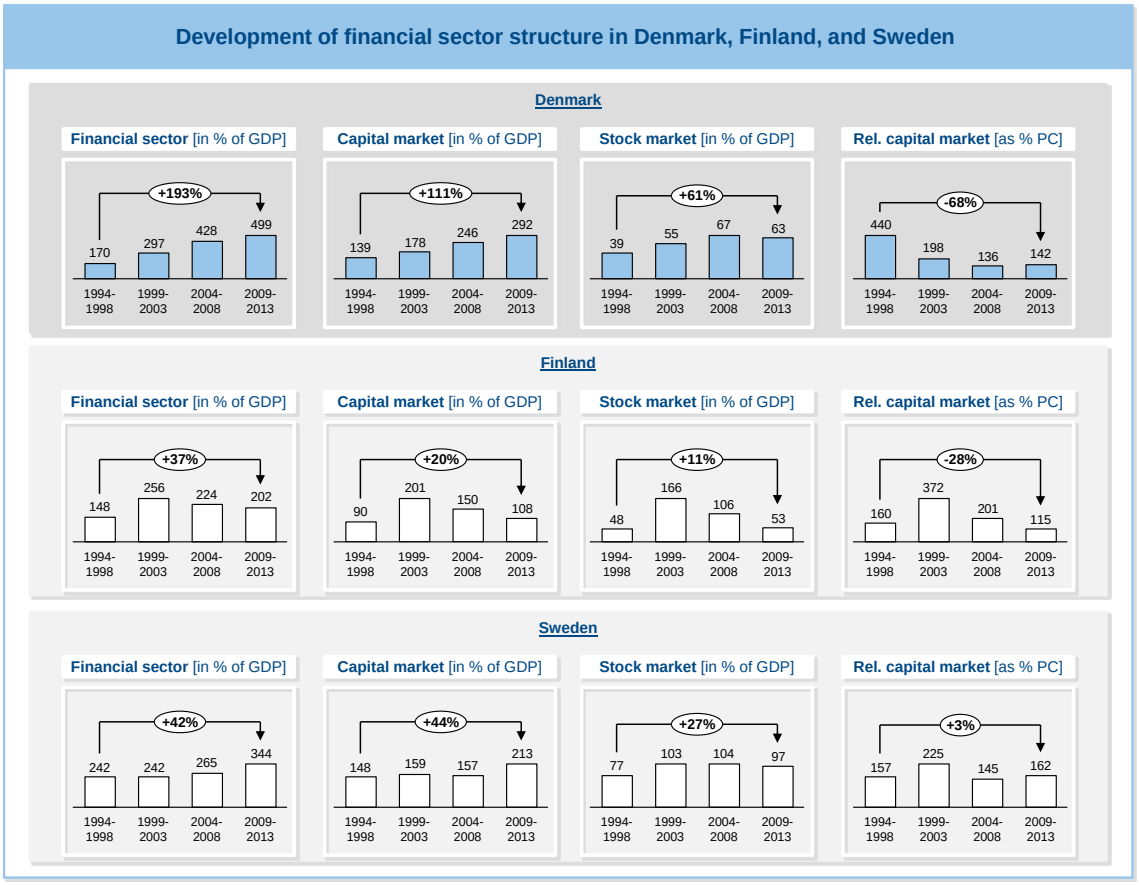
Source: Own analysis and PWC IPO Watch Europe 2015. Data for Panel A from PWC IPO Watch Europe various issues (2013, 2014, 2015). Figure in Panel B from PWC IPO Watch Europe 2015.

Figure 34: IPO Activity in Northern stock market

Financial sector development in the Nordic countries: To complement the previous analysis and to give a more complete picture, the Figure 35 documents developments in Denmark, Finland, and Sweden over the 1994-2013 period along four measures of financial sector structure. Specifically, it illustrates that the Danish financial sector has

[40] While commentators have put forward many potential arguments for a delisting (see the discussion in Doidge et al., 2015 and Thomsen & Vinten, 2014), scholars still disagree about their relative importance.

grown tremendously over the last 25 years. Comparing the 1994-1998 period to the post-crises 2009-2013 period it nearly tripled. With such growth numbers, Denmark by far outperformed its peers. Growth in capital market size was also remarkable, but more in line with what was observed in other countries. As a result, the relative importance of the capital market plummeted over the years. Finally, the stock market, while also growing over the years, lost in relative importance against other parts of the financial sector.



Notes: The figure documents developments in Denmark, Finland, and Sweden over the 1994-2013 period along four measures of financial sector structure. Financial sector refers to financial sector size defined as the aggregate of private credit volume and capital market capitalization normalized by gross domestic product (GDP). Capital market refers to capital market size, which is the GDP-normalized sum of outstanding private debt securities and the market capitalization of listed domestic companies. Stock market refers to stock market size, which is assessed by the GDP-normalized market capitalization of listed domestic companies To smooth temporary effects, in particular fluctuations in stock market valuation, 5-year averages (data permitting) are reported.

Source: Own analysis. Data from World Bank Open Data, BIS statistics, Global Financial Development Dataset, and selected data points as detailed in the Data Appendix.

Figure 35: Financial sector development in the Nordic countries

7 Conclusion and outlook

This research aims to encourage a debate about the future direction of the Danish financial sector. The story it tells is simple: ***The provision of capital funds to the corporate sector and the associated allocation of risk is an important issue for regulators – and society as a whole.***

Thereby, the line of arguments starts from entrepreneurial activities, which represent the source of economic development in any (capitalist) market economy. These activities require funding. Funding, however, is (perceived to be) a scarce resource, even in Denmark with its relatively large financial sector as exemplified in Figure 36 below.

(Perceived) lack of financing for firms
[Enterprises seeking to obtain finance by outcome, type of finance, and time]

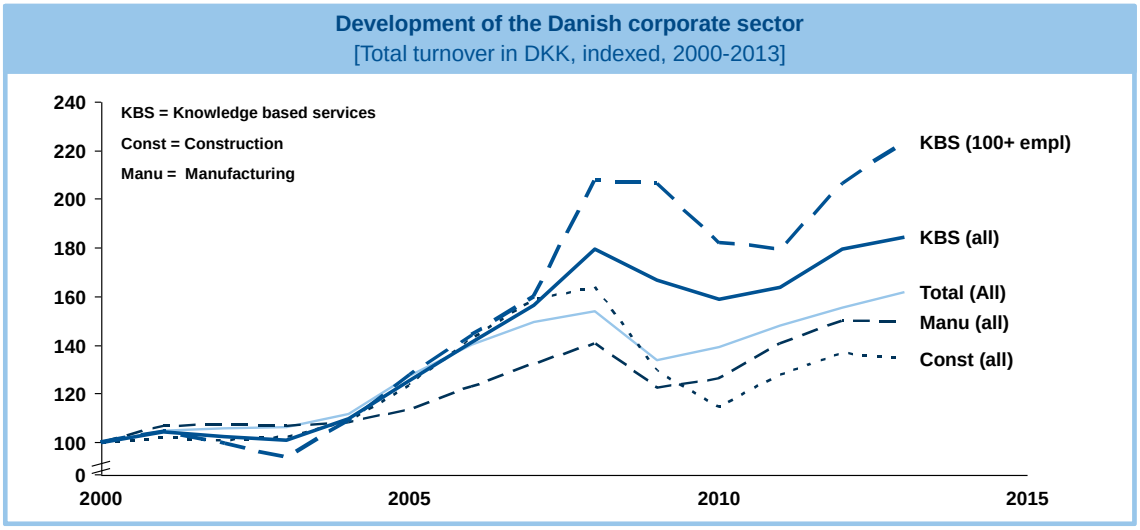
		2007	2010	2014
Fully obtained	Loan finance	92	69	72
	Equity finance	90	72	72
	Other forms of finance	95	80	88
Partially obtained	Loan finance	5	19	14
	Equity finance	5	16	16
	Other forms of finance	4	17	10
Not obtained	Loan finance	3	12	14
	Equity finance	5	12	12
	Other forms of finance	0	3	2

Notes: The figure reports evidence from three surveys on the perceived lack of finance in Denmark by type of requested finance and outcome.

Source: Own analysis. Data from Danmarks Statistik (http://www.statistikbanken.dk/).

Figure 36: (Perceived) lack of financing in Denmark

Relatedly, entrepreneurial activities are – by their very nature – risky. Moreover, as globalization and competition are gaining momentum, innovation becomes more important for developed economies and the evidence suggests that the corporate sector in these economies will have to bear more risk, while pursuing business models with less collateralizable assets. To some extent, this already materializes in Denmark as suggested by Figure 37, which illustrates the development of different parts of the corporate sector in Denmark.



Notes: The figure illustrates the development of the corporate sector in Denmark as measured by total turnover over the 2000-2013 period. It differentiates enterprises from different sectors, Construction, Manufacturing and Knowledge Based Services (KBS). For the KBS sector it also differentiates between the group of small enterprises with 0-99 employees and the group of large enterprises with 100 or more employees.

Source: Own analysis. Data from Danmarks Statistik (http://www.dst.dk/).

Figure 37: Development of the Danish corporate sector

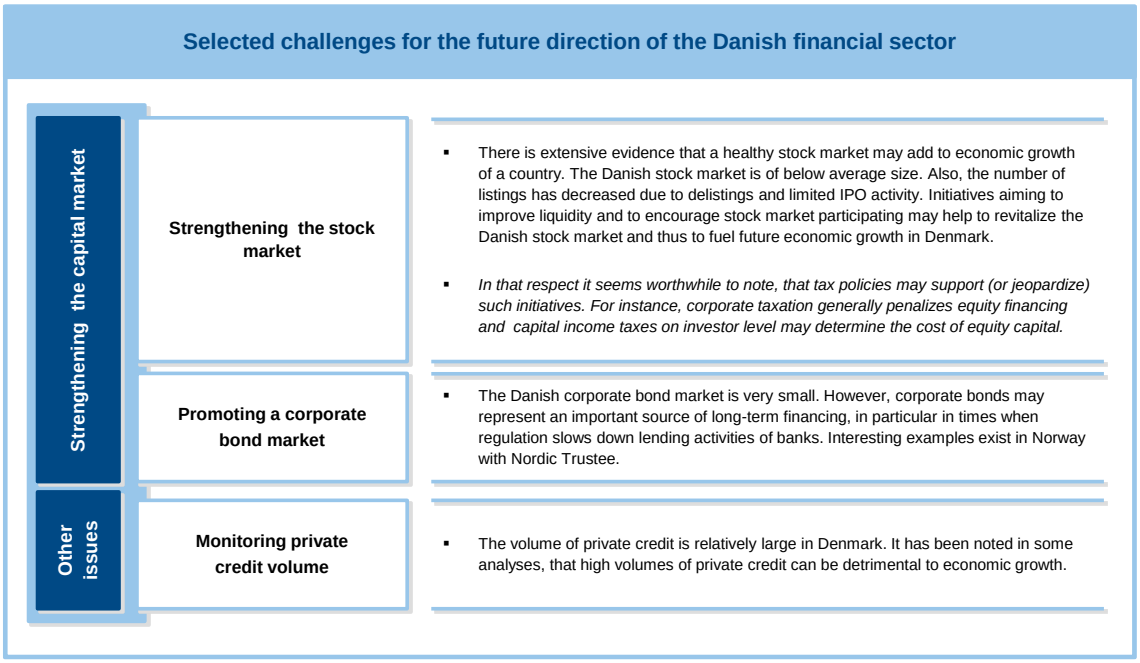
Risky entrepreneurial activities without collateralizable assets require long-term funding from investors willing to bear some (reasonably compensated) financial risk. Capital markets can provide such funding, and probably will become more important as regulation slows down lending activities of banks. In sum, it is argued that capital market-oriented financing solutions, and in particular public equity, became and will become more important for advanced economies.[41]

Based on these arguments, a simple empirical analysis examining the sample of OECD countries over the last 20 years is conducted. The evidence found in that analysis is consistent with the view that capital market size – and in particular stock market size – may add to economic growth (even after controlling for unobserved country heterogeneity and using advanced econometric methods).

Overall this makes a strong case for promoting capital market-oriented financing solutions. Accordingly, there are a couple of challenges for market participants and

[41] As long as regulation does not counterbalance the economic forces described above.

regulators when it comes to decide about the future direction of the Danish financial sector. Three of them are summarized in Figure 38 and detailed below.



Notes: This figure summarizes selected challenges for the future direction of the Danish financial sector.

Source: Own representation.

Figure 38: Challenges for the future direction of the Danish financial sector

Strengthening the stock market: The stock market was shown to be an important part of an economy's ecosystem that may affect economic outcomes. On the micro-level, listed firms may benefit from the capital raised in the stock market by higher growth. On the macro-level, economic growth is stimulated by stock market development. However, there are three prerequisites that the stock market may become a success story: First, firms must be willing to use the stock market. Second, market players must provide a reasonable infrastructure. And finally, investors must be convinced to earn a reasonable rate of return on their investment.

Whether a firm will use the stock market, depends on a cost-benefit analysis. An important determinant of this cost-benefit analysis is the regulatory environment. From the perspective of the firm the costs of regulation should not outweigh the benefits of being listed. Indeed, while the stock market must aim for a balanced power between insiders (e.g. the management) and outside investors, some commentators argue that the magnitude of governance regulation since the late 90s of the last

century have imposed substantial costs on listed firms, such that some of them might actually feel encouraged to delist.[42] On the other hand, most of the regulation was established to ensure that investors may earn a reasonable return on their investments.

Effectively, the various actors must aim to ensure that the benefits of being listed is not outweighed by the cost of going public, i.e. the cost of the IPO process in case the firm is not yet listed, and the cost of being public. To positively influence the listing decision of firms, the market must provide the appropriate infrastructure (trading facilities, equity research, broker services) to ensure a sustainable level of liquidity. Liquidity is important from two perspectives. First, liquidity is often a fundamental prerequisite for institutional investors, either due to external regulations or due to internal (risk management) procedures. Second, liquidity is important for the issuing firm, as liquidity will reduce the cost of capital. With a lower capital, the firm might find more investment opportunities valuable, realize more of them and thus will growth faster.

When it comes to investor returns, taxation becomes important, as taxation of corporate profits and capital income drives a wedge between a firm's (pre-tax) operating profits and the (after-tax) return earned by investors. For instance, around the world most corporate tax codes allow interest expenses on debt to reduce the tax bill, giving debt finance an advantage. Put the other way, standard corporate tax systems penalize equity financing, which however is one of the key ingredients for corporate innovation.[43] An interesting approach in this respect was taken by the Belgium government in 2006, when it introduced the "notional interest deduction" (NID). This measure, which aimed to reduce the discrimination between debt and equity financing, allows companies to deduct a fictitious equity interest from their

[42] Doidge et al. (2015) discuss various rationales for the delistings and examine the phenomenon in the US. Thomsen & Vinten (2014) discuss and examine delistings in Europe.

[43] There has been a long debate about the effect of corporate taxes on firms' capital structure. Feld et al. (2013) survey the literature and argue – based on the results of their meta-analysis – that there is a positive marginal tax effect on the debt ratio, which they estimate to be 0.27. In a recent paper, Doidge and Dyck (2015) provide evidence for causal effects of corporate taxation on corporate policies.

taxable income.[44] Examining the implications of the measure, Panier et al. (2013) and Schepens (2016) document better capitalized firms and banks after the introduction of the NID.

Relatedly, taxation of capital income – including share income – increases the cost of capital for firms. A high cost of capital is generally considered to cause low levels of corporate investments and thus low economic growth. Simultaneously, capital income taxation reduces the (after-tax) return of investors. Thus, many governments have implemented special investment vehicles, which allow private investors to save money (often for retirement) in a tax efficient way. Examples are Switzerland with its "3rd pillar a", Sweden with its "Investment savings account (ISK)", or the US with its "401(k) plans".[45]

Promoting a corporate bond market. The Danish corporate bond market is relatively small. However, as described above corporate bonds may represent an important source of long-term financing, in particular in times when regulation slows down lending activities of banks. In other words, a healthy corporate bond market may allow (some) firms to reduce their cost of capital, such that these firms might find more investment opportunities valuable, realize more of them and thus will growth faster. Thereby, the various actors (exchanges, investment banks, and investors) should carefully look at the experience in other countries. While the German market is currently in turmoil[46], the Norwegian approach with Nordic Trustee could be interesting – either for closer cooperation or as starting point for a Danish initiative.

Monitoring private credit volume. It has been documented that the volume of private credit is relatively large in Denmark. Although it must be acknowledged that much of

[44] For details on the Belgium NID refer to the Belgium Federal Public Service Finance (e.g. http://www.minfin.fgov.be/portail2/belinvest/downloads/en/publications/bro_notional_interest.pdf, accessed May 1st, 2016).

[45] See http://www.bsv.admin.ch/themen/ueberblick/00003/index.html?lang=en (accessed May 1st, 2016) for details on Switzerland's "3rd pillar a", http://www.skatteverket.se/privat/skatter/vardepapper/investeringssparkonto (in Swedish, accessed May 1st, 2016) for details on Sweden's "Investeringssparkonto", and https://www.irs.gov/Retirement-Plans/401k-Plans (accessed May 1st, 2016) for details about the US 401(k) plans.

[46] See Schweizer et al. (2015) for an empirical analysis of the German mini-bond market.

the private credit volume refers to residential mortgages, it has been noted that high volumes of private credit can be detrimental to economic growth (e.g. Law & Singh, 2013 and Arcand et al., 2015). Therefore, it seems advisable to carefully monitor the aggregate private credit volume and – again – to promote capital market oriented financing of firms.

Appendix A. Data sources

This Section provides a description of the data used in the analysis. While Appendix A.1 describes the firm level data, Appendix A.2 explains the macro data.

Appendix A.1. Micro Data

The analysis uses various data sources to study firm behaviour. Most of the analysis is based on *Thomson Reuters Datastream/Worldscope Fundamentals* data covering listed securities and their issuing entities. A second, complementary sample has been constructed using *Bureau van Dijk OSIRIS* data.

Thomson Reuters Datastream/Worldscope Fundamentals sample: The sample is constructed in several steps:

(1) by identifying all active or inactive securities reported by *Thomson Reuters Datastream* and registered once over the 1990-2014 period in one of the following countries: Germany, Belgium, Denmark, Spain, Finland, France, Greece, Ireland, Italy, Luxembourg, Netherlands, Austria, Portugal, Sweden, United Kingdom, and the United States,

(2) by restricting the sample to securities that are classified as primary listings, major share types and equity share types in order to avoid duplicates due to multiple listings,

(3) by excluding all securities issues by firms with headquarter location outside the country of the (primary) exchange at which the security is listed, and

(4) finally, by excluding all securities referring to financial firms (identified by SIC Codes ranging from 6,000 through 6,999, respectively).

For the remaining securities, accounting data and capital market data (all in USD) are drawn from Thomson Reuters Worldscope Fundamentals. The final sample is then the result of a final clearing process, which eliminates observations with data inconsistencies, e.g. observations with missing or negative values for total assets, net sales, or total common equity. While Thomson Reuters Datastream/Worldscope Fundamentals covers most securities since 1986, most of the analysis is restricted to the 1990 – 2013 period. This is for two reasons. *First*, prior to 1990 the data quality is

limited.[47] *Second*, as fiscal years may end throughout the year, a consistent analysis of the various years requires some time lag.

Bureau van Dijk OSIRIS sample: The *Bureau van Dijk OSIRIS* sample is constructed in a more direct way, as the Bureau van Dijk data starts from the company level. Company-level information has been extracted for all firms located in one of the following countries: Germany, Belgium, Denmark, Spain, Finland, France, Greece, Ireland, Italy, Luxembourg, Netherlands, Austria, Portugal, Sweden, and the United Kingdom. Similar to the Thomson Reuters Datastream/Worldscope Fundamentals sample financial firms and observations with inconsistent data have been excluded to derive at the final sample.

Variables for firm-level analysis: For the firm-level analysis several proxies have been used, which are explained in detail in the table below.

Variable	Description	Source
Bank debt leverage	*Capital structure measure*, defined as book value of bank debt to (book value of) total assets	Bureau van Dijk OSIRIS
Rel. bank debt leverage	*Capital structure measure*, defined as book value of bank debt to (book value of) total debt	Bureau van Dijk OSIRIS
Book leverage	*Capital structure measure*, defined as book value of total debt to (book value of) total capital	Thomson Reuters Datastream/Worldscope Fundamentals
Cash flow risk	*Business model measure*, defined as the standard deviation of EBITDA to total assets calculated over three years	Thomson Reuters Datastream/Worldscope Fundamentals
Equity ratio	*Capital structure measure*, defined as book value of (common) equity to (book value of) total assets	Thomson Reuters Datastream/Worldscope Fundamentals
Firm size	*Firm size measure*, defined as the natural logarithm of real total assets, i.e. total assets adjusted for inflation	Thomson Reuters Datastream/Worldscope Fundamentals
Fixed assets ratio	*Asset structure measure*, defined as (book value of) fixed assets to (book value of) net assets	Thomson Reuters Datastream/Worldscope Fundamentals
Intangible assets ratio	*Asset structure measure*, defined as (book value of) intangible assets to (book value of) net assets	Thomson Reuters Datastream/Worldscope Fundamentals
Market debt leverage	*Capital structure measure*, defined as book value of bonds and similar instruments to (book value of) total assets	Bureau van Dijk OSIRIS
Rel. market debt leverage	*Capital structure measure*, defined as book value of bonds and similar instruments to (book value of) total debt	Bureau van Dijk OSIRIS

[47] See Brückner (2013) suggesting even to use data from 1992 onwards.

Net assets	*Firm size measure*, defined as total assets less cash and short term investments.	Thomson Reuters Datastream/Worldscope Fundamentals
Net book leverage	*Capital structure measure*, defined as book value of net debt to (book value of) total capital, where net debt is defined as total debt less cash and short-term investments	Thomson Reuters Datastream/Worldscope Fundamentals
Return on assets	*Profitability measure*, defined as EBITDA to total assets	Thomson Reuters Datastream/Worldscope Fundamentals
R&D (dummy)	*Business model measure*, indicating whether a firm reports research & development expenses in a particular year (1) or not (0).	Thomson Reuters Datastream/Worldscope Fundamentals
R&D intensity	*Business model measure*, defined as research & development expenses standardized by sales. In case the firm does not report research & development expenses, it is set equal to zero.	Thomson Reuters Datastream/Worldscope Fundamentals
Sales growth risk	*Business model measure*, defined as the standard deviation of changes in current sales versus previous year's sales calculated over three years. Thereby, sales are measured in real terms, i.e. deflated, to account for differences in inflation rates.	Thomson Reuters Datastream/Worldscope Fundamentals
Tobin's Q	*Market valuation measure*, defined as the sum of market capitalization plus (book value of) total debt standardized by total capital.	Thomson Reuters Datastream/Worldscope Fundamentals
Total capital	*Firm size measure*, defined as the sum of equity capital and total debt	Thomson Reuters Datastream/Worldscope Fundamentals
Fixed effects	Regression controls, providing fixed time, industry, and country location dummies. Industry dummies are based on 2-digit SIC codes.	Thomson Reuters Datastream/Worldscope Fundamentals

Notes: This table reports details about the firm-level variables used in our analysis. Note, that to limit the influence of outliers, all variables have been winsorized on at the 1%-level.

Source: Own analysis.

Table 1: Definition of variables used in firm-level analysis

Appendix A.2. Macro Data

Country-level data is collected from the World Bank (World Bank Open Data), the Bank for International Settlement (BIS statistics), the Global Financial Development Dataset (Version: September 2015), selected data points as detailed in the technical Data Appendix below, and the academic literature. The basic definitions mostly follow Demirgüç-Kunt, Feyen, and Levine (2013) as detailed below in Table 2.

Variable	Desription	Source
GDP per capita (log)	Logarithm of real GDP per capita (constant 2000 USD)	World Bank Open Data
GDP per capita growth	Logarithmic growth of real GDP per capita (current local currency units)	World Bank Open Data
GDP growth volatility	Standard deviation of GDP growth over 5-year rolling period	World Bank Open Data
Bank's Z-score	Distance to distress measures as the sum of capital to assets and return on assets deflated by the standard deviation of return on assets	Global Financial Development Dataset
Financial sector size	Aggregate of stock market size, bond market size, and private credit volume	Global Financial Development Dataset and selected data points as detailed in the Appendix B
Private credit volume	Domestic credit provided to private sector (% of GDP)	World Bank Open Data and selected data points as detailed in the Appendix B
Capital market size	Aggregate of Stock market depth and Bond market depth	Global Financial Development Dataset and selected data points as detailed in the Appendix B
Stock market size	Market capitalization of listed domestic companies (% of GDP)	World Bank Open Data and selected data points as detailed in the Appendix B
Bond market size	Private bond market capitalization (% of GDP)	Global Financial Development Dataset and selected data points as detailed in the Appendix B
Stock market liquidity	Value of stock market transactions per year (% of GDP)	World Bank Open Data
Openness of trade (log)	Logarithm of the sum of imports and exports (% of GDP)	World Bank Open Data
Inflation (in %)	Logarithm of (1+annual change in CPI) (in %)	World Bank Open Data
Government size (log)	Logarithm of government consumption (% of GDP)	World Bank Open Data
Years of schooling (log)	Logarithm of (1+average years of schooling (25 years))	Barro/Lee (2013)

Notes: This table reports details about the country-level variables used in our analysis.

Table 2: Definition and sources of variables for country level analysis

To start with, the financial sector development indicators are assembled based upon the aggregated data from the Global Financial Development Dataset. Due to data

availability issues, country-level analysis is restricted to two subsets of sample countries:

- OECD member countries – Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States –except for New Zealand and Chile;
- EU15 member countries –Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, United Kingdom – including Switzerland but excluding Luxembourg.

The majority of missing values for sample countries are substituted by hand-collected data from international and national data providers, e.g. Bank of International Settlements, World Federation of Exchanges, Federation of European Securities Exchange, NASDAQ OMX, national stock exchanges and statistics offices as detailed in the Appendix B.

Next, country-level financial data are complemented by indicators of economic development, economic growth and economic risk from the World Bank Open Data along with a set of macroeconomic conditioning variables such as level of educational attainment collected by Barro & Lee (2013), inflation, government size, and openness of trade extracted from World Bank Open Data.

To be included in the analysis, an economy must report data on economic and financial development indicators as well as the set of controls. Further, following Rousseau and Wachtel (2000), to ensure the representativeness of the sample and comparable amount of available cross-sectional units over time, the minimum number of annual observations per country is set to six. The restriction of sample period to 1994-2013 is conditioned upon the data availability on outstanding private debt securities both in World Bank Open Data and Bank of International Settlements. Due to the lack of data on domestic debt securities, New Zealand is completely excluded from the analysis, while Chile is excluded due to the short time series (5 observations with complete information).

References

[All URLs refer to links that have been accessed mid May to mid June 2016]

Aivaziana, V. A. , Y. Geb, and J. Qiuc (2005): *The Impact of Leverage on Firm Investment: Canadian Evidence*, Journal of Corporate Finance 11, pp. 277– 291.

Aizenman, J., Y. Jinjarak, and D. Park (2015): *Financial Development and Output Growth in Developing Asia and Latin America: A Comparative Sectoral Analysis*. NBER Working Paper 20917. Available at: www.nber.org/papers/w20917.

Allen, F. and El Carletti (2012): *The Roles of Banks in Financial Systems*. In: Berger, Molyneux, and Wilson (eds): The Oxford Handbook of Banking. Oxford: Oxford University Press.

Almarzoqi, R. M., S. M. Naceur, and A. Kotak (2015): *What Matters in Financial Development and Stability*. IMF Working Paper WP/15/173. Available at: www.imf.org/external/pubs/ft/wp/2015/wp15173.pdf.

Ang, J. B. (2008): *A Survey of Recent Developments in the Literature of Finance and Growth*. Journal of Economic Surveys 22, pp. 536–576

Asongu, S. A. (2015): *Finance and Growth: New Evidence from Meta-Analysis*. Managerial Finance 41, pp.615 – 639

Atje, R. and B. Jovanovic (1993): *Stock Markets and Development*. European Economic Review 37, pp. 632–640.

Arcand, J. L., E. Berkes, and U. Panizza (2015), *Too much Finance?*, Journal of Economic Growth 20, pp. 105-148.

Ayyagari, M., A. Demirgüç-Kunt and V. Maksimovic (2011): *Firm Innovation in Emerging Markets: The Role of Finance, Governance, and Competition*. Journal of Financial and Quantitative Analysis 46, pp. 1545-1580.

Barajas, A., R. Chami, and S. R. Yousefi (2013): *The Finance and Growth Nexus Re-Examined: Do All Countries Benefit Equally?*. IMF Working Paper WP/13/130. Available at: www.imf.org/external/pubs/ft/wp/2013/wp13130.pdf.

Bartram, S.M., G.W.Brown, and F.R. Fehle(2009): *International Evidence on Financial Derivatives Usage*. Financial Management 38, pp. 185-206.

Bates, T.W., K.M. Kahle, and R.M. Stulz (2009): *Why do U.S. Firms Hold so Much More Cash Than They Used to?*, Journal of Finance LXIV, pp. 1985-2021.

Beal, D., E. Rueda-Sabater, and S.L. Heng (2015): *Why Well-Being Should Drive Growth Strategies*, The 2015 Sustainable Economic Development Assessment by Boston Consulting Group (May 2015).Available at: www.bcgperspectives.com/content/articles/public-sector-sustainability-2015-sustainable-economic-development-assessment/.

Beck, T. (2012): *The Role of Finance in Economic Development–Benefits, Risks, and Politics*. Müller (Ed): Oxford Handbook of Capitalism, Oxford: Oxford University Press.

Beck, T., H. Degryse, and C. Kneer (2014): *Is More Finance Better? Disentangling Intermediation and Size Effects of Financial Systems*, Journal of Financial Stability 10, pp. 50-64

Beck, T., A. Demirgüç-Kunt, L. Laeven and R. Levine (2008): *Finance, Firm Size, and Growth*. Journal of Money, Banking and Credit 40, pp. 1379–1405.

Beck, T., C. Kaserer, and M.S. Rapp (2015): *Beteiligungs- und Kapitalmarktfinanzierung im deutschen Finanzsystem: Zustand und Entwicklungsperspektiven*. Research Report for the German Federal Ministry for Economic Affairs and Energy (BMWi). Available at: bmwi.de/DE/Mediathek/publikationen,did=725590.html.

Beck, T. and R. Levine (2004): *Stock Markets, Banks, and Growth: Panel Evidence*, Journal of Banking and Finance 28, 423-442.

Beck, T., R. Levine and N. Loayza (2000): *Finance and the Sources of Growth*. Journal of Financial Economics 58, 261–300.

Bessler, W. (2015): *Listings and Delistings in the Nordic Countries*. Unpublished Research.

Bessler, W., W. Drobetz and R. Kazemieh (2011): *Factors Affecting Capital Structure Decisions*. In: Baker and Martin (Eds): Capital Structure and Corporate Financing Decisions: Theory, Evidence, and Practice, Hoboken, NJ: Wiley & Sons, pp. 15–40.

Bessler, W., J. Holler, M. Seim and J. Zimmermann (2012): *From Ideas to Products: Financing Innovation and Getting Access to Innovation*. In: Cumming (ed.): The Oxford Handbook of Venture Capital, Oxford: Oxford University Press, pp. 627-667.

Brealey, R. A., S.C. Myers and F. Allen (2013): *Principles of Corporate Finance*. Mcgraw-Hill Higher Education.

Campello, M., C. Lin, Y. Ma, and H. Zou (2011): *The Real and Financial Implications of Corporate Hedging*. Journal of Finance 66, pp. 1615–1647.

CFA Institute (2012): *Fact File: S&P 500 Sigma Events*. By Jason Voss, 2012. Accessible at: blogs.cfainstitute.org/investor/2012/08/27/fact-file-sp-500s-sigma-events.

Čihák, M., A. Demirgüç-Kunt, E. Feyen, and R. Levine (2013): Financial Development in 205 Economies, 1960 to 2010, Journal of Financial Perspectives 1, pp. 17-36

Čihák, M., A. Demirgüç-Kunt, E. Feyen, and R. Levine (2012): *Benchmarking Financial Systems around the World*, World Bank Policy Research Working Paper 6175. Available at: elibrary.worldbank.org/doi/abs/10.1596/1813-9450-6175.

Claessens, S. and L. Laeven (2003): *Financial Development, Property Rights and Growth*. Journal of Finance 58, pp. 2401-2436.

Cotei, C. and J. Farhat (2011): *Worldwide Patterns in Capital Structure*. In: Baker and Martin (Eds): Capital Structure and Corporate Financing Decisions: Theory, Evidence, and Practice, Hoboken, NJ: Wiley & Sons, pp. 111–126.

Costanza, R., M. Hart, S. Posner, and J. Talberth (2009): B*eyond GDP: The Need for New Measures of Progress*, The Pardee Papers # 4/2009. Available at: www.bu.edu/pardee/files/documents/PP-004-GDP.pdf.

De Nicolò, G. and L. Juvenal (2014): *Financial integration, globalization, and real activity*, Journal of Financial Stability 10, pp. 65-75.

Deidda, L. and B. Fattouh (2002): *Non linearity between finance and growth*. Economics Letters 74, pp. 339–345.

Demirgüç-Kunt, A., E. Feyen and R. Levine (2013): *The evolving importance of banks and securities markets*, World Bank Economic Review 27, pp. 476-490.

Demirgüç-Kunt, A. and R. Levine (2008): *Finance, Financial Sector Policies, and Long-Run Growth.* Commission on Growth and Development, Working Paper No. 11, 2008, Washington DC: The World Bank. Available at: siteresources.worldbank.org/EXTPREMNET/Resources/489960-1338997241035/Growth_Commission_Working_Paper_11_Finance_Financial_Sector_Policies_Long_Run_Growth.pdf.

Dewatripont, M., J.-C. Rochet, and J. Tirole (2010): *Balancing the banks: Global lessons from the financial crisis*. Princeton: Princeton University Press.

Doidge, C. and A. Dyck (2015): *Taxes and corporate policies: Evidence from a quasi natural experiment*. Journal of Finance 70, pp. 45-89.

Doidge, C., G. A. Karolyi, and R. M. Stulz (2015): *The U.S. listing gap*. NBER Working Paper No. 21181. Available at: www.nber.org/papers/w21181.

European Commission (2009): *Beyond GDP - Measuring progress, true wealth and the well-being of nations*. Luxembourg : Office for Official Publications of the European Communities. Available at: bookshop.europa.eu/en/beyond-gdp-pbKH3008562/.

EVCA (2015): *2015 European Private Equity Activity - Statistics on Fundraising, Investments & Divestments*. Available at: www.investeurope.eu/media/476271/2015-European-Private-Equity-Activity.pdf.

Fan, J. P. H, S. Titman and G. Twite (2008): *An International Comparison of Capital Structure and Debt Maturity Choices*. Journal of Financial and Quantitative Analysis 47, pp. 23–56.

Feld, L. P., J. H. Heckemeyer, and M. Overesch (2013): *Capital structure choice and company taxation: A meta-study*. Journal of Banking & Finance 37, pp. 2850–2866.

Finnegan, J. (2011): *Some Perspective on Recent Stock Market Volatility*. American Century Investments Blog. Accessible at: americancenturyblog.com/wp-content/uploads/2011/12/Weekly-Market-Update-12-6-2011.pdf.

Frank, M. Z. and V. K. Goyal (2009): *Capital Structure Decisions: Which Factors Are Reliably Important?*. Financial Management 38, pp. 1–37.

Frank, M. Z. and V. K. Goyal (2008): *Tradeoff and Pecking Order Theories of Debt*. In: Eckbo (ed.), Handbook of Corporate Finance: Empirical Corporate Finance, North Holland: Elsevier, pp. 135–202.

Fu, F., S. Huang, and R. Wang (2015): *Why Do U.S. Firms Invest Less and Less Over Time? SSRN Working paper*. Available at SSRN: ssrn.com/abstract=2517593.

Fox, J. (2015): *The Intangible Corporation*. Bloomberg (March 18, 2015). Available at: www.bloomberg.com/view/articles/2015-03-18/brick-and-mortar-gives-way-to-the-intangible-corporation.

Gaspar, J.-M. and M. Massa (2006): *Idiosyncratic Volatility and Product Market Competition*, Journal of Business 79, pp. 3125–3152.

Goldstein, R. (1969): *Financial Structure and Development*. New Haven, CT: Yale University Press.

Hamilton, A. (1781): *From Alexander Hamilton to Robert Morris, [30 April 1781]*. In: Founders Online. Available at: founders.archives.gov/documents/Hamilton/01-02-02-1167.

Irvine, P.J. and J. Pontiff (2009): *Idiosyncratic Return Volatility, Cash Flows, and Product Market Competition*, Review of Financial Studies 22, pp. 1149–1177.

Jensen, M. C. and W. H. Meckling (1976): *Theory of the firm: Managerial behavior, agency costs and ownership structure*, Journal of Financial Economics 3, pp. 305-360.

Kachaner, N. and A. Whybrew (2014): *When "Asset light" is Right*. Boston Consulting Group Report. Available at: www.bcgperspectives.com/Images/When_Asset_Light_Is_Right_Sep_2014_tcm80-171854.pdf

Kaserer, C. and M.S. Rapp (2014): *Capital Markets Development in the European Union – Long Term: Trends, Economic Drivers and Policy Challenges,* AIMA Research Report. Available at: www.aima.org/en/education/research-into-capital-markets-and-economic-growth.cfm.

Killi, A.M. and M.S. Rapp (2016): *Cash holdings and leverage of German listed firms – Evidence from 1992 to 2011*, Betriebswirtschaftliche Forschung und Praxis 68, pp. 157-181.

King, R.G. and R. Levine (1993a): *Schumpeter might be right*, Quarterly Journal of Economics 108, pp. 717-737.

King, R.G. and R. Levine (1993b): *Finance, Entrepreneurship, and Growth: Theory and Evidence*, Journal of Monetary Economics 32, pp. 513-542.

Langfield, S. and M. Pagano (2015): *Bank Bias in Europe: Effects on Systemic Risk and Growth,* ECB Working Paper 1797 (forthcoming in Economic Policy).

Law, S. H. and N. Singh (2013): *Does too much finance harm economic growth?* Journal of Banking and Finance 41, pp. 36-44.

Levine, R. (2005): *Finance and Growth: Theory and Evidence*. In: Aghion and Durlauf (eds): Handbook of Economic Growth, North Holland: Elsevier, pp. 865-934.

Levine, R. (1997): *Financial Development and Economic Growth: Views and Agenda*, Journal of Economic Literature 35, pp.688-726.

Levine, R., N. Loayza and T. Beck (2000): F*inancial Intermediation and Growth: Causality and Causes*. Journal of Monetary Economics 46, pp. 31–77.

Levine, R. and S. Zervos (1998): *Stock Markets, Banks, and Economic Growth*, American Economic Review 88, 537–558.

Lucas, R. (1988): *On the Mechanics of Economic Development*. Journal of Monetary Economics 22, pp. 3–42.

International Monetary Fund (2007): D*enmark: Financial Sector Assessment Program - Technical Note - Review of Danish Capital Market*, IMF Country Report No. 07/121, International Monetary Fund, Washington, D.C. Available at: www.imf.org/external/pubs/cat/longres.aspx?sk=20597.0.

McKinsey Global Institute (2013): *Financial Globalization: Retreat or Reset?,* Research Report, March 2013. Available at: www.mckinsey.com/global-themes/employment-and-growth/financial-globalization.

Matthews, K., and J. Thompson (2005): The Economics of Banking. Chichester: John Wiley and Sons.

Marks, K. H., L. E. Robbins, and G. Fernández (2005): *The Handbook of Financing Growth: Strategies and Capital*, Hoboken, NJ: Wiley & Sons.

Miller, M. H. (1998): *Financial markets and economic growth*. Journal of Applied Corporate Finance 11, pp. 8-15.

Modigliani, F. and M. H. Miller (1958): *The Cost of Capital, Corporation Finance and the Theory of Investment*, American Economic Review 48, pp. 261–297.

Myers, S. (2003), Financing of Corporations. In: Constantinides, Harris, and Stulz (eds): Handbook of the Economics of Finance, vol 1(A), North Holland: Elsevier, pp. 215–253.

Organization for Economic Cooperation and Development (OECD) (2016): *OECD Economic Surveys: Denmark*, OECD Economic Surveys May 2016. Available at: www.oecd.org/eco/surveys/economic-survey-denmark.htm.

Pagano, M., S. Langfield, V. Acharya, A. Boot, M. Brunnermeier, C. Buch, M. Hellwig, A. Sapir and I. van den Burg (2014): *Is Europe overbanked?*, Report No.4 of the European Systemic Risk

Board's Advisory Scientific Committee, Frankfurt. Available at: www.esrb.europa.eu/pub/pdf/asc/Reports_ASC_4_1406.pdf.

Panier, F., F. Pérez-González, and P. Villanueva (2013): *Capital structure and taxes: What happens when you (also) subsidize equity?*. Working Paper. Available at: www.bis.org/events/confresearchnetwork1603/perez_gonzalez.pdf.

Parsons, C. and S. Titman (2008): *Capital Structure and Corporate Strategy*. In: Eckbo (ed.), Handbook of Corporate Finance: Empirical Corporate Finance, North Holland: Elsevier, pp. 203–234.

Pennacchi, G. (2012): *Narrow Banking*. Annual Review of Financial Economics 4, pp. 141-159.

Rajan, R. G., and L. Zingales (1998): *Financial Dependence and Growth*. American Economic Review 88, pp. 559–586.

Ram, R. (1999): *Financial development and economic growth: Additional evidence*. Journal of Development Studies 35, pp. 164-174.

Rapp, M.S. and I. Udoieva (2016): *What Matters in the Finance-Growth Nexus of Developed Economies? Evidence from OECD Countries.* SSRN Working Paper. Available at: http://ssrn.com/abstract=2813587.

Rioja, F. and N. Valev (2004a): *Finance and the sources of growth at various stages of economic development*. Economic Inquiry 42, pp. 127–140.

Rioja, F. and N. Valev (2004b): *Does one size fit all? A reexamination of the finance and growth relationship*. Journal of Development Economics 74, pp. 429–447

Robinson, J. (1952): *The Generalization of the General Theory*. In: Robinson (1952), The rate of interest, and other essays, New York and London: Macmillan, pp. 67–142.

Rouseau, P. L. and P. Wachtel (2011): What is happening to the impact of financial deepening on economic growth?. Economic Inquiry 49, pp. 276–288.

Rouseau, P. L. and P. Wachtel (2000): *Equity Markets and Growth: Cross-Country Evidence on Timing and Outcomes, 1980-1995*. Journal of Banking and Finance 24, pp. 1933-57.

Sahay, R., Čihák, M., N'Diaye, P., Barajas, A., Ayala, D., Gao, Y., Kyobe, A., Nguyen, L., Saborowski, C., Svirydzenka, K. and S.R. Yousefi (2015): *Rethinking Financial Deepening: Stability and Growth in Emerging Markets,* IMF Staff Discussion Notes No. 15/08. Available at: www.imf.org/external/pubs/cat/longres.aspx?sk=42868.0.

Schepens, G. (2013): *Taxes and Bank Capital Structure*. Journal of Financial Economics 120, pp. 585–600.

Schokkaert, E. and K. Decancq (2013): *Beyond GDP - Measuring Social Progress in Europe*. Metaforum KU Leuven Paper (April 2013). Available at: www.kuleuven.be/euroforum/viewpic.php?LAN=E&TABLE=DOCS&ID=857.

Schumpeter, J.A. (1934): *The theory of economic development: An inquiry into profits, capital, credit, interest, and the business cycle*. Translated from the German "Theorie der wirtschaftlichen Entwicklung" by Redvers Opie, Harvard Economic Studies 46.

Schweizer, D., J. Proelss and M. Mietzner (2015): *Hidden Champions or Black Sheep? Evidence from German Mini-Bonds*. SSRN Working paper. Available at SSRN: ssrn.com/abstract=2625224.

Shen, C.-H. and C.-C. Lee (2006): *Same Financial Development yet Different Economic Growth—Why?*. Journal of Money, Credit, and Banking 38, pp. 1907-1944.

Smith, A. (1776): *An Inquiry into the Nature and Causes of the Wealth of Nations*. Methuen Publishing Ltd., London (Edition 1904).

Thomsen S. and F. Vinten (2014): *Delistings and the costs of governance: a study of European stock exchanges 1996–2004*. Journal of Management and Governance 18, pp. 793–833.

Valickova, P., T. Havranek, and R. Horvath (2015), *Financial Development and Economic Growth: A Meta-Analysis*. Journal of Economic Surveys 29, pp. 506–526.

Werner, R.A. (2015): *A lost century in economics: Three theories of banking and the conclusive evidence*. International Review of Financial Analysis (forthcoming).

World Economic Forum (2014): *The Role of Financial Services in Society: Towards Responsible Financial Innovation*, Available at: www.weforum.org/reports/role-financial-services-society-towards-responsible-financial-innovation.

World Economic Forum (2013): *The Role of Financial Services in Society: A Multistakeholder Compact*, Available at: www3.weforum.org/docs/WEF_FS_RoleFinancialServicesSociety_Report_2013.pdf.

Wurgler, J. (2000): *Financial markets and the allocation of capital*. Journal of Financial Economics 58, pp. 187-214.

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About the project and the author

This research is part of a broad research project "**Nordic Finance and the Good Society**" initiated by the Center for Corporate Governance at Copenhagen Business School. The project aims to propose a fresh, new look at the Nordic financial sector with a view to finding a way forward towards growth and value creation. The project will focus on business strategies and governance, but will also address policy and regulation issues.

For more details please visit: https://sf.cbs.dk/nfgs_uk.

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