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TRENDS IN ZOMBIE FIRMS RESEARCH: A BIBLIOGRAPHIC REVIEW

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Abstract:

The aim of the paper is to explore the knowledge infrastructure of research addressing the zombie issue using a bibliometric review approach combined with content analysis. The review includes 114 papers by 247 authors in 77 journals compiled using Web of Science database. The study demonstrates an exponential increase in research on the zombie issue after 2018, identifies four research streams within this topic, discusses their main findings so far, and proposes some research challenges and future research agenda of this relatively new research theme.

Key words: *zombie firm, zombie lending, bibliometric analysis, content analysis*

1. Introduction

The term 'zombies' refers to the living dead who appear in scenes from horror and fantasy movies. However, we do not have to encounter this concept only in mass culture, i.e. in films, literature, or video games (Browning et al., 2016), but in recent times it has also spread to economic issues and has become a respected term even in governmental reports and scientific publications, while the parallel remains – zombie firms are operating on the market despite they should already be bankrupt due to their over-indebtedness and financial distress.

Zombie issues began to appear frequently in economic journals in connection with the financial crisis and the economic stagnation in Japan after the year 2000 (e.g. Ahearne & Shinada, 2005; Caballero et al., 2008), but gradually researchers are also focusing on this topic in Europe (e.g. Urionabarrenetxea et al., 2017; Adalet McGowan et al., 2018; Blažková & Dvoutělý, 2022), while the number of publications has increased significantly in connection with crises, both the financial crisis in 2008 and the Covid-19 pandemic crisis. Since the first

significant publication defining zombie firms (Hoshi, 2006), this topic has been addressed by various authors, the number of articles focussing on zombie research has increased rapidly, and several underlying research streams in zombie research have emerged.

The beginning of this research area can be marked in the late 1990s in connection with the economic crisis in Japan, followed by a colossal stagnation of the economy lasting more than a decade. As investigated by Ahearne & Shinada (2005) or Caballero et al. (2008), the phenomenon of zombie firms is considered to be one of the causes of this economic situation. The behaviour of Japanese banks, known as "zombie lending" or "evergreening", i.e., banks keep lending to insolvent borrowers, permitted troubled firms to survive and poorly contributed to Japanese economic performance (Caballero et al., 2008). This research on credit misallocation was later followed by scholars from other countries (e.g. Andrews et al., 2017; Adalet McGowan et al., 2018; Albertazzi & Marchetti, 2010; Broz & Ridzak, 2017), particularly due to the 2008 crisis, when unconventional monetary measures were introduced by central banks around the world. However, as later studies have revealed (e.g. Urionabarrenetxea et al., 2017; Gray, 2018; Blažková & Dvoutě, 2022), the emergence and existence of zombie companies may not always be established due to favourable lending policies. Generally, these studies mainly concern and investigate the potentially high negative effect of zombie firms on the economy and growth (e.g. Tan, 2016; Adalet McGowan et al., 2018; Osterhold & Gouveia, 2020; Yu et al., 2021; Logarušić & Raguz Krištić, 2022). At present, economists highlight the risk of expansion of zombie firms as a result of the crisis related to the Covid-19 pandemic, which has become the subject of the latest studies of zombie issues (e.g. Zoller-Rydzek & Keller, 2020; Dursun-de Neef & Schandlbauer 2021; Altman, 2021).

Given that this research topic is relatively new and unexplored, to our knowledge, no studies have yet examined the intellectual structure of this area of research. Although the number of zombie studies is growing significantly, there is still a lack of a clear view of how zombie research topics, concepts, and methods are interconnected or how they follow each other. Therefore, we respond to this research gap by exploring the literature on zombie issues using a bibliometric review approach combined with content analysis (Donthu et al., 2021; Krippendorff, 2018). The analysis covers articles indexed in the Web of Science database (Clarivate Analytics, 2023) for the entire period of history until 27th February 2023, when we performed the data extraction. Since the existing zombie literature focuses on different aspects of this issue, our paper aims to map the overall research domain on the zombie phenomena and extract future research directions to guide further development in this novel research stream.

This study provides an overview of how essential papers have been built into each other, formulating leading underlying research streams, identifying potential research collaborations, and highlighting the key journals publishing the most significant works. In addition, the content analysis results present the main factors of the existence of zombie companies, methods of measuring and evaluating the consequences, integrated and harmonised into one comprehensive framework. Finally, based on the findings, future research trends and recommendations, advancing zombie firms research have been derived and presented. The procedure and methodological approach of our study allow us to address the following research questions:

RQ1: What are the key journals, influential institutions, and articles dealing with zombie research?

RQ2: How has zombie research evolved over time, and what underlying research streams were the most influential for future research in zombie phenomena?

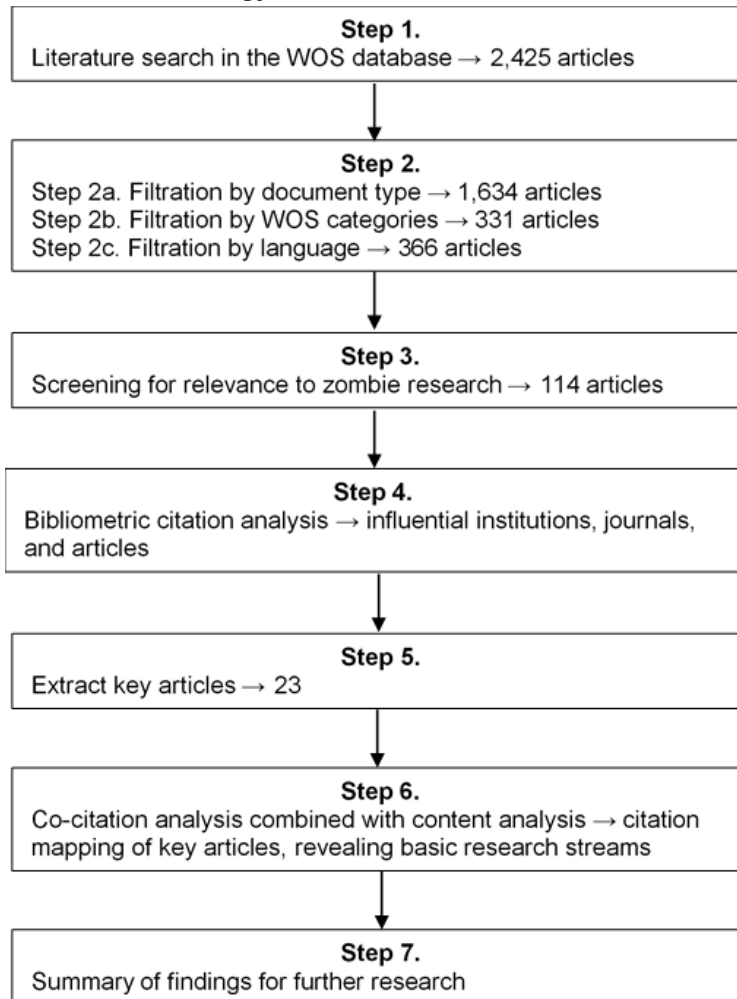
2. Research Methodology

This study was conducted from February 2023 to May 2023 and combines the scientometrics technique (bibliometric review) and the content analysis to map the evolution and structure of current research on zombie issues, identify the main characteristics in this research field, and highlight potential trends for future studies.

Data were collected from the Web of Science (WOS) online database (Clarivate Analytics, 2023), the most renowned academic database used in published bibliometric studies within the economic disciplines of research (e.g. Rey-Martí et al., 2016; Gil-Gomez et al., 2021; Jalal et al., 2021). We searched for the papers published until the end of February 2023 (the extraction date was 27th February, when we obtained complete citation data from the WOS database), keeping the initial period as far as the history of the WOS database is, i.e., covering the initial period since 1900. The literature search was conducted for relevant articles using 'zombie' and 'zombies' as keywords in the WOS database (Clarivate Analytics, 2023). The initial search provided 2,425 articles, which were further filtered by document type (article), WOS categories (Economics, Business Finance, Social Science Interdisciplinary, Political Science, Multidisciplinary, Geography, International Relations, Business, Area Studies, Management, Social Issues, Asian Studies, Urban Studies, Law, Public Administration, Agricultural Economics Policy, Development Studies, Industrial Relations Labor), and language (English). This filtering resulted in 366 articles whose abstracts, or complete articles where applicable, were further carefully reviewed for relevance to our topic of interest. Finally, 114 articles were found relevant to the research on zombie firms. Our sample of 114 papers was written by 247 authors connected to 186 institutions. Figure 1 presents the workflow of our analysis.

We used the *HistCite*[™] 12.3 software for bibliometric analysis, which is widely used in studies in the economic field to provide timeline visualisation of citations, identify citation and co-citation patterns, and thereby point out the subsequent impact of these citations (e.g. Fetscherin & Heinrich, 2015; Maditati et al., 2018; Alon et al., 2018; Bahoo, 2020).

Figure 1 – Research methodology



Source: Own elaboration, inspired by the PRISMA approach for conducting a systematic literature review (Moher et al., 2015)

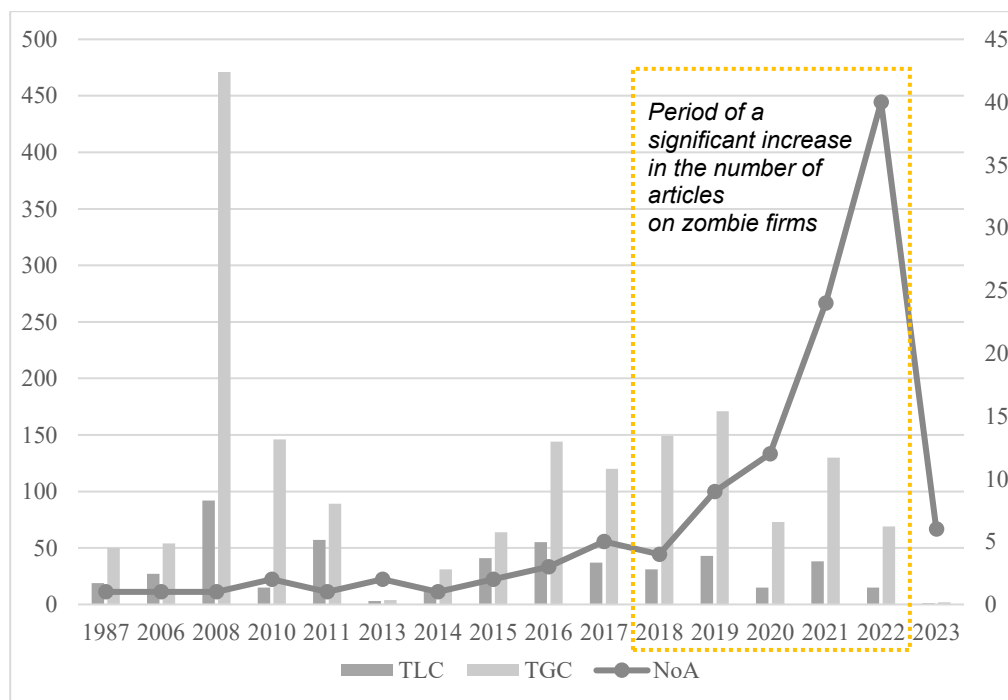
3. Results

The results of the bibliometric citation analysis provide an answer to the first research question (RQ1), namely the evaluation of the key journals, leading academic institutions publishing papers with zombie issues and influential authors. Subsequently, impactful and trending articles in zombie research are identified and analysed using the graph maker tool to display co-citations in the map. Based on content analysis, the second research question (RQ2) is answered, i.e. the development of zombie research is evaluated, and research directions are deduced. Concerning our stated main research questions, we calculate a set of statistics and rankings that we present below.

3.1 Publication trends

We tracked the number of publications and citations over time to identify the trends in publications and citations in this research area. Figure 2 shows a fundamental descriptive analysis of yearly aggregated-level publications and citations of 114 papers. Figure 2 shows total global citations (TGC), i.e. how frequently the papers were cited in the WOS database, and total local citations (TLC), i.e. how frequently the citations appeared within the zombie research community (among the 114 papers). These indicators were inspired by similar studies relying on bibliometric analysis as the primary method (Garfield et al., 2006). As can be seen, there has been an exponential increase in research on the zombie topic in recent years, i.e. from 2018 (indicated by a dashed line in the graph in Figure 2), which confirms an evolving interest, also presupposing its continuation. It might be noted that the number of records and citations in 2023 does not yet correspond to the current development, as the final download of articles for analysis was carried out at the end of February 2023.

Figure 2 – Number of publications and citations



Note: NoA – Number of articles published related to the zombie issue, TLC – Total Local Citations received, TGC – Total Global Citations received.

Source: Authors' compilation based on the Web of Science database (Clarivate Analytics, 2023)

3.2 Most influential institutions

To identify the most influential institutions in zombie research, we measured the importance of different academic institutions (on the aggregate level of universities) based on the total number of published articles related to zombie research (NoA) and the citations received (similarly as e.g., Maditati et al., 2018; Fetscherin & Heinrich, 2015; 2018; Alon et al., 2018). We used two types of scores for the citations received, i.e., TLC and TGC scores (Garfield et al., 2006). The leading institutions in zombie research are located in China, the USA, the Netherlands, and Italy. As seen in Table 1, there are two main centres of zombie research worldwide in terms of countries, namely China and the USA, which have the largest representation of institutions involved in zombie research. However, the most influential researchers come from various universities within these regions, such as *Zhongnan University of Economics and Law* (particularly School of Accounting and School of Public Administration), *Wuhan University* (particularly Economics and Management School), *Erasmus University* (particularly School of Economics), *New York University* (Stern School of Business), *University of California San Diego* (particularly School of International Relations and Pacific Studies), and *The University of Chicago* (particularly School of Business), among others. These institutions (listed in Table 1) can be considered as so-called "centres of excellence" in zombie research to date and, therefore, as target institutions for potential cooperation of academics, PhD students, policymakers and other stakeholders.

Table 1 – Most influential institutions

Institution	Rank based on NoA			Institution	Rank based on TLC		
	NoA	TLC	TGC		NoA	TLC	TGC
1 Zhongnan University of Economics and Law (China)	10	36	106	University of California San Diego (USA)	3	134	670
2 Wuhan University (China)	6	14	56	National Bureau of Economic Research (USA)	3	126	666
3 Erasmus University (Netherlands)	4	32	111	The University of Chicago (USA)	3	109	619
4 New York University (USA)	4	3	17	Erasmus University (Netherlands)	4	32	111
5 University of California San Diego (USA)	3	134	670	Zhongnan University of Economics and Law (China)	10	36	106
6 National Bureau of Economic Research (USA)	3	126	666	University of California, Davis (USA)	3	30	83
7 The University of Chicago (USA)	3	109	619	Peking University (China)	3	35	73
8 University of California, Davis (USA)	3	30	83	Wuhan University (China)	6	14	56
9 Peking University (China)	3	35	73	Bank Italy (Italy)	3	9	27
10 Bank Italy (Italy)	3	9	27	New York University (USA)	4	3	17

Notes: NoA - Number of articles related to zombie firms research; TLC – Total Local Citation score shows the count of citations to a paper within the collection; TGC – Total Global Citation score shows the count of citations to a paper received from all articles.

Source: Authors' compilation based on the Web of Science database (Clarivate Analytics, 2023)

3.3 Most influential journals

Bibliometric citation analysis is a valuable tool to assess the influence of a journal in a specific area (Donthu et al., 2021). We deploy this tool to assess journals' performance in zombie firms' research areas and rank them according to the number of published articles related to this topic. Table 2 summarises the top 20 journals in terms of the number of articles (NoA) that are devoted to the topic of zombie firms, the number of citations to papers within a collection per year (TLC/t), and the average count of citations to a paper received from all articles globally (TGC/t), as explained by Garfield et al. (2006) and as commonly used to present the results of bibliometric analysis, e.g. Maditati et al. (2018), Kapoor and Kar (2023), or Goyal et al. (2021). Journals are ranked based on the number of research articles related to zombie firms.

Table 2 – Ranking of the top 20 journals (based on number of articles)

	Journal	IF 2021	JCR Category. Quartile	Abbr.	NoA	TLC/t	TGC/t
1	<i>Applied Economics Letters</i>	1.287	Q4 (Economics)	AEL	6	1.00	1.33
2	<i>Economic Modelling</i>	3.875	Q1 (Economics)	EM	5	8.40	27.30
3	<i>Review of Financial Studies</i>	8.414	Q1 (Business, Finance + Economics)	RFS	5	6.20	25.70
4	<i>Emerging Markets Finance and Trade</i>	4.859	Q1 (Economics + International Relations), Q3 (Business)	EMFT	5	1.50	1.50
5	<i>International Review of Economics & Finance</i>	3.399	Q2 (Business, Finance + Economics)	IREF	4	3.44	6.39
6	<i>Journal of Banking & Finance</i>	3.539	Q2 (Business, Finance + Economics)	JBF	4	0.00	5.13
7	<i>China Economic Review</i>	4.744	Q1 (Economics)	CER	3	3.14	18.64
8	<i>China & World Economy</i>	2.451	Q2 (Economics)	CWE	3	0.40	1.27
9	<i>Economic Policy</i>	3.844	Q1 (Economics)	EP	2	4.00	8.17
10	<i>Journal of the Japanese and International Economics</i>	1.985	Q3 (Economics + International Relations)	JJIE	2	3.00	5.50
11	<i>China Journal of Accounting Research</i>	N/A	N/A	CJAR	2	1.71	2.76
12	<i>Resources Policy</i>	8.222	Q1 (Environmental Studies)	RP	2	1.60	7.20
13	<i>Japan and the World Economy</i>	1.703	Q3 (Economics)	JWE	2	1.40	4.35
14	<i>Economic Analysis and Policy</i>	4.444	Q1 (Economics)	EAP	2	0.33	7.33
15	<i>Journal of Credit Risk</i>	0.88	Q4 (Business, Finance)	JCR	2	0.25	2.00
16	<i>Asian-Pacific Economic Literature</i>	0.6	Q4 (Economics)	APEL	2	0.00	0.00
17	<i>Journal of Risk and Financial Management</i>	N/A	N/A	JRFM	2	0.00	1.33
18	<i>Pacific-Basin Finance Journal</i>	3.239	Q2 (Business, Finance)	PBFJ	2	0.00	6.92

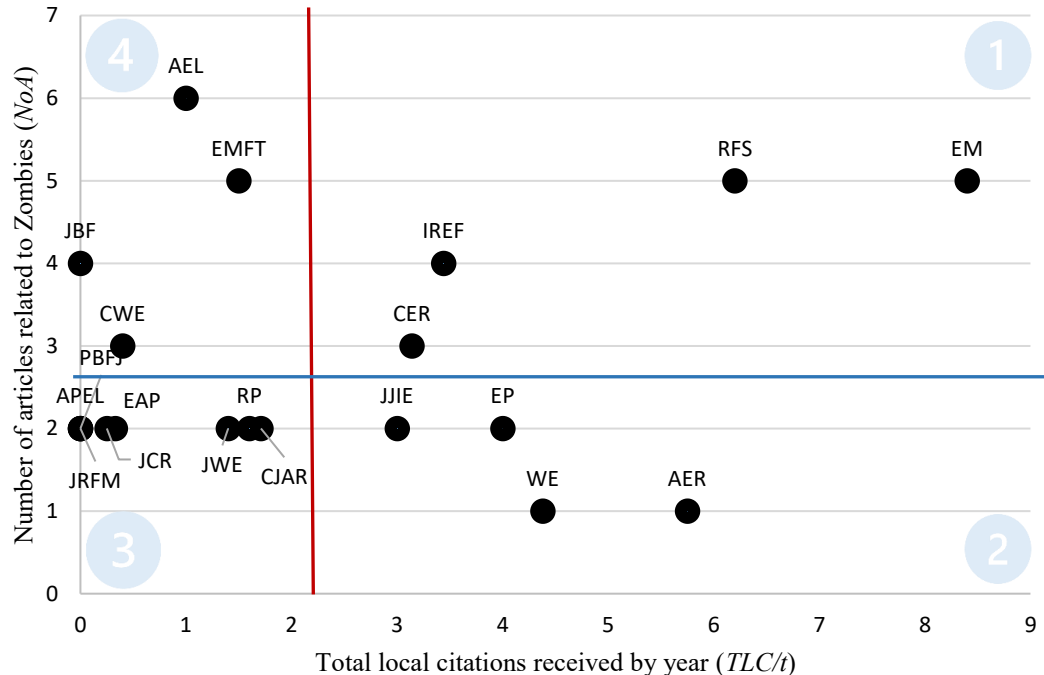
19	<i>American Economic Review</i>	11.49	Q1 (Economics)	AER	1	5.75	29.44
			Q2 (International Relations)				
20	<i>World Economy</i>	2.0	Q3 (Business, Finance + Economics)	WE	1	4.38	6.85

Notes: NoA – Number of articles related to Zombie; TLC/t – Total Local Citation score per year shows the count of citations to a paper within the collection per year; TGC/t – Total Global Citation score per year shows the count of citations to a paper received from all articles per year.

Source: Own elaboration in HistCite™ 12.3 software

Our results show that the list of most influential journals includes general-interest economics journals (e.g. *Applied Economic Letters*, *American Economic Review*, *World Economy*, *Economic Analysis and Policy*) followed by those with a focus on finance (e.g. *Review of Financial Studies*, *Journal of Banking and Finance*, *International Review of Economics & Finance*, *Emerging Markets Finance and Trade*, *Journal of Credit Risk*, *Journal of Risk and Financial Management*). Among the most influential journals in the field of zombie firms' literature, a significant group of journals can be identified that focus on issues of Asian, especially Chinese and Japanese, economies (e.g. *China Economic Review*, *Journal of the Japanese and International Economics*, *China Economic Review*, *Asian-Pacific Economic Literature*, *Japan and the World Economy*).

Figure 3 – Most influential journals on zombie firms research – graphical analysis



Note:

AEL - *Applied Economics Letters*

EM - *Economic Modelling*

CJAR - *China Journal of Accounting Research*

RP - *Resources Policy*

RFS - <i>Review of Financial Studies</i>	JWE - <i>Japan and the World Economy</i>
EMFT - <i>Emerging Markets Finance and Trade</i>	EAP - <i>Economic Analysis and Policy</i>
IREF - <i>International Review of Economics & Finance</i>	JCR - <i>Journal of Credit Risk</i>
JBF - <i>Journal of Banking & Finance</i>	APEL - <i>Asian-Pacific Economic Literature</i>
CER - <i>China Economic Review</i>	JRFM - <i>Journal of Risk and Financial Management</i>
CWE - <i>China & World Economy</i>	PBFJ - <i>Pacific-Basin Finance Journal</i>
EP - <i>Economic Policy</i>	AER - <i>American Economic Review</i>
JJIE - <i>Journal of the Japanese and International Economics</i>	WE - <i>World Economy</i>

Authors' compilation based on the Web of Science database (Clarivate Analytics, 2023)

To give the audience a more profound knowledge of the zombie firms literature, we divide the 20 most influential periodicals into four quadrants according to their impact and performance and illustrate their relationship in Figure 3. The variable for journal performance in the zombie research area is the number of articles devoted to this topic published in these journals. This proxy (NoA) is plotted on the y-axis. The second variable, tracking the impact of articles on zombie companies, is measured by the average annual number of citations within the collection (TLC/t) and is plotted on the x-axis. The boundaries of the quadrants are formed by the mean values of both variables, which in the case of the number of publications is 2.85 per journal and in the case of the average number of local citations is 2.35. The division of journals into individual quadrants allows identifying four groups of periodicals. In quadrant number 1, there are journals that both have a high performance in the field of publishing articles on the topic of zombie companies and, at the same time, have a significant impact on the scientific audience in this area. In quadrant number 2, we find journals that have a low focus on the issue of zombie companies but a high impact on scholars. Similarly, the journals in quadrant 3 have both low focus and low impact on the audience. Quadrant 4 includes journals whose performance in the number of articles on zombie firms is high, but the impact in terms of the number of citations is low.

3.4 Most influential articles

To measure the research performance at the level of individual scientists, we monitor research productivity not only based on the number of publications but primarily on impacts in terms of citations. As Rey-Martí et al. (2016, p. 1654) stated, "the number of citations received by an article may owe to the popularity of the article's author or research field rather than the relevance of the article itself". Therefore, we use the annual Total Local Citation score (TLC/t) to identify the top 10 articles according to impact and application within the boundaries of zombie research (see Table 3). We also reviewed the contents of these top 10 articles and summarised the key findings of each study in Table 3. Thus, this adds value to the research community, allowing us to understand better the critical contributions of the most cited studies being published.

As shown in Table 3, the most highly cited article was published in the *American Economic Review* in 2008 by Caballero et al. and topped the lists of TLC/t (5.75) and TGC/t (29.44). The second article was published in the *Economic Modelling* journal in 2021 by Chang et al., with 4.67 TLC/t and 7.33 TGC/t. Finally, the article by Fukuda and Nakamura published in 2011 in the *World Economy* ranked third with 4.38 TLC/t and 6.85 TGC/t. Two

articles have authors only from China, two articles only from Japan, one article has authors only from France and one only from the Czech Republic, and the remaining four articles resulted from international cooperation, i.e. between the USA and Japan (two articles), USA and China, and among India, the Netherlands, Spain, and Germany.

Table 3 – Ranking of the top 10 articles according to annual TLC/t (= Total Local Citation score per year)

	Article	Journal	Key findings	TLC	TLC/t	TGC	TGC/t
1	Caballero et al. (2008)	<i>American Economic Review</i>	The increase of zombie firms in an industry (due to zombie lending in Japan) depressed the investment and employment growth of non-zombie firms and widened the productivity gap between zombies and non-zombies. Zombie-dominated industries exhibited more depressed job creation and destruction and lower productivity.	92	5.75	471	29.44
2	Chang et al. (2021)	<i>Economic Modelling</i>	Greater levels of government intervention can increase the risk of a firm becoming a zombie firm. The government encourages the creation of zombie firms through subsidies, resource support, financial support and taxes.	14	4.67	22	7.33
3	Fukuda and Nakamura (2011)	<i>The world economy</i>	The authors discovered that reducing the number of employees and selling unused fixed assets was necessary to recover zombie companies in Japan in the first half of the 2000s. Other important factors for the recovery of zombie firms were the favourable macroeconomic environment and external support, including debt relief and capital reduction.	57	4.38	89	6.85
4	Adalet McGowan et al. (2018)	<i>Economic Policy</i>	The authors demonstrated that zombie firms suppress labour productivity performance in OECD countries. A higher share of industry capital sunk in zombie firms is associated with lower investment and employment growth of non-zombie firms and less productivity-enhancing capital reallocation. The rise of zombie firms is linked to the decline in potential OECD output growth.	24	4.00	49	8.17

5	Acharya et al. (2019)	<i>The Review of Financial Studies</i>	The authors showed that zombie lending incentives arise if banks are weakly capitalised, leading to significant market distortions in industries with a high prevalence of zombie firms. Due to credit misallocation and the resultant market distortions, creditworthy firms operating in industries with a high zombie prevalence were negatively affected regarding employment growth and investments.	19	3.80	93	18.60
6	Tan et al. (2016)	<i>Asian Economic Papers</i>	The authors found that China's government policies increased the performance of zombie firms and crowded out the growth of private firms. The higher the concentration of state-owned banks (and state-owned enterprises), the more favourable the environment for growing zombie firms.	30	3.75	63	7.88
7	Shen and Chen (2017)	<i>China Economic Review</i>	The increase in state-led investments reduces the investment rate of non-zombie firms and raises that of zombie firms. The overall investment rate is lower because of the "crowding out" of non-zombie firms. The absence of zombie firms leads to a higher growth rate of output, hence a higher rate of job creation, and higher wages for the workers due to the higher overall productivity growth.	22	3.14	78	11.14
8	Kwon et al. (2015)	<i>Review of Economic Dynamics</i>	The authors demonstrated on the firm data of Japanese manufacturers that zombie lending distorted resource reallocation across plants, especially because it allowed zombie firms to avoid reducing production inputs, such as labour. Without zombie lending, the annual loss in aggregate productivity growth would have been about one percentage point lower.	28	3.11	47	5.22

9	Imai (2016)	<i>Journal of the Japanese and International Economies</i>	The author confirmed that the reduced land values that caused the credit crunch in healthy firms did not lead to declining loans among zombie firms due to zombie lending. In addition, zombie lending has created unproductive and unprofitable investments among zombie firms. The author also points out that the investment increase resulting from evergreen loans was not productive or profitable.	24	3.00	44	5.50
10	Blažková and Dvouletý (2022)	<i>Journal of Small Business Management</i>	The authors detected extreme zombie firms (i.e. firms with negative equity) in the Czech food industry. They identified that zombie firms were most often located in metropolitan areas than rural areas, were smaller companies with limited liabilities, and were most likely middle-aged companies. The authors also predicted the worsening of financial results before a firm turned into a zombie firm – a decrease in total assets and profitability, debt growth, and accumulation of the previous year's losses.	5	2.50	8	4.00

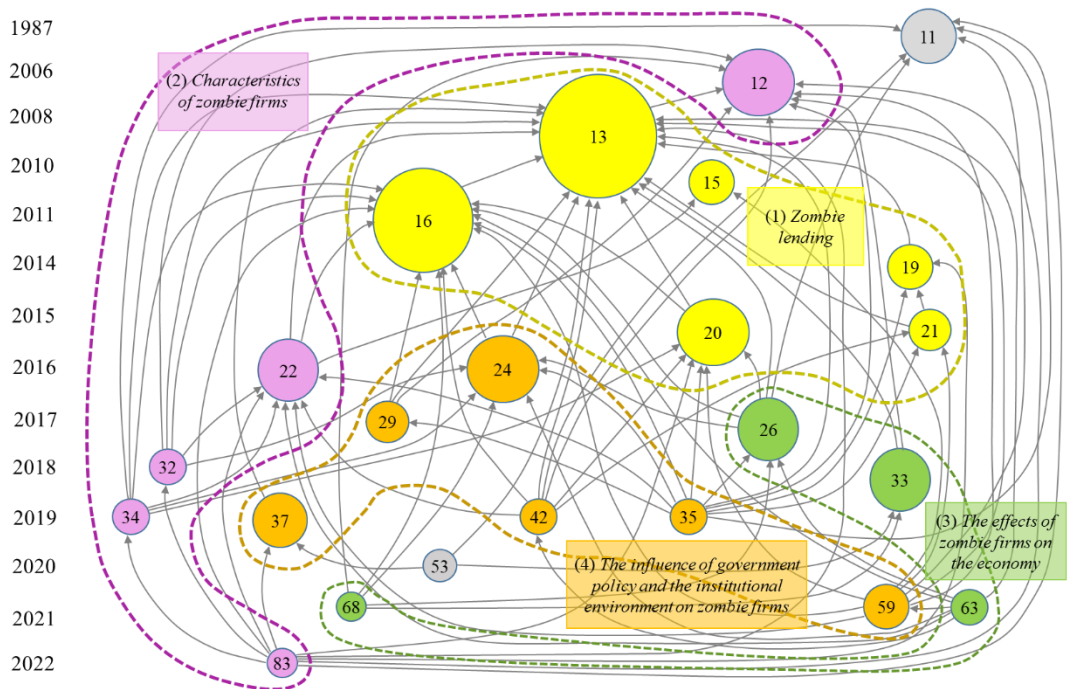
Notes: TLC - Total Local Citation score; TLC/t – Total Local Citation score per year; TGC – Total Global Citation score; TGC/t – Total Global Citation score per year.

Source: Authors' compilation based on the Web of Science database (Clarivate Analytics, 2023)

3.5 Citation Mapping

We applied a co-citation mapping technique to visualise reciprocal citation and co-citation of articles over time (Donthu et al., 2021). This enables us to identify comprehensive themes in the research on zombie firms. Since we aimed to identify the core structure of the zombie research, we included those articles that have been cited at least five times – the threshold of $TLC > 4$ was chosen as the cut-off criterion allowing us to get meaningful results. This criterion yielded 23 articles out of the 114 articles analysed, showing that 20% of articles were cited at least five times.

Figure 4 – Citation mapping of zombie research



Note: Each node refers to the ID of a particular article, namely

11 – Kane (1987)	22 – Imai (2016)	37 – Acharya et al. (2019)
12 – Hoshi (2006)	24 – Tan et al. (2016)	42 – Liu et al. (2019)
13 – Caballero et al. (2008)	26 – Shen and Chen (2017)	53 – Schivardi et al. (2020)
15 – Hoshi and Kashyap (2010)	29 – Jiang et al. (2017)	59 – Chang et al. (2021)
16 – Fukuda and Nakamura (2011)	32 – Urionabarrenetxea et al. (2018)	63 – Geng et al. (2021)
19 – Bruche and Llobet (2014)	33 – Adalet McGowan et al. (2018)	68 – Dai et al. (2021)
20 – Kwon et al. (2015)	34 – Goto and Wilbur (2019)	83 – Blažková and Dvoutěý (2022)
21 – Jaskowski (2015)	35 – Dai et al. (2019)	

Source: Own elaboration in HistCite™ 12.3 software

In Figure 4, the vertical axis shows the years of publication, and the nodes represent individual articles (marked with a unique ID), the size of which depends on the TLC – the more citations, the larger node indicating the more influential article. In addition, lines with arrows show cross-citation relationships between articles, i.e. the article from which the arrow originates cites the article to which the arrow points. We conducted a content analysis, which enabled us to answer our second research question regarding the evolution of zombie research over time and identify underlying research streams.

This citation map is the result of an analysis using *HistCite*TM 12.3 software, whereas based on the subsequent content analysis of the 23 selected articles, the authors supplemented it with the marking of different but, at the same time, interrelated research streams within the given topic, as described in Figure 4. These research streams are: (1) the research on bank behaviour known as "zombie lending" or "evergreening" when banks kept lending to insolvent borrowers; (2) detecting zombie firms and the investigation of their characteristics; (3) the investigation of effects of zombie firms on other "healthy firms" and hence on the industries and whole economy; and (4) addressing the influence of government policy and the institutional environment on the emergence and existence of zombie firms. The following sections discuss relevant articles of these research streams, finally allowing us to draw directions for further research in this area.

3.5.1 Zombie lending

The first concerns about zombie issues originated in Japan when economists started to investigate the problems in the financial system and their relations to the Japanese economic stagnation early after the year 2000 (Caballero et al., 2008; Kwon et al., 2015), which is the subject of the first group of articles. They focused on bank behaviour known as "zombie lending", "evergreening", or "forbearance lending" (Bruche & Llobet, 2014) when banks kept lending to insolvent borrowers. As explained by Hoshi (2006), these firms were helped in order to protect their incumbent employees since the pressure to save firms in troubles that have many employees is especially high in Japan. Under the institutional mechanism called the 'main bank' system, the main bank was required to offer a 'rescue' package to distressed companies (Hoshi, 2006). In addition, banks kept lending to insolvent firms because they also wanted to prevent their own losses in the balance sheets (Hoshi & Kashyap, 2010). By keeping these troubled "zombie" firms alive, banks allowed competition in the economy to be distorted, a fact that has become the subject of a number of studies.

The most influential work is the article by Caballero et al. (2008) (number 13 in Figure 4), who examined the implications of suppressing the normal competitive process through misdirected bank lending. This article has inspired researchers across various sub-streams within zombie research, as the authors not only explain the Japan story but also constructed the zombie measure to identify zombie firms and, based on the theory of creative destruction, they also modelled the impacts of the zombie firms' existence on the market environment. Fukuda and Nakamura (2011) (number 16 in Figure 4) extended the method of identification of zombie firms introduced by Caballero et al. (2008) and performed multinomial logistic regressions to investigate the nature of corporate restructuring that helped recovery of zombie firms. Kwon et al. (2015) (number 20 in Figure 4) focused on how much zombie lending accounted for Japan's poor economic performance during the 1990s.

Using matched firm-plant data, they provided evidence of distorted resource reallocation across plants, and based on a counterfactual analysis, they quantified the loss in aggregate productivity growth from zombie lending. Other topics of this research stream were analyses of Japanese policy on bank recapitalisation (Hoshi & Kashyap, 2010 (number 15 in Figure 4); Bruche & Llobet, 2014 (number 19 in Figure 4)), and investigating why banks engage in zombie lending practises (Jaskowski, 2015 (number 21 in Figure 4)).

Although it might seem that this research stream is limited to the Japanese environment, developments have shown similarities in times of crisis in Europe, where zombie lending also occurs (Bruche & Llobet, 2014; Jaskowski, 2015). As mentioned by Jaskowski (2015), there is evidence that banks in Spain, Ireland or Great Britain are refinancing bad loans and misreporting non-performing loans as well as the true market value of the assets used to cover those loans. The questions arise as to why banks engage in bogus loan restructurings or whether there are any incentives for this behaviour, which provides stimuli for further investigation across countries.

3.5.2 Characteristics of Zombie Firms

The second stream of zombie literature aims to understand zombie firms' characteristics, behaviour, and presence in different industries or countries. A seminal work in this area is the article by Hoshi (2006) (number 12 in Figure 4), who identified zombie firms in Japan during the five years from 1997 to 2001 and aimed to explain how these zombie firms in the economy are born. Based on the probit models, the probability of becoming a zombie firm was estimated as a function of the firm profitability, financial structure, size, location, and industry. Blažková & Dvouletý (2022) (number 83 in Figure 4) followed up on this research and, except describing differences between zombies and non-zombies in the Czech food industry in 2003-2015, they applied the panel data approach to investigate the dynamics of the process of becoming a zombie firm. Goto & Wilbur (2019) (number 34 in Figure 4) contributed to clarifying the characteristics of zombie firms in the Japanese data, especially on the durability of the zombie status. Urionabarrenetxea et al. (2018) (number 32 in Figure 4) focused on the riskiest zombie firms and, using a Spanish sample from 2010 to 2014, they developed a method for ranking zombie firms based on risks and changes over time, i.e. an index called EZIndex constructed based on four dimensions of the extreme zombie problem: extension, contagion, recovery signs and immediacy. Another influential work is the one by Imai (2016) (number 22 in Figure 4), who examined Japanese zombie firms' borrowing and investment behaviour using balanced panel data and concluded that evergreening induced non-productive and non-profitable investment among zombie firms. Nevertheless, the research on zombie firms' characteristics and their reasons for survival and behaviour still leave many topics for future research, such as examining the top management and board member characteristics.

3.5.3 The Effects of zombie firms on the Economy

Research on the effects of the zombie firms' existence is closely related to all three other research streams because whether one examines banking behaviour causing the emergence of zombie firms (*Zombie lending*), the behaviour of zombie firms themselves

(*Characteristics of zombie firms*), or the institutional and governmental environment influencing their survival (*The influence of government policy and the institutional environment on the emergence and existence of zombie companies*), the effects of these zombie firms on other entities always arise. However, the articles included in this research stream are specifically devoted to how zombie companies affect healthy companies, regardless of the causes of their genesis and the environment in which they exist.

Shen and Chen (2017, p. 327) (number 26 in Figure 4) empirically tested the relationship between zombie firms and the over-capacity Chinese manufacturing industry during 2011-2013 and concluded that "zombie firms cause and worsen over-capacity by crowding out healthy firms by distorting resource allocations". Their contribution also lies in highlighting the role of resource allocation in the birth and lifespan of a zombie firm, which is also mentioned by Geng et al. (2021) (number 63 in Figure 4). Geng et al. (2021) also used Chinese data (from 1998 to 2007) to investigate the impact of zombie firms on industrial upgrading. They found out that zombies endanger industrial upgrading in two ways: first, by distorting resource allocation, and second, by inhibiting innovations. Dai et al. (2021) (number 68 in Figure 4) investigated the impact of downstream zombies on the cash conversion cycle of suppliers and concluded that suppliers pass their trade credit burden further along the supply chain. Dai et al. (2021, p. 394) pointed out, "As the proportion of downstream zombie firms increases, suppliers of zombies delay the payment to their own suppliers, and productive firms can delay payment more ". The negative effects of zombie firms on the economy are also evident in other countries; for example, Adalet McGowan et al. (2018) (number 33 in Figure 4) investigated the effect of the existence of zombie firms on productivity in OECD countries and showed that zombie companies stifle productivity performance.

3.5.4 The Influence of Government Policies and the Institutional Environment on the Emergence and Existence of Zombie Companies

As Figure 4 illustrates, this research stream is coming to the fore in the current period as economists and the public realise the seriousness of the problem and respond to it by attempts to intervene in the functioning of the market. The articles are most concerned with government policy in China, which the authors say is inducing the formation of zombie firms in various ways, such as through resource and financial support, subsidies, or taxes. Tan et al. (2016) (number 24 in Figure 4) criticised government investment boosting the performance of zombie firms and a high concentration of state-owned banks and enterprises, which means a more favourable environment for zombie firms to operate. Their findings recommend a change in government investment and comprehensive reform of the state sector, which should eliminate zombie firms. Likewise, Jiang et al. (2017) (number 29 in Figure 4) and Dai et al. (2019) (number 35 in Figure 4) found that government subsidies and credit endorsement the government are important causes of the persistence of zombies in China, and moreover, such continuous financial support from the government and banks does not contribute to the recovery of zombie firms. As confirmed by Liu et al. (2019) (number 42 in Figure 4), government subsidies also distort the investment behaviours of subsidised Chinese zombie firms, which in turn leads to poor performance. It turns out that local governments in China are also involved in perpetuating the zombie firm issue (Jiang et

al., 2017; Chang et al., 2021 (number 59 in Figure 4)), as the authors discuss the ways in which local governments in China use economic and legal means to intervene in firms and affect their operations, especially due to fierce competition among regions (Chang et al., 2021), which is closely related to the effort to maintain employment stability (Jiang et al., 2017). Acharya et al. (2019) (number 37 in Figure 4) explored the consequences of the Outright Monetary Transactions (OMT) program introduced by the European Central Bank in 2012, which was supposed to help avert the collapse of the Eurozone by stabilising government bond yields and restoring financial stability. Although the health of banks has improved, which has led to a greater supply of loans to the corporate sector, these loans have often been provided to poor borrowers, as confirmed by Acharya et al. (2019). This measure therefore led to a market distortion due to credit misallocation, harming healthy firms, especially if they operated in sectors with a high prevalence of zombie firms.

In the conclusions of these research studies, a number of different political implications appear for how to adjust government policies and, in the case of China, incentives for structural reforms and increasing the role of market forces in these reforms. But what all the authors agree on is that there is a necessity and urgency of getting rid of zombie businesses.

4. Conclusions and future research agenda

This study aimed to map the research area of zombie issue and assess the current development of this field of knowledge, including identifying possible future research directions. We thus respond to the exponential increase in research on the zombie topic after 2018, which implies the assumption of its continuation. We pursued two research questions addressing key journals, influential institutions, and articles dealing with zombie research (RQ1) and the underlying research streams carrying the most weight for future research in zombie phenomena (RQ2).

To address our first research question (RQ1), we collected data from the Web of Science database and conducted a bibliometric analysis of 114 articles related to the zombie issue. This allowed us to uncover the journals that represent the zombie research in the literature and thus contribute to the transfer of knowledge toward the scientific community and the public, the institutions most involved in research on this topic, and the most influential articles regarding their citations. Our results showed that the list of the most influential journals dominates general-interest economics journals (e.g. *Applied Economic Letters*, *American Economic Review*, *World Economy*, *Economic Analysis and Policy*,) followed by those with a focus on finance (e.g. *Review of Financial Studies*, *Journal of Banking and Finance*, *International Review of Economics & Finance*, *Emerging Markets Finance and Trade*, *Journal of Credit Risk*, *Journal of Risk and Financial Management*). As for the institutions dealing with zombie research, there are two main centres of zombie research worldwide in terms of countries, namely China and the USA, which have the largest representation of institutions involved in zombie research. However, the most influential researchers come from various universities within these regions, such as *Zhongnan University of Economics and Law*, *Wuhan University*, *Erasmus University*, *New York University*, *University of California San Diego*, *The University of Chicago*, among others.

Finally, we identified the top 10 articles according to impact and application within the boundaries of zombie research – the most highly cited article (we ranked the articles based on the count of citations to the article within the collection per year, i.e. TLC/t; in addition, here we also present the total count of citations in WOS database as of 31st May 2023, i.e. at the end of our study period) was a study by Caballero et al. published in the *American Economic Review* in 2008 (5.75; 492), the second article was by Chang et al. published in the *Economic Modelling* journal in 2021 (4.67; 28), and the article by Fukuda and Nakamura published in 2011 in the *World Economy* ranked third (4.38; 98).

Our bibliometric analysis has revealed that the study by Kane (2020) can be marked as the beginning of zombie research in economic studies. The article by Kane (1987) dealt with the consequences of setting an unrealistic low credit criterion by the US Federal Deposit Insurance Corporation, although it does not create a specific direction of research and is therefore not included in any of the four identified research areas, its fundamental importance lies in the primary naming of zombie entities in the economy. The first group of empirical studies devoted to the zombie phenomenon emerged in Japan as a reaction to the problems in Japan's financial system, and their focus is on the banking behaviour referred to as "zombie lending" or "evergreening" (Caballero et al., 2008; Hoshi & Kashyap, 2010; Fukuda & Nakamura, 2011; Kwon et al., 2015; Jaskowski, 2015). Subsequently, two directions of zombie research crystallised; on the one hand, research on the effects of zombie firms on "healthy" firms and the economy in general (Shen & Chen, 2017; Adalet McGowan et al., 2018; Geng, 2021; Dai et al., 2021), and the second, studies assessing the influence of the environment (i.e. government measures and institutional environment) on the existence of zombie firms (Tan et al., 2016; Jiang et al., 2017; Acharya et al., 2019; Liu et al., 2019; Dai et al., 2019; Chang et al., 2021). The fourth research topic, i.e. detection of zombie firms and the investigation of their characteristics, appears in articles across time and is interconnected with all the mentioned research directions (Hoshi, 2006; Imai, 2016; Urionabarrenetxea et al., 2018; Goto & Wilbur, 2019; Blažková & Dvoutělý, 2022).

With regard to our second research question (RQ2), we applied a co-citation mapping technique of *HistCite*TM 12.3 software and visualised the most cited articles into a graph. Based on reciprocal citation and co-citation of articles over time and exploration of articles through content analysis, four research streams related to research on zombie firms were identified: (1) the research on bank behaviour known as "zombie lending" or "evergreening" when banks kept lending to insolvent borrowers; (2) detecting zombie firms and the investigation of their characteristics; (3) investigation of effects of zombie firms on other "healthy firms" and hence on the industries and whole economy; and (4) addressing the influence of government policy and the institutional environment on the emergence and existence of zombie firms.

Several conclusions can be drawn based on the identified research streams discussed in the previous section to highlight implications for the academic literature. We found out that most of the studies on zombie issues in the past were concentrated in Japan, China, and the USA. Extension and exploring this research topic in other countries, especially within Europe, would help to achieve new knowledge in order to take up the struggle against the increasing threat of these zombie firms for sustainable economic development, as the inefficient and low-productivity firms are a barrier to sustainable

economic growth, which is evidenced by the economic theory (e.g. Schumpeter, 1961). Overall, the theory of zombie firms is still developing; authors in their studies borrow theories from various economic literature. For instance, Caballero et al. (2008), Fukuda and Nakamura (2011), Imai (2016), and Goto and Wilbur (2019) related their research to the concept of soft budget constraints (Kornai, 1979), as the Japanese experience was similar to the situation in socialistic economies, where firms never went bankrupt and exited market, even though they were highly indebted, thanks to the various state financial subsidies or other instruments. Jaskowski (2015) referred to the literature on contract theory and assumed that on the markets, a default on promises between investors and borrowers might occur if there is no mechanism to ensure their compliance. Still, it is evident that zombie companies, to some extent, receive external funding from investors to fund their day-to-day operations. Thus, future research should provide explanations and answers to the motivations of investors, providing resources to zombie firms and the consequences of these financial transactions. Jiang et al. (2017, p. 341) based their study on the social exchange theory, which views behaviour as an exchange of tangible or intangible commodities or services, and explained hereby that "the government is more inclined to grant subsidies to zombie companies that assume greater policy burdens, specifically those offering more jobs". Liu et al. (2019) explained the expansion and survival of zombie firms through government intervention theory and stated that the information asymmetry between firms and the government mainly causes government intervention failure. Blažková and Dvouletý (2022) summarise that there is not yet an adequate amount of studies on this extensive and relatively new research area that would provide sufficient knowledge to create a unified theory of zombie firms. On the other hand, the potential of a theory that is under construction is limitless and provides a huge scope for further scientific research.

Some research issues are still waiting to be explored, some of which were already mentioned in the discussion of the relevant research streams. If we were to summarise further research topics that emerged from the bibliometric and content analysis, we would provide the following. Researchers should investigate the effects of soft bank lending practices in other economies that have been studied so far, especially during periods of crisis, since such loans often coincided with financial crises, which would contribute to discussions on financial sector supervision and regulation. There is also great potential to analyse the real impact of zombie firms on the economy, which has so far been explored to a limited extent. In addition, other characteristics of zombie firms should be explored, such as, e.g. top management and board member characteristics, to analyse how to stop spreading the problem when results are significantly unfavourable. One particular research recommendation would be to study to what extent the presence and intensity of zombie firms are moderated by the institutional environment (North, 1987), which could be studied by implementing the lenses of multilevel analysis (Hox et al., 2017). The investigation of the relationship between the role of the social and institutional environment and the emergence and genesis of zombie firms appears as another research topic resulting from the performed analysis. Here we recommend paying particular attention to the prerequisite and screening of the applicants for government aid and investigating to what extent previous financial health is an assumption to obtain public support. We propose a testable assumption that zombie companies receive more likely public support in programmes where the previous

financial track record of the companies is not examined ex-ante. And last but not least, it is critical to specify which firms can be categorised as zombies since there is still no uniform procedure used to identify them and measure the extent of the problem.

Furthermore, we recognise some limitations of this study. All articles reviewed in this study were written in English; therefore, future research should also investigate non-English research to supplement knowledge in this field, which was not currently possible due to the limited language skills of the author team. Also, given that our study analysed articles indexed only in the Web of Science database, future researchers could also examine articles from other databases, such as Google Scholar or Scopus, that could add additional information to the research on zombie firms. Nevertheless, the results of our analysis provide a compelling insight into a relatively new research theme, so we would like to encourage academics to investigate this issue further within the directions we suggest.

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