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Where states and markets meet: the financialisation of sovereign debt management

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ABSTRACT

Financial markets play an indispensable role in the management of sovereign debt, that is, the mechanics of how and from whom governments borrow. This paper suggests a novel, two-dimensional concept to measure the financialisation of sovereign debt management (SDM): (1) the reliance on financial markets as a governance mechanism and (2) the adoption of a sense-making framework grounded in financial economics. We split this concept into nine indicators and apply it to data from 23 OECD countries between 1980 and 2010. Our analysis illustrates the predominant commonalities across countries, but at the same time, country-specific differences. We interpret them as two sides of the same coin in the light of an overarching trend of increasing alignment to financial markets. This article is not only one of the first cross-national as well as longitudinal studies of the dynamics in SDM; it also reveals that the relationship between finance and governments in the SDM is by no means one-sided.

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Introduction

At the World Bank's 1989 *Government Borrowers' Forum* in Helsinki, representatives of about 30 countries met officials from Merrill Lynch, Morgan Stanley and Salomon Brothers, who were 'specially invited to present their prescriptions for advanced debt management' (Nars 1997: 5). The three investment banks had already done much work on the topic. For some years, they had been 'fishing for new business by telling their official customers how to move around their existing borrowing sources' and were even 'offering their computer packages free in the hope of winning the business, such as swaps, that they generate' (*The Economist* 1988: 117–18). In the end, they obviously made a big catch; since in the mid-1990s, most sovereign bodies were already using financial market techniques and instruments for managing their continuously rising levels of public debt.

Now, numerous examples from around the globe illustrate the potential consequences of this development. Several governments in Europe, for instance, used derivatives such as interest rate swaps for window-dressing purposes to hide their official debt levels. In the wake of the European Economic and Monetary Union (EMU), Italy and Greece were the most prominent offenders (Piga 2001a, 2001b, Dunbar 2003, Lagna 2016). Another problem when using derivatives is the risk of recording financially harmful losses. This happened, for example, in Australia, where the government was subsequently accused of 'losing billions of […] taxpayer dollars through "gambling"' (Yusuf and Batten 2009: 295) and Belgium, with losses amounting to 44.3 billion francs (van Gerwen and Cassimon 2000).[1] Episodes like these demonstrate 'the entrance of financial markets in the management

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of public debt, extending financial logic to the public sphere' (Marazzi 2011: 120), which is a relevant but still underexplored subject (Munoz Martinez 2016).

Scholars of international and comparative political economy regularly investigate the relationship between financial markets and governments. They often analyse phenomena like deregulation, globalisation, financialisation of the economy, soaring public debt levels, financial repression and crises (e.g. Helleiner 1994, Cohen 1996, Epstein 2005a, Krippner 2011, Boyer 2013, Hardie *et al*. 2013, van Riet 2013, Dyson 2014, Streeck 2014, Reinhart and Sbranica 2015, Rommerskirchen 2015). Contributions then focus either on the ways in which the explosive growth of global financial markets constrains governments (Cerny 1994, Strange 1996, Streeck 2014) or on how public authorities have essentially facilitated the re-emergence of these markets (Helleiner 1994, 1995, Krippner 2011). Our paper, in contrast, illuminates the state–market nexus in the sovereign bond market, 'a most likely locus of financial market influence' (Mosley 2004: 183) on government policies. We do so by examining sovereign debt management (SDM), a phenomenon to which so far 'political scientists have paid scant attention' (Mosley 2015: 158). Understood as *the mechanics of how and from whom* governments borrow money, SDM is not concerned with the actual level of debt, but with the manipulation of its structural composition.[2] This includes both the use of various debt instruments and the techniques of selling them to financial investors. By analysing changes associated with SDM, this article provides a clearer understanding of the state–market nexus in the age of global financial markets. We conceptualise this as part of a larger process to which there have been rather few political economic contributions so far: the *financialisation of the state* (Wang 2015, Lagna 2016).

How did SDM change over the last few decades? Is there a uniform development across countries or do they substantially differ? These are the puzzles which this paper addresses. As *one of the first cross-national as well as longitudinal* studies of this topic (cf. Abbas *et al*. 2014), our objective is foremost conceptual and descriptive. Following Caramani (2010: 43), we assume that empirical, descriptive analysis plays a major role in comparative politics, as it 'allows us to *get dependent variables right*' and 'to *discover phenomena*' (italics in original). We characterise the outcome, suggest a concept including indicators and provide data on a phenomenon which the discipline has not sufficiently identified and captured yet. Future studies on the causes and effects of the financialisation of SDM might draw on our work.

Our study of 23 selected OECD countries from 1980 to 2010[3] reveals a fundamental transformation in the ways governments manage their debt. Following Epstein's (2005a: 3) notion of financialisation as 'the increasing role of financial motives, financial markets, financial actors and financial institutions', we extend this framework to SDM. In contrast to other concepts such as 'marketisation', we argue that referring to 'financialisation' best suits the analysis of the changes in SDM that we uncover. However, to be analytically clearer and more precise, our concept of financialisation of SDM includes two dimensions: (1) the reliance on the market as a governance mechanism and (2) the adoption of a sense-making framework grounded in financial economics. As we will justify in more detail, narrowing Epstein's broad definition equips us to analyse the financialisation of SDM effectively.

The main finding of our study is that the process of financialisation of SDM is characterised by overarching commonalities accompanied by country-specific differences in both dimensions. Although the process fundamentally affects all countries, national specificities continue to exist. Financialised forms of SDM may take different shapes according to country-specific contexts. Drawing on Streeck (2012: 22), this 'highlights the commonalities of [capitalism and] its varying institutional embodiments, or more precisely: the common dynamics that are responsible for the parallel trajectories on which national capitalisms historically move'.

In order to further clarify and underpin our argument this article proceeds as follows: the next section elaborates our understanding of a financialisation of SDM in more detail and illustrates how far it differs from its former non-financialised form. We view SDM as economic activity, because it comprises decisions on how and from whom governments borrow money to finance

their budget deficits. Hence, we analyse its past and present forms along two dimensions: the governance mechanisms used to coordinate this economic activity between different actors (Hollingsworth and Lindberg 1985, Mayntz 2001) and the underlying intellectual frameworks of economic ideas, which enable sense-making and legitimisation (Weick 1995, Weick *et al*. 2005, Fligstein *et al*. 2014). We split these two dimensions into a set of nine indicators[4] for our analysis in sections three and four. Finally, section five points to the contribution of this article to the analysis of the financialisation of the state and the state–market nexus. We conclude that financialisation is a continuing process affecting crucial state areas. Moreover, financial markets effectively *define* but do not *determine* courses of action for SDM.

The financialisation of SDM: a two-dimensional concept

Before we reveal our concept for measuring the change in SDM and argue why it is useful to transfer the term financialisation to this area, we want to emphasise that all governments in our sample have been facing ever-higher debt levels. Figure 1 shows that since the 1980s, there has been an overall trend towards rising indebtedness in our 23 OECD countries. In 30 years, the debt-to-GDP ratio more than doubled from less than 30 to almost 75 per cent. While this alone is not new news, Figure 1 also reports that the share of marketable debt (MD)[5] grew even more strongly. With the exception of a few rather short periods, most notably in the late 1990s, MD has constantly risen in relation to non-marketable liabilities. As a result, its share in total government debt increased from about 70 per cent in 1980 to more than 90 per cent in 2010. Consequently, this figure confirms that political science should not only scrutinise the levels or change rates of public debt, but also show how far governments use market-based modes of refinancing and the related financial markets transactions of debt managers.

When social scientists analyse current trends in the dynamics of financial markets and debt, they very often refer to the term 'financialisation' (van der Zwan 2014). Dealing with this *rise of finance*, most contributions are in line with Epstein's (2005b) previously mentioned concept and centre on three subfields: the economy (e.g. Krippner 2005, 2011), corporations (e.g. Fligstein 1990, Froud *et al*. 2006) and the everyday life of households (e.g. Langley 2008, Fligstein and Goldstein 2015).

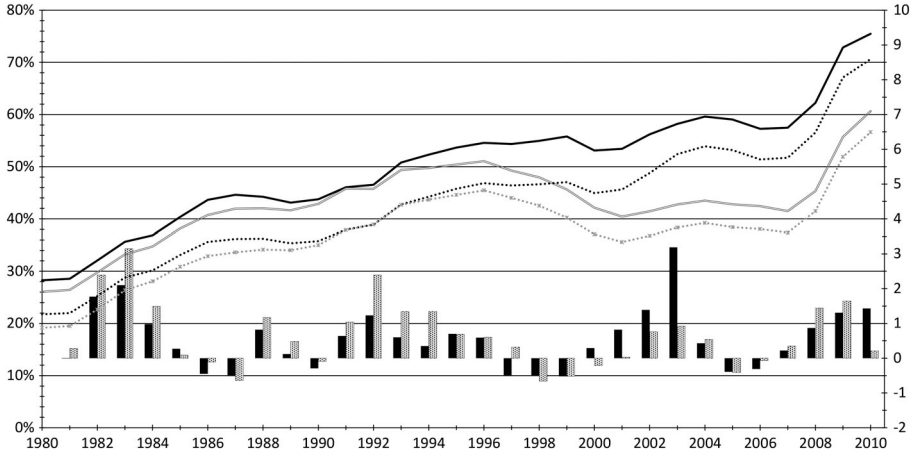

Figure 1. Total central government debt (continuous line) and total marketable debt (dotted line) as a % of GDP (left). Annual growth of marketable debt as a share of total central government debt (bars) in percentage points (right). OECD 23: bold, OECD 22 excluding JAP: light. Sources: own calculations using OECD (2015) and other primary sources (see supplementary file).

Notes: data for all countries from 1980–2010 except CAN, IRL, ESP (1981–2010), FIN, LUX (1990–2010), FRA, NZL (1992–2010), NOR (1982–2010), CH (1986–2010) and UK (1998–2010). Although the picture becomes obscured with Japan out of the equation, the overall trend still holds. While the other countries reduced their debt-to-GDP ratios from 1996–2001 and even in the past relied on MD more strongly, Japan caught up with respect to the latter from 2000–3.

Surprisingly, with few exceptions (Wang 2015, Lagna 2016), explicit analyses of the *financialisation of the state* are still missing (Davis 2009: 177–87, van der Zwan 2014: fn. 13).

Of course, scholars acknowledge that there is a close relationship between financialisation in general and the role of governments in expanding their markets for sovereign debt (e.g. Mosley 2003, Quinn 2010, Hardie 2012,[6] Pacewicz 2013, Streeck 2014). Illustrative episodes are the ongoing Eurozone crises or the Basel II agreement of 1992, which more or less squeezed banks into buying zero-risk weighted sovereign bonds. Nevertheless, how governments become *actively* engaged in private sector style financial market practices to manage their debt is usually left aside (Mosley 2010: 29). In addition, the political science literature on SDM and related topics is still in its infancy (exceptions are Datz 2008, Gabor 2012, Dyson 2014, Trampusch 2015, 2016, Lagna 2016, Livne and Yonay 2016, Munoz Martinez 2016).

This paper contributes to filling these gaps in three ways. First, we extend the concept of financialisation by applying it to the practices involved in SDM. Second, we suggest that the process of financialisation of SDM is reflected in an increasing reliance on financial markets as governance mechanisms and the adoption of a sense-making framework grounded in financial economics. Third, we complement existing analysis by adding a longitudinal and cross-national perspective. Thus, we provide new data and a conceptual application to the debate on financialisation.

The reason for bringing these extensions into the literature on financialisation becomes clear when one inspects the main trends of SDM over the last few decades. Economic and advisory literature on SDM shows that between the 1970s and 1990s, SDM has fundamentally changed in major OECD countries (Carracedo and Dattels 1997: 100–5, Nars 1997, Magnusson 1999, Blommestein 2002, Wheeler 2004, Wolswijk and de Haan 2005: 6–8, Storkey 2006, Andabaka Badurina and Svaljek 2012: 77). Table 1 displays the main characteristics of past and present SDM. While the former can be described as non-financialised since it was less dependent on financial markets, their actors and logics, the latter clearly features many aspects of a growing alignment of SDM practices with financial markets. For better analytical understanding and conceptual clarity, we suggest

Table 1. Characteristics of financialised and non-financialised SDM.

Characteristics	Non-financialised SDM	Financialised SDM
Governance mechanism	Non-market (*hierarchical, network*)	Financial market (*competitive*)
	• Interest rates on bonds were politically controlled and determined; captive sources of financing; debt monetisation • Financing decisions based on short-term expediency within a highly regulated domestic environment • Predominantly loans and long-term relationship financing	• Predominantly marketable debt instruments sold to privileged primary dealers *(Indicators: MD, PDS)* • Interest rates on bonds are market-determined by auctions, thus subject to supply and demand *(Indicator: Auctions)* • Sovereign refinancing as a tool to develop financial markets and broaden the investor base in a globally deregulated and competitive environment. *(Indicators: MDNR, MDFC, ILBs)*
Sense-making framework	Macroeconomics → *passive administration*	Financial economics → *active management*
	• Operational responsibility in the hands of central banks and civil servants inside Departments of Finance or Treasuries • Limited toolkit of instruments at use • Traditional public sector form of cash-based accounting	• Operational responsibility in the hands of specific and separate agencies (DMOs). *(Indicator: DMOs)* • Use of complex financial innovations like derivatives, which allow for separating issuance from portfolio decisions. *(Indicator: Swaps)* • Modern private sector form of accruals accounting. *(Indicator: Accruals Accounting)*

Source: own compilation based on the literature quoted in the main text.

discussing both forms of SDM according to the predominantly adopted governance mechanisms and the respective underlying sense-making frameworks, a point that will we now develop in detail.

Following the common conception of governance in the comparative political economy literature, economic activities can be coordinated through various governance mechanisms: state or firm hierarchies, networks, associations or market transactions (Hollingsworth and Lindberg 1985, Hollingsworth and Boyer 1997, Mayntz 2001, Lütz 2003). In the past, two of them mainly played an important role in SDM. On the one hand, hierarchical governance describes non-financialised SDM best, since non-market, state-centred coordination was its crucial feature. Highly controlled sovereign bond markets, with investors 'captured' by investment regulations, formed the (mostly) domestic environment in which financing decisions were based on short-term expediency. Another significant aspect of this was the use of debt monetisation (inflation) for deficit financing until the 1970s.

On the other hand, there were also certain aspects of networks, because bank loans and long-term-oriented relationship financing were dominant features of SDM (Panizza *et al*. 2009: 655–6, Abbas *et al*. 2014). Thus, sovereign borrowers accessed capital markets with the help of banks, which functioned as their underwriters and whose reputation and 'brand' granted 'market access on favourable terms' (Flandreau and Flores 2009: 647).

In contrast, when describing present, financialised SDM, it is indispensable to speak of competitive (financial) market-based forms of governance. They take place in a globally deregulated environment and largely follow the logic of supply and demand. While in the past interest rates on bonds were politically determined, they are now subject to market fluctuations because debt instruments are issued at auctions with competitive bidding.[7] Furthermore, the role of MD has been strengthened to deepen and widen financial markets. In order to measure this change towards financial market-based governance of SDM, we use the following six indicators: the share of MD, marketable debt held by non-residents (MDNR) and marketable debt in foreign currency (MDFC), as well as the introduction of auctions, primary dealer systems (PDSs) and index-linked bonds (ILBs).

The second analytical dimension is about divergent underlying sense-making frameworks of SDM. Before developing this at length, we would like to emphasise why it seems crucial to us to include it in our concept. As Livne and Yonay (2016), for example, have elaborated for the Israeli case (GDMU), specific economic ideas and mathematical models based on these ideas effectively pre-shape discussions about debt management decisions. This is part of the larger argument about the influence of economists on policy-making in general (Hall 1989, Fourcade 2006, 2009) and financial ideas in particular (Blyth 2003). Referring to Karl Weick's (1995) insights from organisational sociology and psychology when analysing decisions of the US Fed, Fligstein *et al.* (2014: 9–18) note that it is crucial to reflect different ways of sense-making. This means that within (economic or financial) organisations, evaluating different courses of action, and ultimately taking a decision, is always structured by pre-existing frameworks that represent a specific view of how the economy works (Fligstein *et al*. 2014: 11). Therefore, sense-making frameworks and governance mechanisms are interwoven (Weber and Glynn 2006). Relating this to our case, we argue that non-financialised SDM relied on the intellectual foundation of classic macroeconomics (Pecchi and Piga 1995, Giovannini 1997: 44). Starting in the 1960s, SDM included macroeconomic goals and was a tool for stabilising the economy. This clearly distinguished it from private sector debt management (Wolswijk and de Haan 2005: 6–8). Debt management was viewed as an 'extension of monetary policy' (Currie *et al*. 2003: 11), which implies that macroeconomists inter alia 'assigned debt management the important role of stabilizing aggregate demand' (Pecchi and Piga 1995: 30). This becomes clearer when one takes into account the fact that in the past, operational responsibility for SDM was in the hands of central bankers and civil servants inside treasuries or ministries of finance. Administrative tasks were performed with a limited toolkit of debt instruments at hand, while bureaucrats at the same time used traditional public forms of cash-based accounting. Next to the emphasis on the macroeconomic impact of borrowing decisions, debt managers acted rather passively, since SDM was restricted to 'keeping books and records on borrowing transactions and the repayment of debt' (Andabaka Badurina and Svaljek 2012: 76).

In contrast, financialised SDM takes monetary policy as given (Abbas *et al*. 2014: 4, fn. 3) and is informed by financial economics as its intellectual foundation (Nars 1997). The fact that sovereigns have started to make sense of their debt as a 'portfolio' instead of focusing on individual loans (Caplen 1995) mirrors the crucial shift in the underlying frameworks towards financial economics. This perspective implies that debt managers are focusing on optimisation calculations based on cost–risk trade-offs. Standard portfolio theory (Markowitz 1952) provides instructions for the best possible combination of investment alternatives in order to optimise the investor's portfolio. An optimal portfolio minimises risks while maintaining or increasing the expected return. This main tenet of portfolio theory has been adopted by state executives (Abbas *et al*. 2014: 4) – only in reverse. They now aim at minimising debt service costs resulting from a portfolio of liabilities, just as a private 'asset manager would seek to add return to his portfolio' (Lee 1996). Hence, a greater significance and consideration of risks in the daily debt management operations has accompanied the shift in frameworks (Magnusson 1999, OECD 2005, Holler 2013). While conducting our research, we have found numerous instances of evidence justifying sense-making as a conceptual dimension. A notable example is the former CEO of the German *Finanzagentur*, who explicitly speaks of the importance of Markowitz' (1952) portfolio theory and its modern versions for day-to-day debt management practices (Daube 2009). Thus, in general, we regard this change in sense-making frameworks as a fundamental 'shift in thinking (…) which redefined debt management in important ways' (Currie *et al*. 2003: 15).

This implies, first, that nowadays, in most OECD countries, SDM is the operational responsibility of special debt management offices (DMOs), which primarily employ well-paid professional portfolio managers coming from private investment banks (e.g. Currie *et al*. 2003). Because DMOs compete with private financial institutions in hiring these experts, they also reformed their salary scales. On the one hand, these personnel are recruited based on experience in private financial sector firms but also with regard to their skills in risk and portfolio management, including the corresponding mathematical models such as Monte Carlo simulations. The German *Finanzagentur* (2002), for instance, has set up a team of trained financial economists, mathematicians and physicists to execute portfolio management and financial engineering.[8] On the other hand, the newly hired staff also contributes to the establishment of a specific culture. For the UK for example, Davies (2005: 234), at that time senior official at the UK DMO, notes that 'the most important aspect is that a strong risk management culture pervades the organization at all levels'. This perception of risk is typically associated with classic portfolio theory. To detect the risk structure inscribed in the debt portfolio, the introduction of accruals accounting brings a market-based view to public balance sheets (Newberry 2015). Accounting, including its various historical forms, is a generally important aspect of sense-making, since it functions as a 'cognitive device' (Carruthers and Espeland 1991: 55). Moreover, Quinn (2016: 7) even regards it as one of the 'building blocks of understanding'. Speaking of financial economics, the application of portfolio theory to debt management then advises debt managers to diversify risks by issuing various types of securities and using mathematics in financial risk management. As a result, each country now possesses its own characteristic debt portfolio, put together and constantly manipulated in the light of the cost–risk trade-off. In other words, 'debt managers have increasingly become risk managers as well' (Bröker 1993: 12). This allows them to play with interest rates and currency rate risks. They do so by using various forms of derivatives. In this regard, together with the aforementioned introduction of accruals accounting, 'sense-making frameworks (…) reflect beliefs about what is, and beliefs about what ought to be' (Starbuck and Milliken 1988: 51). Formerly, stricter international capital controls and less developed financial instruments had blocked this option. We operationalise the shift to financial economics in the sense-making framework with the following three indicators: the use of derivatives, the introduction of accruals accounting and the establishment of professional DMOs.

After having synthesised the main features of financialised SDM, the following two sections present our empirical analysis. Therefore, we start with the governance mechanisms before dealing with the sense-making frameworks. By connecting our indicators to the empirical material,

we highlight the commonalities of financialisation while also pointing to country-specific trajectories as differences within this trend. We rely on metric and non-metric (timing) data provided by international organisations like the OECD, the IMF and the World Bank, as well as academic research on this topic.[9] Although conceptual considerations guide our choice of indicators, the scarcity of useful cross-national data at the same time constrains it.

Governance mechanisms of SDM: from states to financial markets

The first six indicators that we present refer to the governance of SDM. Regarding the timing of reforms, we analyse the years of introduction of auctions, PDSs and ILBs. Concerning metrics, we look at MD in general, as well as the share held by non-residents (MDNR) and issued in foreign currencies (MDFC).

Figure 2 depicts the *share of marketable debt* (MD). Its volume measures the degree to which debt managers are able 'to maintain the marketability of the government's debt instruments [which …] thereby ensures continued and broader access to financial markets' (OECD 1982: 12). It also suggests that liquid secondary markets, on which bonds are sold and traded,[10] are increasingly significant. Therefore, the share of MD is a proxy for the level of securitisation of sovereign debt. Furthermore, 'to the extent financial markets are seen to have a comparative advantage in diversifying risk, the cost–risk trade-off also implies that sovereign debt managers will typically prefer to issue marketable debt' (Abbas *et al*. 2014: 4). Thus, the higher the share of MD, the more debt managers use the market mechanism to borrow and the more financialised the SDM becomes. The numbers in Figure 2 reveal a clear increase in the MD share across our sample of 23 OECD countries. First, after a brief initial decline in the very beginning, the median rose by more than one-third from 65 per cent to 90 per cent in the period 1981–2010. Second, as the scatter plot shows, this trend has even affected countries that were initially reluctant to issue MD. Whereas in the early 1980s, Denmark, the USA or Austria already relied (almost) exclusively on MD, countries like Germany and Spain were at the bottom of the distribution

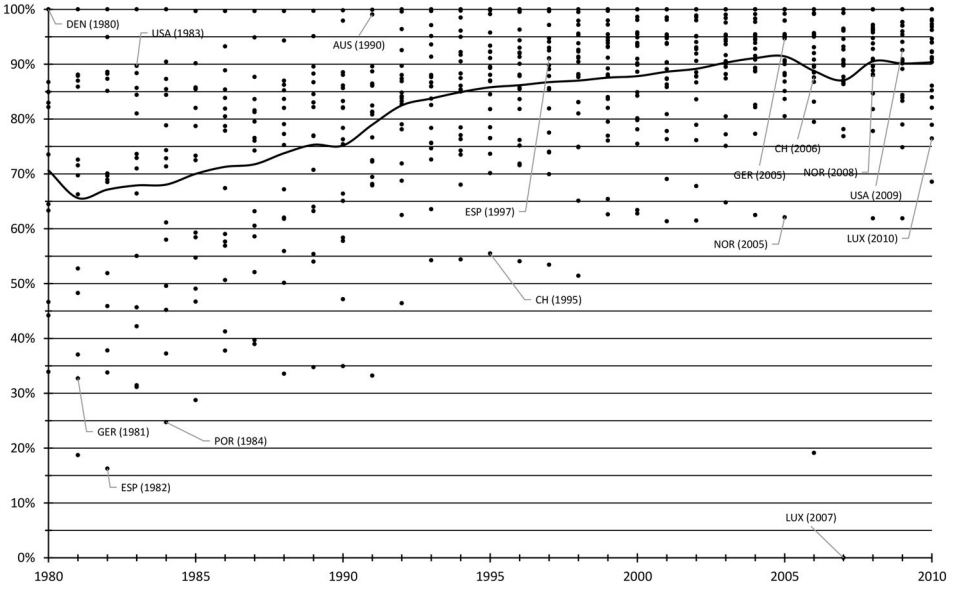

Figure 2. Marketable debt in % total outstanding central government debt, 1980–2010. Sources: own calculations according OECD (2015) and other primary sources (see supplementary file). Black line: median.

Note: Data for all countries from 1980–2010 except CAN, IRL, ESP (1981–2010), FIN, LUX (1990–2010), FRA, NZL (1992–2010), NOR (1982–2010), CH (1986–2010) and UK (1998–2010).

list with values of 33 and 16 per cent. However, from the late 1990s, both have been constantly recording averages above 94 and 91 per cent.

Despite supporting our claim of substituting hierarchies and networks with (financial) markets as governance mechanism, data on the share of MD also present some evidence for the unequal manner of this process. Since there are still differences in the degree to which debt managers use MD, as the examples of Norway (63 per cent in 2005) or Luxembourg (76 per cent in 2010) show, we can argue that this aspect of financialisation unfolds on country-specific trajectories.

Our next two indicators of the governance dimension of the financialisation of SDM build on what we have argued so far. By seizing the opportunity of appealing to non-resident buyers, debt managers can take part in international capital markets. The *share of marketable debt held by non-residents* (MDNR) covers exactly that and represents a tendency which has gained further momentum in some countries after the effective abolition of exchange rate risks by the EMU (Wolswijk and de Haan 2005: 17–18). Consequently, a higher proportion of MDNR signals a shift towards a financial market governance mechanism in SDM. Turning to our data, Figure 3 *clearly* displays an increasing trend throughout almost all our countries. In the 30 years that we cover, the median value has quadrupled, reaching 45 per cent in 2010. In the early 1980s, Iceland was the only country with more non-resident than resident debt. At the end of the period, however, Finland, France and Austria lead our sample. Many countries now issue nearly half of their liabilities to non-residential investors; Portugal is a prime example connecting this to financialisation (Rodrigues *et al*. 2016: 15–18). With a share of about 20 per cent MDNR, Canada and Norway lie at the other end of the spectrum. There are also countries which almost exclusively issue debt domestically. An example is Luxembourg, the only reporting country with zero per cent MDNR throughout. Japan also falls in this category. Because of its model of domestic pension fund capitalism with large institutional investors (Tokuoka 2010, Andritzky 2012), Japanese debt managers do not need to turn to international capital markets or do so very carefully, taking a share of about only five per cent.[11] Finally, there are also countries which have actually reduced their share of MDNR (e.g. New Zealand from 53 per cent in 1995 to

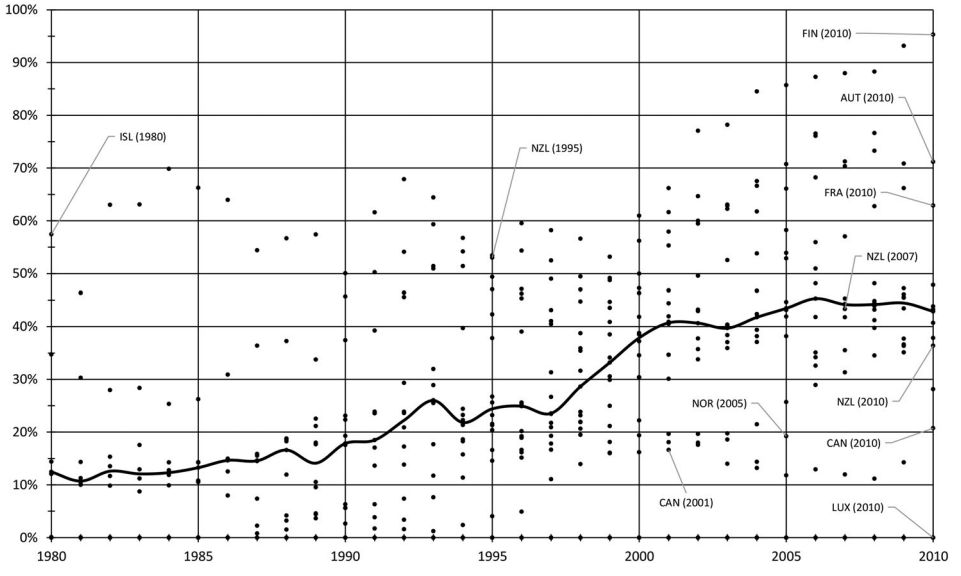

Figure 3. Marketable debt held by non-residents in % of total central government debt, 1980–2010. Sources: own calculation based on OECD (2015) and other primary sources (see supplementary file). Black line: median.

Notes: Data for all countries from 1980–2010, except: CAN (1981–2010), FIN (1990–2010), FRA (1987–2010), IRE (1995–2010), ITA (1988–2010), NED (1985–2001), NZL (1992–2010), NOR (1989–2010), SWE (1995–2010) and UK (1996–2010). No data for: AUS, BEL, GER, GRE, JAP and CH.

36 per cent in 2010). Overall, this confirms our claim that financialised SDM is common to developed capitalist economies, while at the same time unfolding unequally and on country-specific trajectories.

Marketable debt issued in a foreign currency (MDFC) can be another tool to attract a broader range of investors. In the past, this instrument especially enabled countries with limited domestic capital markets and minor currencies, like Ireland or the Scandinavian economies, to attract international investors. Whereas countries with leading currencies like the USA, Switzerland, Germany or the UK either refrained completely from MDFC or started using it relatively recently (Carracedo and Dattels 1997: 112). We would like to stress that foreign currency and non-resident debt are not necessarily mutually exclusive in all cases. There is, for example, also the possibility of issuing domestic currency debt to non-residential investors as well as having resident creditors buy foreign currency debt. The main line of division here runs along the size of the economy. The OECD (2012a: 5), for instance, notes that 'for the larger OECD countries, foreign currency issuance does not appear crucial for attracting non-resident financial investors (…)'. On the other hand, even Germany now issues a *Dollar-Bund* as a reaction to investor demands and this provides a wider choice of instruments (Finanzagentur 2005). The scatter plot in Figure 4 displays the share of MDFC over time and shows a decline in country-specific differences. At its peak in 1985, the median MDFC value was about 11 per cent, whereas nowadays it is close to zero. As illustrated below, prime examples of this fall in MDFC are Portugal, Finland and Ireland. However, not all countries have reduced their share equally: marketable foreign currency debt still makes up 20 per cent in Denmark and Sweden. With Germany and the Netherlands going against the tide, there are even some contemporary 'outliers'. Both countries have started issuing MDFC quite recently, although still at very low levels of three and one per cent.

Two major causal factors have seemingly fuelled this development: first, a steep decline in MDFC occurred in the wake of the EMU. The introduction of the euro as a common currency has fundamentally reduced national exchange rate risks while simultaneously widening the investor base (Favero *et al*. 2000: 4). At the same time, the euro itself has contributed to further financialisation in general (Rossi 2013). Second, an increase in the use of derivative financial instruments not only gave

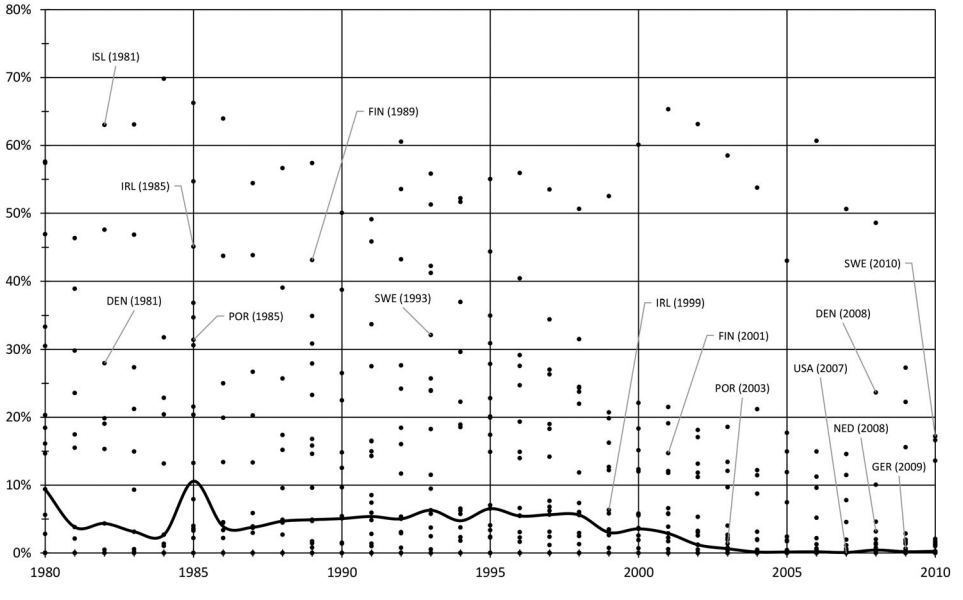

Figure 4. Marketable debt in foreign currency in % of total central government debt, 1980–2010. Sources: own calculation based on OECD (2015) and other primary sources (see supplementary file). Black line: median.

Note: Data for all countries from 1980–2010, except: FIN (1980, 1985, 1989–2010), FRA (1980, 1985, 1989, 1991–8, 2002–10), GER (1980, 1985, 1989, 1991, 1993–2010), GRE (1980, 1985, 1989, 1991, 1993, 1995, 2006–10), IRL (1980, 1985, 1989, 1991, 1993, 1995–2006), JAP (1980–2009), LUX (1990–2010), NZL (1992–2010), NOR (1981–2010), POR (1980, 1985, 1989, 1991, 1993, 1995, 2000–10), ESP (1980, 1985, 1989–2010) and CH (1986–2010).

sovereign debt managers the potential to hedge existing risks, but also made MDFC numbers disappear from the balance sheets. We will come back to this again in more detail when discussing the use of derivatives. In sum, our findings overall reflect a development of MDFC in the direction of financialised SDM. While these factors, which seemingly account for general decline of foreign currency debt at first sight – the EMU and the use of swaps – both express financialisation on their own, cross-national variation in MDFC signifies country-specific trajectories embedded in a general trend towards a financialised SDM as a commonality.

Three other important indicators which measure the change in the governance mechanism towards a financialised SDM are the *introduction of auctions*, *PDSs* and *ILBs*. For these indicators, we were able to collect the years of their introduction. The first two measure in more detail the institutionalisation of primary and secondary markets, and hence the shift from relationship financing to market-based techniques in the issuance of debt instruments (World Bank and IMF 2001, Andabaka Badurina and Svaljek 2012: 76).[12] *Auctions* mean that prices of government securities are determined through arm's length, competitive bidding by (international) investors. According to Bröker (1993: 17), the use of auction techniques is 'perhaps the most typical indication of market governance in public debt management'. Complementarily, the introduction of a PDS indicates the establishment of a communication and selling mechanism. It ensures continuous orientation towards investor demands (e.g. Arnone and Iden 2003, AFME 2015) because a fixed number of global investment banks 'are appointed by sovereign issuers to buy, promote and distribute sovereign bonds' (AFME 2015: x).[13] They are the debt managers' advisors on issuing matters as well as their eyes and ears in the market and are 'entrusted to distribute debt and promote secondary market liquidity' (Gabor 2012: 6). In return, they have privileged access to government bonds including 'fairly generous selling commissions' (Kalderen 1997: 86). Another specific aspect of this investor orientation – and thus financial market governance – is the *introduction of ILBs*. This indicator captures whether debt managers wish to attract and meet a growing demand from institutional investors (Lemoine 2013) and broaden their investor base. These instruments usually link the interest paid by sovereigns to the domestic inflation rate. Hence, they particularly hedge the long-term interests of pension funds or insurance companies.

Figure 5 illustrates the cumulative proportion of adopters, where we record the timing of the introduction of these three indicators. Over time, we see an impressive and clear trend of commonalities in the financialisation of SDM. Whereas in 1980 only five countries were already using auctions with PDS

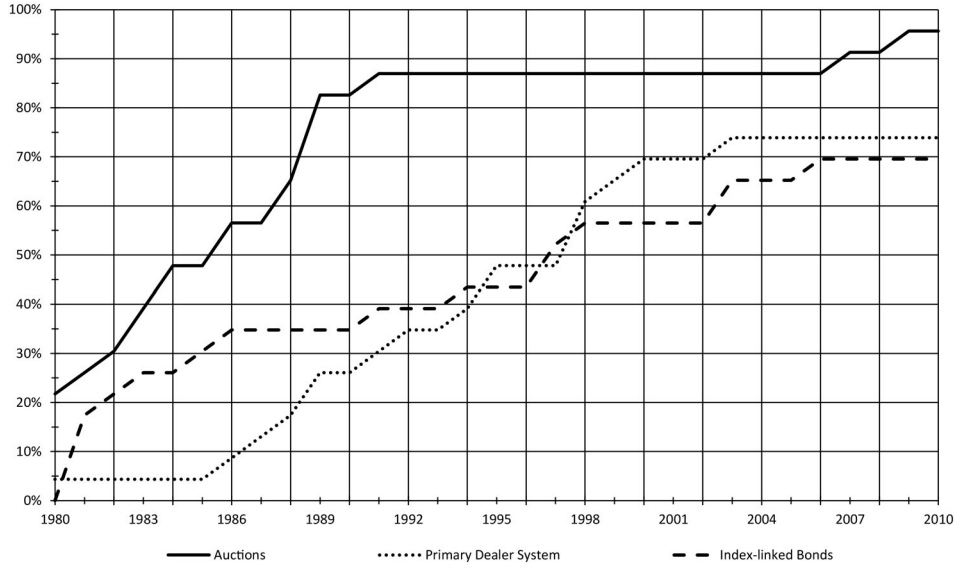

Figure 5. Auctions, primary dealer systems and index-linked bonds as cumulative proportion of adopters, 1980–2010. Source: own compilation according to various primary sources (see supplementary file).

and ILBs almost non-existent, by 2010, the picture has been reversed: 16 countries were issuing ILBs, 17 had set up a PDS and all but one made use of auctions. As the progress of each curve shows, financialisation of SDM unfolds at a steady pace. In the early 1980s, a few 'innovative' governments paved the way for others to follow. Although the number of countries using auctions has changed only little since the early 1990s, the establishment of PDS and the introduction of ILBs unfolded more gradually over the entire 30-year period. In the end, however, what had once been non-financialised SDM with hierarchical and network governance, ultimately transformed into financialised SDM based on financial markets as governance mechanism.

As with the previous indicators, it is important to stress that this trend of commonalities does not imply a levelling out of differences. For instance, countries still vary to some degree in the specific mechanics of how they operate either single-price or multiple-price auctions (Bröker 1993: 97, OECD 2012b). At a single-price auction (also uniform-price or Dutch auction), 'all bonds are sold at the same lowest accepted price', but at a multiple-price auction, 'bonds are sold at the actual bid price of successful bidders' (OECD 2012b: 64). Furthermore, differences exist not only in the timing of the introduction of a PDS, but also in its design. Most significantly, the number of primary dealers included and the supervision of a PDS reflect these differences (Arnone and Iden 2003: 22).

Moreover, speaking of country-specific trajectories, this also holds true for the extent to which debt managers actually use ILBs. Some countries such as the UK, Sweden, France and the USA have increasingly expanded their ILB use over the years. Yet, other countries do not issue ILBs at all, either because inflation pressure is low, as in Switzerland, or because debt managers prefer other variable-rate instruments like those available in Austria, Belgium and Portugal (Missale 1999: 63–6) (see supplementary file Tables 11 and 12). ILBs differ not only in the extent to which they are used, but also with regard to their underlying index. In addition to the Consumer Price Index, other 'inflation indices (such as wholesale prices, average earnings and the GDP deflator) have been used' (Deacon *et al*. 2004: 6). Although ILBs are a debt instrument of generally increasing importance, there are still noticeable differences underlying country-specific trajectories.

Completing this first part of our empirical analysis, we conclude that there is ample evidence underpinning our argument for a shift from hierarchies and networks towards financial markets as a governance mechanism of SDM. In line with our concept, we interpret this as the first aspect of the financialisation of SDM, shared by all countries in our sample, but with different country-specific trajectories. In the following, second, empirical section, we now examine the underlying sense-making frameworks.

Sense-making frameworks of SDM: from macroeconomics to financial economics

Our three final indicators – the introduction of *accruals accounting,* the establishment of *DMOs* and the use of *derivatives* – grasp the shift from macro- to financial economics sense-making frameworks of SDM. In this regard, it is especially important to note that since the late 1980s, these frameworks, which shape how debt managers view the role of SDM in the economy and thus guide their day-to-day behaviour, have increasingly been grounded in the principles of portfolio theory (Bröker 1993, Nars 1997). It follows from this that a financialised SDM narrowly aims at minimising long-term borrowing costs at an acceptable level of risk (IMF and World Bank 2001, Hubig and Blommestein 2013: 21). In other words, 'government debt managers increasingly combine cost considerations with related risk considerations in the well-known trade-off fashion which has been developed by modern portfolio theory' (Bröker 1993: 40). This refers to the assumption that decreasing potential costs go along with increasing risks. In particular, there is a trade-off between reducing either borrowing costs or rollover risk.[14] Together, these three indicators describe a fundamental change: in a *portfolio theory way*, debt managers now treat the composition of sovereign liabilities as a debt portfolio similar to the asset and liability structure of a finance company.

Thereby, the *introduction of accruals accounting* captures the attempt to reveal the total cost and risk structure inscribed in sovereign debt portfolios. This signals transparency vis-à-vis financial investors and helps debt managers to 'take adequate borrowing and restructuring decisions' (Bröker 1993: 154). Thus, the introduction of accruals accounting reflects an important aspect of the shift in the sense-making framework towards financial economics: the perceived necessity to adjust the data basis and its representation for decision-making. According to Taylor and Crocker (1981, cited Starbuck and Milliken 1988: 51), frameworks 'categorize data, assign likelihoods to data, hide data, and fill in missing data'. In contrast to its traditionally administrative cash-based form, accruals accounting introduces a market-based view of finance to the public sector that resembles a corporate balance sheet (Newberry 2015). In an OECD publication, Günther Bröker (1993: 154) highlights this similarity and notes that the only remaining difference is that 'during a particular reporting period, a government debt manager would count as "total costs" of the government debt or of individual debt instruments what a portfolio manager would count as "total return" on his portfolio'. As Figure 6 depicts, the introduction of accruals accounting marks a relatively new phenomenon. Beginning in the late 1980s and early 1990s with only a few pioneering countries like Spain (1986), New Zealand (1989), USA (1990) or Belgium (1991), it then accelerated at the end of the Millennium. Eventually, by the end of our reporting period, 70 per cent of the countries had introduced it. Zooming in on this commonality, one also finds nuanced differences in accruals accounting. As the IMF study by Khan and Mayes (2009: 2) shows, some countries execute on 'full accrual basis' that is in line with international accounting standards (e.g. Australia, Canada or France), while others combine cash and accruals accounting (e.g. Finland, Ireland or Sweden).

The degree of SDM financialisation also depends very much on the existence of separate DMOs. The establishment of DMOs is an important reform. They very often hire investment bankers or hedge fund managers. Thus, DMOs reflect another aspect of shifting sense-making frameworks towards financial economics. DMOs are responsible for most of the tasks described above and generally follow the organisational structure of a private sector financial institution having separate front, middle and back offices, each with distinct functions (Hubig 2013: 4, IMF and World Bank 2014: 21). Performing according to pre-defined benchmarks, they are equipped with financial sector personnel and technology. With the establishment of DMOs, since the late 1980s,

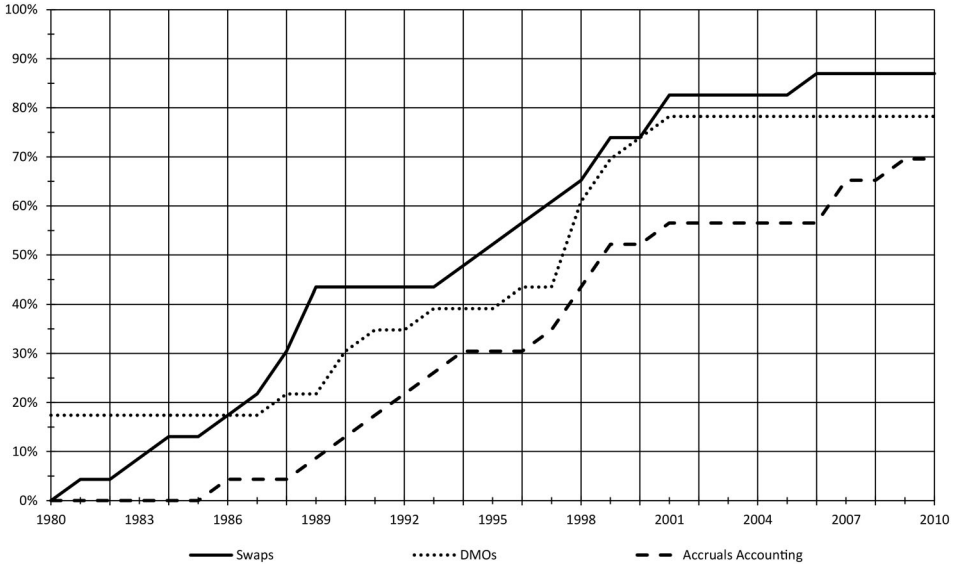

Figure 6. Swaps, debt management offices and accruals accounting as cumulative proportion of adopters, 1980–2010. Source: own compilation according to various primary sources (see supplementary file).

governments have increasingly replaced passive issuance with portfolio management practices similar to those found in the private sector (Currie *et al*. 2003). An illustrative case is the Swedish DMO. In addition to hiring financial sector staff, the *Riksgälden* even hires external portfolio managers and uses the *SimCorp Dimension* software package that was especially designed for private investment funds and asset managers (Jönsson 2005: 227). It is important to note that with the application of such computer programmes, the respective forms of sense-making based on financial economics are transferred to these public DMOs since the respective models effectively pre-shape what can be perceived, detected and handled as inherent risk (Grimpe 2012). Apart from the USA, which had already introduced a separate public debt entity in 1940, the forerunners regarding DMOs were Switzerland (1979), New Zealand (1988), Sweden (1989), Iceland (1990), Ireland (1990) and Denmark (1991). Another significant wave, during which many European countries followed suit, marked the period before the introduction of the euro. After that, the curve has remained flat, so that now, 18 of our 23 countries have a DMO (Figure 6). Although, the introduction of separate DMOs is a common trend in the sample, there exist different organisational settings with correspondingly different degrees of independence from political interference (e.g. Cassard and Folkerts-Landau 1997: 23–36, Currie *et al*. 2003, Gross and Hoshmand 2015, Trampusch 2015, 2016). One can distinguish three different locations for a DMO: inside or outside the Ministry of Finance (with New Zealand and the UK for the former and Germany and Ireland for the latter) or within the Central Bank (e.g. Denmark).

Our final aspect of the shift in frameworks of SDM towards financial economics is the *use of financial derivatives*. In contrast to the various debt instruments dealt with in the previous section, derivatives are risk management instruments. This becomes clear when one sketches the entire debt management process along its timeline. Before using derivatives, the organisational structure (staff, software, etc.) has to be set up. Also, the debt portfolio itself has to exist and to be perceived as such. This means that both its composition of different instruments (foreign currency, long-term or short-term debt, etc.) and the notion of having a portfolio to hand which now has to be risk-managed must be given. Especially for the latter, the shift in frameworks is crucial. Accordingly, we argue that tracking the use of derivatives for debt management allows us to conclude that sense-making is now based on financial economics. In the case of SDM, derivatives usually encompass interest rate and cross-currency swaps. This is of crucial importance because it captures the fine-grained fundamentals of portfolio theory. Derivatives can be seen as useful tools for achieving two goals: lowering borrowing costs and optimising risk structure (Finanzagentur 2002, OECD 2002, 2011). By using swaps, debt managers seek to 'reduce the size of liabilities and to increase the value of the portfolio' (Delduque 2000: 12). Inscribed in this very principle, there is always the opportunity of trying to take advantage of small differences in prices (Medeiros *et al*. 2007: 3). By doing so, debt managers might then turn into traders (Grimpe 2012).

Despite the hedging function of derivatives, one cannot exclude the potentially speculative and opportunistic behaviour that goes along with them. The few studies of government swap deals so far strikingly indicate their misuse, for example, for window-dressing purposes (Piga 2001a, Irwin 2012, Lagna 2016). Even international advisers like the IMF view this as a twilight zone and legal limbo (Medeiros *et al*. 2007: 42). Although we have traced the year when governments permitted the use of derivatives for SDM, exact numbers for the extent to which debt managers have actually used this risk(y) instrument are not accessible, because most sovereigns treat the conditions, contents and results of swaps deals as highly confidential (Piga 2001a, Irwin 2012, Munoz Martinez 2016). Trailblazers in the use of swaps are Austria (1981), Denmark (1983), Canada (1984), Finland (1987), Australia (1988), Belgium (1989) and New Zealand (1989). In the 1990s, most other countries followed suit and now almost 90 per cent of them have entered derivatives markets (Figure 6). Thus, we can speak of another crucial commonality in the process of financialisation of SDM in our sample. However, looking at individual countries or country groups also reveals differences, both in the types of swaps they use and the extent to which they do so. The former depends very much on a country's monetary position. Cross-currency swaps are important for countries with weak currencies

such as New Zealand or Sweden. Before the introduction of the euro, this was also true for other Nordic economies, most of the South, Ireland and Belgium (Missale 1999: 57–8, Wheeler 2004: 33). Still, this does not mean that these countries now refrain from using swaps but they use them differently, since the euro itself contributed to further financialisation, as already pointed out. Examples like Finland, where the advent of the euro 'allowed for an increase in the use of derivative instruments' (Republic of Finland State Treasury 2013: 47), and Ireland, where the national debt management agency (NTMA) decided to hedge all foreign currency debt in euros from 1999 onwards (NTMA 1993–2011), underline this fact. Differences in the extent of swap use mainly depend on existing legal limitations, as a 2002 OECD report has noted for Finland, Germany, Italy and Spain. Furthermore, the degree of risk taking is different among countries. More aggressive DMOs, like the Swedish *Riksgälden* or the German *Finanzagentur*, also use tactical swaps, which are supposed to save additional costs in the short to medium term.

Summing up, we argue that countries have become more alike. Despite existing country-specific differences, they are all subject to common trends and benchmarks. This, we argue, runs through our entire empirical analysis. Whether it is regarding a shift from hierarchies and networks to financial markets as governance mechanisms, or concerning the substitution of macroeconomics with financial economics as underlying sense-making frameworks, financialisation is a mega trend affecting all political economies and their SDM. Of course, this does not mean that we rule out distinct trajectories or even stark differences. What we want to stress instead is that one must always reflect them against the common background of financialisation. In the concluding paragraphs of this study, we now discuss the main implications of our results and the future options for research.

Discussion and conclusion

This article has directed the attention of political scientists away from changes in the level or rate of public debt to the study of SDM. We have discussed a phenomenon which, until now, has almost fallen below the radar of debates in international and comparative political economy: the financialisation of SDM. Against this background, our main contribution is conceptual and descriptive. We have mapped a new research field for political science by providing a two-dimensional concept, including indicators and data. With these, we have also shown that the financialisation of SDM exists and how it has spread across a subset of OECD countries. Transferring the term 'financialisation' to the arena of SDM, we defined it via a two-dimensional concept as the increasing reliance on financial markets as governance mechanism and the adoption of sense-making frameworks grounded in financial economics that both define governments' decisions about how and from whom they borrow. The financialisation of SDM suggests the decline of the 'old mode' of SDM, which was very much based on hierarchy (for example, political determination of credit conditions) or networks (for example, long-term relationship financing), and grounded in an intellectual framework stemming from macroeconomics.

The main result is that we discern a double trend of overarching commonalities and country-specific differences in the financialisation of SDM. This trend confirms Streeck's (2012: 22) notion of a common trajectory of national capitalisms, 'as result of their ever closer interaction in capitalist world markets', on the one hand, and their 'differentiation and specialization' because of 'differences in economic, political and ideational power', on the other hand.

Consequently, our analysis also suggests that further studies aiming to detect the determinants of the financialisation of SDM should refer to both an increasing interdependence between capitalist political economies and country-specific trajectories because of domestic conditions. In the analysis of the commonalities that result from growing interaction, it might be of interest that our data on the timing of reforms reveal that the USA is the single innovator, followed by the early adopters Sweden, Finland and New Zealand (see supplementary file: Table 14). Krippner (2005, 2011) confirms this likely role-model function of the USA by showing that in the 1970s, the US government worked to create the world's financial markets, because it was looking for a way to fund its debt. This implies that the

USA was the first country interested in creating a market in sovereign debt. Global investment banks like Baring, Merrill Lynch, J.P. Morgan, Salomon Brothers and UBS then triggered the spread of reform to other countries. Central bankers and debt managers of pioneering countries (USA, Ireland, New Zealand, Sweden or Denmark) and international organisations (IMF, World Bank, OECD and UNCTAD) functioned as major transmitters (Nars 1997: 5, Australian National Audit Office 1999: 47, Wheeler 2000: 154–5, 2004: 22, fn. 4, Currie *et al*. 2003: 16, Gabor 2012: 4–6; Grimpe 2012). This pattern resembles Streeck's (2012: 22) explanation of the financialisation of the economy: '[I]f the United States adopts financialization as its preferred strategy of wealth creation, this redefines the constraints and opportunities for the rest.'

However, national differences are the other side of the coin. Obviously, one should not treat them as merely endogenous to economic conditions like the rise of information and communications technologies and the capital market pressures, which investors and institutional creditors exert on governments (Mosely 2015). Our data point to country-specific trajectories in the use of instruments which are conditioned by domestic political economic institutions and conditions. They include pension schemes (e.g. Japan and non-resident holdings), the size of domestic capital markets (e.g. New Zealand and foreign currency bonds) or socio-economic contexts (e.g. Switzerland with low inflation risk and no ILBs). This signals that key characteristics of a country's debt profile remain contingent to a certain point and that further research should distil the political economic determinants thereof (Hoogduin *et al*. 2010, Breen and McMenamin 2013). These differences may also mirror country-specific interplay between economic, political and ideational power.

Our notion of commonalities and differences happening simultaneously also addresses a broader discussion: Are governments *playing, or played by, the market* (Schelkle and Barta 2014)? Do sovereigns use markets by making choices and do they still have autonomy (e.g. Mosley 2003, 2004, 2010) or do markets use governments (e.g. Strange 1996, Streeck 2014)? With reference to this, our analysis provides evidence that one needs to take into account both arguments. In the financialisation of SDM, politics and states do play a major role. Central bankers and debt managers were reviewing best practices in SDM and cooperating with investment banks to learn more about portfolio theory and its application in practice. The negotiators of the Basel agreement had sufficient knowledge about how to boost the sovereign debt market through banking regulation. Moreover, the share of non-resident debt holders may depend on political factors such as the fractionalisation of political parties (e.g. Hoogduin *et al*. 2010, Mosley 2015: 158). However, it is also accurate to discern a rising influence of international financial markets on governments. This is not only evidenced by global investments banks as major transmitters of the adoption of portfolio theory in SDM or their role as primary dealers of government bonds. Both the global financial crisis and the ongoing sovereign debt crisis in the Eurozone nicely illustrate this. Examples like these support the view that financial markets exert discipline over EMU governments (Streeck 2014, Rommerskirchen 2015). Consequently, in a broader sense, our study indicates that the relationship between finance capital and governments in the SDM is complex, by no means one-sided and in flux.

Our study not only contributes to the debate on the state–market nexus, but also alludes to the literature on the financialisation of the state. Wang (2015) interprets this process as a shift towards the 'shareholding state' as an increasing shareholder and institutional investor in the economy. Our analysis, however, demonstrates that financial markets have also already entered the core domain of modern democracies: public finance and debt. Here, the question arises whether the financialisation of SDM makes democratic borrowing control an intractable problem. Do parliaments, their commissions and supreme audit offices still understand the structure of government debt and the complex financial instruments debt managers use? In particular, the obvious non-transparency of sovereign swap deals may cast doubt on the possibility of adequate democratic control. Similarly, other conflicts may evolve, for example, between the roles of governments as prominent financial market actors and market regulators: *Quis custodiet ipsos custodes?* Dealing with these questions promises further insights into the dynamics and prospects of the tight connection between financial markets and public finance as well as their *democratic control*.

Notes

1. So far, financial markets have punished not only central governments but also local administrations for using derivatives. Notable examples are Orange County, CA, the London borough of Hammersmith and Fulham or the German city of Hagen.
2. Of course, debt levels and fiscal policies play a role as SDM seeks to cut down interest payments on public debt and thus indirectly reduce its level. Still, SDM does not include debt ceilings or other austerity policies.
3. Our sample contains different types of developed capitalist economies and thus is suitable for cross-national, inter-temporal comparison. Selecting 1980–2010 as our period of analysis is due to both data availability and the fact that the early 1980s saw the beginning of the financialisation of the economy. As the OECD currently modifies its database, data end in 2010.
4. One could also include other quantitative and qualitative indicators. However, due to the limited availability of cross-national data, we decided to concentrate on the nine we present in this paper. Other potential indicators are, for example: the introduction of risk-management software, system based on Value-at-Risk, the performance of DMOs against pre-defined benchmarks, the permission to use debt buybacks or Repos, the introduction of a regular issuance calendar or the possibility of stripping, that is, the separate trading of interests and debt titles in secondary markets. Another important aspect of SDM that underwent substantial changes are the maturities of outstanding debt. Although we had initially included them into our analysis, we finally decided to leave them out for two reasons. On the one hand, the data gaps are too large and the most common indicator for measuring maturities, the Macaulay duration, was not available for our country set at all; on the other hand, the correct interpretation of maturity requires enormous case-specific knowledge, for example, how maturities are combined with swap deals which make long-term maturities shorter.
5. While marketable debt instruments include short-term (Treasury bills), medium-term (notes) and long-term securities (bonds), typical non-marketable debt instruments are foreign-currency loans, loans from financial institutions and savings bonds for personal investors (cf. Missale 1999).
6. Hardie (2012) speaks of the financialisation of the sovereign bond market, but he limits his analysis to emerging market economies and leaves out the management of sovereign debt.
7. However, as was nicely demonstrated in the aftermath of the recent financial crisis, central banks still have a certain influence on the interest rates of sovereign bonds.
8. In a survey report about DMOs in OECD countries, McCray (2005: 75) notes that 55 per cent of all DMO staff are involved with middle office functions like portfolio management and risk management policy.
9. We have extracted our metric data – for the indicators marketable debt, marketable debt held by non-residents and marketable debt in foreign currency – mainly from the OECD Central Government Statistics database (2015), the collections of Missale (1999) and Abbas *et al*. (2014), as well as further primary sources such as annual DMO reports or treasury bulletins. For these indicators, we report the annual country values of their share of total outstanding central government debt as well as their medians. However, the available sources did not allow us to trace back the year of their first use (with exception of ILBs). Metric data on the use of ILBs, which we did not include in the main text due to the word constraint, are listed in the supplementary file. Regarding the indicators auctions, primary dealer systems, accruals accounting, DMOs and swaps, it is not possible to measure them metrically, either because of their qualitative nature or due to the lack of availability of data. Therefore, we identify the year of their introduction, which enables us to describe the timing of the reforms across countries. Overall, we have also sent out email inquiries to several national debt managers and central bankers. Nevertheless, despite thorough consultation of the material, there are still notable gaps in the data. In cases of doubt, we sought to obviate these by incorporating only values we were able to cross-reference. Since our data remain partially incomplete, please check the annotations below each figure for details.
10. Market liquidity generally refers to the ability of markets to facilitate quick transactions. This means, for instance, that once an asset is acquired, it can be sold again on short notice.
11. In the cases of Luxembourg and Japan, there is however, a very small share of *non-marketable* debt held by non-residents, which cannot be traded further on the secondary market. To the same extent, Switzerland has lately started to sell some titles to non-residents, although so far only less than 1 per cent.
12. There are roughly three types of selling techniques: Auctions, syndications and issuance on tap.
13. Most prominently, primary dealer systems typically include banks like Barclays, BNP Paribas, Citigroup, Deutsche Bank, J.P. Morgan, HSBC or Morgan Stanley.
14. Rollover risk is refinancing risk that occurs when debt is about to mature. If interest rates develop adversely when rolling over old with new debt, future payments are higher than before.

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