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The Focus of Academic Economics: Before and After the Crisis

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ABSTRACT

Has the global financial crisis of 2007ff had a visible impact on the economics profession? To answer this question we employ a bibliometric approach and compare the content and orientation of economic literature before and after the crisis with reference to two different samples: A large-scale sample consisting of more than 440,000 articles published between 1956 and 2016 and a smaller sample of 400 top-cited papers before and after the crisis. Our results suggest that – unlike the Great Depression of the 1930s – the current financial crisis did not lead to any major theoretical or methodological changes in contemporary economics, although the topic of financial instability received increased attention after the crisis.

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JEL Codes: A14, B20, B26, G01, N00, N01

1. Introduction

The Great Depression of the 1930s represents the major economic breakdown in the 20th century. Thereby, the advent and persistence of the Great Depression not only led to changes in economic policy – most notably the introduction of the *New Deal* in the U.S. –, but also had repercussions on economic thinking and the discipline of economics. In Kuhnian terms, the Great Depression constituted a major anomaly for mainstream economic theory. In the late 1920s and early 1930s economists had difficulty finding a convincing narrative suitable for reconciling their theoretical presumptions with actual economic developments. Since then, many economists have taken the Great Depression as a starting point for departing from more traditional venues in economic thought to explore alternative pathways (e.g. Fisher 1933, Keynes 1936, Minsky 1982). As a result of these developments, novel arguments gained credibility in economics, which led to a partial shift in the paradigmatic foundations of the discipline.

> "In the words of Thomas Kuhn, we may well say that a change of paradigm had occurred: precisely what he has termed a 'scientific revolution'. All the events that took place around Keynes clearly indicate this deep conviction: the conviction of setting a scientific revolution into motion." (Pasinetti 2007, 24)

Similarly, the global financial crisis that erupted as a consequence of the collapse of Lehman Brothers on September 15 in 2008 and had – like the Great Depression – worldwide repercussions, led to a public and academic debate on the credibility and soundness of modern economics in general (Acemoglu 2009, Schneider/Kirchgässner 2009, Carrick-Hagenbarth/Epstein 2012). In the course of its international diffusion, the financial crisis created follow-up problems related to tightened credit-conditions, distressed balance sheets of firms, banks and households and, eventually, bailouts of banks, which increased the constraints on public and private economic actors alike. Also, and again similar to the Great Depression, the financial crisis and its aftermath constitute an on-going challenge or anomaly for contemporary mainstream economics, which, like in the 1930s, encounters obvious difficulties in reconciling economic events with basic theoretical suppositions (e.g. Colander et al. 2009, Krugman 2009, Bertocco 2017). Hence, the financial crisis has not only been discussed as an economic challenge, but also as a symptom of the "failures of the economics profession" (Krugman 2012).

Against this backdrop, the main aim of this paper is to gain a better understanding of the impact of the global financial crisis on the scientific discipline of economics. To answer this question, we employ a bibliometric approach and compare the content and orientation of economic literature before and after the crisis with reference to two different samples: a large-scale sample representing the full spectrum of economic discourse employing data from more than 400 economics journals, and a more selective sample consisting of the 400 top-cited papers before and after the financial crisis. Thereby, we not only analyze what kind of topics and issues the economic literature addresses, but also which sources and foundations are used when doing so.

To operationalize this general research interest for the purpose of our study, we focus on a set of three subquestions to detect changes in economics on different levels. First, we ask for changes in the topical and methodological focus of the economic literature as indicated by the most frequently used terms and phrases in keywords and abstracts. Second, we investigate the composition and origin of dominant outlets, authors and institutions. Third, we analyze the characterization of financial markets, their associated operations and their economic impact in the economics discipline. These questions operate on different levels, with the first and third question aiming for illustrating general developments regarding the content of academic research. The second question, on the other hand, focuses on changes in institutional prominence and impact throughout the discipline.

Within economics, a rich and long-established literature on the role of top-cited papers, journals, authors and departments (Arrow et al. 2011, Chang et al. 2011, Kim et al. 2006, Oswald 2007, Diamond 1989) has recently been complemented by more descriptive accounts on the changing properties of economic literature (e.g. Hamermesh 2013, Card/DellaVigna 2013, Laband 2013, Kosnik 2015, Angrist et al. 2017). The latter contributions mostly inform us of the average number of authors and published papers, changes in paper-length, increasing numbers of references per paper and so forth. Of these papers, Kosnik (2015) and Angrist et al. (2017) also find evidence of conceptual changes, like a stronger focus on microeconomic issues as compared to macroeconomic questions or an increase in the number of empirical papers. Interestingly, and despite the fact that about 8%[4] of references from top articles refer to books (Nederhof et al. 2010), references to books are neglected in most applications. Furthermore, some analyses focus on the impact of existing intellectual hierarchies in economics on major economic journals (Hodgson/Rothman 1999, Fourcade et al. 2015) or the role of social relations and networks for publication prospects (Colussi 2017, Goyal et al. 2006). While most of these papers are rich in data and lessons to be drawn, to our knowledge, no contribution yet has focused on the question whether and how the financial crisis had an impact on the orientation of the economics discourse.

The motivation to address this question rests on the twofold criticism received by economists in the course of the recent financial and economic crisis. First, it has been argued that (neoclassical) economic theory cannot adequately explain the emergence of the crisis, and, consequently, could not predict it (Roubini/Mihm 2010, Leijonhufvud 2014, Wray 2011). Second, some critics maintain that economists' efforts to influence economic policy and business practices have effectively contributed to the crisis. For example, economists argued in favor of deregulating financial markets (Beker 2010, Elster 2009, Kotz 2009) and assisted in introducing formal models for price prediction that fostered herd behavior (Akerlof/Shiller 2009, Ouarda et al. 2013) and control illusion (Colander et al. 2009). In addition, some economists are exposed to conflicts of interests in the course of advising companies that operate in financial markets (Carrick-Hagenbarth/Epstein 2012, Krugman 2009) or by legitimizing risky financial practices in general (Zingales 2014). In light of these criticisms, this paper aims to get a better understanding how economic research has actually responded to the crisis, whether and where it has changed its orientation and how it has rationalized the financial crisis as an extraordinary event. In other words, it suggests using a major event - the financial crisis – to provide a novel perspective on an established subject: the properties and characteristics of the economics literature.

2. Methodology

This study employs a data-mining approach to a large-scale sample consisting of 443,424 articles published between 1956 and 2016. These articles contain 3,496,722 corresponding citations and have been published in 417 different journals, which are listed in the research area 'Economics' as assigned by Clarivate Analytics' *Web of Science*. Accordingly, all data used is taken from *Web of Science*. First, the data is analyzed with the goal of identifying some major topical characteristics of the economic discourse, which serves as a foundation for our discussion of how economists' research interests and activities changed in the aftermath of the crisis. Then, a smaller sample consisting of the 400 top-cited papers before and after the crisis is constructed in order to gain a better understanding of the sources the contemporary research discourse draws on. To use such a smaller-sized sample is to exploit the power-law distribution underlying academic attention (Solla-Price 1965, Newman 2006), as the top-cited 400 papers account for a sizeable share (about one tenth, see below) of total citations. Finally, we analyse the development of references to thirty manually selected and historically influential books on financial and economic crises to provide an

[4] Nederhof et al. (2010) compare the references to books from the 10% most cited articles in political science, economics and psychology between 1997 and 2003. They find that references to books account for about 8% to 8.5% of references.

additional perspective on changes in the interpretation of economic crises.[5] For a comparison of the descriptive properties of both samples studied see Table 1.

The full sample comprises two subsets that cover the pre-crisis period from 2001 to 2006 and the post-crisis period from 2008 to 2013. The pre-crisis subsample includes about 53,000 articles published in 238 journals, and the post-crisis dataset roughly 100,000 articles published in 345 different outlets. In each of these periods, the articles contain 508,274 and 1,176,998 references to 90,562 and 161,071 other articles represented in our full sample, respectively.

For the top-cited sample, the 400 most referenced papers in the pre- and post-crisis period were selected. Due to an equal number of citations at rank 400, the first period covers 406 top-cited articles and the second 405, published in 48 journals respectively. 251 articles and 36 journals are present in both samples. The top-cited articles in the pre-crisis (post-crisis) sample receive about 11.5% (10%) of total citations recorded and, therefore, represent a substantial amount of all citations in the respective time-period. These numbers are well in line with the high concentration of citations in the overall discipline (Glötzl/Aigner 2017).

	Full sample		**Top-cited sample**	
Articles	443,424		560	
Journals	417		60	
Citations[6]	3,464,255		174,043	
Books (selection)	30		-	
References to these books	11,152		-	
	Pre-crisis	**Post-crisis**	**Pre-crisis**	**Post-crisis**
Articles	53,202	98,383	406	405
Journals	238	345	48	48
Cited References	507,641	1,175,510	--	--
References received (in % of total)			58,321 (~11.5%)	115,722 (~10%)
Referenced Articles	90,250	160,382	--	--
Books (selection)	28	30	-	-
References to these books	2,055	4,241	-	-

Table 1: Overview on the analyzed samples

To analyze the conceptual focus in the two periods the shares of articles using a specific keyword are calculated. To ensure consistency, a keyword dataset for the time-period between 1996 and 2016 was compiled, which comprises only those 99 journals that have recorded publications throughout the relevant time-period and provide keywords for at least 10% of their articles (See Table 2). Introducing this limitation proves necessary as only 61.8% of all entries in this time period also include data on keywords. Although this procedure excludes some major economic journals from the sample[7], because their entries do not contain keywords, the final sample still covers 130,834 articles with a total of 458,309 keywords, where 126,913 of these keywords are unique. In the final keyword sample 80.4% of the articles covered contain keywords. On average, an article with keywords has 4.36 keywords. More specifically, the pre-crisis (post-crisis) key-word sample contains 31,501 (45,127) articles and 97,456 (177,194) keywords.

[5] Table A4 in the appendix provides an overview on the 30 selected books. Table A5 provides the same statistics on these books for the top 5 journals in economics (see below). The focus on a limited set of books is motivated by the fact that while WoS contains information about citations to books, this information needs to be coded manually. A similar approach has been taken by Nederhof et al. (2010).

[6] Only considering citations to articles that are included in the dataset. Overall these articles cite ~11.8 million items.

[7] Including the 'Top' economic journals *American Economic Review, Journal of Economic Perspectives, Journal of Economic Literature, Quarterly Journal of Economics* and *Review of Economics and Statistics*.

Furthermore, 74.2% (88.6%) of the articles have keywords with an average of 4.17 (4.43) keywords per article.[8]

Due to the smaller sample size of less than 600 papers in the top-cited sample, the focus rests on key terms and phrases used in the abstracts, instead of analyzing only an article's keywords. This allows us to get a richer picture regarding the topical and conceptual focus of the top-cited papers under study. Similarly, as in the keyword sample, the top-cited papers also suffer from a lack of data availability when it comes to assessing abstracts as well as the geographical and institutional origin of authors. As the sample of top-cited papers is much smaller, we decided to manually complement the respective dimensions to arrive at a full dataset without missing values. In cases where no abstract was available we chose to use either the first paragraph of the article or, if available, the supplied table of contents, which is often found in earlier articles and journals. Following standard practices in textual analysis, stop-words (e.g. "the", "and", "or"), punctuations and apostrophes were removed in order to further improve the quality and homogeneity of the data.[9]

Sample	Articles	Articles with keywords	Keywords	Unique keywords
All articles (1996-2016)	**256,260**	**158,492 (61.8%)**	**701,970**	**182,647**
Keyword sample (1996-2016)	**130,834**	**105,186 (80.4%)**	**458,309**	**126,913**
Pre- & post-crisis sample	**76,628**	**63,349 (82.7%)**	**274,650**	**85,569**
Pre-crisis sample	31,501	23,360 (74.2%)	97,456	38,558
Post-crisis sample	45,127	39,989 (88.6%)	177,194	62,594

Table 2: Detailed overview on samples with all keywords.

To distinguish between the economic discipline as a whole, and research with some topical relation to the financial crisis, we composed a list of 45 finance-related terms[10], which we coded separately[11]. The respective terms have been selected by inspecting a list of the 1000 most-used terms in the abstracts of the top-cited sample and noting all those with a specific financial meaning.

In addition to occurrences of terms in abstracts, and keywords, we also analyse changes in the reception of crisis-related books. In doing so we opted for a deductive approach and manually coded references to important crisis-related books, from which we eventually identified and analysed the top 30 (see also

[8] To ensure consistency the keyword data set was standardized and corrected for differences between British and American spelling with the help of the Spell Checker Oriented Word Lists project. For further information please refer to http://wordlist.aspell.net. Further, the plural 'crises' was recoded to the singular 'crisis', in order to capture also articles that discuss crises in general. As indicated beneath the figures, in some cases similar keywords were aggregated to gain a better picture of general trends (see Table A2 in the appendix).

[9] When analysing these abstracts, we counted the absolute number of occurrences of the respective terms, instead of calculating the share of articles, which contain the respective term in their abstracts, as the total number of occurrences of a certain term within abstracts provides a more nuanced indication of the term's relative importance. However, it seems important to note, that although some key terms are highly concentrated in a few abstracts, shifting to shares would not affect the overall findings of this paper.

[10] The selected terms are the following: Arbitrage, ARCH, Asset*, Bank*, Bond*, Confiden/ce/t, Credit*, Currenc*, Debt*, Dollar*, Equit/y/ies, FDI, Financ*, Fluctuation*, Forecast*, Friction*, Fund*, Inequalit*, Insurance*, Intermediate*, Investor*, Liabilit*, Liquidit*, Monetary, Money, Opportunit*, Option*, Ownership, Premi/um/a, Present, Profit*, Protection, Return*, Rich, Risk*, Rule*, Share/s, Shareholder*, Shock*, Stock*, Uncertaint*, Volatil*, Walk*, Wealth, Yield*.

[11] We coded all terms or keywords that started with the same strings as the respective term. Hence, the subset would include also keywords such as 'market of **bond**s', '**bond**smarket' as 'bond' is one of our search patterns. But it would exclude 'market**bond**s' as the term does not start with 'bonds'.

Tables A4 and A5 in the appendix). All but two books under study, which have been published in 2009, were referenced before and after the crisis (see Table 1).

3. A bird's eye's view: Economists' aggregate focus

In what follows we aim to provide a bird's eye's view of the development of topical trends in the economics discipline, with a special focus on the advent of the financial crisis. The goal is to illustrate changes in topics economists have been concerned with by analyzing the keywords of all papers in our database published within the respective time-frames. Thereby we try to shed light on the question of how economists changed their research orientation and interests in response to the crisis. In a second step, we ask whether these changing research interests in economics have also led to a shift in the sources underlying contemporary research.

3.1 General topical trends

To identify the major research interests of economists and how these interests changed due to the crisis we examine those keywords that show the highest relative frequencies within our data. Figure 1 shows the share of articles containing one of the top 15 keywords used within our sample for both periods of analysis. To make the data comparable across periods, the article shares calculated from our keyword dataset with regard were normalized to (a) the share of papers containing keywords and (b) the average number of keywords.

First and foremost, Figure 1 shows an astonishing consistency of research foci among periods: Leaving aside shifts in individual ranks, 13 out of 15 top-keywords from the pre-crisis period also belong the top 15 keywords in the post-crisis period. The two new terms entering the set of the 15 most popular keywords are "financial crisis" (at rank 12), and "innovation" (rank 11), while "cointegration" and "inflation" are the corresponding drop-outs at ranks 23 and 16 in the post-crisis sample. The concept of a "financial crisis" only had a marginal impact on economic research in the pre-crisis years, where it is positioned at rank 132 and is used as a keyword in roughly every 500th article, while, in the post-crisis years, the relative frequency of "financial crisis" quadrupled and the term significantly gained in ranks.

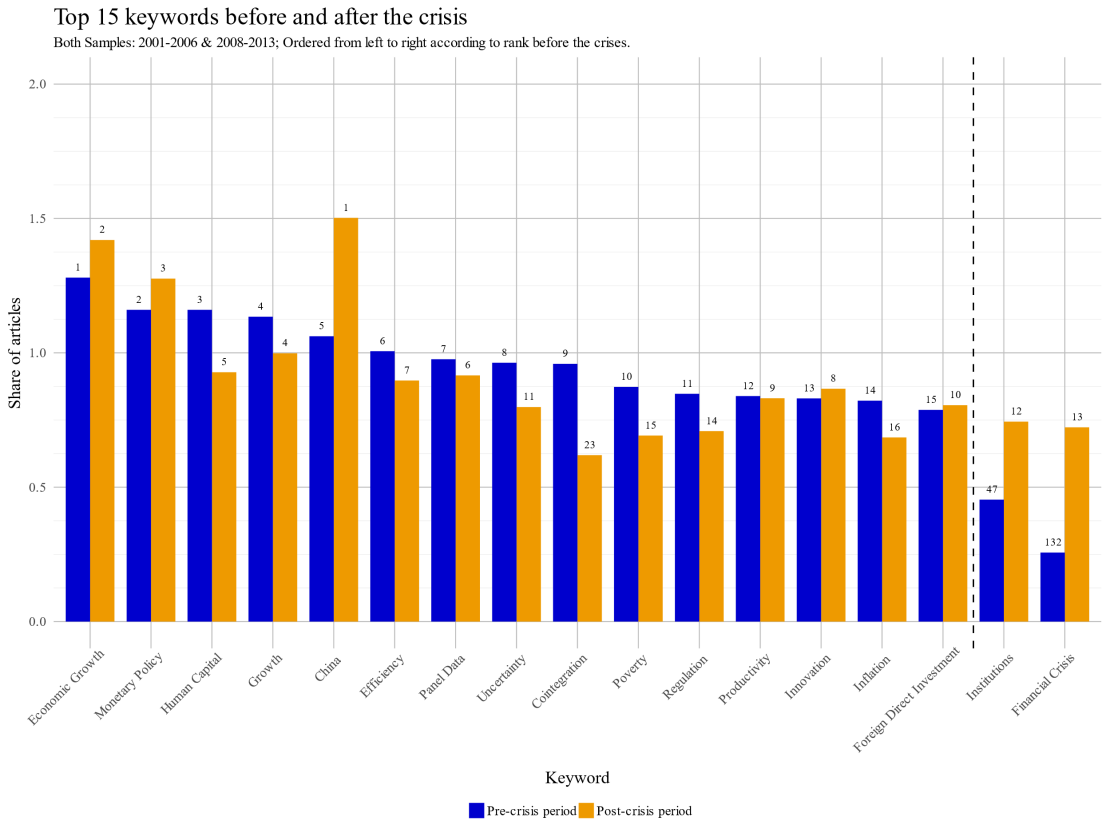

Figure 1: Top 15 keywords before and after the crisis. See Table A2 in the appendix for a list of the 250 most used keywords.

Furthermore, we find that the relative share of the top-15 keywords decreases over time for most terms, pointing to a topical diversification of the economic discourse over time. However, this general trend towards an increasing diversity of research fields and topics within economics as a whole has not been mirrored at the top of the attention scale, as indicated by the rather constant ranks of the most frequently used keywords over time as depicted in Figure 1. Although fifteen keywords may not seem to be a large amount, the reader should keep in mind that – due to the skewed nature of patterns of attention in academia (Solla-Price 1965; Newman 2006) – taking all papers containing at least one of these fifteen keywords generates a sample encompassing 11.8% of all articles collected in our keyword sample. Hence, in sum these 17 keywords represent a sizeable proportion of the underlying literature.

Topically, our data points to a continuing importance of key macroeconomic issues and questions of economic development, as represented by keywords like "(economic) growth", "monetary policy", "productivity", "regulation", "inflation" and "poverty". Typical keywords indicating a microeconomic research orientation, like "human capital", "uncertainty" or "efficiency" appear less frequently in the above list. These outcomes stand in contrast to results achieved by applying topic modeling techniques on full-texts of economics articles (e.g. Kosnik 2015; Angrist et al. 2017), which consistently show a relative decrease in the share of the economic literature devoted to macroeconomic research. A possible explanation of these differences is that many terms typically associated with a microeconomic approach (like "rational(ity)", "utility" or "opportunity cost") are too general to be used as keywords, but do appear rather often in full texts. In addition, microeconomic research shows a greater degree of topical and, hence, terminological diversification, while the core macroeconomic problems stay the same over time as well as across countries. In this perspective, the greater conceptual fragmentation of microeconomic research (Colander et al. 2004, Rodrik 2015, Kapeller 2013) in conjunction with the fact that a high degree of analytical generality is ascribed to major microeconomic terms (Lazear 2000) provides a plausible rationale for these different outcomes.

The above assertion that economic discourse exhibits a high degree of continuity in terms of its internal hierarchy of fields and themes, can be further substantiated and extended by analyzing the correlation between the relative usage of keywords in the pre-crisis as well as the post-crisis period.

Figure 2 shows a scatter-plot of such a correlation for all finance-related keywords (in red) and all other keywords (blue). As expected from the well-known skewed distribution of attention in scientific discourses (Solla-Price 1965), many instances of very small shares and a few outliers with comparatively intense representation can be observed. The overall correlation of shares attained by given keywords in the pre- and post-crisis periods is high with a correlation coefficient of 0.922. These values indicate that the post-crisis variation in popular keywords can be efficiently predicted by referring to the keyword's past popularity, which further reinforces the observation that the topical hierarchies in economic discourse are remarkably stable. In addition, the predicted shares in later period are significantly below the respective shares in the earlier period, which underscores our point that the economic discourse has experienced a general increase in topical diversity[12], which only mildly impacts existing topical hierarchies.

Looking more closely at the issue of topical hierarchies, we are effectively able to identify some impact of the financial crisis in economic discourse, as our set of finance-related terms experiences a relative increase in aggregate attention as our estimation results predict relatively higher shares of attention in the later period for finance-related keywords. However, the results also indicate that this relative increase in attention is largely driven by three main outliers – "financial crisis", "liquidity" and "monetary policy" – that are by and large responsible for the relative increase in attention devoted to finance-related terms. Removing these outliers from the sample of finance-related term – as shown in Figure 2 – leads to breakdown of the connection between finance and increased attention.

Differentiating between non-finance- and finance-related terms also in terms of topical hierarchies indicates that finance-related research is even more strongly coined by existing conceptual and topical priors as the data on the subsample of finance-related terms shows an even higher correlation-coefficient than the rest of the terms analyzed (0.919 to 0.940).

[12] *Ceteris paribus* this increase in diversity leads to a decrease in the shares of all keywords.

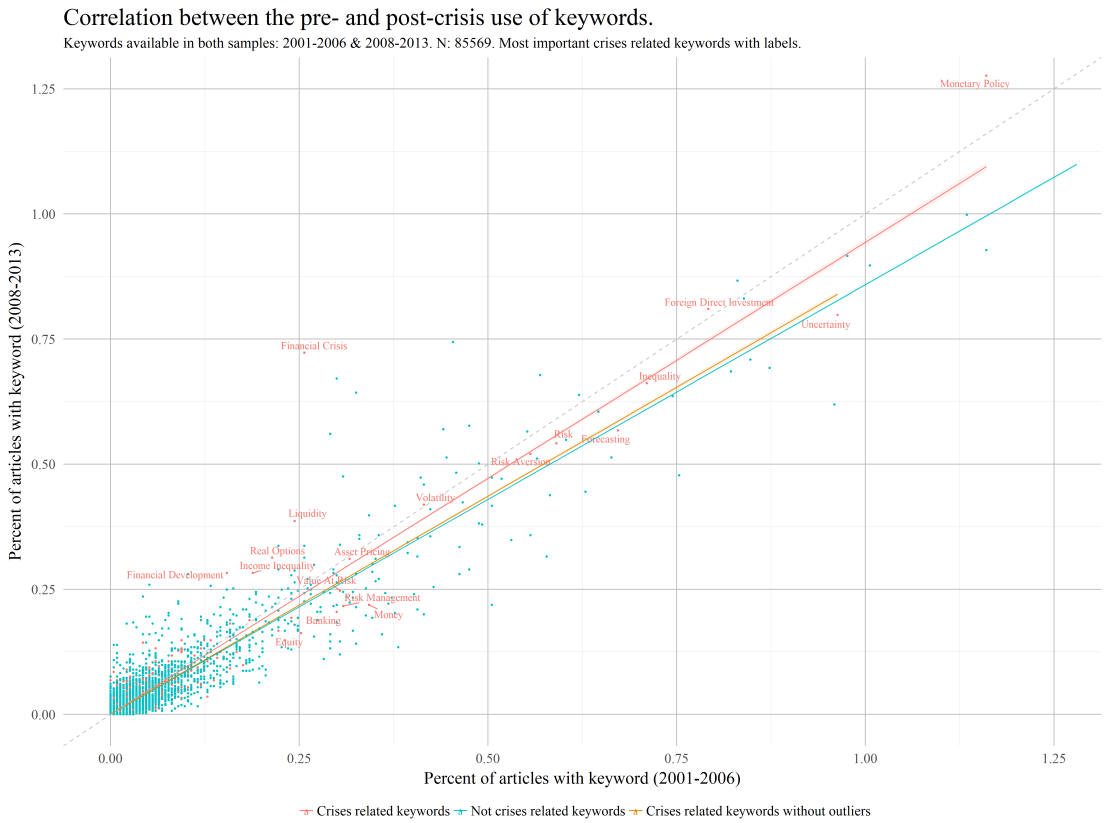

Figure 2: Correlation between the pre- and post-crisis use of keywords.

Overall, this finding suggests that the financial crisis has indeed had an impact on economic discourse, by reorienting attention within the discipline. Nonetheless, the results also imply that this kind of reorientation has been limited in two ways: the rise in attention relates only to a very restricted set of keywords and is generally framed by concepts, that are already well-established in the economics discipline. It follows, that the crisis has not led to any stark changes in the way economists conceptualize financial markets that is evident from the inspection of keywords. In addition to the more specific matter of the crisis, these results point towards a stable overall topical orientation in the economics discipline and a general increase in the diversity of topics addressed.

3.2 The role of finance and economic crises

While the previous section provided some information on general topical trends in academic economics, we now focus more directly on financial aspects and issues related to crises. Figure 3 shows the development of the relative importance of financial keywords (see section 2) by plotting those keywords with the greatest importance overall (left panel) as well as those finance-related keywords that experienced the strongest relative change in prominence after the crisis (right panel).

The left panel of Figure 3 indicates that, with the exceptions of "finance*, "risk*" and "volatile*", which show an upward trend, the relative prominence of the most-used finance-related terms stayed rather constant over time and has not been strongly affected by the advent of the crisis. The right panel, on the other hand, reveals some concepts that increase in popularity after the crisis. Among them are "liquid*", "credit*", "stock*", "friction*", "fund*" and "shock*", while other terms, such as "currency", "arbitrage" and "money" show decreasing trends. In sum, these trends in terminology point to an interpretation of the financial crisis caused by a lack or withdrawal of liquidity and misperceptions of risk related to increased volatility (both driven by rising default rates in the subprime sector), which eventually manifested in a breakdown of stock- and credit-markets and the emergence of systemic frictions in capital markets.

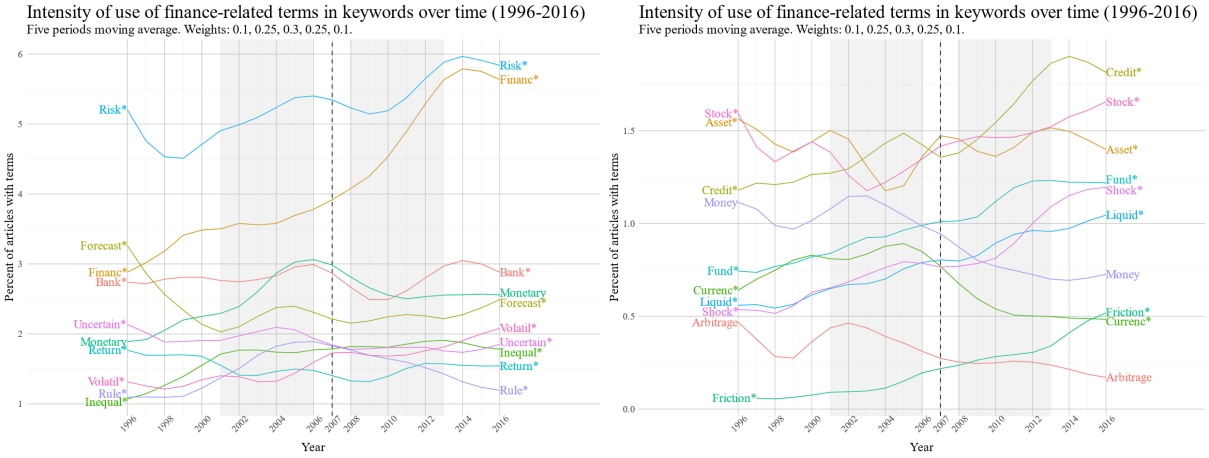

Figure 3: Intensity of use of finance-related terms over time (Left: 10 most used terms; Right: 10 terms with biggest relative change (excluding Risk* and Financ*). Labels refer to first and last observations, respectively.

Predominant interpretations on the nature, causes and consequences of the financial crisis also become visible when analyzing the relative frequency of keywords, in articles with keywords that explicitly contain the sequence "financ*". Investigating the terms that co-occur in articles with finance shows a remarkable change between the two periods (see Figure 4). Numerous terms, such as "financial development", "financial intermediation", "behavioral finance" and ""financial constraints" became more important before the crisis and lost importance shortly after. In contrast, "financial crisis" started to attract numerous publications after 2007, and "monetary policy" kept increasing steadily also after the economic crisis. The rise of "microfinance" on the other hand seems to be unrelated to the financial crisis and derives its momentum from endogenous dynamics in the economics profession, for instance, the rising prominence of quasi-experimental field studies (Banerjee/Duflo 2010). In sum, the development of the top keywords co-occurring with "financ*" suggests that the crisis invalidated or delegitimized some established ideas – like the conception of financial actors as mere "intermediaries"- but does not show a corresponding rise of novel concepts more closely related to issues of financial instability and breakdown.

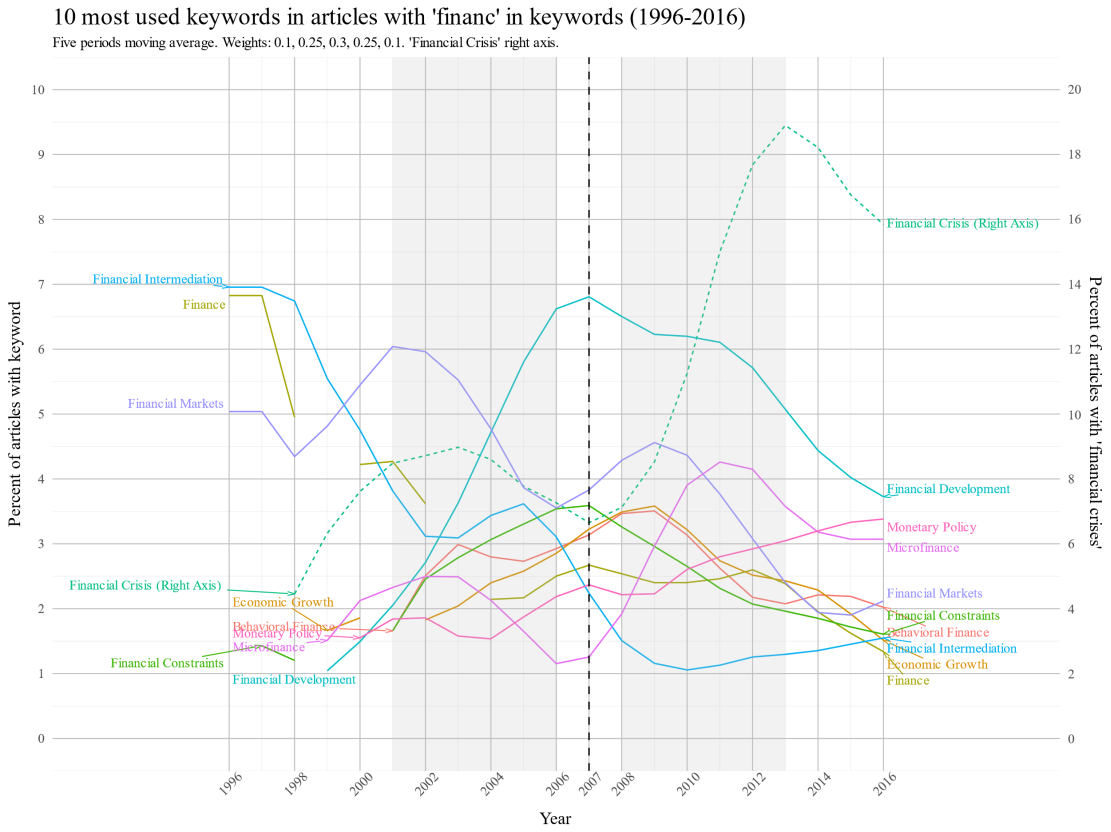

Figure 4: Top 10 keywords in articles with "financ" in keywords. For readability, we removed single observations, i.e. values preceded and followed by NAs (a full visualization see Figure A1 in the appendix). Labels refer to first and last observations, respectively.

Predominant interpretations on the nature, causes and consequences of the financial crisis also become visible when analyzing the relative frequency of keywords, which directly relate to different types of economic crises. Figure 5 represents such an analysis by plotting the development of those keywords, which contain the word "crisis". The results indicate that debates on economic crises were already framed in financial terms before the financial crisis, especially after the advent of the dot-com bubble in the early 2000s. In addition, a much stronger focus can be observed on the role of "currency crises" in the pre-crisis phase, which was further reinforced by the emergence of the "asian financial crisis" in the late 1990s (1997-99). This latter event was seemingly recognized as a "currency crisis" and less as a "financial crisis" or "banking crisis". The relative conceptual dominance of "currency crisis" quickly vanishes after the global financial crisis emerges and is replaced by a constantly increasing focus on a "(global) financial crisis". In addition, also the frequency of the more general term "economic crisis" increases markedly. The more nuanced expressions with lower relative frequency shown at the bottom of Figure 5 in turn allow for tracking the changing interpretation of the financial crisis and its consequences over time: these data indicate that the financial crisis was first rationalized as a "credit crisis" related to the "banking" sector and, especially, the segment of "subprime" lending. Interestingly, the framing of the crisis in this phase was based on the naming of relevant actors and sectors (banks, banking, subprime), but largely avoided the closely corresponding notion of a "debt crisis", which only catches up to the other two wordings as the financial crisis – due to the impact of government support for banks at the brink of collapse (Howarth/Quaglia 2015) – translates from a mere "banking crisis" into a "sovereign debt crisis" after 2010.

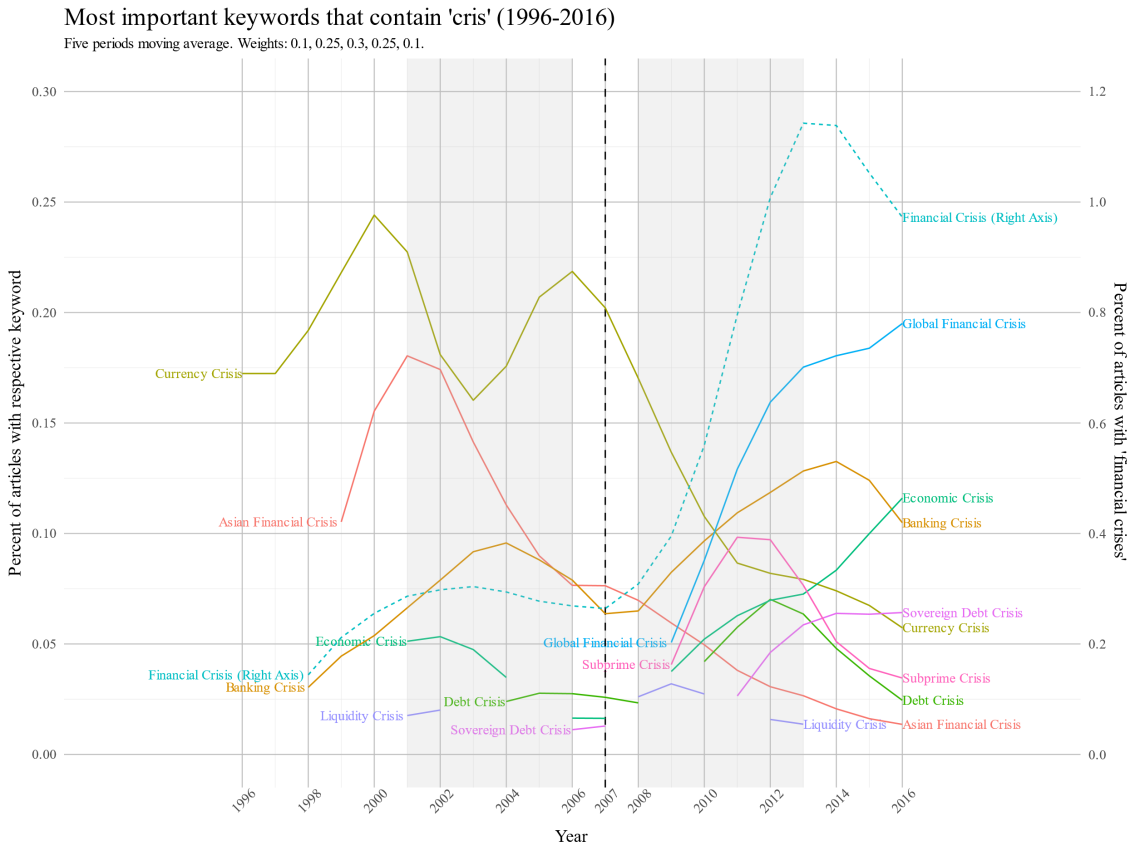

Figure 5: Most important keywords that contain "cris" (1996-2016) i.e. those keywords that have been present in most of the 20 observed years. Some of the keywords have been merged, for an overview see Table A2 in the appendix. For readability, we removed single observations, i.e. values preceded and followed by NAs (a full visualization see Figure A2 in the appendix). Labels refer to first and last observations, respectively.

3.3 The role of major crisis-related books in the economic discipline.

Finally, the development of references to major crisis-related works in economics can provide insights into the development of a scientific discipline, as books often serve as markers for changes in paradigmatic or theoretical orientation (Hicks 1999). Figure 6 shows the ten books in our sample with the strongest representation in economic discourse (left panel) as well as those ten that experienced the biggest percentage point change after the crisis, also including the two books published after 2008 (right panel), which immediately gained broad attention and linked the financial crisis either to high levels of government debt (Reinhart and Rogoff 2009) or to inappropriate regulation and animal spirits (Akerlof and Shiller 2010). Overall, the share of articles that cite the thirty crisis-related works under study[13] has increased after the financial crisis. Particularly Reinhart and Rogoff (2009) received high attention considering that it has been cited by 3 in every 1000 articles published after the financial crisis. This number is only higher for five selected classical books by Keynes (1936), Schumpeter (1942), Veblen (1899), Marx (1867) and Polanyi (1944). Of these only Keynes (1936) could gain additional 0.05 percentage points from before to after the crisis. Marx (1967), Polanyi (1944), and two books by Minsky (1982, 1986) gained 0.03 percentage points, suggesting an increased interest in the general stability-properties of capitalism (see Appendix A4). However, these tendencies do not apply to journals located at the very top of the discipline's institutional hierarchy. When restricting the analysis to the citing behaviour

[13] Table A4 and A5 provide an overview on all thirty crisis-related books included in our analysis.

of the 'Top 5' journals in economics[14] we find that Reinhart and Rogoff (2009) as well as Akerlof (2010) also received more attention in the top 5 journals, while only minor or negative changes after the crisis can be observed for Marx (1967), Polanyi (1944) and Keynes (1936). Moreover, Minsky's (1982, 1986) contributions are not cited at all in the top economic journals. In addition, it can be observed that while its importance in the overall sample declined after the crisis, Friedman and Schwartz (1963) was one of the books with the strongest growth in citations in the top 5 journals (see Figure A5), with 1.4 in 100 papers in top 5 journals citing it after the crisis.

Overall, this analysis suggests that after the financial crisis there has been a renewed interest in classical and contested contributions on the instability of capitalism. However, these questions played a minor role at the very top of the discipline. In addition, the decline of citations to these books in more recent years, as shown in the right panel of Figure 6, suggests that the increased interest in classical and contested books was only a temporary phenomenon for most works under study (Marx (1967) is one obvious exception).

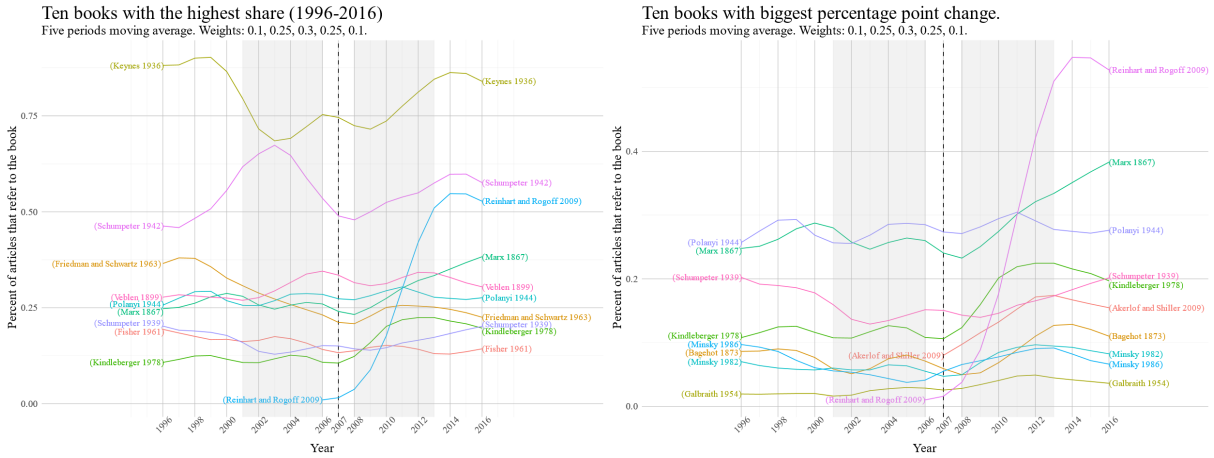

Figure 6: Share of articles that refer to books. Left: Ten books with the highest share of references. Right: Ten books with the greatest increase in recognition. For better visualisation we removed Keynes (1936) from the right figure.

In sum, the findings suggest that the financial crisis had a visible impact on the economic profession and its discourse as it led to a renewed interest in questions of economic instability. However, the data also implies that this renewed interest has not much affected the major topical foci as well as the basic research orientation of contemporary economics. This latter finding also applies to economic research related to financial issues. With respect to the interpretation of the financial crisis, the findings point to a dominant narrative, which emphasizes the role of misleading risk-perceptions and tightening liquidity conditions which lead to a sharp rise in volatility as well as to a banking and credit crisis conjoined by a corresponding drop in stock market values. These developments in turn triggered several sovereign debt crises due to the perilous effects of automatic stabilizers and the impact of failing banks on government budgets. In highlighting these factors it is also worth noting those aspects that are largely missing or, at least, much less prominent when it comes to understanding the financial crisis, like the role of private debt (Mian/Sufi 2015), financial innovations as a means for the expansion of the financial sector (Crotty 2009) or the case of financial market (de)regulation (Beker 2010, Elster 2009, Kotz 2009).

4. An impact-centered view: Economists' attention in terms of top-cited papers

[14] These are typically considered to be the *American Economic Review, Econometrica,* the *Journal of Political Economy,* the *Quarterly Journal of Economics* and the *Review of Economic Studies* (see also Card/DellaVigna 2013).

In contrast to the foregoing section, which focused on what economists actually publish, we now turn our attention to the most prominent sources upon which the contemporary economic research discourse draws. Specifically, we inspect the 400 top-cited papers in the pre- and post-crisis period (i.e., 2001-2006 and 2008-2013). The aim is to illuminate the foundations of contemporary research interests. Again, although the focus lies only on a small proportion of the available economics literature, this sample is carefully selected as the less than 600 papers incorporated in our analysis account for more than 10% of all citations made in the periods under study (see section 2 for more details).

In what follows we first explain some general properties of these two samples to illustrate the main characteristics of top-cited papers as well as to explain the special case of analyzing two entangled samples of articles. As the set of papers under study can be considered highly influential we also consider institutional aspects by looking for systematic changes in disciplinary attention with respect to specific institutions, regions and journals. We then proceed by analyzing word and phrase frequencies from abstracts, which substitutes for the preceding analysis of keywords. This way, we partially compensate for the decrease in total sample size by considering larger parts of the text associated to a given contribution. Eventually, we search for specific contributions entering our set of top-cited papers in the post-crisis phase that might illuminate prevailing interpretations of the financial crisis within mainstream economic discourse.

4.1 General observations

This section provides a general description of the properties of top-cited papers in the two periods under study. The goal is to identify representative ideas and patterns prevailing at the top of the discipline by analyzing the articles that receive the comparably greatest attention before and after the crisis.

As has already been indicated, our sample of 400 top-cited papers in pre- and post-crisis periods covers exactly 560 articles. It follows that both samples – the top-cited papers before and after the crisis – have a significant overlap of 251 papers. In other words, the majority of top-cited papers before the crisis retain their position and are also top-cited papers after the crisis. Correspondingly, 155 papers out of the 400 most cited articles before the crisis drop out of this group of top-cited papers and thereby make room for approximately the same number of new entrants (154 papers). The Venn-Diagram depicted in Figure 7 collects these numbers as well as the average publication age of articles in each period.

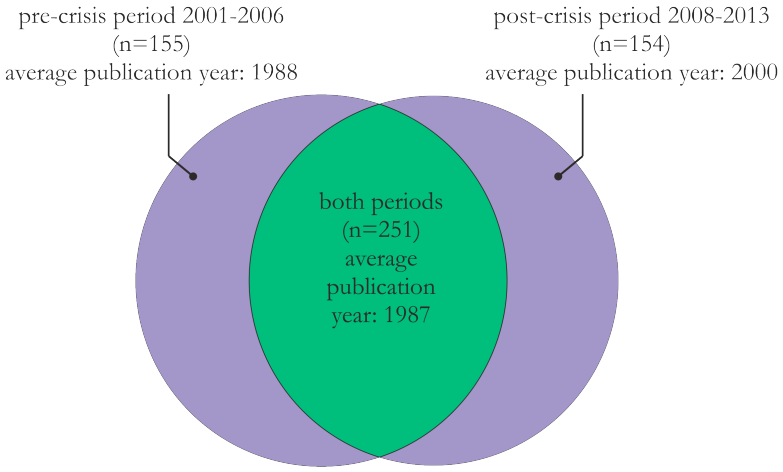

Figure 7: Venn-Diagram of distinct and intersecting 400 most-cited articles before and after the crisis.

A substantial difference between the top-cited papers associated solely with the post-crisis period (the new entrants) and the remaining top-cited papers is that they include papers published more recently. In contrast, the papers that are top-cited in both periods are, on average, as old as those that drop out of the list of the top 400 papers in economics.

Figure 8 provides information on the most frequently occurring affiliations, geographical origins and publishing outlets among the top 400 papers. Here the overall result strongly resembles earlier findings on intellectual concentration in economics (Hodgson/Rothman 1999, Fourcade et al. 2015, Medoff 2006). Although this concentration declines slightly in the period after the crisis, it still remains on a high level. Generally, more than 70% of the top-cited papers originate in the United States and more than one half of these papers are associated with a group of highly influential universities, all located in the United States. Among all subsamples the 'Top 3' institutions remain stable: The University of Chicago, Harvard University and MIT consistently obtain a share greater than 20% of all top-cited papers in all periods/subsamples under study.

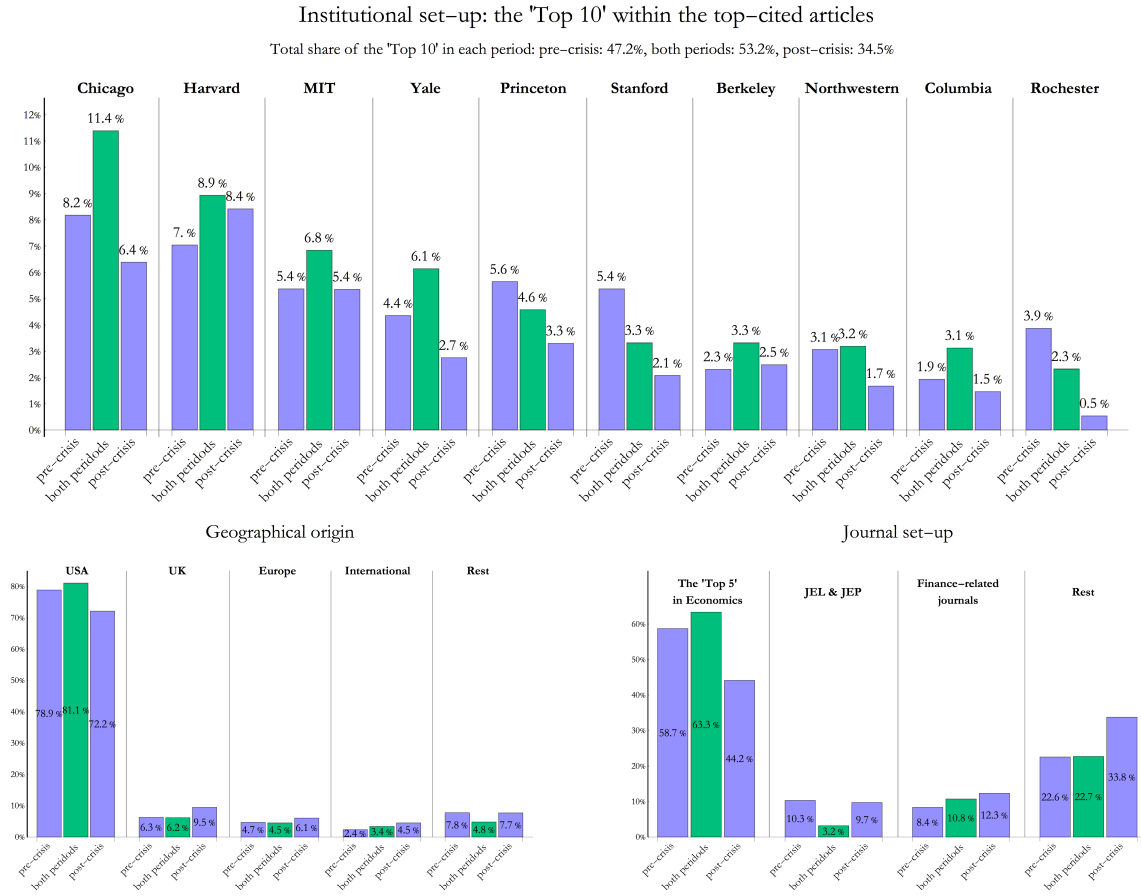

Figure 8: Most important institutions, regions and journals associated with the 400 most cited articles before and after the crisis.

The analysis shows that the top of the economics discipline is dominated by Anglo-Saxon countries, which account for more than 80% of all affiliations associated with top-cited papers across all subsamples studied. The role of other parts of the world, including international institutions such as the World Bank and IMF, remains marginal. A similarly strong position can be identified on the level of economics journals, where the majority of top-cited papers are published in the 'Top 5' journals in economics. In addition, we find that papers published in the two main outlets of the American Economic Association beside the *American Economic Review,* the *Journal of Economic Perspectives* and the *Journal of Economic Literature,* also have a relatively high probability of belonging to the set of top-cited papers, although this effect

seems to be limited to more contemporary contributions. Finally, the results show that finance-related journals among the top 400, such as, among others, the *Journal of Financial Economics*, the *Journal of Finance* or the *Journal of Monetary Economics* occupy about 10% of the set of top-cited papers. In the wake of the (financial) crisis, the share of finance-journals has increased marginally, while the dominance of the Top 5 slightly declined.

4.2 Topical trends

When looking for topical shifts within the referenced material, a series of interesting trends can be found, which are mostly in close alignment with our findings on contemporary research discourse in section 3, but also reveal some noteworthy differences. However, these differences do not point to contradictions, but rather explain how topical shifts on the level of current discourse relate to or reflect changes in the foundations of more contemporary work.

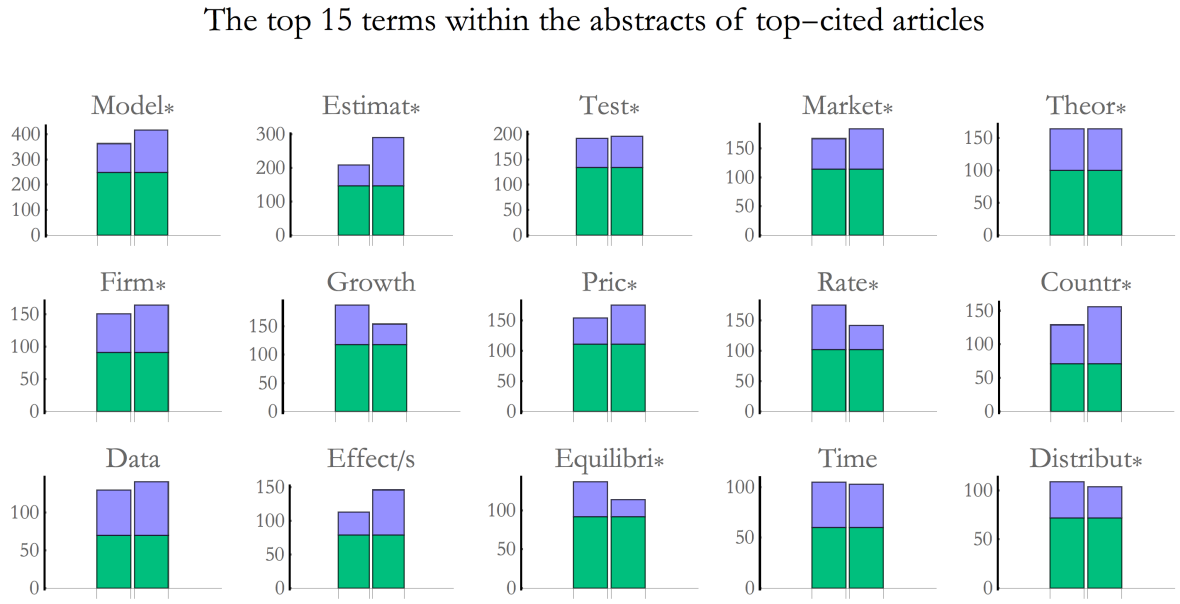

Figure 9: The 15 most used terms in abstracts of the 400 most cited articles before and after the crisis.

Figure 9 shows the top fifteen words appearing in the abstracts of the top 400 referenced articles. First of all, it illustrates that economics is a science relying on models and driven by modeling ambitions: On average, every abstract mentions some term starting with "model*" nearly once, with an increasing tendency over time. Next, the results indicate that sources of contemporary research are becoming more empirical, as the usage of "theor*" and "equilibri*" stagnates or declines and empirical markers, like "data", "countr*", "estimat*" or "test*" are on the rise. Additionally, and in contrast to our findings on contemporary discourse, we do not find much indication for the importance of macroeconomic themes – and if so, there are indications of a declining interest, as in the case of "growth" and its cousin "rate*". Correspondingly, more microeconomic issues like "market*", "firm*" or "pric*" receive increased attention. We suggest one might explain the divergence between Figures 1 and 9 in terms of the relative importance of micro- and macroeconomic themes with reference to the different perspectives taken by our two main datasets. While our large-scale sample shows a continuing interest in a relatively narrow set of questions on growth, inflation, trade and distribution, which explains a higher density in terms of keywords, our dataset on top-cited papers asks for the main intellectual foundations of these contemporary works. Correspondingly, what Figure 9 shows is that the continuing interest in macroeconomic questions is more and more answered by employing microeconomic concepts and

applications, a trend often summarized by referring to "microeconomic foundations" in macroeconomic research (King 2012, Lucas 1976).

When looking at two-word phrases (2-grams) instead of single terms very similar patterns can be observed to those seen before, in a more fine-grained setting (Figure 10). First, there is an increase in importance of some expressions related to empirical research ("unit root", "panel data", "Monte Carlo"), which is contrasted by a decrease in other empirical markers like "time series" or "asymptotic distribution". While in sum these changes still point to an increasing importance of empirical research, they also indicate a certain shift in the focus of applied work, which seems to move towards broader, more inclusive samples ("panel data" vs. "time series") as well as towards more exploratory statistical techniques contrasting traditional analytical approaches ("Monte Carlo" vs. "asymptotic distribution"). Again, a relative decline can be noted in typical macroeconomic expressions, like "economic growth", "growth rate", "business cycle*" and "monetary polic*", but also a declining interest in technology, education and skills as illustrated by the relative decrease in the importance of "human capital" or "R&D". In addition, among the set of highly cited papers, both financial aspects ("asset pric*", "risk aversion"), and also in international aspects ("exchange rate*") become more important.

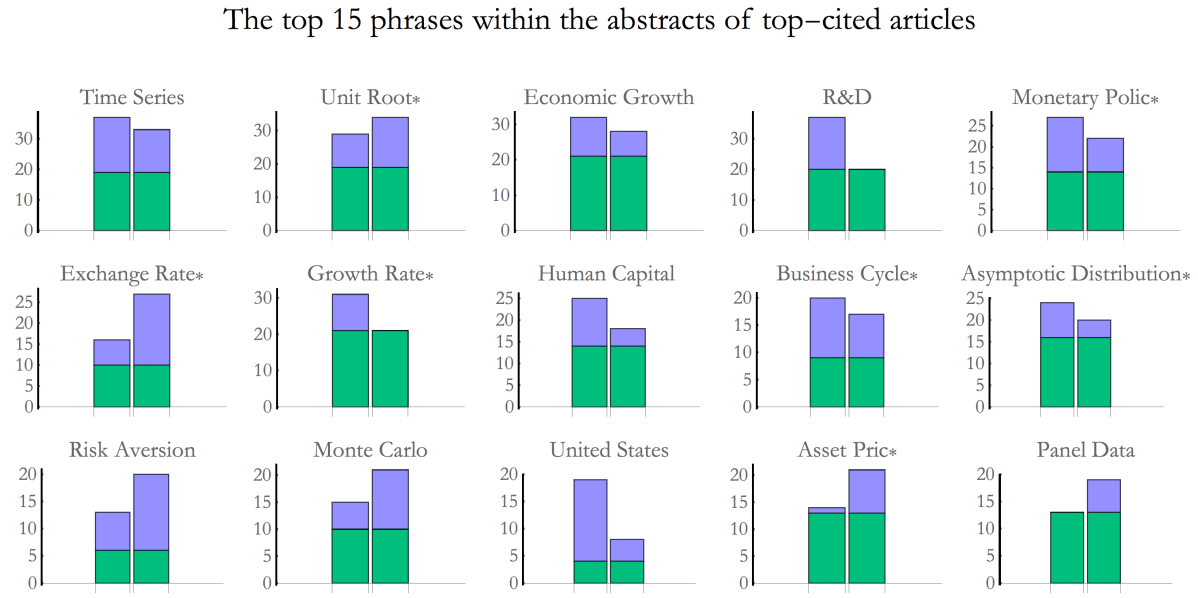

Figure 10: The 15 most used phrases in abstracts of the 400 most cited articles before and after the crisis.

4.3 The role of finance and crisis

Turning from these general observations to the specificities of finance, we again make use of the same deductively selected finance-related keywords used in Figure 3 and plot the number of occurrences of finance-related keywords within the abstracts of the top 400 references in both periods (Figure 11).

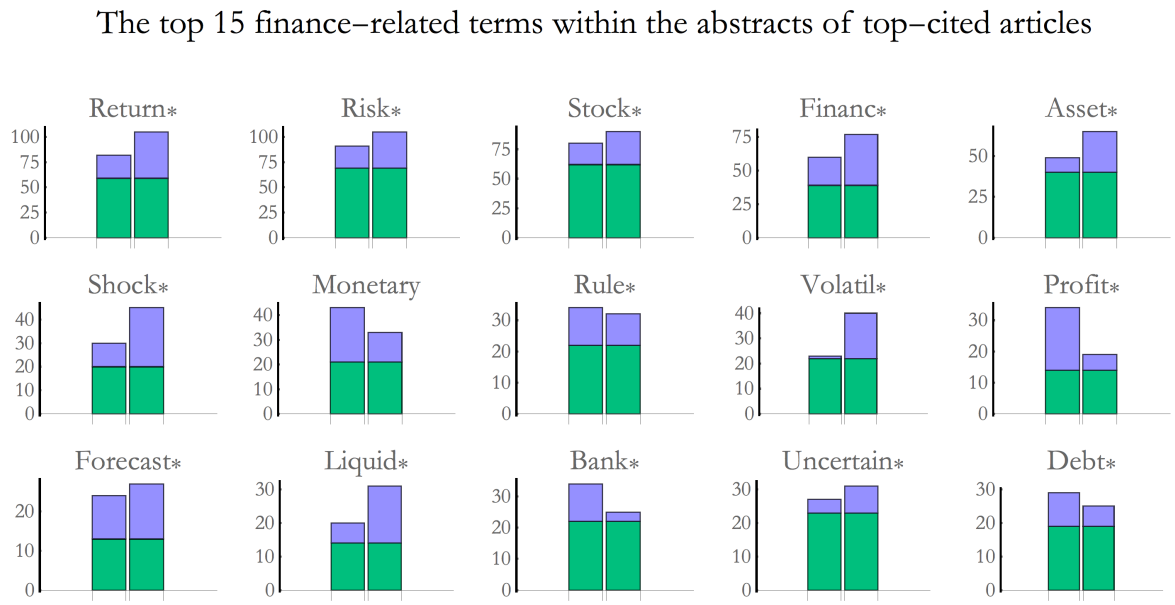

Figure 11: The top 15 finance-related terms in both samples.

We find tendencies very similar to those identified in our analysis of contemporary discourse. Specifically, the changes in top-cited sources after the financial crisis point towards an interpretation of the crisis as an unanticipated "liquidity*"-"shock*" leading to an increase in "risk*" and "uncertain*", which affects "return*" and amplifies the "volatil*" of "stock*"- and "asset*"-markets. Macroeconomic conditions, like those emerging from "monetary" policy, or the composition and ownership of financial stocks – financial "wealth"[15] and corresponding "debt" – are of decreasing relative importance within the sources cited in the contemporary literature.

A complementary result is provided by the inspection of the top 15 finance-related phrases[16], which are plotted in Figure 12. Here the same general trends can be observed – a declining importance assigned to monetary policy (see also "central bank*") conjoined by an increase in attention towards issues of risk ("risk aversion", "risk premi*") and returns on financial assets ("expected return*", "stock return*", "asset pric*"). In contrast, there seems to be decreasing interest with regard to more traditional ideas of return on investment (see the decrease in "rate/s of return") and a correspondingly stronger impact of the idea of financial intermediation. In addition, we can make some more nuanced observations on the conceptualization of financial markets, where the decline in the use of the concept of "financial intermediation" in published papers (see Figure 4) is not paralleled by a corresponding decline in importance on the level of cited references (see Figure 12), which underscores our argument that the reception of the financial crisis within the economic discipline has happened along already established paths. However, some decline in the belief in efficient financial markets is evidenced by the relatively decreasing impact of the concept of a "random walk" (Malkiel 1973, Fama 1970), which is complemented by an increase in relevance for policy-related terms like "financial development" or "policy rule*".

[15] "Wealth" ranks 16th on the list and is therefore not visible in Figure 11. For further information see Table A3 in the Appendix.
[16] That is, phrases of two words that contain one of the above listed finance-related terms.

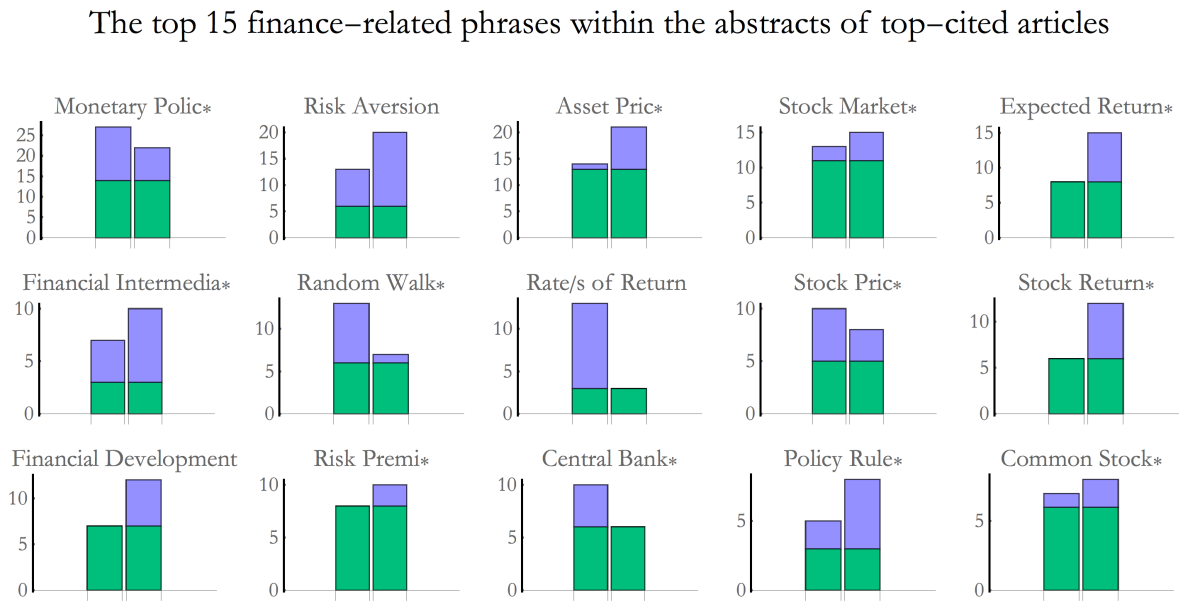

Figure 12: The top 15 finance-related phrases in both samples.

In sum our data on topical trends within the most important sources of contemporary economic discourse indicate a series of distinct patterns, relating to the prevailing ontological (e.g., micro vs. macro), methodological (e.g., "Monte Carlo" vs. "asymptotic distribution") and topical commitments within the economics discipline. With regard to the topics, there is an increasing prominence of financial aspects among the sources contemporary research draws on. In the context of finance our observations are twofold: First, some changes in the relative frequencies of specific concepts – most importantly, the terms "equilibrium" or "random walk" – point to a slight decrease in the importance ascribed to the efficiency properties of market competition. Second, those labels, which experience a strong increase after the crisis – like issues of liquidity, risk perception and asset pricing – provide indications for the way in which the economics discipline rationalized and interpreted the financial crisis. The observation that the prominence of traditional policy terms ("monetary policy") as well as terms relating to financial stocks ("wealth", "debt") is decreasing among cited sources complements this interpretation of the way academic economics dealt with its major anomaly. Judging from these word counts the financial crisis is mainly an issue of liquidity-shocks and individual misperceptions of risk affecting stock market returns and asset prices and has nothing, or not much, to do with structural conditions of inequality of ownership and income (Van Treeck/Sturn 2012, Mian/Sufi 2015), innovations and new products in the financial sector (Crotty 2009) or the increase in financial openness and the corresponding rise of the shadow-banking sector (Ban/Gabor 2016, ECB 2016).

An interesting and noteworthy difference between our sample of papers published before and after the crisis (as discussed in section 3) and the sample of main sources of this literature studied in this section resides in the degree to which the literature makes use of the term "crisis" and "(financial) crisis". The term "financial crisis" occupies rank 132 in the list of most popular pre-crisis keywords and experiences a significant rise to rank 13 in the post-crisis period. Similarly, the term "crisis" moved from rank 742 in the pre-crisis sample to rank 242 in the post-crisis sample (see Table A1 in the appendix). In contrast, the term "crisis/crises" is almost absent in the prime sources on which current research draws on. For our two samples of top-cited papers, the terms "crisis" and "crises" respectively (not to speak of "financial crisis/crises") are not found within the list of the 1000 most used words in the abstracts of the papers. This observation further reinforces our finding, that the conception of "crisis" is too much an antagonism

for prevailing understandings of economic processes as equilibrating and is, therefore, not prominently represented by the influential academic literature from the past.

4.4 Crisis-related papers and the reception of the financial crisis

In addition to understanding the general characteristics of top-cited papers in economics, in what follows we focus on temporal outliers in our sample of top-cited papers after the crisis to get a better understanding of the crisis' impact on economics. For one, it might well be the case that some older, prescient contributions exist, that have been rediscovered and exploited by economists to improve their understanding of current events. For another, more recent papers produced after the crisis might provide important contributions explaining the financial crisis and its causes, which, as a consequence, receive large flows of citations. In addition, such contributions could allow for tracking the prevailing interpretation of the financial crisis within the economic mainstream.

And indeed, such outliers in our dataset can be located: In total, there are 15 articles, which have been published before 1990, and enter the top 400 most-cited papers only after the crisis. Together, these papers make up roughly 10% of all new entrants into the top 400. These older articles thereby outnumber contributions which have been published only recently after the crisis and made it immediately in the top 400; in total, there are only four such papers. At first sight, this result is not that surprising as citations only accrue with a certain time-lag, which implies that papers published *during* our period of analysis (2008-2013) have a much harder time entering the sample of top-cited papers.

Most surprisingly, financial aspects and the crisis only play a minor role in these outliers: while four of the fifteen new entrants published earlier than 1990 deal with financial aspects (Merton 1976, 1980, Amihud/Mendelson 1986, Fama/French 1988), the other eleven papers focus on international trade (Anderson 1979, Krugman 1979, Bergstrand 1985), econometric specificities (Mundlak 1978, Krinsky/Robb 1986, Holtz-Eakin et al. 1988), business cycles (Hamilton 1983, Greenwood et al. 1988) and other topics quite unrelated to the financial crisis (Lucas 1978, North/Weingast 1989, Andreoni 1989). Of the four papers published in 2009 two relate to either financial aspects (Brunnermeier/Pedersen 2009) or the crisis directly (Brunnermeier 2009), while the other contributions from 2009 focus on the improvement of existing econometric techniques (Roodman 2009, Petersen 2009). It seems noteworthy that, although citations take some time to accrue, this latter finding is not primarily driven by the chosen time-frame. Indeed, when looking at later time-spans (2009-14, 2010-15) no new entrants can be identified in the list of the 400 most cited papers that deal directly with the crisis – Brunnermeier (2009), however, retains its position within in the top 400. More specifically, when comparing our sample with the one obtained for the time-span 2010-15, 45 new entrants in the top 400 can be found (compared to 2008-13). While 26 of those were published in the pre-crisis phase (i.e. before 2008), 19 were published after 2007. In sum, and quite surprisingly, only five of these latter papers deal with aspects of finance and credit. Three of those five stem from the pre-crisis phase and two of them develop the argument on the essential role of liquidity (Allen/Gale 2000, Acharya/Pedersen 2005), which is, later on, employed by Brunnermeier (2009) and Brunnermeier/Pedersen (2009) as a main element of his ex-post rationalization of the main events and mechanisms related to the financial crisis of 2007ff.

In sum, we observe a strong overlap between the general patterns of the economic discourse on the financial crisis as identified in section 3, and most prominent sources on the financial crisis identified in this section. In fact, the core paper of Brunnermeier (2009), which aims for "Deciphering the Liquidity and Credit Crunch", closely follows the basic argument as reconstructed from our keyword analysis. Within the latter we find a rising importance of concerns related to liquidity, misperceptions of risk, asset market volatility and credit frictions. The very same themes form the backbone of Brunnermeier's argument, which starts from reviewing institutional changes in the financial sector – like a stronger reliance on short-term financing or the introduction of securitization (CDOs) and credit insurance (CDS)

– to provide a rationale for the prevailing of systematic misperceptions of risk and increased market volatility. It is noteworthy that the exact role assigned to these institutional changes was not visible in our keyword analysis as most research focused on the resulting risk-misperceptions. These become obvious in 2007, when rising default rates on subprime mortgages provided the first hint of an increase in systemic risk in the housing sector, which increased market volatility and amplified existing credit frictions. The associated drop in housing prices then created to a downward spiral due to higher margins and the decreased value of established collaterals (see also Brunnermeier/Pedersen 2009), which led to a "dry-up" in market liquidity in housing as well as international credit markets. Eventually, this development translated into a fully-fledged credit crunch as Lehman Brother collapsed in September 2008. Generally, market liquidity and the associated notions of volatility and credit friction play a key role in this account, which is also visible in our data on the relative prominence of keywords.

This coincidence between our large-scale analysis of popular keywords in current economic discourse and our inspection of the most relevant sources for understanding and rationalizing the financial crisis, then provides a coherent picture: the financial crisis is mainly rationalized as an exogenous shock, caused by a sudden dry-up in liquidity, which has its roots in past misperceptions of risk (Akerlof/Shiller 2010). These past misperceptions are in turn linked to securitization and short-term funding of financial institutions, which are interpreted as a source of asymmetric information in financial markets (Brunnermeier/Pedersen 2009). Eventually, this expansion of the financial sector proves to be without solid footing and translates into a problem of sovereign debt, which features as a prominent notion in our large-scale analysis of keywords and books (Reinhart/Rogoff 2009).

By identifying this dominant line of interpretation on both levels – the level of general post-crisis discourse in economics as well as the level of key sources informing this discourse on the role, impact and interpretation of the financial crisis – we are not only able to track the dominant mainstream economic narrative on the financial crisis, but may also illuminate those aspects that are absent from this standard account. Generally, it is noteworthy, that the crisis is not at all related to more long-term secular trends – such as the successive increase in inequality, the tendency to deregulate financial markets or the trend for increasing leverage and debt-to-GDP ratios. The lack of consideration of such long-term developments is thereby directly tied to the notion of market- and funding-liquidity, which serves as a conceptual placeholder for the assumption of an exogenous shock arising from misperceptions of risk. By explaining the financial crisis and its follow-up events as consequence of such an exogenous shock manifesting in a shortage of liquidity, the relevant literature also manages to circumvent debates on the regularity of economic crises and stability of financial capitalism in general (Minsky 1982, Boyer 2000) and thereby fully retains the standard account of efficient and equilibrating markets, which are subjected to exogenous shocks. Finally, we find that distributional considerations, which could play a role in explaining, why the subprime-sector is especially vulnerable and how this vulnerability is connected to housing- and income-policies, are largely absent in the standard rationalization of the financial crisis as prevalent within the economic mainstream. As a consequence distributional issues do not increase in importance after the crisis.

This rationalization of the financial crisis in standard terms of rationality, risk, asymmetric information and efficiency also translates into the archetypical policy-perspective, as Brunnermeier (2009) emphasizes the need for a strong role of central banks in providing liquidity to participants in financial markets. Thereby, it is important to note that the role of the central bank in this context is restricted to the provision of a secure, i.e. liquid, environment for financial market actors and does not encompass the more traditional functions of financial regulation and supervision and demand management via interest rate policies.

5 Conclusion

In this paper, we document that the financial crisis did not have much impact on the paradigmatic development of contemporary economics. In contrast to the experience of the Great Depression, which led to the emergence and acceptance of novel theoretical concepts on a large scale, the financial crisis and its consequences have, by and large, been rationalized with reference to existing theoretical concepts. Although we do observe a slight shift away from the idea that financial markets are efficient by default and prices only follow random walks, the basic conceptualization of (financial) markets as being efficient and equilibrating in principle seems unquestioned. On the contrary, the rising prominence of the concept of "liquidity" – understood as the availability of funds to absorb financial assets to be sold – in the aftermath of the crisis indicates that the financial crisis is seen by economists as a major external shock, unforeseen because of the limits imposed on rational behavior by asymmetric information, and not as something intrinsic to the economic process. Similarly, our analysis of the reception of major crisis-related books shows an only temporary increase of interest in classic contributions dealing with financial and economic instability, which was even weaker for more distinguished journals. These observations signify a key difference in terms of the 'lessons learned' from past crises when compared to the Great Depression, which gave rise to a broad consensus that capitalist economies are not self-sustaining, a consensus that eventually helped to forge the mixed economies dominating the richer parts of the planet.

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Appendix

Pre-crisis	Post-crisis
1. Economic Growth (299), 2. Monetary Policy (271), 3. Human Capital (271), 4. Growth (265), 5. China (248), 6. Efficiency (235), 7. Panel Data (228), 8. Uncertainty (225), 9. Cointegration (224), 10. Poverty (204), 11. Regulation (198), 12. Productivity (196), 13. Innovation (194), 14. Inflation (192), 15. Foreign Direct Investment (185), 16. Globalization (176), 17. Unemployment (174), 18. Inequality (166), 19. Forecasting (157), 20. Investment (155), 21. Learning (151), 22. Trade (147), 23. Africa (145), 24. Asymmetric Information (141), 25. Risk (138), 26. Economic Development (136), 27. Endogenous Growth (135), 28. Education (133), 29. Willingness To Pay (132), 30. Business Cycles (130), 31. Risk Aversion (130), 32. Competition (129), 33. Bargaining (124), 34. Political Economy (121), 35. Asia (118), 36. Migration (118), 37. Contingent Valuation (118), 38. Moral Hazard (115), 39. Employment (114), 40. International Trade (114), 41. Externalities (111), 42. India (111), 43. Latin America (109), 44. General Equilibrium (108), 45. Convergence (108), 46. Experiments (107), 47. Institutions (106), 48. Fiscal Policy (104), 49. Welfare (103), 50. Privatization (100), 51. Sustainability (99), 52. Public Goods (99), 53. Gender (97), 54. Volatility (97), 55. Incomplete Markets (97), 56. Corporate Governance (96), 57. R D (95), 58. Transaction Costs (95), 59. Exchange Rates (95), 60. Networks (94), 61. Developing Countries (92), 62. Auctions (92), 63. Transition (89), 64. Core (88), 65. Health (88), 66. Nash Equilibrium (87), 67. Educational Economics (86), 68. Search (85), 69. Long Memory (84), 70. Agriculture (83), 71. Consumption (83), 72. Income Distribution (82), 73. Information (82), 74. Oligopoly (81), 75. Incentives (81), 76. Agglomeration (81), 77. Money (80), 78. Experimental Economics (80), 79. Bounded Rationality (79), 80. Environment (79), 81. Governance (77), 82. European Union (77), 83. Taxation (76), 84. Entrepreneurship (76), 85. Data Envelopment Analysis (76), 86. Indeterminacy (76), 87. Game Theory (75), 88. Stability (75), 89. Equilibrium (75), 90. Asset Pricing (74), 91. Insurance (74), 92. Environmental Policy (73), 93. Market Power (72), 94. Corruption (72), 95. Risk Management (72), 96. Imperfect Competition (71), 97. Mergers (71), 98. Development (71), 99. Value At Risk (71), 100. Adverse Selection (70), 101. Climate Change (70), 102. Simulation (70), 103. Overlapping Generations (70), 104. Bootstrap (70), 105. Banking (70), 106. Wages (69), 107. Matching (69), 108. Collusion (69), 109. Property Rights (68), 110. Experiment (68), 111. Entry (68), 112. Rational Expectations (68), 113. Tax Competition (68), 114. Mexico (66), 115. Biotechnology (66), 116. Fertility (65), 117. Technology (65), 118. Evolution (64), 119. Garch (64), 120. Business Cycle (63), 121. Decentralization (63), 122. Inflation Targeting (62), 123. Altruism (62), 124. Total Factor Productivity (62), 125. Fairness (62), 126. Japan (61), 127. Technical Efficiency (61), 128. Technological Change (60), 129. Trade Liberalization (60), 130. Heterogeneity (60), 131. Mechanism Design (60), 132. Financial Crisis (60), 133. Equity (59), 134. Market Efficiency (58), 135. Market Structure (58), 136. Repeated Games (58), 137. Technology Adoption (58), 138. Redistribution (58), 139. Instrumental Variables (57), 140. Liquidity (57), 141. Social Capital (57), 142. Interest Rates (57), 143. Cooperation (56), 144. South Africa (56), 145. Exports (56), 146. Credit Risk (56), 147. Exchange Rate (56), 148. Valuation (56), 149. Product Differentiation (55), 150. Transition Economies (55), 151. Structural Change (55), 152. Spillovers (54), 153. Time Series (54), 154. Risk Sharing (54), 155. Real Exchange Rate (53), 156. Labor Supply (53), 157. Trust (52), 158. Banks (52), 159. Biodiversity (52), 160. Optimal Taxation (52), 161. Voting (52), 162. Decision Making (52), 163. Causality (52), 164. Reciprocity (52), 165. Signaled (51), 166. Multiple Equilibria (50), 167. Regional Development (50), 168. Real	1. China (638), 2. Economic Growth (603), 3. Monetary Policy (542), 4. Growth (424), 5. Human Capital (394), 6. Panel Data (389), 7. Efficiency (381), 8. Innovation (368), 9. Productivity (353), 10. Foreign Direct Investment (344), 11. Uncertainty (339), 12. Institutions (316), 13. Financial Crisis (307), 14. Regulation (301), 15. Poverty (294), 16. Inflation (291), 17. Education (288), 18. Climate Change (285), 19. Inequality (281), 20. Entrepreneurship (273), 21. Africa (271), 22. Unemployment (270), 23. Cointegration (263), 24. Learning (257), 25. India (245), 26. Welfare (242), 27. Forecasting (241), 28. Competition (240), 29. Experiment (238), 30. Asymmetric Information (233), 31. Risk (230), 32. Risk Aversion (221), 33. Investment (218), 34. Fiscal Policy (218), 35. Willingness To Pay (217), 36. International Trade (213), 37. Experiments (205), 38. Globalization (203), 39. Corruption (202), 40. Migration (201), 41. Corporate Governance (201), 42. Political Economy (200), 43. Gender (195), 44. Trade (189), 45. Economic Development (186), 46. Latin America (180), 47. Volatility (178), 48. Health (177), 49. Asia (177), 50. Public Goods (174), 51. Experimental Economics (169), 52. Liquidity (164), 53. Employment (162), 54. Moral Hazard (161), 55. Governance (152), 56. Agriculture (152), 57. Business Cycles (152), 58. Sustainability (151), 59. R D (150), 60. European Union (149), 61. Bargaining (148), 62. Developing Countries (146), 63. Development (144), 64. Heterogeneity (143), 65. Trust (143), 66. General Equilibrium (142), 67. Auctions (137), 68. Exchange Rates (134), 69. Endogenous Growth (134), 70. Real Options (133), 71. Mechanism Design (133), 72. Asset Pricing (132), 73. Information (132), 74. Incentives (128), 75. Business Cycle (127), 76. Voting (123), 77. Externalities (123), 78. Wages (123), 79. Social Capital (122), 80. Agglomeration (121), 81. Income Inequality (120), 82. Matching (120), 83. Financial Development (120), 84. Quantile Regression (119), 85. Data Envelopment Analysis (119), 86. Convergence (119), 87. Bootstrap (118), 88. Cooperation (118), 89. Technical Efficiency (115), 90. Consumption (115), 91. Income Distribution (113), 92. Instrumental Variables (112), 93. Adverse Selection (112), 94. Altruism (110), 95. Happiness (110), 96. Sub Saharan Africa (109), 97. Privatization (108), 98. Democracy (107), 99. Japan (107), 100. Structural Change (107), 101. Bounded Rationality (107), 102. Fairness (106), 103. Labor Supply (106), 104. Ambiguity (106), 105. Value At Risk (105), 106. Market Efficiency (105), 107. Market Power (104), 108. Game Theory (104), 109. Mexico (104), 110. Capital Structure (104), 111. Search (103), 112. Trade Liberalization (103), 113. Exchange Rate (103), 114. Property Rights (103), 115. Structural Breaks (102), 116. Inflation Targeting (102), 117. Networks (102), 118. Environmental Policy (100), 119. Obesity (100), 120. Health Insurance (100), 121. Nash Equilibrium (99), 122. Stability (99), 123. Energy (99), 124. Decision Making (99), 125. Labor Market (98), 126. South Africa (98), 127. Technological Change (96), 128. Elections (96), 129. Insurance (95), 130. Discrimination (95), 131. Signaled (94), 132. Ecosystem Services (94), 133. Educational Economics (94), 134. Total Factor Productivity (94), 135. Reputation (93), 136. Contingent Valuation (93), 137. Money (93), 138. Overlapping Generations (93), 139. Risk Management (92), 140. Collusion (92), 141. Rent Seeking (91), 142. Fertility (91), 143. Immigration (91), 144. Taxation (91), 145. Granger Causality (89), 146. Income (89), 147. Brazil (89), 148. Transaction Costs (89), 149. Reciprocity (88), 150. Identification (88), 151. Garch (87), 152. Banking (87), 153. Technology (87), 154. Behavioral Economics (86), 155. Core (86), 156. Diversification (85), 157. Policy (85), 158.

Pre-crisis	Post-crisis
Options (50), 169. Immigration (50), 170. Commitment (49), 171. Health Insurance (49), 172. Kalman Filter (49), 173. Deregulation (48), 174. Unit Roots (48), 175. Incomplete Information (48), 176. Identification (48), 177. Coordination (47), 178. Sustainable Development (47), 179. Monopolistic Competition (47), 180. Reputation (47), 181. Social Security (47), 182. Conservation (47), 183. Economics (46), 184. Telecommunications (46), 185. Generalize Method Of Moments (46), 186. Terrorism (46), 187. Capital Structure (45), 188. Europe (45), 189. Discrimination (45), 190. Price Discrimination (45), 191. Purchasing Power Parity (45), 192. Structural Breaks (45), 193. Unit Root (44), 194. Income Inequality (44), 195. Internet (44), 196. Pricing (44), 197. Consistency (44), 198. Dynamics (43), 199. Integration (43), 200. Labor Market (43), 201. Dea (43), 202. Stochastic Volatility (43), 203. Aggregation (43), 204. Economic Integration (43), 205. Mobility (43), 206. Russia (43), 207. Hedging (43), 208. Diversification (43), 209. Rationality (43), 210. Technical Change (42), 211. Economic Geography (42), 212. Brazil (42), 213. Term Structure (42), 214. Fiscal Federalism (42), 215. Preferences (42), 216. Knowledge (42), 217. Technology Transfer (41), 218. Arbitrage (41), 219. Granger Causality (41), 220. Currency Crisis (41), 221. Performance (41), 222. Model Selection (40), 223. Monopoly (40), 224. Competitiveness (40), 225. Productivity Growth (40), 226. Indonesia (40), 227. Methodology (40), 228. Pollution (40), 229. Communication (39), 230. Monetary Union (39), 231. Location (39), 232. Markov Chain Monte Carlo (39), 233. Auction (39), 234. Var (39), 235. Input Output Analysis (39), 236. Germany (39), 237. Turkey (39), 238. Environmental Regulation (39), 239. Credibility (38), 240. Private Information (38), 241. Democracy (38), 242. Gmm (38), 243. Capital Mobility (38), 244. Cost Benefit Analysis (38), 245. Liberalization (38), 246. Environmental Kuznets Curve (38), 247. Policy (38), 248. Default (38), 249. Expected Utility (38), 250. Costs (38)	Incomplete Markets (85), 159. Endogeneity (85), 160. Communication (84), 161. Environment (84), 162. Spatial Econometrics (84), 163. Social Networks (84), 164. Patents (83), 165. Choice Experiment (83), 166. Russia (83), 167. House Prices (83), 168. Oligopoly (82), 169. Biodiversity (82), 170. Redistribution (82), 171. Credit Risk (82), 172. Europe (81), 173. Self Employment (81), 174. Portfolio Choice (80), 175. Prospect Theory (80), 176. Causality (80), 177. Spillovers (80), 178. Stochastic Volatility (80), 179. Evolution (80), 180. Foreign Aid (80), 181. Purchasing Power Parity (80), 182. Microfinance (80), 183. Electricity (79), 184. Exports (79), 185. Incomplete Information (79), 186. Conflict (79), 187. Bayesian Estimation (78), 188. Kalman Filter (78), 189. Commitment (78), 190. Simulation (78), 191. Land Use (78), 192. Financial Markets (77), 193. Product Differentiation (77), 194. Climate Policy (77), 195. Robustness (77), 196. Propensity Score Matching (77), 197. Gmm (77), 198. Interest Rates (76), 199. Food Security (76), 200. Repeated Games (75), 201. Emerging Markets (75), 202. Optimal Taxation (74), 203. Competitiveness (74), 204. Oil Prices (74), 205. Performance (74), 206. Ethiopia (74), 207. Terrorism (73), 208. Field Experiment (73), 209. Loss Aversion (73), 210. Crime (73), 211. Var (72), 212. Technology Adoption (72), 213. Housing (72), 214. Phillips Curve (72), 215. Multiple Equilibria (72), 216. Market Structure (71), 217. Equilibrium (71), 218. Time Series (71), 219. Banks (71), 220. Infrastructure (71), 221. Quality (70), 222. Trade Policy (70), 223. Pricing (70), 224. Sustainable Development (70), 225. Mortality (70), 226. Energy Efficiency (69), 227. Equity (69), 228. Regime Switching (69), 229. Social Preferences (68), 230. Panel Cointegration (68), 231. Cost Benefit Analysis (68), 232. Long Memory (68), 233. Tax Competition (68), 234. Environmental Kuznets Curve (68), 235. Remittances (68), 236. Regional Development (67), 237. Knowledge (67), 238. Expectations (67), 239. Economic Geography (67), 240. Private Information (67), 241. Gravity Model (67), 242. Crisis (67), 243. Congestion (66), 244. Discrete Choice (66), 245. Social Norms (66), 246. Contagion (66), 247. Decentralization (66), 248. Unit Root (65), 249. Germany (64), 250. Earnings (64)

Table A1: 250 most used keywords in the pre- and post-crisis period.

Label	Keywords (Observations)
Financial Crisis	Financial Crisis (666), 2008 Financial Crisis (2), Financial Market Crisis (2), United States Financial Crisis (2)
Currency Crisis	Currency Crisis (125), Balance Of Payments Crisis (11), Exchange Rate Crisis (5), Balance Of Payment Crisis (3)
Banking Crisis	Banking Crisis (91), Bank Crisis (5), Systemic Banking Crisis (2)
Global Financial Crisis	Global Financial Crisis (81), Global Economic Crisis (10), Global Crisis (5)
Economic Crisis	Economic Crisis (61)
Asian Financial Crisis	Asian Financial Crisis (27), Asian Crisis (19), East Asian Crisis (10), Asian Currency Crisis (3), Asian Economic Crisis (3)
Subprime Crisis	Subprime Crisis (24), Housing Crisis (6), Subprime Mortgage Crisis (5), Sub Prime Crisis (4)
Debt Crisis	Debt Crisis (22), Credit Crisis (19)
Sovereign Debt Crisis	Sovereign Debt Crisis (16), European Sovereign Debt Crisis (9), Fiscal Crisis (4), Euro Area Debt Crisis (2)
Liquidity Crisis	Liquidity Crisis (15)
Food Crisis	Food Crisis (12), Food Price Crisis (6), Global Food Crisis (3), World Food Crisis (2)
Euro Crisis	Euro Crisis (11), Eurozone Crisis (10), European Debt Crisis (8), Euro Area Crisis (3), Eurozone Sovereign Debt Crisis (2)
Energy Crisis	Energy Crisis (4)
Insurance Crisis	Insurance Crisis (4)
Self Fulfilling Crisis	Self Fulfilling Crisis (4)
Twin Crisis	Twin Crisis (4)
BSE Crisis	BSE Crisis (3)
Emerging Market Crisis	Emerging Market Crisis (3)

Label	Keywords (Observations)
International Crisis	International Crisis (3)
Capitalist Crisis	Capitalist Crisis (2)
Causes Of Financial Crisis	Causes Of Financial Crisis (2)
Ltcm Crisis	Ltcm Crisis (2)
Mexican Crisis	Mexican Crisis (2)
Russian Crisis	Russian Crisis (2)
Stock Market Crisis	Stock Market Crisis (2)
Structural Crisis	Structural Crisis (2)
Systemic Crisis	Systemic Crisis (2)

Table A2: Merged crisis-related terms depicted in Figure 4.

Rank	Term (General)	Pre-Crisis	Post-Crisis	Both Periods		Rank	Term (Finance)	Pre-Crisis	Post-Crisis	Both Periods
1	Model*	115	168	248		1	Return*	23	46	59
2	Estimat*	61	143	147		2	Risk*	22	36	69
3	Test*	58	62	134		3	Stock*	18	28	62
4	Market*	53	70	114		4	Financ*	21	38	39
5	Theor*	64	64	100		5	Asset*	9	25	40
6	Firm*	60	73	91		6	Monetary	22	12	21
7	Growth	69	36	118		7	Shock*	10	25	20
8	Pric*	43	64	111		8	Rule*	12	10	22
9	Rate*	73	40	102		9	Volatil*	1	18	22
10	Countr*	58	85	71		10	Profit*	20	5	14
11	Data	60	71	70		11	Forecast*	11	14	13
12	Effect/s	34	67	79		12	Bank*	12	3	22
13	Equilibri*	45	22	92		13	Liquid*	6	17	14
14	Time	45	43	60		14	Debt*	10	6	19
15	Distribut*	37	32	72		15	Uncertain*	4	8	23
16	Result/s	33	36	63		16	Wealth	10	6	16
17	Change*	35	34	62		17	Option*	5	7	19
18	Distribution*	31	31	66		18	Present	9	9	13
19	Return*	23	46	59		19	Investor*	1	10	19
20	Risk*	22	36	69		20	Bond*	2	1	25
21	Level*	38	45	43		21	Ownership*	2	7	19
22	Capital	36	26	61		22	Fluctuation*	7	8	12
23	Income*	44	29	48		23	Share/s	4	7	15
24	Trade	7	86	26		24	Fund*	3	7	15
25	Function*	22	25	71		25	Premi/um/a	5	3	16
26	Variable*	27	44	46		26	Inequal*	4	6	13
27	Cost*	39	29	43		27	Equit/y/ies	1	5	15
28	Stock*	18	28	62		28	Shareholder*	1	9	8
29	Polic/y/ies	31	22	54		29	Opportunit*	4	2	11
30	Evidence	23	34	44		30	Credit*	0	2	14

Table A3: The 30 most used general (left) and finance-related terms (right) in abstracts of the 400 most cited articles before and after the crisis.

Book	Rank	Times cited	Percent of articles that cite book	Times cited before crises	Times cited after crises	Percent before crises	Percent after crises	Percentage point change	Rank percentage point change	Relative change in share	Rank (Top 5)	Times cited (Top 5)	Percent of articles that cite book (Top 5)	Times cited before crises (Top 5)	Times cited after crises (Top 5)	Percent before crises (Top 5)	Percent after crises (Top 5)	Percentage point change (Top 5)	Rank percentage point change (Top 5)	Relative change in share (Top 5)
(Keynes 1936)	1	2034	0.79	372	740	0.7	0.75	0.05	4	1.07	**2**	62	0.79	17	10	0.81	0.41	-0.4	20	0.51
(Schumpeter 1942)	2	1413	0.55	326	507	0.61	0.52	-0.09	30	0.85	**3**	51	0.65	19	9	0.9	0.37	-0.53	21	0.41
(Veblen 1899)	3	806	0.31	168	327	0.32	0.33	0.01	12	1.03	**5**	28	0.36	8	10	0.38	0.41	0.03	11	1.08
(Marx 1867)	4	753	0.29	139	284	0.26	0.29	0.03	7	1.12	**21**	4	0.05	2	2	0.09	0.08	-0.01	12	0.89
(Polanyi 1944)	5	716	0.28	140	283	0.26	0.29	0.03	8	1.12	**11**	10	0.13	1	3	0.05	0.12	0.07	8	2.4
(Friedman and Schwartz	6	670	0.26	144	237	0.27	0.24	-0.03	28	0.89	**1**	72	0.92	15	34	0.71	1.4	0.69	2	1.97
(Reinhart and Rogoff	7	554	0.22	-	260	-	0.26	0.26	1	-	**4**	33	0.42	-	21	-	0.87	0.87	1	-
(Schumpeter 1939)	8	421	0.16	71	148	0.13	0.15	0.02	10	1.15	**12**	10	0.13	-	6	-	0.25	0.25	3	-
(Kindleberger 1978)	9	418	0.16	62	190	0.12	0.19	0.07	3	1.58	**6**	20	0.26	7	6	0.33	0.25	-0.08	18	0.76
(Fisher 1961)	10	387	0.15	86	144	0.16	0.15	-0.01	23	0.94	**8**	14	0.18	4	4	0.19	0.17	-0.02	15	0.89
(Keynes 1930)	11	359	0.14	67	111	0.13	0.11	-0.02	26	0.85	**17**	5	0.06	1	2	0.05	0.08	0.03	10	1.6
(Friedman 1969)	12	309	0.12	83	102	0.16	0.1	-0.06	29	0.62	**9**	11	0.14	6	3	0.28	0.12	-0.16	19	0.43
(Kalecki 1954)	13	264	0.1	48	88	0.09	0.09	-	16	1	**-**	-	-	-	-	-	-	-	-	-
(Bagehot 1873)	14	225	0.09	37	85	0.07	0.09	0.02	11	1.29	**7**	17	0.22	3	6	0.14	0.25	0.11	6	1.79
(Akerlof and Shiller 2009)	15	213	0.08	-	127	-	0.13	0.13	2	-	**16**	5	0.06	-	3	-	0.12	0.12	5	-
(Friedman 1959)	16	205	0.08	49	70	0.09	0.07	-0.02	24	0.78	**10**	10	0.13	2	1	0.09	0.04	-0.05	16	0.44
(Minsky 1982)	17	188	0.07	33	87	0.06	0.09	0.03	5	1.5	**-**	-	-	-	-	-	-	-	-	-
(Minsky 1986)	18	182	0.07	25	83	0.05	0.08	0.03	6	1.6	**-**	-	-	-	-	-	-	-	-	-
(Harvey 1982)	19	153	0.06	25	62	0.05	0.06	0.01	15	1.2	**-**	-	-	-	-	-	-	-	-	-
(Friedman and Schwartz	20	141	0.06	31	42	0.06	0.04	-0.02	25	0.67	**14**	7	0.09	1	5	0.05	0.21	0.16	4	4.2
(Fisher and Brown 1922)	21	134	0.05	32	46	0.06	0.05	-0.01	21	0.83	**13**	9	0.11	2	4	0.09	0.17	0.08	7	1.89
(Friedman 1956)	22	128	0.05	26	51	0.05	0.05	-	17	1	**18**	4	0.05	-	1	-	0.04	0.04	9	-
(Keynes 1923)	23	126	0.05	28	40	0.05	0.04	-0.01	22	0.8	**15**	7	0.09	3	2	0.14	0.08	-0.06	17	0.57
(Galbraith 1954)	24	86	0.03	12	40	0.02	0.04	0.02	9	2	**19**	4	0.05	1	1	0.05	0.04	-0.01	13	0.8
(Steindl 1952)	25	83	0.03	10	31	0.02	0.03	0.01	14	1.5	**-**	-	-	-	-	-	-	-	-	-
(Kindleberger 1973)	26	74	0.03	22	14	0.04	0.01	-0.03	27	0.25	**20**	4	0.05	1	1	0.05	0.04	-0.01	14	0.8
(Hayek 1933)	27	57	0.02	9	20	0.02	0.02	-	18	1	**-**	-	-	-	-	-	-	-	-	-
(Galbraith 1990)	28	27	0.01	4	16	0.01	0.02	0.01	13	2	**-**	-	-	-	-	-	-	-	-	-
(Duesenberry 1958)	29	16	0.01	5	5	0.01	0.01	-	19	1	**-**	-	-	-	-	-	-	-	-	-
(Weintraub 1978)	30	10	-	1	1	-	-	-	20	-	**-**	-	-	-	-	-	-	-	-	-

Table A4: Citations after 1996, before and after the financial crisis to 30 selected books.

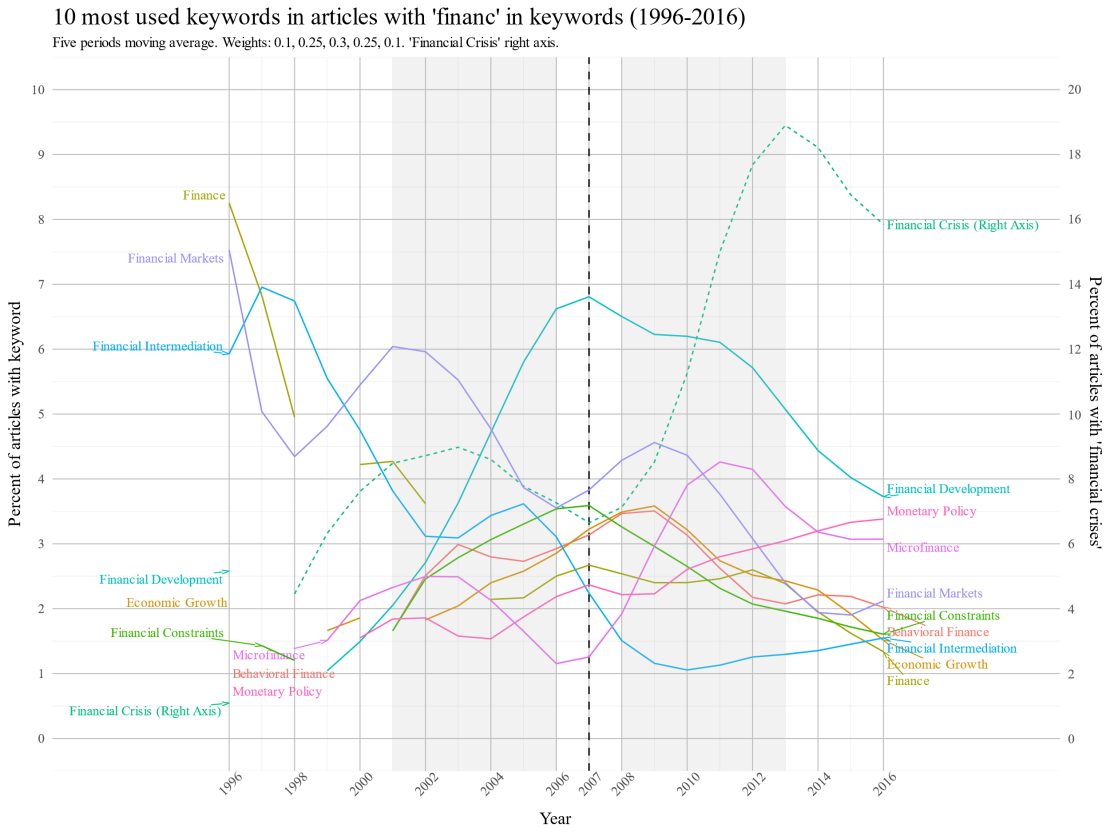

Figure A1: Top 10 keywords in articles with 'financ' in keywords, including single observations. Labels refer to first and last observations, respectively.

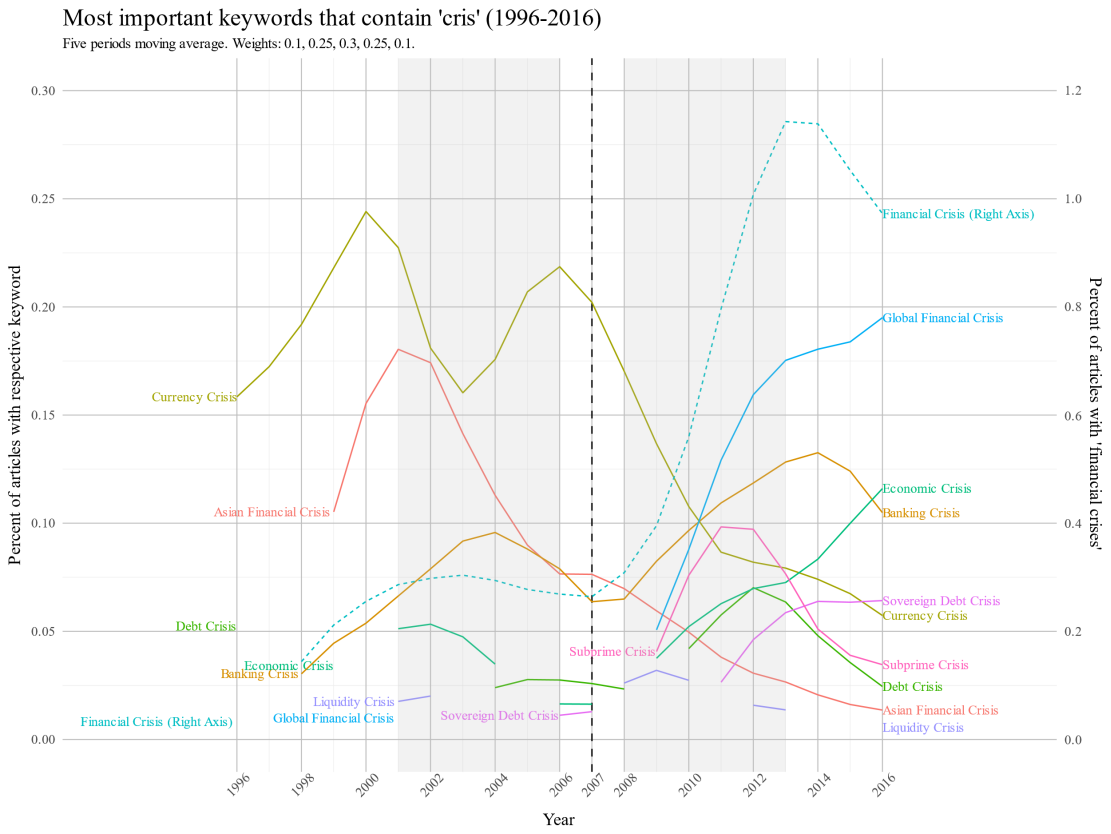

Figure A2: Most important keywords that contain 'cris' (1996-2016) i.e. those keywords that have been present in most of the 20 observed years, including single observations. Labels refer to first and last observations, respectively.

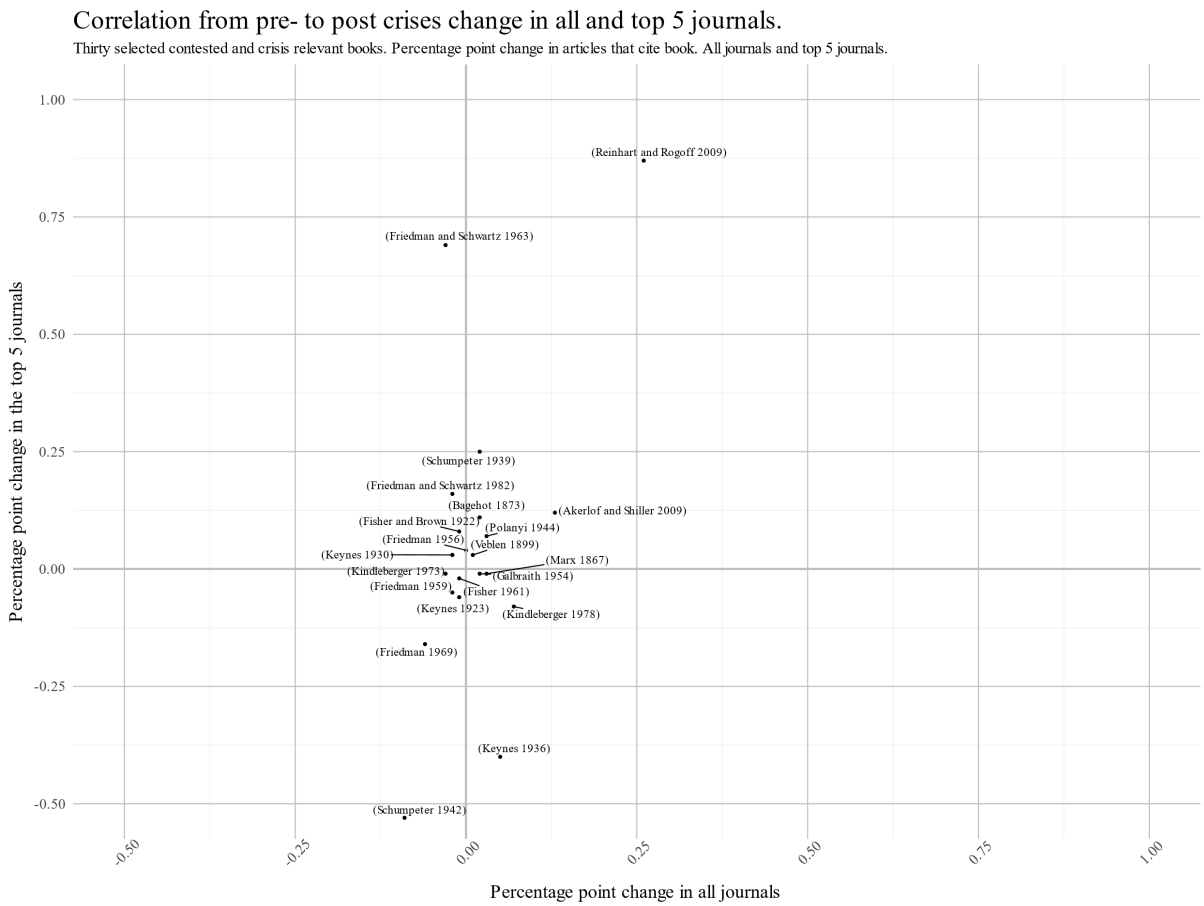

Figure A3: Correlation from pre- to post-crisis percentage point change in references to thirty selected books in all and top five journals.