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The Zombie Firms' Phenomenon:

Origin and Economic Consequences in OECD Countries

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Agenda

Introduction

This dissertation study illustrates the phenomenon of zombie firms and zombie lending, from the definition, causes, and economic global implications.

An increasing number of papers have been written recently about the phenomenon, since it has become significantly important worldwide, from both an economic and political point of view. Several authors have pointed out the raise in zombie firms since the congestion inhibits economic growth and generates distortions in the market.

The study of zombie firms, and the reasons behind zombie lending, must be acknowledged and taken into account by policymakers and governments, to know the phenomenon and prevent the negative consequences on productivity and allocation of resources. The researches made are focused on raising the awareness of the problem and on the potential solutions that might be implemented by policymakers.

It is massively important to highlight the effects of the increase in zombie firms, since it enhances misallocation of resources in the market and, consequently, deteriorates even the performance of non-zombie firms creating distortions in the market, and impact on the real economy.

The essay begins with the first manifestation of the phenomenon, namely the Japan crisis of the 1990s: this phase of the economic stagnation of the economy as a consequence of the speculative bubble burst in 1991. This event has been particularly significant since the origin of zombie firms has been attributed in particular to the forbearance policies implemented by Japanese banks in response to the massive decline in asset prices, and consequently in the value of collaterals.

The second section will discuss the different characteristics of the financial systems, in particular market-based and bank-based financial systems, which present opposite features and that might in a certain sense, have influenced the diffusion of the zombie firms' phenomenon.

Indeed, after the Japanese crisis of the 1990s, the issue of zombie lending started to spread in Europe and OECD countries, where after the OMT program implemented after the Great Financial Crisis, Europe saw its share of zombie companies increasing overtime and banks had their portion of NPLs in balance sheets growing significantly.

After there will be a section focused on the discussion that brought together several studies in recent years, that is about the criteria of identification of zombie firms. Although the argument has been debated for long time, there is not an official preferred way to classify zombie firms yet, and the relevant alternatives will be

listed and discussed. In particular, the paper will analyze the phenomenon in Italy, which in recent years has been disproportionately increasing.

Following, the essay will address which have been the major causes for the development of the phenomenon, in particular focusing on weak banks and the extraordinary measures of expansionary policies put in place after the crisis, which kept interest rates near zero for over a decade.

As a conclusion, it will be discussed the importance of the insolvency regimes' design across countries, highlighting the differences and the consequences for the aggregate productivity in the economy.

The objective of this essay is to provide an overall view of the origin and the development of zombie firms, and mostly, how it is still affecting and slowing down the economic growth in several countries. As it has been said before, it is important to raise the awareness of the phenomenon, which has been ignored by governments and by media for different years, until the consequences have become striking in recent years.

I. Zombie Phenomenon in Japan

a. Japanese Financial System Overview

Japan is known to have a bank-centered financial system, even if it has also one of the biggest stock markets worldwide. Recently, the mergers and the failures of different financial institutions left Japan with few banks holding almost half of all the private loans and deposits.

The government plays an important role in the banking system, and the largest activity of deposit-taking is in the hand of the Japan Post, which has over nine times the number of branches of all other city banks.

The real problem of the banking sector is the shrunk profitability, which has been low for over ten years. Indeed, the net operating profit of banks has been negative since 1993, according to Fukao (2003), but the losses have been canceled with capital gains on stocks and lands. The cumulative losses collected by banks since 1990 amount to ¥91,5 trillion, which is 18% of Japanese GDP.

Due to the recession Japan was facing in that period, this the first reason attributed to banks' losses, but with losses becoming too large and persistent, reaching 80% of the lending increment between 1986 and 1990, they became a clear sign of a deeper structural problem in the banking industry. The first cause of the low profitability is directly linked to the decrease in profitability of the lending activity. Figure 1 taken from a study of Kashyap (2002) clearly show the difference in profitability between the US and Japanese banking system: in the first one, banks' interest margin has always been contained between 3,3% – 3,5%, while in Japan it was maximum 1,3% of assets.

The second problem of shrinking profitability is that Japanese banks relied too much on revenue from lending: indeed, in 2003 the category of non-lending revenue was only 38% of revenue coming from lending activities, while in the United States it was around 78%. Another difference was in fees and commission income as part of total income, that between the decades of 1976-1996 have more than doubled in the United States, but instead were kept constant in Japan.

Nipponese banks could have tried to found new high-margin products to offer to clients, but in reality, the difference was due to regulations, like the one that did not allow banks until 1998 to exercise activities such as OTC derivative transactions, underwriting of securities, and brokerage. A lot of borrowers during the 1980s shifted from bank financing towards bond financing on the market, both locally and abroad.

A. Japan (trillion yen, except last three rows)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
A. Interest income – interest expense	7.1	8.9	9.8	9.2	9.7	10.8	10.7	10.0	9.6	9.7	9.4
B. Other revenue[a]	2.6	2.2	2.5	2.8	2.1	3.3	3.7	3.6	3.1	2.5	3.0
C. Operating costs	7.1	7.5	7.7	7.7	7.8	7.8	8.0	8.0	7.5	7.3	7.1
D. Salaries and wages	3.7	3.9	4.0	4.0	4.0	4.0	4.0	4.0	3.6	3.5	3.4
E. Gross profit = A + B – C	2.6	3.5	4.5	4.3	4.0	6.3	6.4	5.6	5.2	4.9	5.3
F. Loan losses	0.8	1.0	2.0	4.6	6.2	13.3	7.3	13.5	13.5	6.3	6.6
G. Net operating profit = E – F	1.8	2.5	2.5	-0.4	-2.2	-7.0	-1.0	-7.9	-8.3	-1.4	-1.3
H. Realized capital gains[b]	2.0	0.7	0.0	2.0	3.2	4.4	1.2	3.6	1.4	3.8	1.4
I. Net profit = G + H	3.8	3.3	2.5	1.7	1.0	-2.6	0.2	-4.2	-6.9	2.3	0.1
J. Assets	927.6	914.4	859.5	849.8	845.0	848.2	856.0	848.0	759.7	737.2	804.3
Outstanding loans[c]	424.3	445.8	460.3	472.3	477.8	482.7	482.3	477.9	472.6	463.4	456.9
Return on assets (I/J)	0.0041	0.00360	0.0029	0.0020	0.0012	-0.0031	0.0002	-0.0050	-0.0090	0.0031	0.0001
Labor costs/operating costs (D/C)	0.52	0.52	0.52	0.52	0.51	0.51	0.50	0.50	0.48	0.48	0.48
(Interest income – interest expense)/ assets (A/J)	0.0076	0.0097	0.0114	0.0108	0.0115	0.0127	0.0125	0.0118	0.0126	0.0132	0.0117
(Interest income – interest expense)/ total income = A/(A + B)	0.7320	0.8018	0.7967	0.7667	0.8220	0.7660	0.7406	0.7353	0.7559	0.8017	0.7581

B. U.S. (millions of dollars, except last three rows)

A. Interest income – interest expense	114,948	121,288	132,872	138,785	145,999	153,483	161,172	172,667	180,601	189,655	200,814
B. Other revenue[a]	54,759	59,482	65,411	74,706	75,952	81,956	92,515	102,946	121,808	142,238	149,501
C. Operating costs	115,295	124,233	130,455	139,204	143,637	148,936	159,241	168,339	192,222	201,883	212,728
D. Salaries and benefits expenses	51,558	52,861	54,588	57,977	60,360	63,129	66,659	71,325	78,533	84,877	87,817
E. Gross profit = A + B – C	54,412	56,537	67,828	74,287	78,314	86,503	94,446	107,274	110,187	130,010	137,587
F. Loan losses (provisions)	31,953	34,158	26,061	16,753	10,892	12,411	15,483	18,913	21,218	20,758	27,796
G. Net operating profit = E – F	22,459	22,379	41,767	57,534	67,422	74,092	78,963	88,361	88,969	109,252	109,791
H. Realized capital gains	483	2,971	4,001	3,055	(558)	530	1,108	1,836	3,119	179	(2,293)
I. Net profit (before taxes) = G + H	22,942	25,350	45,768	60,589	66,864	74,622	80,071	90,197	92,088	109,431	107,498
J. Assets	3,378,859	3,420,481	3,496,120	3,695,838	3,999,354	4,299,278	4,554,234	4,989,642	5,410,923	5,690,193	6,152,551
Outstanding loans	2,045,822	1,989,229	1,969,920	2,088,626	2,296,944	2,539,682	2,736,615	2,895,082	3,156,861	3,398,030	3,704,686
Pre-tax return on assets (I/J)	0.0068	0.0074	0.0131	0.0164	0.0167	0.0174	0.0176	0.0181	0.0170	0.0192	0.0175
Labor costs/operating costs (D/C)	0.4472	0.4255	0.4184	0.4165	0.4202	0.4239	0.4186	0.4237	0.4086	0.4204	0.4128
(Interest income – interest expense)/ assets = A/J	0.0340	0.0355	0.0380	0.0376	0.0365	0.0357	0.0354	0.0346	0.0334	0.0333	0.0333
(Interest income – interest expense)/ total income = A/(A + B)	0.6773	0.6710	0.6701	0.6501	0.6578	0.6519	0.6353	0.6265	0.5972	0.5714	0.5732

Profitability of Japanese and US banks from 1990 to 2000

Source: Kashyap (2002) – Figure 1

Moreover, a critical issue of the Japanese banking system is the size: the industry is too large and the offer for high-margin financial services is low. The decisions of corporate borrowers have been strictly limited in time by several capital controls that were inhibiting overseas investments etc., and even if in 2001 most of these regulations have been removed, consumers have not shifted much of their decisions.

Despite the deregulation of 2001, Japanese banks kept relying on lending operations as the major source of revenue. This minority of offer concerning all the major global banks, and also Japanese banks have always been the last to enter new markets or propose new products.

Another before-mentioned particular is implied both by the large size of the banking sector and by the strong presence of government: strong competition. The government-sponsored Japan Post with the highest number of branches and much greater convenience in service offer, or Japan's Government Housing Loan Corporation that held roughly 40% of all the mortgage loans, for example, had an enormous advantage compared to normal banks. All the government-sponsored financial institutions contributed to shrinking the profitability of banks since they can afford to charge a lower interest rate than private institutions.

Finally, another issue with banks was the practice of evergreening, involving the extension of credit to low-quality borrowers. One explanation for the origin of this phenomenon, that will be further discussed in this work, is that it was not just in the interests of the institutions to do so, but the government was implicitly or explicitly putting pressure on banks to not force the borrowers to declare bankruptcy, since it would have implied massive job loss and consequent increase in unemployment.

Even if in 2003 the economy seemed to have a little recovery, according to Hoshi and Kashyap (2004), it will not be effective until there will be a significant change in policies of the financial sector, since, for all the previous reasons, Japan exhibited a not-well functioning financial system. The problem was that regulators did not force banks to change approach with customers towards making more detailed risk analysis of the profiles, and the government kept persisting to protect creditors and shareholders of failed banks, and to bail out weak banks. Policies were reactive and delayed, making changes to the system only when it was strictly necessary.

b. Credit Misallocation in Japan and Economic Stagnation

One of the most important events of the late XX century was the economic crisis in Japan, which caused a huge stagnation of the economy lasting for over a decade. The phenomenon of zombie firms has been partly considered as one of the causes of this economic situation, during which Japan registered the lowest growth compared to all Organization for Economic Co-operation and Development (OCSE) countries. Still, nowadays, Japan has not returned to postwar economic health.

Following the events, researchers at the first beginning of the XXI century started to study the causes of the economic crisis, discovering atypical behaviors of banks and corporations that damaged the economic system.

Japan has always had a bank-based financial system, where firms relied much more on bank loans over bond financing, differently from market-based financial systems like the United States. Indeed, in Japan credit allocation decisions are based on different criteria: Japanese banks are willing to lend also to troubled firms since they perceive helping these companies as a national duty. Instead, US banks' lending decisions are the outcome of accurate credit risk and profit maximization analyses, seen as a priority for the institutions.

The Japanese crisis of the 1990s began with the burst of the real estate and stock market bubble, which triggered a significant drop in asset prices that massively hit banks since real estate assets were often used as collateral and represented a relevant portion of banks' balance sheets. The speculative bubble emerged

as a consequence of an expansionary monetary policy where interest rates were low to incentivize demand for financing. The increase in companies' liquidity improved not just investments in core activities, but also in speculative activities in both the stock and the real estate market, boosting asset prices. When the bubble burst, banks accumulated lots of bad loans since a considerable number of companies were not capable to repay the obligations anymore. As consequence, banks reduced loans, leading due to a credit crunch and causing companies to cut their investments. The banking system during those years was facing the issue of low profitability, and the additional losses on loans accumulated contributed to a decrease even more in the capital held by banks. This is why many banks remained undercapitalized and they kept extending loans to weaker and troubled firms, characterized by a high probability of default or in financial distress, even if these players would not have been able to survive in the market. In normal conditions, without the support of institutions, these firms should have gone through the process of bankruptcy, or at least, restructuring.

Banks were deliberately mis-valuating their riskier loans and, consequently, their capital, showing to be sufficiently capitalized so that the government did not have the duty to intervene and bailout them in case of failure. That would have implied additional financial costs for the authorities and a large surge in unemployment. So, the government was aware that banks were overestimating their capital, and it didn't prevent banks to lend to troubled firms to ease the credit crunch that was happening.

As prices were declining and assets losing value, banks faced a lot of difficulties and increasing pressure in meeting capital requirements, since every time a bank had to call in a non-performing loan, it had to set aside more capital, meaning fewer earnings, higher minimum level of capital for the bank and a higher cost of capital for investors. Despite the decreasing ability of banks to satisfy customer credit needs and the fading health of Japanese banks, the study of Joe Pick and Eric Rosengren (2003) demonstrated that most of the firms did not switch to other sources of financing like bond issues.

The phenomenon of banks that preferred to follow perverse policies by deliberately keeping to make credit available to troubled borrowers, rather than re-qualify loans as non-performing through periodical impairment tests, is defined as Bank Forbearance. Thus, by implementing forbearance practices favoring distressed companies, banks were following their interests to avoid any government and fiscal pressure. As long as banks continued to lend money to firms sufficiently to cover interest payments on the outstanding loans, firms did not have to declare bankruptcy, and banks did not have to record increases in non-performing loans (NPL) or even reclassify them. This practice is normally called "evergreening" of loans: by not increasing their NPLs, banks are not required to account for losses and additional charge offs by increasing bank reserves so that the earnings and the capital are not shrunk. In principle, a bank should reclassify a loan as non-performing when the interest payments are not executed for over three months, but a bank might avoid mandatory increase of NPLs by providing a sufficient amount of credit to the company to pay interests on

debt, without having to declare bankruptcy. In addition, evergreening benefitted banks especially during times of flow-interest rates since the credit amount that firms have to pay to banks is lower.

To face this crisis, the government started a series of capital injections that mostly targeted large institutions: banks' bailouts were made to keep guaranteeing the operations of the payment system and stability during the crisis period, ensuring the flow of credit in the economy. The effects of bailout, generally, depend on important factors like the size of recapitalization, the conditions of banks before the event, and the capacity to satisfy capital requirements defined by the Tier 1 capital ratio (i.e., the ratio of a bank's core equity capital to its total risk-weighted assets), and on the bank borrowers' quality characteristics. Consequently, government recapitalizations were of different sizes depending on the mentioned factors.

In 1998 the Diet confirmed the amount of JPY 30 trillion of public funds, with JPY 13 trillion targeted to a recapitalization of principal banks, mainly through subordinated debt and preferred shares.

Giannetti and Simonov (2011) analyzed the effectiveness of the government interventions on banks, credit supply, and on the borrowers. Given the financial situation of the Japanese banking system, lots of recapitalizations were not sufficiently large to make all banks satisfy the capital requirements: most banks remained undercapitalized, and while some others reported Tier 1 capital ratio above standards. The second and the third injections between 1998 and 2005 were three and four times larger than the first one, and in addition, 64 banks issued new equity to private investors. On average the amount of capital injected per bank was JPY 75 billion, slightly more than 1% of bank assets. Moreover, the number of mergers involving banks increased, where bigger banks were acquiring weaker ones to save them, or simply to reach an important size to be considered "too big to fail". Yet, this was another method that in the end did not improve banks' capitalization.

Notwithstanding all injections of public and private capital, not all the institutions increased the availability of credit, but only the injections that allowed banks to meet capital requirements raised the supply of credit.

The study of Philippon and Schnabl (2009) confirmed that for a bailout to be effective, the recapitalization must be of considerable size to cover banks' debt problems. Also, the work of Giannetti and Simonov (2011) showed that not all the injections increased the availability of credit, due to the different financial conditions of banks before the recapitalizations: after the intervention, undercapitalized banks were willing to be involved in perverse lending practices and decrease the credit supply to more profitable firms.

Probably, there are two reasons why banks did not reach the minimum capital requirements even after government injections. The first one is that the measurement of banks' ability to meet capital requirements was likely to be overstated, reporting a higher net wealth: in Japan, it was acknowledged that banks understated the amount of non-performing loans in the balance sheet and included deferred tax credit to

compute capital (Kashyap, 2002). The second reason is that since the capital injections made by the government were executed in the form of preferred shares and subordinated debt, this new amount of capital was not included in the Tier 1 ratio, causing banks to remain undercapitalized.

If banks had received a large amount of funds, they would have lent more money to creditworthy borrowers and less to troubled firms. Conversely, if banks' capital injection had been so small that they remained undercapitalized, they would have been more willing to extend credit to troubled firms encouraging bad lending policies: they might have been also willing to recall loans to creditworthy borrowers since the capital injections eased the objective of meeting capital requirements. According to the model of Diamond and Rajan (2000) and Diamon (2011), recapitalizations that are too small are detrimental for lending policies and might reduce the availability of loans to borrowers with good investment opportunities. They might also encourage loan evergreening of insolvent borrowers when banks fail to meet capital requirements.

As consequence, the problem of inability to meet capital requirements remained unsolved, and the main implication of bad lending policies was on capital allocation. The study of Giannetti and Simonv (2011) introduced the presence of low-quality firms, classified depending on their levels of profitability, productivity, and dependence on bank loans, as defined by the work. The term was coined for the first time by Caballero, Hoshi, and Kashyap (2008) and they were identifying as "zombie" a firm with negative profits and high leveraged, not generating enough cash flows to repay even interest on debt, that should have exited the market but instead was kept artificially alive by subsidies from banks or the government. Zombie companies were only kept alive by credit institutions, otherwise, they would have gone bankrupt and out of the market. The evidence showed that Japanese banks were trying to benefit these troubled companies, by granted interest rates concessions, moratoriums on loan principle or interests, and also giving them direct subsidies aimed to keep the loan as performing on the balance sheet so that banks were not obliged to impair these loans as non-performing and write off capital. Simonov and Giannetti (2011) confirmed the theory in their study: after the recapitalization, banks able to meet capital requirements decrease the number of loans they extend to zombie firms, and simultaneously, extend more credit to profitable and healthy borrowers. The effects are opposite for banks that were not able to reach minimum capital requirements after recapitalizations.

All these studies demonstrated how capitalization of banks was important for lending policies: in particular, capital infusions that were sufficiently large not only reached the goal of increasing the supply of credit but also made the allocation of capital more efficient.

This is how, according to Caballero, Hoshi, and Kashyap's (2008) study, banks permitted troubled firms to survive and to poorly contribute to Japanese economic performance.

The decisions of credit allocation made by banks were not all based on solid risk analysis aimed to profit maximization, but a considerable portion was driven by a sort of national duty to support distressed companies. Thus, banks kept increasing NPLs and at the same time, the value of assets used as collateral for loans was declining, challenging the stability of the Japanese banking system.

This phenomenon of banks with progressively deteriorating balance sheets keeping to give credit to troubled firms takes the name of "zombie lending". This is where zombie distortion started, and the growing government debt made to guarantee banks' deposits to support these companies revealed itself as a very inefficient program to pretend to sustain the economy and avoid excessive unemployment. Zombie lending practices implied also a reduction in corporate restructuring processes and a delay in the economic recovery due to the inhibition to a correct distribution of resources to profitable companies. Problems related to credit supply and the selection of borrowers further damaged the situation of troubled, heavily-leveraged firms, which kept accepting credit without really solving their internal structural issues. By keeping companies artificially alive, banks enabled them to skew competition. A firm that is about to exit the market should lose market share and dismiss employees, but instead, when a company is classified as a zombie the process is different. Zombie firms caused prices to decrease and salaries to increase, reduced companies' profits, even for healthy companies. Caballero, Hoshi, and Kashyap (2008) showed that sectors with a high presence of zombie firms showed a low turnover of employment, lower investments, and employment growth rate even for healthy companies, making the market unattractive for new players and preventing their entry and investments.

In the end, policies of forbearance and evergreening brought to distortion in competition and misallocation of resources. Weaker firms were kept alive with bank loans and, eventually, government subsidies, not with profits deriving from company core business.

c. Defining Zombies and Consequences

Looking to the study of Hoshi (2000) on the credit supply across the different sectors, it can be shown that the underperforming sector like real estate and construction which saw their profitability shrunk by the burst of the bubble in the 1990s, on average received more credit than over good-performing sectors like manufacturing. Japanese manufacturing firms are subject to global competition and so they require large subsidies and helps, otherwise, they could not be protected. After the bubble burst, the loans given to real estate companies kept increasing, while instead credit given to manufacturing companies decreased: the problem is that the credit given to underperforming sectors did not promote new investments.

As Hoshi (2000) highlighted, the distortions in competition and in the market caused by the misallocation of credit were more pronounced in sectors with a big share of zombies. Consequently, troubled firms were surviving in the market, and they knew that even by avoiding effort banks would have given credit to them, generating also a moral hazard problem. In addition, the study of Sekine, Kobayashi, and Saita (2003) showed that the additional loans taken by high leveraged firms in underperforming sectors were negatively contributing to firms' performance, reducing their ROA.

Joe Peek and Rosengren (2003), in their study, aimed to explain which were the reasons that incentivized Japanese banks towards zombie lending practices.

Firstly, this is due to Basil I international standards imposed I 1988, where banks with an international presence were required to hold capital (which was classified as Tier 1, Tier 2, and Tier 3 to clarify the strength or reliability of such capital held) equal to 8% of their risk-weighted assets, to offset risk. Banks that were already undercapitalized or with a low equity level preferred to renew loans to distressed borrowers, hoping that they would have recovered or they would have been save by the State.

Secondly, it must be considered that Japan's financial system has always been classified as bank-centered, where companies prefer to take financings from banks, rather than on the market. Several studies observed a peculiarity of the Japanese economy that was strictly linked to zombie lending, that is the characteristic close relationships between firms and banks, also called “Keiretsu”. This term identifies a business network of companies of different sectors with interlocking relationships and sometimes with certain equity stakes in each other i.e., cross-share. Usually, it is defined as the “main bank” of a firm the financial institution with whom the firm operates more, and it is in charge of restructuring firms’ management in financial distress, monitor the firm, and can serve as a form of corporate governance.

The tight relationships between banks and companies (business relationships, cross-shares, board of directors’ relationships) allow banks to have direct access to more information. Consequently, according to Peek and Rosenberg (2005), firms in case of distress or financial difficulties are backed up by those institutions, willing to give more credit and allowing the company to keep a higher debt over assets ratio. This model of perverse credit allocation emerged mostly in the case of weak banks or when the firm is part of the *keiretsu*.

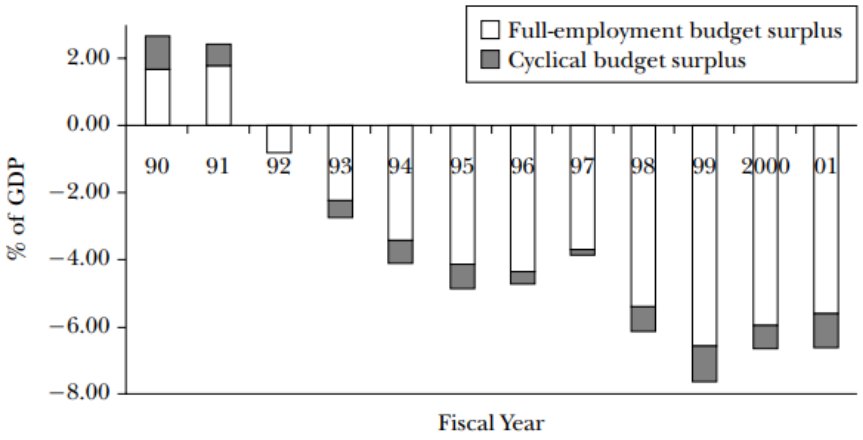
The supporting and monitoring activities of banks implied easier access to credit for companies, and an influence on companies’ investment decisions, discouraging risky projects that would have caused even more losses, both for companies and for banks. By having more bank pressure, companies were more inclined to take less-risky projects, going against shareholders' interests of profit maximization.

Keiretzu relationships were extremely linked and advocate of zombie lending since they incentivized banks’ policies of forbearance. In particular, it has been noticed that bank credit in Japan increased during the years of the crisis, main banks of underperforming companies were more inclined to lend to them than to other

institutions, due to the presence of close relationships or perhaps a weak bank balance sheet. But, in the end, it must be highlighted that keiretsu did not bring any benefits to zombie companies in terms of growth, profitability, and stability of bank relationships.

In addition to all these reasons incentivizing zombie lending, there were also pressures from the government on banks to keep extending loans to financially distressed firms, to avoid a sharp increase in unemployment, default rates, and expenses linked to bailouts of both banks and companies. During that period, the Japanese government was facing an increasing deficit, as can be seen from Figure 2, and the evergreening practices of banks were the response to pressure to avoid even stricter regulations.

This suggests that most Japanese banks were able to survive the difficult economic situation and respect the capital requirements just because the government was turning a blind eye to the policies implemented and the regulatory agencies made allowances for their activities.



Budget Suplus: 1990–2001

Source: Hoshi and Kashyap (2004) – Figure 2

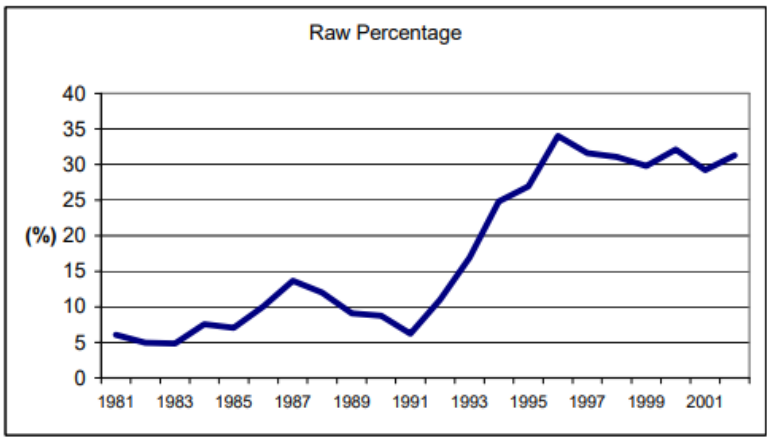
d. The Role of Zombie Companies in the Stagnation of the Economy

A few years later after this study, Caballero, Hoshi, and Kashyap (2006) focused on the Japanese economic crisis analyzing more in detail the stagnation of the economy and the role of zombie companies. In their study, zombies were only classified based on the subsidies they receive, not by their growth, profitability, or productivity. Most of the support received by zombies involved the reduction on interest payments or debt remission: banks' decisions to restructure lending to distressed businesses, rather than simply renewing them, allowed to reduce the capital needed by the bank. Otherwise, if not restructuring debt, banks will be

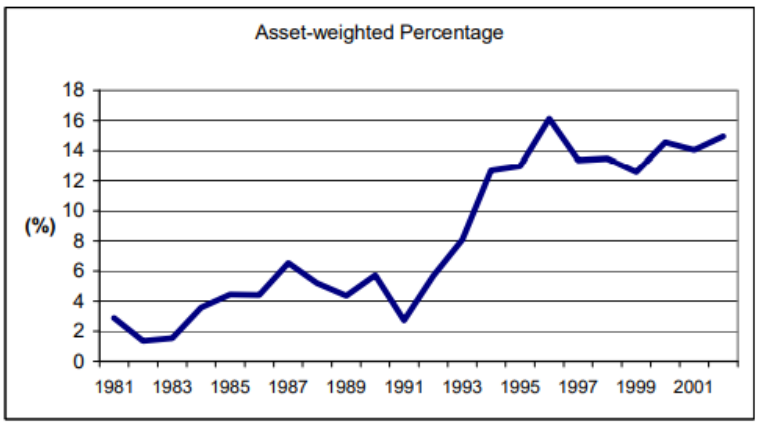
forced to re-qualify the loan as “at-risk”, implying that the banks must set aside up to 70% of loan value as a reserve in case of loan loss. On the other hand, restructuring the debt allows setting aside just 15% of loan value as a reserve.

Caballero, Hoshi, and Kashyap (2006) supported the previous study of Peek and Rosengren (2003) and in particular, shown in Figure 3, measured with data the phenomenon of forbearance practices, the availability of credit, and the probability of lending to companies was higher for troubled, almost-insolvent firms.

The first graph illustrates the portion of Japanese firms that benefitted from subsidized credit, taking into account all the listed firms in different sectors. The raw percentage increased from roughly 5% at the beginning of the 1980s to 30% in the first years of the new millennium, and after 1994 it has been always over the 25%..



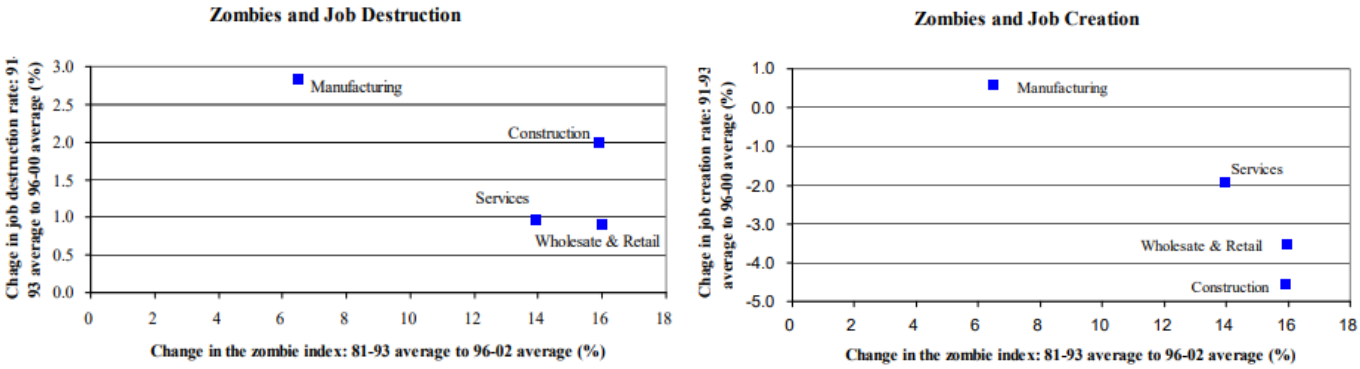
a. Prevalence of firms receiving subsidized loans in Japan



b. Percentage of zombie firms weighted by assets in Japan

Source: Caballero, Hoshi and Kashyap (2006) – Figure 3.

According to the previous definition of zombie firms in the study, focusing on the fact that a zombie company has no profit and keeps receiving financial aids taking advantage of subsidized credits, it is possible to evaluate the effects of zombie lending on the Japanese economy. Referring to the study of Caballero, Hoshi, and Kashyap (2006), they showed the effect of zombie firms on job creation and job destruction rates against the change in the zombie index in Figure 4.



Job destruction and job creation rates in sectors with high presence of zombies in Japan

Source: Caballero, Hoshi and Kashyap (2006) – Figure 4.

As it can be seen from the first graph, the job destruction rate raised in every industry, especially in the manufacturing and construction industry, which constitute the sectors with the lowest presence of zombie firms. This means that the presence of zombie firms diminishes job destruction, as expected.

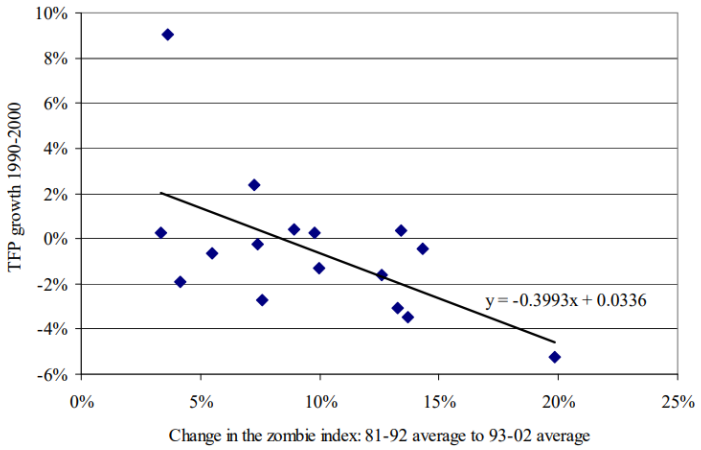
Of course, not all sectors were affected in the same way by the crash of asset prices during the crisis, as example construction was one of the sectors that were massively hit by the decline, after a period of booming in previous years: in this case, the presence of zombies has inhibited job creation and raised job destruction.

The presence of zombie firms in the market promotes misallocation of resources and distortion of competition: troubled firms are supported with resources that could have been better exploited for profitable and healthy companies. Consequences in the market are enormous, involving product price depression, higher salary costs, and lower productivity.

The study shows also shreds of evidence of the consequences of the subsidies to zombie firms on productivity.

Figure 5 shows the average growth of total factor productivity (TFP) against the change in the presence of zombies, measured by the crisp zombie index. As it is evident, the regression line is downward sloping, meaning that industry sectors where the presence of zombies is higher are the ones with the lowest TFP growth.

Zombie firms without support from institutions and government would be forced out of the market because of their extremely low productivity. Indeed, the presence of these firms in the market is counterproductive for two reasons: they take resources that could be used more efficiently by other companies, so lowering the average productivity, and also inhibits the entry into the market of new players.



Zombies and TFP growth

Source: Caballero, Hoshi and Kashyap (2006) – Figure 5.

II. Different Types of Financial System

There had always been a controversy on which would be the best and most efficient financial system for growth: bank-based or market-based?

Several empirical studies and the different system histories have identified Germany and Japan as the models for a bank-based financial system, and the United States, United Kingdom, and most of the Anglo-Saxon countries as models for the market-based financial system. The study of Levine (2002) was focused on understanding which type of system is better for long-run economic growth, looking in particular at these four countries which have had similar long-term growth rates and that made up over 50% of the world's output.

Each financial system has its advantages and drawbacks.

According to Levine (2002), the bank-based view considered this type of system to be better for savings circulation, identify good investment opportunities and implement robust corporate control. The system is centered around the role of banks, which can:

1. acquire more information on companies and managers, thus having a better capital allocation and governance
2. managing cross-sectional, intertemporal, and liquidity risk enhancing investment efficiency and economic growth
3. mobilizing capital to exploit economies of scale (Sirri and Tufano, 1995).

Moreover, this perspective found out some critical aspects of the other type of financial system, like discouraging the acquisition of information, since developed markets rapidly unveil information; on the opposite side, by building long term relationships banks do not immediately disclose information in markets (Boot, Greenbaum, and Thakor, 1993). Another advantage attributed to bank-based systems is that they have better monitoring of firms compared to markets, and so the risk of post-lending moral hazard is reduced. Finally, the control and the pressure exerted by powerful banks on firms allowed to more effectively compel to repay their financial obligations compared to capital markets, in particular in countries with poor contract enforcement abilities: in some cases, without the pressure of banks on firms, investors might be discouraged to contribute to the industrial expansion of countries with underdeveloped institutions.

On the other hand, the *market-based view* pointed out the importance of efficient markets on growth, since the market allows to:

1. fostering greater incentives to research firms since it is easier to profit from this information by trading in big liquid markets
2. enhancing corporate governance by easing takeover and making it easier to tie managerial compensation to firm performance

3. facilitating risk management

Capital markets are considered to have a positive impact on aggregating and spreading information, promoting efficient transfer investors, enhancing firm financing and economic performance. Of course, this perspective stressed the constraints of a bank-centered financial system, as the tight relationships might have been considered as a limit for innovation and competition. Moreover, powerful banks having poor regulatory restrictions on activities might create conflicts between firm managers and creditors, limiting efficient corporate governance.

According to Merton and Bodie (1995), Levine (1997), there is a third perspective called the *financial services view* that focus just on the importance of financial settlements and intermediaries to mitigate inefficiencies in the financial markets and provide financial services, so that overall the different financial systems enhance economic growth. The view is not focusing on the type of financial system implemented, but the main problem is to create a favorable environment where financial intermediaries are capable of delivering their services.

The last perspective examined is the one of La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1998*): the law and finance view*. Here, the emphasis is on the importance of the legal system in the financial sector, defined as a set of contracts made by legal rights and implementation mechanisms. Therefore, an effective legal system eases and improves the efficiency of both markets and banks' operations, and consequently improves a good allocation of resources and economic growth.

For sure, according to the authors, the dilemma is not properly on the choice of the financial system, but rather on the quality of laws and enforcement mechanisms in different countries.

After considering all the previous views and studies, Levine (2002) provided empirical support on the fact that none of the two types of systems is specifically effective to promote economic growth. Looking at the extreme cases of the study, that is to say, countries with well-established banks sector but weakly developed markets, or countries with well-developed markets but with poorly developed banks, there is no significant difference in the performance. Indeed, the data did not support specifically the bank-based or the market-based perspective, because this distinction does not explain the differences of countries in economic performance: the results are consistent with the financial service view, by classifying countries according to the degree of development of the financial system, rather than the type.

Indeed, countries with a higher level of financial development, taking into account both markets and bank developments, exhibit also larger economic growth rates. Financial development is heavily linked with the quality of the legal system, defined by both the legal rights of investors and the system's capacity of enforcing these rights, which has a positive correlation with long-term growth.

In general, well-functioning financial systems have a positive influence on economic growth, regardless of the type, and the data are also aligned with the law and finance growth, which highlights the importance of the legal system for the financial sector.

Rajan and Zingales (2001) are other authors that focused on this financial system dilemma, studying the features and the development of the two financial systems to see the implications on industrial growth. In particular, after looking at different research along the XX century, they found evidence that the underdevelopment of financial markets and institutions would prevent an immediate response to financial needs. Despite this has been questioned, several hypotheses claimed that financial markets and institutions help firms to face problems of moral hazard and adverse selection, implying a lower cost of financing from investors: so, according to Rajan and Zingales (1998a), financial development should heavily benefit companies typically relying on external financing for their growth. To support the statement, they tested whether industries that are relying more on external financing grow relatively quicker in countries that exhibit, a priori, a higher financial development. The implication would be that, all else equal, industries heavily relying on external financing like pharmaceuticals, should develop faster in countries with a higher financial development, compared to industries requiring less external financing like tobacco.
Through an experiment conducted in three countries with three different degrees of financial development, authors analyzed the growth rates of the pharmaceutical industry and the tobacco industry, to demonstrate the effective causal link from finance to economic growth taking into account the origins and type of legal systems, and the size of the industries throughout all the period. It seemed that industries that exhibited a small size at the beginning of the period and financially dependent had higher growth in financially developed countries, suggesting that financial development enhances growth.
Normally new firms rely more on external financing rather than mature firms, and authors found that the degree of financial development has around twice the economic effect on the growth of the number of establishments in an industry, suggesting the importance of the financial system for young, innovating firms.
A piece of evidence from the study of Carlin and Mayer (1998) showed that industries financing mainly through equity capital markets tend to grow faster, and invest more in research and development in countries with better accounting standards. On the opposite side, industries relying more on debt-financing tend to have slower growth in better financially developed countries, and also invest less into research and development: instead, bank-dependent industries benefit from the growth of the banking system but are their development is not much linked to improvement in accounting standards.
It has been noticed a crucial difference between equity-financed firms and bank-dependent industries, which is the amount of hard assets and intangible assets in their balance sheets: normally, firms that tend to rely on equity financing have fewer hard assets, but more intangible assets, meaning a lot of room for growth

opportunities. On the contrary, in financially underdeveloped countries collaterals are necessary to obtain loans, and so bank-dependent companies have normally a lot of tangible assets and less intangible ones. Therefore, industries would rely more on hard assets due to the struggle to obtain financing in underdeveloped financial markets.

According to Carlin and Mayer's (1998) results, the intangible assets in firms relying on equity financing are easier to be funded as the financial system develops, and consequently, the industry grows faster allowing to finance research and development expenses, which are known as the major source of intangible assets. The study on bank dependence of Carlin and Mayer (1998) was conducted in Japan, where they showed that industries relying on bank support tend to be more capital-intensive. In fact, in weakly financially developed countries, these companies have an overload of collateral and can finance their research and development expenses. With the progressive development of finance, these advantages of hard assets companies tend to be inhibited by financial constraints, and so they lower their research and development activities.

In conclusion, it seems that a better financial system allows easier financing for companies, because the importance of collaterals is reduced, and the importance of intangible assets increases. The outcome gives also an explanation why companies in industries dependent on external finance have a greater presence in countries with well-developed markets.

Normally, bank-based systems tend to have a greater comparable edge to finance asset-intensive industries, instead of high-technology industries as in market-based systems, since these industries are more traditional and less risky. Consequently, the lack of price signals on their profitability is not a great issue in investment decisions. In addition, borrowers provide lots of collateral to banks, which are also attractive to new lenders in case existing ones prove to be too demanding. Since loans are usually backed by physical assets, they are quite liquid, and so the accumulation of information within the system is less likely to be a barrier to fund these assets.

Market-based systems exhibit a comparative advantage for industries relying on intangible assets, and Carlin and Meyer (1998) discovered that equity and skills-based industries in countries with good-developed accounting standards are more involved in research and development activities.

Another research conducted by Houston and James (1996) on the financial arrangement of listed companies in the US showed that firms with ties to single banks use fewer bank debt, on the overall debt, as their market-to-book ratio increases. In this case, the ratio has been considered a measure of the proportion of intangible assets compared to tangible ones. Instead, companies having several relationships with banks exhibit a larger market-to-book value since their portion of bank debt on the overall debt is higher. Companies avoid relying on one single bank when they have a higher market-to-book ratio, probably because they do not want a single bank to have too much power to influence strategic decisions and extract rents. Moreover, companies

having different bank relationships, and so in the case of a market-based financial system, avoid the risk of concentration of power.

Even if some developed countries have both good accounting standards and a great share of bank lending, these are mostly exceptions. Usually, economies are more developed towards one financial system, either bank-based (or relationship-based) or market-based (or arm's length), even if this distinction is relatively important compared to the overall development of the financial system.

To better understand the study and the thesis of the authors, that bank-dependent industries experience faster growth in bank centered financial systems only when the economies are relatively underdeveloped, it is key to understand the basic functions of a financial system: to channel resources to get the highest productivity and locate risks where they are best bearable.

According to Rajan and Zingales (1998a), bank-based financial systems allow the possibility for institutions to have a return from firms based on the fact that they exercise a sort of power over borrowers: the power comes in many ways, from having the direct or indirect ownership of the firm, to be the main lender. In this way, the lender exploits its power over the borrowers, similar to a monopoly. The drawback is that often this system comes with "opacity", meaning that there are several regulations comparable to barriers to entry, that increase the cost of entry in the system and protect the relationships from the menace of competition. This serves also as an explanation why authors noticed a negative correlation between accounting standards and the size of the banking sector.

On the opposite side, one of the main features of the market-based financial systems is transparency, where the lender is protected by explicit contracts, and since the market is the main mean for transactions, institutional relationships are less important. Transparency is a guarantee of protection for investors in market-based financial systems.

Another fundamental system is the level of reliance on legal enforcement: market-based systems are not efficient where there is not a good legal system, which can ensure also transparency in the market. Indeed, the swift and impartial enforcement of contracts by the law courts is a crucial requirement for the survival of the market-based system. Instead, in a relationship-based system, parties are inclined to honor the agreements among each other and maintain a trustable reputation, aiming to provide a continuous stream of future business within the same business network.

To further explain the difference between the two systems, the authors analyzed the example of a transaction and how it is conducted.

In a bank-based system, the bank and borrower are often tied by relationship, either due to frequent past contracts or ownership stakes. In this context, there are several factors that the bank takes into account when evaluating the loan, not just the debt-servicing capacity of the firm or the ability to repay debt in the long term, but also several non-contractual levers that the bank is empowered to use to pull out the

repayment. Moreover, the interest rate on the loan is continuously negotiated between the two parties, and might not have a straight tie to the intrinsic risk of the borrower's project.

On the opposite side, in market-based systems, the information is widely spread and there is a larger range of potential lenders, and the interest rate of the loan will be competitive to compensate the acquirer of the loan for time value and risk of the project.

The bank-based system presents a sort of entry barrier, which limits competition, allows banks to have more financial power, and encourages collaboration among the two counterparties. Japan can be taken as one of the most striking examples since the relationship between banks and group of companies are particularly strong and are called *Keiretzu*, as mentioned also in the previous part regarding the Japanese crisis: due to these tied relations, the main banks implemented questionable practices to help troubled borrowers. Keiretzu constituted a big limitation for competition, allowing institutions to get a larger amount of the benefits accruing to the borrower, compared to the competitive environment in market-based systems.

Due to the missing competition and the opaque nature of the relationship-based system, there are no price signals driving decisions, and the cost of the borrowers is simply given by the negotiation with the lender: it is also true that these relationships among lenders and borrowers create additional value. As a consequence, the real cost of financing for the borrower can be significantly different from the risk-adjusted rate.

This conclusion on the difference in the cost of funding brings to another interesting discussion, investigated by Levine (2001): are relationship-based systems leading always to worse investment decisions?

The outcome of the study is no, considering the investment decisions of a firm in both the long term and the short term. Indeed, in the short run companies might finance at a lower cost of funding compared to the real one without causing investment distortions, while in market-based systems this would not be possible since the institution will not recover enough the initial subsidized financing with companies' long-term value. The institution is able to ease the borrower with an initial under-average rate and to charge an above-market interest rate in the long run when the investment of the firm is supposed to generate profits. For this reason, companies are less likely to be bailed out in market-based systems.

To summarize, in bank-based systems institutions are exploiting their monopoly power to increase their profits by charging above-market rates to offset the initial eased cost of financing for troubled borrowers.

As mentioned before, one of the main characteristics of the relationship-based system is the poor price signals, meaning that investment decisions are not taken upon market signs and so prices turn to be less effective causing a misallocation of resources, due to the lower amount of information reflected.

According to Michael Jensen (1986), in market-based systems, outsiders do not have much power, and so the management is able to easily implement empire-building strategies without effective intervention. This issue is named "agency cost of free-cash-flow" and implying an incorrect distribution of resources.

Nonetheless, an existing solution to this problem is the takeovers, while in bank-based systems, there is not a corrective self-activating mechanism to the misallocation of resources caused by weak price signals.

A clear example has been previously exanimated in this thesis, which is the work of Hoshi et al. (1991) in Japan during the 1970s-1980s. The investment decisions of firms not relying much on banks' relations were mainly dependent on the ability of the firm to generate cash flows from its operations, demonstrating a direct positive connection between operating cash flows and investment expenses. On the opposite side, the investment decisions of firms with strong ties with banks and institutions were less concerned about the amount of generated operating cash flows. Banks were keeping to invest, closing one eye of the firms' financial statements, causing these companies to damage their value in the long run. Nevertheless, despite banks were not correctly signaling the situation to the borrowers, the stock market was not hiding signals: as the study shows, companies highly tied to banks presented a lower Tobin's Q (i.e., a proxy for a firm's investment opportunities) compared to firms without banks' relationships, indicating a great skepticism in the capital market.

To further demonstrate that relationships can alter the correct allocation of funds, Peek and Rosengren (1998) saw that during the 1990s the Nipponese banks increased their lending to the United States commercial real estate market, and a few years later the American subsidiaries of the Japanese banks amounted to almost 20% of all commercial real estate lending of the US banking sector. During the crisis and the severe bubble burst of asset prices in Japan, the Japanese banks cut their lending in the United States, even though over there prices were going up, and enlarged their lending in the domestic market. This is evidence that Japanese banks preferred to invest in a troubled, declining market, rather than keeping their profitable opportunities overseas.

These findings bring to the conclusion that in bank-based systems price signals are less informative and obscured, bringing to an erroneous and inefficient allocation of funds.

On the opposite side, prices in a market-based system carry lots of information and investors rely on prices' guidance. Thus, the more transactions are made the higher the amount of widespread information in the market, and the more likely the decisions based on that information are correct.

It is also reasonable to point out that sometimes managers in companies are even too much price-driven, window-dressing earnings to meet the market demand in the short term, attracted by the potential gains.

The bottom-line of the different researches seem to be that the distinction between the type of financial systems is not so important, but Rajan and Zingales (1998b) suggested that bank-based financing might be more suitable for underdeveloped countries with weak institutions, where the market would not have the necessary infrastructural support to function and the market signals might not carry significant information. Instead, market-based systems acquire relevant importance for growth only in case the country is already financially developed.

The conclusion of the studies might not find the answer to the original question on which financial system is best suitable for growth, but there is a puzzle that has been the focus of more recent studies: the importance of venture capital in market-based systems to finance technology-intensive industries. Authors found this type of institution as a hybrid form of financing, taking the best of both systems.

The venture capital presents lots of characteristics of relationship-based systems, starting from the control exercised on the borrower, but the puzzle is why they do not deal with asset-intensive companies.

According to Levine (2001), venture capital help to reduce the illiquidity of the borrowers, which is the relationship-based main problem, and to do this they need a solid market. Normally, venture capitalists are directly involved in the management of the firm, to make control processes standardized and transparent on the market for investors, aiming to find a proper exit for the company. The normal course of action for a company financed by venture capitalists is to shift from being managed by the founders to being run mostly by professional managers, which also eases external investors to take control of the company.

The venture capital relationship model with companies is structured to be limited to a certain timespan, enough to make the company attractive for external investors and exit in the market with a value that will anticipate the future growth of the company. Since the transaction will be executed in the market, the price has great importance and disciplines the investment: also, the market ensures incentives for innovation, liquidity. For venture capitals, all these market benefits are coupled with the control given by the nature of the relationships they have with firms.

In conclusion, bank-based systems are suitable for early stages of industrialization, for physical-asset intensive industries, and in countries where there is a poor legal system enforced. Instead, for well-developed economies with knowledge-intensive industries, a hybrid form of the financial system would be more suitable

III. Zombie Phenomenon in Europe

a. Consequences of the Outright Monetary Program (OMT)

In the first years of the XXI century following the real estate bubble, the Great Financial Crisis (GFC), and the Sovereign debt crisis, Europe experienced poor economic and financial conditions. In particular, European banks' balance sheets registered increasing non-performing loans (NPLs).

As happened in Japan in the 1990s, even in Europe the average productivity declined and it exhibited also an increasing portion of low-productivity and high-leverage firms.

One of the main reasons for the overall decline in productivity is associated with the misallocation of economic resources, supposed to be caused indirectly by the downward trend of interest rates in recent years. Of course, the objective of low rates is to incentivize lending for companies to boost the economy by having a more convenient cost of credit, but also it is an incentive for distressed companies to take loans. It has been pointed out by several studies that loosen monetary policies and a perverse allocation of resources favored an increase in the share of zombie firms.

The raise in zombie share in Europe during years between 2010-2014 has been documented by McGowan, Andrews, and Millot (2017) and Storz et al. (2017), especially in countries such as Spain, Portugal, and Italy, and overall, as it was previously explained, among the main causes of the phenomenon of zombification there was the prolonged expansionary monetary policy implemented by the Central Bank in recent years.

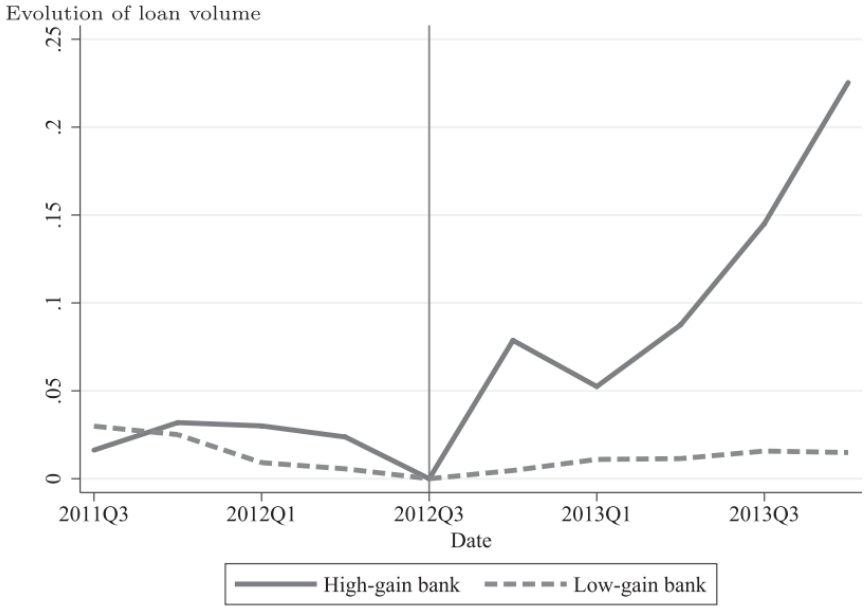
Indeed, to face the declining economic situation and in response to investors' fear of exorbitant sovereign debt considered "unsustainable" in some southern European countries, the European Central Bank (ECB) implemented unconventional monetary policies to re-establish trust in distressed countries in the periphery of the Eurozone.

Among the unconventional policies implemented, the most important was the Outright Monetary Program (OMT) announced in July 2012 by Mario Draghi, former president of the ECB.

The program consisted of allowing the ECB to purchase countries' government bonds in the secondary market with, theoretically, no limits. The announcement of the program caused yields to rise immediately, and as consequence, a decrease in spreads of sovereign bonds of countries with excessive debt. The price of bonds spiked, and banks that held lots of these distressed countries' bonds registered large extraordinary gains.

The problem was, as Mario Draghi pointed out, that the overall financial positive developments had not to be translated into a robust economic recovery, and the situation in the Eurozone remained complex.

Several studies conducted on the effectiveness of the OMT program demonstrated that it had successfully reduced the spread of distressed countries' government bonds, but the increase in credit supply given by banks' windfall gains realized from the sale of distressed countries' securities, increased also zombie lending practices.



Evolution of loan volume pre and post OMT

Source: Acharya, Eisert, Eufinger and Hirsch (2019) – Figure 6.

The phenomenon of zombie lending according to Acharya, Eisert, Eufinger, and Hirsch (2019) was considered the reason pf the slowdown in the economic recovery of Europe. Indeed, despite the OMT program had an indirect implication on the capitalization of banks and allowed even weak banks to increase equity levels and credit supply, some banks remained undercapitalized.

Exactly with similar lending practices as happened in Japan banking crisis documented by Caballero, Hoshi, and Kashyap (2008), the result of the study pointed out that around 8% of credit supply considered in the sample was given to zombie firms at a subsidized interest rate (i.e., loans at a favorable interest rate), meaning that certain firms' interest payments were below the amount charged by most healthy and creditworthy firms.

Thus, weakly capitalized banks after the OMT program was more inclined to extend or renew loans at a below-market-interest rate to troubled companies with whom they already had lending ties. This shift in credit supply from creditworthy firms towards distressed borrowers brought to an inefficient capital allocation, distortions of competition in the market, and negative effects on employment and investment growth for healthy companies.

Actually, in Europe in that period, in Portugal, Spain, and Italy, 50%, 40%, and 30% of the debt were given to firms that were not capable of repaying the interests with their EBIT. The principal countries involved in the sovereign debt crisis were those defined as "GIIPS", Greece, Ireland, Italy, Portugal, and Spain).

On average, banks incorporated in GIIPS countries registered an increase in equity levels of 8%, against the 1% increase of non-GIIPS institutions. Banks that mostly benefitted from the windfall gains on government bonds extended the credit supply more than those that didn't have such gains. The problem of the credit allocation laid in the quality of borrowers.

The reason to give subsidized credit to low-quality companies (i.e., interest coverage ratio lower than the country average for at least three consecutive years) was that banks wanted to avoid reclassifying the loans as non-performing, since it would have implied a lower income for banks and, consequently, to tie up more equity capital. On the opposite side, banks that satisfied the required level of capital post-OMT, increased the credit supply especially to healthy firms, decreasing their zombie lending practices. The studies have demonstrated that in the period post-OMT the major part of banks' credit supply was addressed to low-quality borrowers, as proof of zombie lending practices in Europe. Secondly, it has been noticed that borrowers' financial performance remained weak even after receiving the credit from banks.

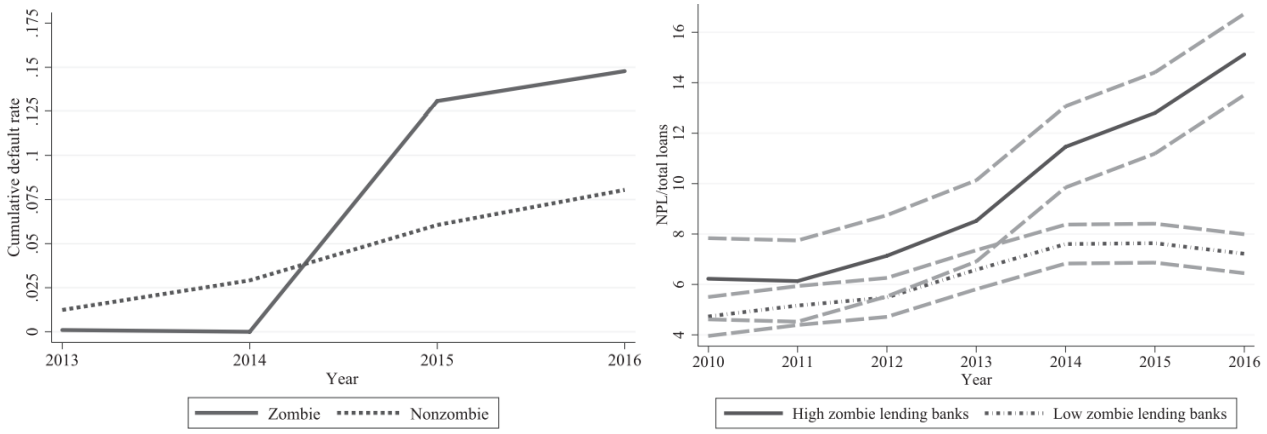
Looking to the study of Acharya et al. (2019) and Schivardi et al. (2018), they analyzed the financial results of borrowers before and after the OMT program and pointed out a substantial difference between non-zombie and zombie firms on where credit was channeled. Non-zombie firms used credit derived from financing mainly to build cash reserves, and so the increase in company debt was almost equal to an increase in cash holdings: employment, investments, and ROA had a substantial change. The main objective of these companies seemed to restore financial stability by increasing their reserves, trying to come back to pre-crisis levels. Zombie firms instead, use almost all the credit from loans to repay previous debt and interest payments, and the leverage had increased way further than the increase in liquidity or cash holdings. As a definition of zombie firms, these do not generate enough cash to cover neither interest expenses.

Despite the differences, none of the two categories exhibited a significant increase in employment, investments, or ROA, demonstrating that even after the program and the injection of liquidity, zombie firms kept having a lower-than-average performance: this implies that the low-productivity and low-performance of firms are due to structural internal problems, and not to exogenous shocks or event.

Looking at the long-run consequences of zombie lending practices, borrowers had all similar default rates for the 2 years after the program announcement, but zombie firms exhibited an increase in default rate from 2015, as shown in Figure 7a. Companies have been classified as defaulted if they declared bankruptcy or if they have opened insolvency proceedings. Data from 2016 showed that 15% of zombie firms defaulted

compared to only 7,5% of healthy firms. Moreover, zombie congestion caused in Europe a misallocation of resources with consequent crowd-out to healthy firms, and also distortions in market competition. But companies were not the only ones who suffered from all these defaults.

Figure 7b illustrates that the banks involved in zombie lending practices run after the OMT saw an increase in non-performing loans (NPL) relative to total loans. The difference with banks not involved in these practices is evident, as the NPLs/loans ratio had only a small increase: probably institutions that were giving credit to zombie firms extended their credit supply also to other categories.



7a: **Cumulative default rates evolution** **7b: Evolution of Non-Performing Loans**

Source: Acharya, Eisert, Eufinger and Hirsch (2019) – Figure 7.

To summarize, the OMT program was introduced to improve the health of the banking sector post-crisis in certain countries of the Eurozone, and thanks to the windfall gains realized due to the increase in sovereign debt prices, banks improved their capitalization. Overall, the credit supply to firms across Europe increased, not all the loans were given to healthy borrowers: it has been noticed that banks that did not meet capital requirements post-OMT were inclined to evergreen loans to weak firms, that were not in conditions to reimburse the debt or pay interest expenses. Indeed, zombie lending practices allowed weak banks to not write off capital and register an increase in NPLs.

The long-term results of zombie lending in Europe were the same experienced in Japan, where the misallocation of resources negatively affected healthy firms that were in sectors with high zombie congestion by presenting lower employment growth and investments.

Results of the study conducted by Acharya et al. (2019) showed that central banks can directly influence prices of securities that banks hold and indirectly affect bank recapitalizations, by realizing gains from the sale of the securities and improve equity levels. Despite this, it is necessary to effectively look if banks are able to reach capital requirements imposed because some banks might remain undercapitalized regardless of the realized windfall gains. This might incentivize evergreening and zombie lending practices, so that the positive financial effects of the central bank program are not fully reflected in the real economy.

In conclusion, to fully bring benefits to the economy, unconventional monetary policies must be implemented into a well-capitalized banking sector, or they must be combined with targeted recapitalization programs.

b. Incidence and Effects of Zombies in Europe

Given the effects previously analyzed of zombie firms in Japan and other countries, the report of Hallak, Harasztosi, Schich, (2018) aimed to deeply estimate the influence of this phenomenon in European countries and the potential consequences of the congestion of zombie firms on healthy firms in the same country.
The research refers mainly to the studies Caballero, Hoshi, Kashyap (2008) and McGowan, Andrews, and Millot (2017) to deal with the issue of distressed companies which should exit the market, but that in reality are rarely liquidated, causing negative externalities and crowding out other healthy companies.
In particular, they have been taking into account a similar definition of zombie firm as McGowan, Andrews, and Millot, considering the interest coverage ratio lower than 1 for three consecutive years and a company's age of at least 10 years: the interest coverage ratio is a widespread proxy for assessing loan repayment capacity, and a historical record of this value below one is a clear indication of hard financial times.
The research of Hallak, Harasztosi, Schich, (2018) encompasses non-financial firms from 19 European countries during years from 2010 to 2013, and they consider three progressively more restrictive definitions of zombie firms:

1. Zombie A refers to any firms with an interest coverage ratio equal to or less than one for at least 3 consecutive years
2. Zombie B refers to any zombie A firm but having an age of at least 10 years
3. Zombie C refers to any zombie B firm with an interest coverage ratio below or equal to one for five consecutive years

These identification criteria are summarized in Table 2:

	Age Restriction	Coverage ratio ≤ 1
Zombie A	None	At least 3 consecutive years
Zombie B	≥10 years	At least 3 consecutive years
Zombie C	≥10 years	At least 5 consecutive years

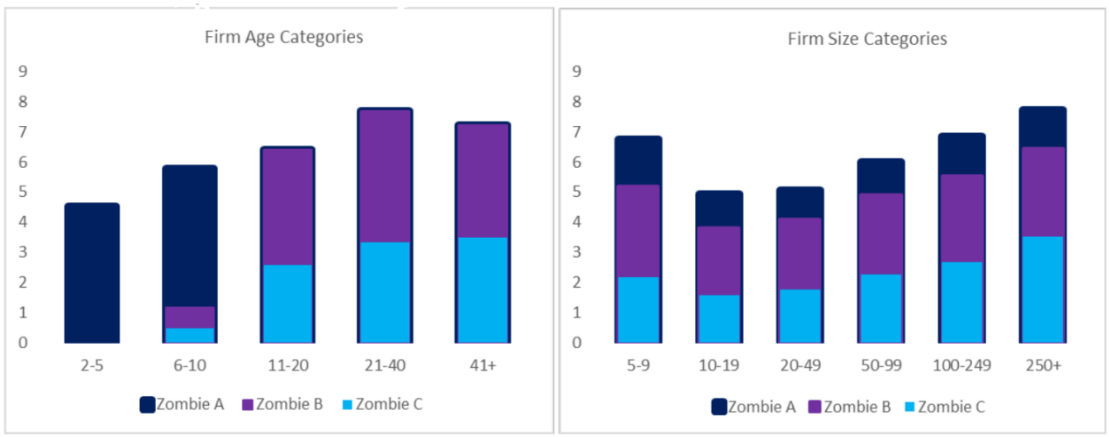
Zombie Firms Definitions

Source: Issam, Peter and Sebastian (2018) – Table 2

Following the study, the authors focused on understanding how the share of zombie firms can vary according to age, size (i.e., number of employees), and country.

It has been noticed that the portion of zombie firms increases proportionally with age, even if the graph in Figure 8a exhibits a U-trend: indeed, the share of zombie firms in small companies counting 10-19 employees is 3.8%, to progressively increase with the size and showing a rise of 56% in companies with over 250 employees.

This trend is recognizable even in Figure 8b that shows the share of zombie firms according to the age of companies. Young companies exhibit the lowest zombie portion, amounting to 4.5%, while instead older firms of 21-40 years display up to 7.7% share of zombies. Going forward, for companies aging over 41 years old, the zombie share reduces a little bit to 7.2%.



Zombie Share by Firm Age and Size

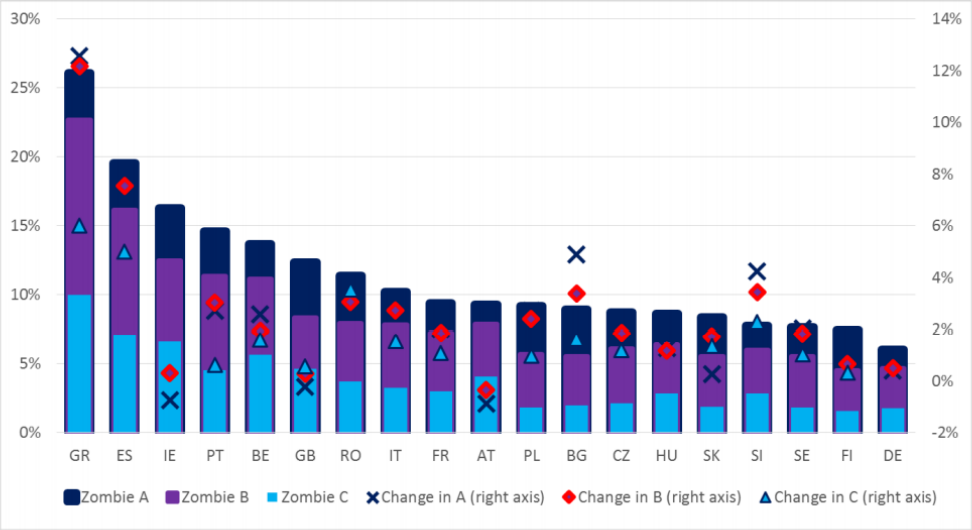
Source: Hallak, Harasztosi, Schich, (2018) – Figure 8

The results are aligned with the study of McGowan, Andrews, and Millot (2017), even if they obtained a higher share of zombie firms aging over 41 years, amounting to 11.5%. Both studies highlight the fact that the share of zombie firms grows with age and size, and can be explained by the fact that older and bigger firms have more historical financial records, more reliable financial reports, and also might have developed

stronger relationships with banks. These factors strengthen their reputation and might have contributed to building trust during a period of hard financial conditions. Secondly, the sunk cost of loan restructuring and the potential need for additional capital is tendentially larger for bigger companies.
Authors broke down the results on the share of zombie firms by countries in European Union, spotting an increasing trend between 2011 and 2013 except for the United Kingdom and Ireland.

In particular, as displayed in Figure 9**,** the results of the change are striking in those countries affected by the sovereign debt crisis, meaning Spain, Portugal, Greece, and Italy. The measure used is the total capital sunk in zombie firms, calculated as the total amount of funding allocated to zombie firms that were not used for healthy and profitable companies.

Across countries, the differences are stunning, in Greece the capital sunk in zombie firms reaches 25%, while instead in Northern countries like Finland, the Czech Republic and Slovakia are very low, around 5%.



Notes: This figure shows the share of zombie firms by country in 2013, identified by bars and calculated as the number of zombie firms over total number of firms. Change in percentage points of zombie shares between 2010 and 2013 shown as circles. Note that change in Zombie incidence for definition cannot be calculated for all countries due to data limitations, therefore panel C does not have indications for e.g., IE or DE.

Zombie Firms Incidence by Country

Source: Hallak, Harasztosi, Schich, (2018) – Figure 9

The problem of zombie congestion is the effect on non-distressed firms in the same country or sector, for at least three different reasons.

Firstly, zombie firms are capable to get loans from banks at a low interest rate given their level of risk, and this for sure influences the ability of non-zombie firms to take loans, since they will be required to pay a higher cost of financing to offset the loss on zombies. The rate to obtain bank credit for healthy companies

can become so higher that they might decide to rely on internal financing, shrinking their earnings and dividends. Secondly, both zombie firms and non-zombie compete on the same market, but given the zombies' financially weak situation, they might receive subsidies from banks and increase product market competitive pressure, taking away market share from healthy companies. By doing this, healthy companies are worse off, and to recover the share in the market they might be forced to drop their prices and, consequently, shrinking their profitability. Lastly, to retain the workforce zombie firms might increase salaries, crowding out labor resources to other companies.

The outcome of all these consequences is that the potential growth of non-zombie firms is lowered, and these companies might be forced to progress only with more productive incumbent projects. The data are confirmed by the studies of Caballero, Hoshi and Kashyap (2008) and McGowan, Millot, and Andrews (2017), which found out that the share of assets held by zombie firms in a certain sector impacts the employment and investment growth of healthy companies operating in the same sector.

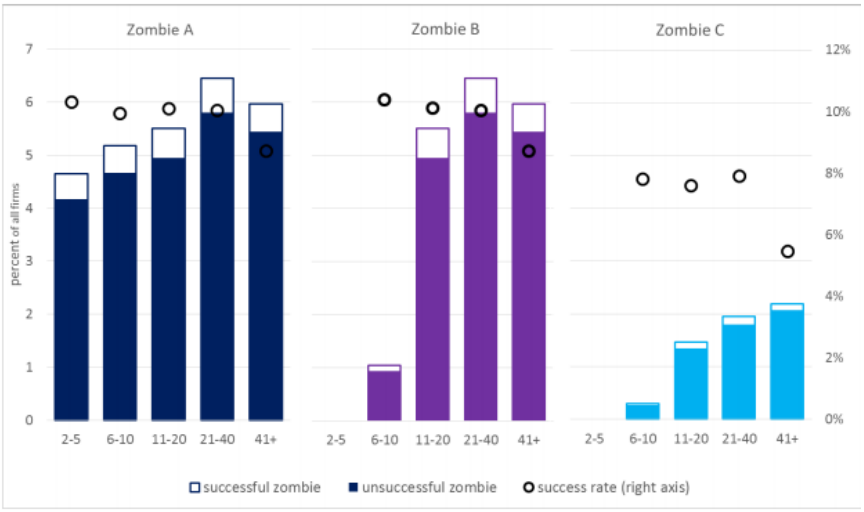
From the same study, it has been demonstrated that normal healthy firms invest much more than zombie firms in their respective countries and sectors. it is relevant to point out that even if the zombie presence in a certain sector influences the entry of new players and the performance of non-zombie firms, there was no significant adverse effect identified for new entrants in terms of investments.

Finally, Hallak, Harasztosi, Schich, (2018) investigated the persistence of the zombie status in Europe according to the three definitions. Considering the reasons for a bank to pursue evergreening practices or bank forbearance to support distressed firms, banks are keeping additional "private" information about the borrowers which allows them to better compute the creditworthiness of the clients in a more accurate way than any other outside investor. Given this additional information, banks might effectively provide liquidity insurance to their existing customers.

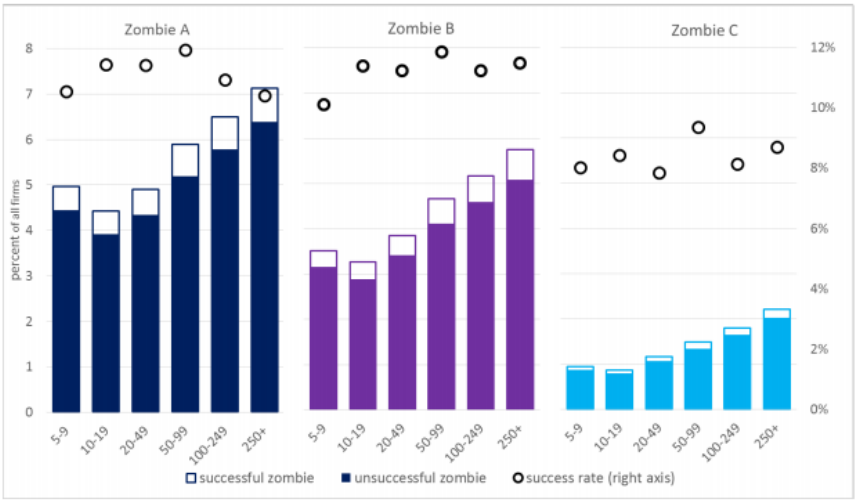
Authors looked for pieces of evidence of zombies remaining in their status for the following two years or recovering, finding out that the average share of successful zombie (i.e., companies classified as zombies in 2010 or 2013 but reporting an interest coverage ratio above 1 in the next two years) is 9.73%, regardless the definition used. Alternatively, evidence is that around 90% of zombie companies remain zombies in the following two years or either exit from the market.

The results showed in Figure 10 change according to the age and the size of the firms. Large firms with over 250 employees exhibit the lowest success rate of 10.46%, and the trend shows that the firm age is negatively correlated with the success rate: older companies are thus particularly likely to remain zombie once classified accordingly.

PANEL A: Share by Age



PANEL B: Share by Number of Employees



Zombie Status Persistence

Source: Hallak, Harasztosi, Schich, (2018) – Figure 10

IV. Identification of Zombie Firms

a. Definition and Criteria of Identification

After the Japanese crisis where for the first time the phenomenon of zombie companies came out, an increasing number of pieces of literature started to study and analyze the characteristics and peculiar features.

According to the general definition of zombie firm, a highly leveraged firm unable to generate enough cash flows to repay interests on debt and that keeps surviving on the market through subsidized credit obtained by the government or by the banking system is defined as a zombie.

To classify zombie firms, several authors have used different variables, criteria, and proxies to univocally identify the characteristics of zombie companies.

Caballero, Hoshi, and Kashyap (2008) in their analysis of the Japanese crisis identified zombie firms by only assessing whether firms are receiving subsidized credit, not looking at profitability or productivity.

This practice because, following the study of Peek and Rosenberg (2005) on the reasons for which banks were implementing perverse lending practices between 1993 and 1999, banks were effectively extending subsidized credit at low-than-market interest rates to distressed companies, disadvantaging healthy and profitable companies.

The authors focused in particular on credit assistance to firms that involved a direct interest rate subsidy, and their calculations aimed to identify the interest rate gap between the effective interest rate paid by the company and the reference interest rate (R*), which has been used as lower bound of the study.

The reference interest rate by the definition is the one expected only for the highest-quality borrowers, based on companies with AAA ratings.

For the nature of the study, the identification method is complex since it is difficult to find accurate data on the debt of each firm. Banks have almost no incentive to reveal their misclassification of loans. This is why the authors considered only a subgroup of listed companies with data publicly available. The data have been taken from Nikkei Telecom 21 between January 1990 and May 2004.

Under different econometric hypotheses and assumptions, the aim is to identify subsidized received by the company, given the difference between the actual interest rate (r) and the notional lower bound rate (r^*).

In general, the objective is to detect subsidized credit, and to select interest rates that are very beneficial for the borrowers, so that R* would be less than what the major part of firms would pay in the absence of subsidies.

The minimum required payment for each firm each year, $R^*_{i,t}$ is defined as:

$$R^*_{i,t} = rs_{t-1} BS_{i,t-1} + \left(\frac{1}{5} \sum_{j=1}^{5} rl_{t-j} \right) \cdot BL_{i,t-1} + rcb_{\text{min over last 5 years},t} * Bonds_{i,t-1}$$

Where $BS_{i,t-1}$, $BL_{i,t-1}$, $Bonds_{lit-1}$ represent short-term bank loans (less than one year), long-term bank loans and total bonds outstanding for firm *i* during year *t.* Terms rs_{t-1} , rl_{t-1} , $rcb_{min\ over\ last\ 5\ years,t}$ are the average short-term prime rate at year t, the average long-term prime rate in year t, and the minimum observed coupon rate on any convertible corporate bond issued in the last five years before t.

This is the estimation used to compute the lower bound, respecting the constraints given. It must be clear that the precise interest rates on specific loans or bonds and the related maturities are unknown.

As previously mentioned, the aim is to compare the actual interest payment made by firms ($R_{l,t}$) with the theoretical lower bound $R^*_{i,t}$. This difference is normalized over the amount of total borrowings at the beginning of the period $BS_{l,t-1}$ related to firm I in the year t.

By identifying the *interest rate gap* $x_{i,t}$ it is possible to theoretically identify potential firms that might have exploited these advantageous lower interest rates.

Thus, the resulting variable *interest rate gap* $x_{i,t}$ is calculated as:

$$x_{i,t} \equiv \frac{R_{i,t} - R^*_{i,t}}{B_{i,t-1}} = r_{i,t} - r^*_{i,t}$$

As consequence, according to Caballero, Hoshi, and Kashyap (2008) every firm I in year t exhibiting a negative interest rate gap $x_{i,t} < 0$ is classified as zombie firm.

However, the problem with this strategy is that classifies as a non-zombie firm a company that has an interest rate gap slightly higher than 0. For this reason, the authors proposed even a second method to identify zombies which is more robust.

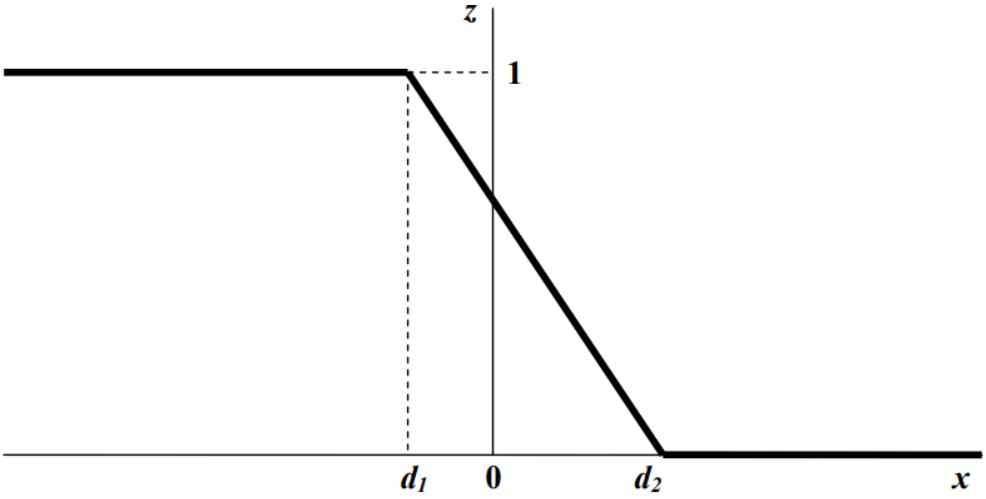
The second approach assumes that the set of zombies is a “fuzzy” set. In fuzzy sets, compared to the traditional one where an element can only belong or not to a certain set, an element can belong to a particular subset to a certain degree, so that the indicator function can take any value in the interval [0;1], and not just 0 or 1 as in classical set theory. By taking a “fuzzy” set of zombies, authors are assuming that some firms could be more or less zombie-like.

The function that defines a fuzzy subset is called “membership function” which is assumed to be

$$z(x;d_1,d_2)=\begin{cases}1 & \text{if } x<d_1\\ \dfrac{d_2-x}{d_2-d_1} & \text{if } d_1\le x\le d_2 \quad \text{where } d_1\le 0\le d_2\\ 0 & \text{if } x>d_2\end{cases}$$

The shape of the function is shown in Figure X and it is determined by two parameters d_1 and d_2 : it is possible to notice that when both parameters d_1 and d_2 are zero, the second approach converges to the first.

The fuzzy set defined "zombie firms" which are defined as companies receiving sufficient financial help from their creditors to survive despite their poor profitability. The problem is that it is difficult to classify how much financial help is considered sufficient, and this is a limitation of the fuzzy approach and the methods assigned a number between 0 and 1 to those firms which have a not clearly defined zombie status.



Membership function for a fuzzy Zombie set

Source: Caballero, Hoshi and Kashyap (2008) – Figure 11

McGowan, Andrews and Millot (2017) following the reasoning of Caballero, Hoshi and Kashyap (2008) and defining zombies based on the receipt of subsidized bank credit, proposed a simplified version where the minimum required payment for each firm each year, $R^*_{i,t}$ is defined as:

$$R^*_{i,t} = rs_{t-1}BS_{i,t-1} + \left(\frac{1}{5}\sum_{j=1}^{5} rl_{t-j}\right)BL_{i,t-j}$$

Where $BS_{i,t}$, $BL_{i,t}$ represent short-term bank loans (less than one year) ,long-term bank loans for firm i during year t, rs_t is the short-term prime rate and rl_t is the long-term prime rate at year t (both are calculated as

annual average of monthly rates). The definition is taken by the ORBIS database, different from the previous one, which allows considering a broader sample of firms, but requires very detailed information about the debt distribution for each company to compute the lower bound interest rate.

By using a different database, the study is done on a panel of 9 OECD countries during the period between 2003-2013, accounting just for the non-farm non-financial sectors.

Another strategy of the authors was to consider accounting parameters to classify zombies according to their weak financial structure.

1. Firms with an *interest coverage ratio* (i.e., operating income over interest expenses) less than 1 for at least three consecutive years.
2. Firms with negative profits.
3. Firms with negative value-added.

These indicators have been used because they are easier comparable among countries and also because the ORBIS database contains all the necessary information of the criteria. Moreover, the interest coverage ratio is less endogenous to productivity than negative profits and includes channels besides subsidized credit through which zombie companies can survive in the market. The clause of three years has been introduced in order to distinguish zombies from young firms or start-ups since it is normal to exhibit negative or low profitability at the beginning of a company's lifecycle: by exhibiting persistent financial weakness across three years, the definition can ensure to distinguish zombie from start-ups.

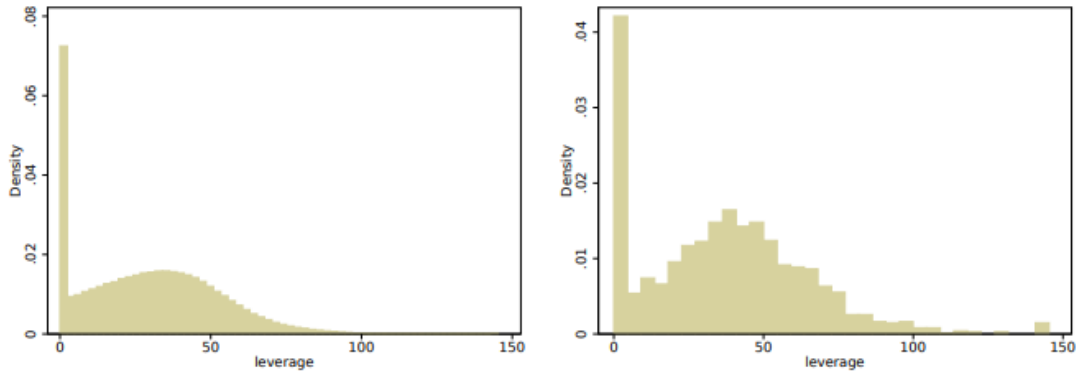
In the same year, the definition of zombie firm has been analyzed also from Schivardi, Sette, and Tabellini (2017), which identified zombie firms simply as firms for which the expected marginal return of capital is below the risk-adjusted market cost of capital: this implies that lending to zombie firms leads to misallocation of capital since it could be invested in more profitable, high-return investments. Looking to zombie phenomenon from the risk and return view, authors proposed new criteria of identification, aiming to obtain indications of low profitability and high-default risk:

1. Return on Assets (ROA) is lower than the cost of capital for the safest borrowers
2. *Leverage* (i.e., total financial debt over total assets) exceeds a given threshold L, usually amounting to 40%.

The ROA is obtained as the ratio between EBITDA and total assets, and since data to measure the expected future profitability are not available, authors relied on the three-years moving average of the ROA. On the other side, the cost of capital for the safest borrower is calculated as the average interest rate charged on the credit lines to the safest firms, called also *prime rate* (PRIME), which are characterized to have a Z-score of either 1 or 2. The Altman Z-score is a measure defining the riskiness of a company and varies from 1 (safest) to 9 (riskiest).

Leverage instead is used to measure the default risk, since high leveraged firms are more subject to default risk. The threshold L varies and to understand if leverage is too high or low, the authors considered the distribution of leverage in the year 2005 for firms that exited the market in 2006 or 2007: the median of the distribution amounts to 40%.

Authors saw also that the share of zombies has little changes by changing L between the 40th and the 60th percentile, as shown in Figure 12, meaning that the definition of zombie is not notably sensitive to the value of the chosen threshold L.



(a) Whole sample (b) Firms Exiting and with Roa<Prime Rate

Leverage of Firms

Source: Schivardi, Sette, Tabellini (2017) – Figure 12

From the graph, it is evident that zombie firms have higher leverage and are somewhat larger than non-zombie firms. This is explained by the fact that if leverage is used to enlarge assets, the size becomes bigger and so it is almost "mechanical" that by increasing leverage, the size of the firm increases too.

Authors tried another method to measure profitability in their definition of zombie firms, by comparing the EBITDA to the interest expenses to assess the creditworthiness: of course, if interest expenses overcome the EBITDA for a considerable amount of time, it means that the debt is unsustainable for the company. In particular, the authors introduced the variable *RATIO*, defined as the ratio between the three-year moving average of EBITDA and the three-year moving average of interest expenses.

To clarify, the second definition classified a company as a zombie firm if:

1. *RATIO* is below 1
2. *Leverage* is above a threshold L, usually 40%

Both the two definitions of Schivardi, Sette, and Tabellini (2017) are correct, but the second one is considered to be more stringent compared to the first one: taking the same sample of firms in the same time period, the

share of firms classified as a zombie is 18% according to the first definition, and 10% according to the second one.

Overall, definition 1 is preferred since it relies on the economic notion of credit misallocation, that is low return on capital, but to check the robustness of the outcomes, definition 2 can be used as more restrictive.

Another study by Storz, Koetter, Setzer, and Westphal (2017) focused to investigate on bank stress in the five euro area periphery countries (Greece, Spain, Ireland, Portugal, and Slovenia) during the years between 2010 and 2014 presents another definition of zombie firms.

According to their study, a firm is classified as a zombie if:

1. Return on Assets (ROA) is negative
2. Net investments are negative
3. *Debt servicing capacity* (i.e., EBITDA over financial debt) is lower than 5% for at least two consecutive years

Combining the different criteria, the method identifies zombie firms as non-profitable, and that do not invest beyond the value of their depreciation. The second constraint is used to avoid classifying young, expanding firms as zombies. Also, by using a low debt servicing capacity ratio instead of interest coverage in the iii), authors ensured to not classify as healthy firms zombie receiving a high amount of subsidized credit, and also that they captured highly leveraged companies. The threshold of 5% for iii) implies that the median firm in the sample, which pays approximately 5% of interest on its debt, has an interest coverage ratio of 1.

Banerjee and Hofmann (2018) in their study wanted to better understand the causes and consequences of zombie firms and revised also the definition. Previous authors claimed that one of the reasons for the origin of zombie lending was weak banks rolling over loans to distressed companies, instead of writing them on the balance sheet. Indeed, from the 1980s, a factor that could have heavily influenced the situation is the downtrend in interest rates. The decreasing interest rates as part of loosened monetary policies contributed to reducing the financial pressure on zombie firms to restructure or exit the market. This finding was confirmed by the outcome of the study, where was shown that lower interest rates tend to boost zombie share.

According to Banerjee and Hofmann (2018), (2020), the presence of zombie firms, defined as firms unable to cover debt servicing costs from current profits over an extended period, raised significantly after the Great Financial Crisis (GFC) across advanced economies. To study the phenomenon, the authors focused on listed non-financial companies in 14 countries from 1987 to 2016, taking into account a longer period compared to previous studies.

Their two alternative definitions include not just the lack of profitability over an extended period or the age of the company, but also the future expected profitability since at the moment the profitability of a company might be low due to corporate restructuring or new investment expenses, but it is likely to rise.

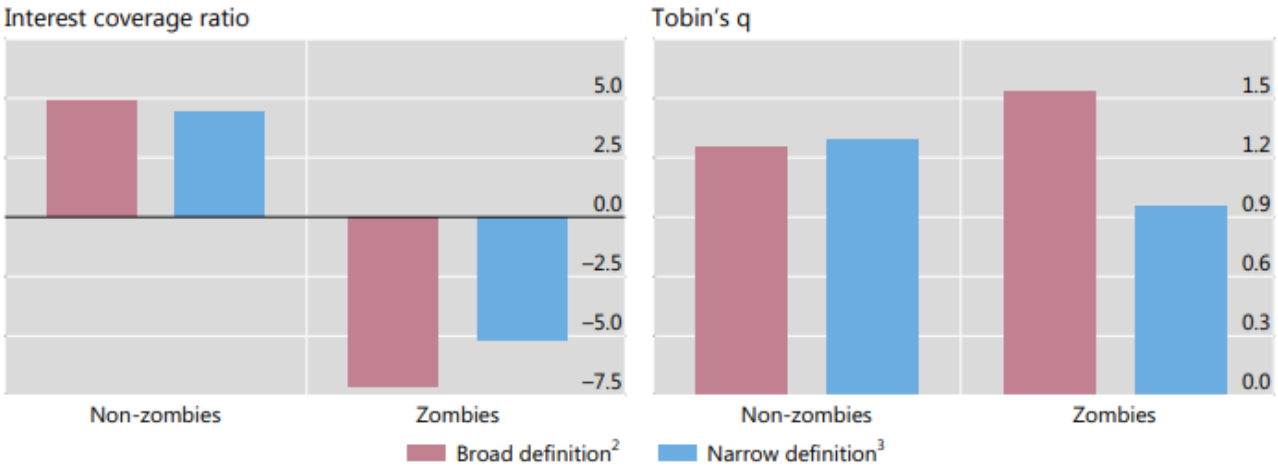
The first definition to classify a zombie firm has been referred to the one of McGowan (2017):

1. *Interest coverage ratio* (ICR) (i.e., operating income over interest expenses) less than 1 for at least three consecutive years, and if the firm is at least 10 years old

The second definition is stricter since it adds also the constraint on the potential future growth:

1. Tobin's Q (i.e., the market value of assets over replacement cost) below the median of the sector in any given year

The ii) criteria identify firms with low expected future growth potential. Figure 13 shows the difference in interest coverage ratio and Tobin's Q for zombie and non-zombie firms.



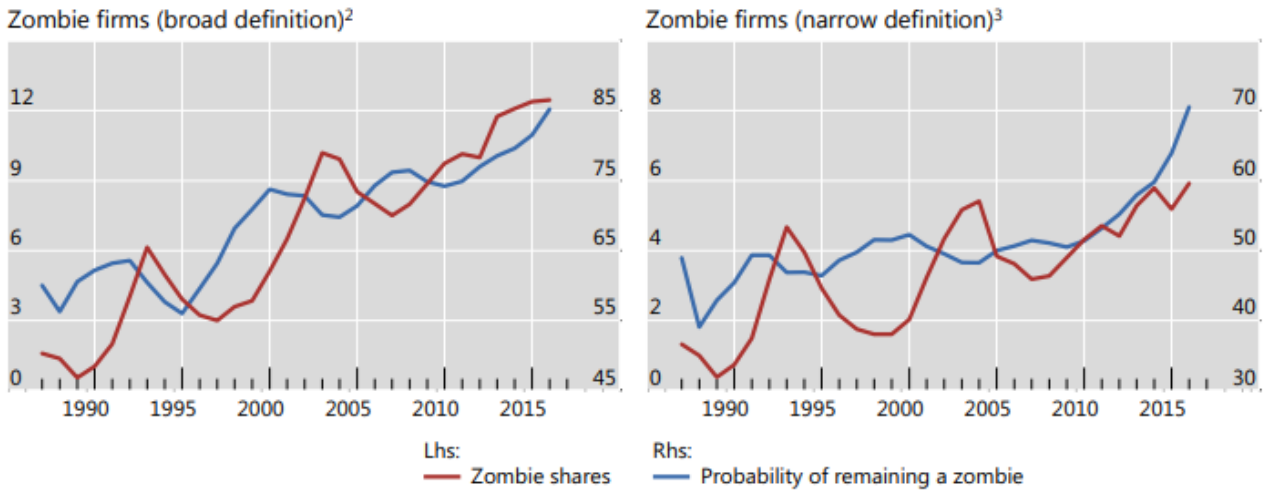
Interest Coverage Ratio and Tobin's Q of zombies and non-zombies

Source: Banerjee and Hofmann (2018) – Figure 13

Healthy companies exhibit an average interest coverage ratio around 4 times earnings, while for zombie firms, as they are making losses, the average measure is around -7,5 and -5,0 according to the narrower definition which takes both the criteria into account. The astonishing difference between the two definitions is for the Tobin's Q of zombie firms, where under the broad definition the median of the future expected growth is higher compared to the narrow definition. Investors expect firms to have low future profit potential.

Both definitions confirm the fact that zombie firms have been increasing since the 1980s across all the 14 advanced economies considered in the study. Figure 14 depicts that the share raised from an average of 2% to 12% in 2016 using the broad definition, while under the narrow definition it went from 1% to 6%. The trend was not constantly increasing since the economic downturns in the 1990s, 2000, and 2008 are noticeable.

Of course, the cause of the rise is that most firms firstly classified as zombie did not change their status rather than going into recovery or declaring bankruptcy: in particular, the probability for a zombie firm to remain a zombie in the subsequent years increased from 60% in the 1980s to 85% in 2016 under the broad definition, and from 40% to 70% under the narrow one.



Zombie firms increasing share and probability to remain a zombie overtime

Source: Banerjee and Hofmann (2018) – Figure 14

b. Characteristics of Zombie Firms

Once identified the main definition of literature, it is important to consider also which are the main features of the performance of zombie firms compared to healthy companies.

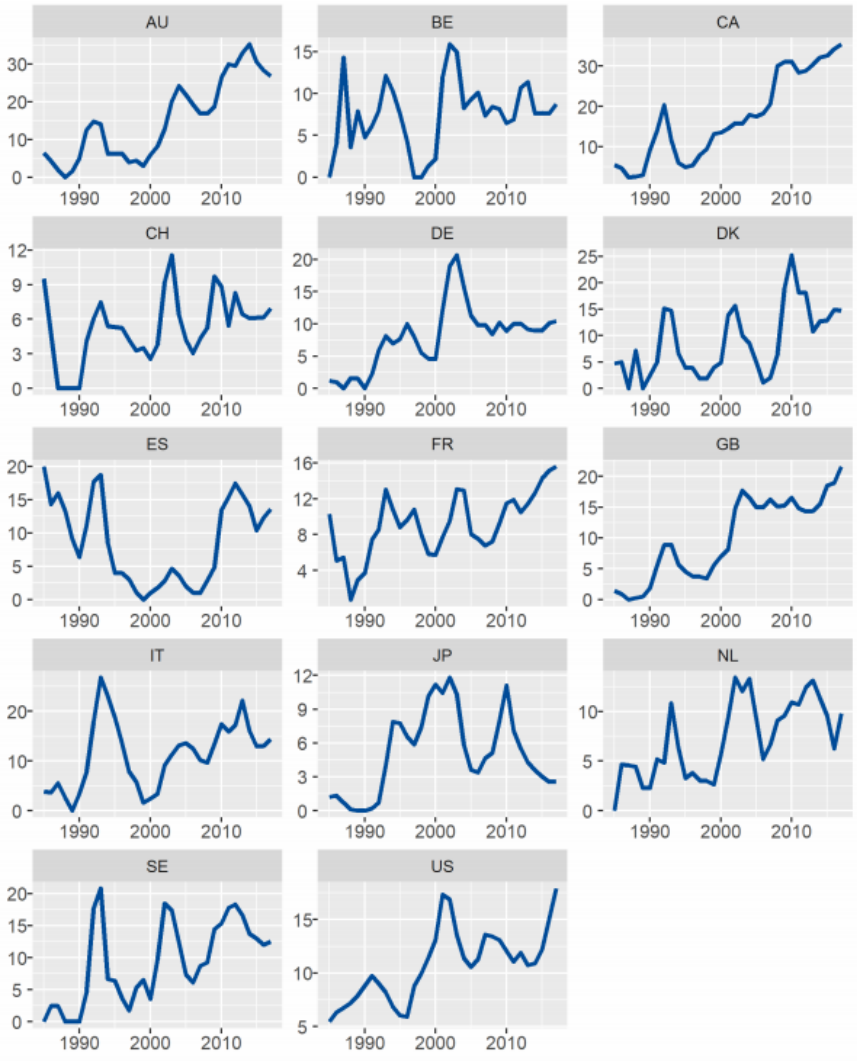
The first study that will be taken as a reference is the one of Banerjee and Hofmann (2020), using their previously-mentioned definition of zombie firms based on the persistent lack of profitability and future growth potential.

The share of zombie firms has been massively increasing since the 1980s, as shown in the previous section, reaching 15% of listed firms in 2017 in 14 advanced economies, with a percentage of capital sunk in zombie firms around 6-7%. However, the numbers are very likely to be underestimated since the study only considered listed firms, and in particular not small and medium-sized enterprises (SMEs). Moreover, taking into account only listed companies, authors saw that zombie stocks were significantly more in Anglo-Saxon countries compared to Europe or Japan, since generally they have a market-based financial system, and so

companies are more willing to be listed on the stock market to raise funds. In particular, Anglo-Saxon countries have more listed companies, and more precisely, more listed SMEs, which in 2017 were averaging 50% against 28% in Europe and 15% in Japan. This suggests that the results of the authors for continental Europe and Japan might be biased, because not all the SMEs in the are listed, and therefore, considered into the sample.

The distinction of SMEs companies is important because they are more likely to become zombie firms. Indeed, Figure 15 exhibits the differences in zombie congestion across several countries, and the highest zombie share has been registered in Anglo-Saxon countries, which is around 30% and where the percentage of zombies has been increasing since the financial crisis. Instead, in European countries the presence is reduced to a maximum of 15%, and has been constant or even had reduced during the GFC: the only exemption appears to be France, where the presence of zombie firms grew more than twice since 2008.

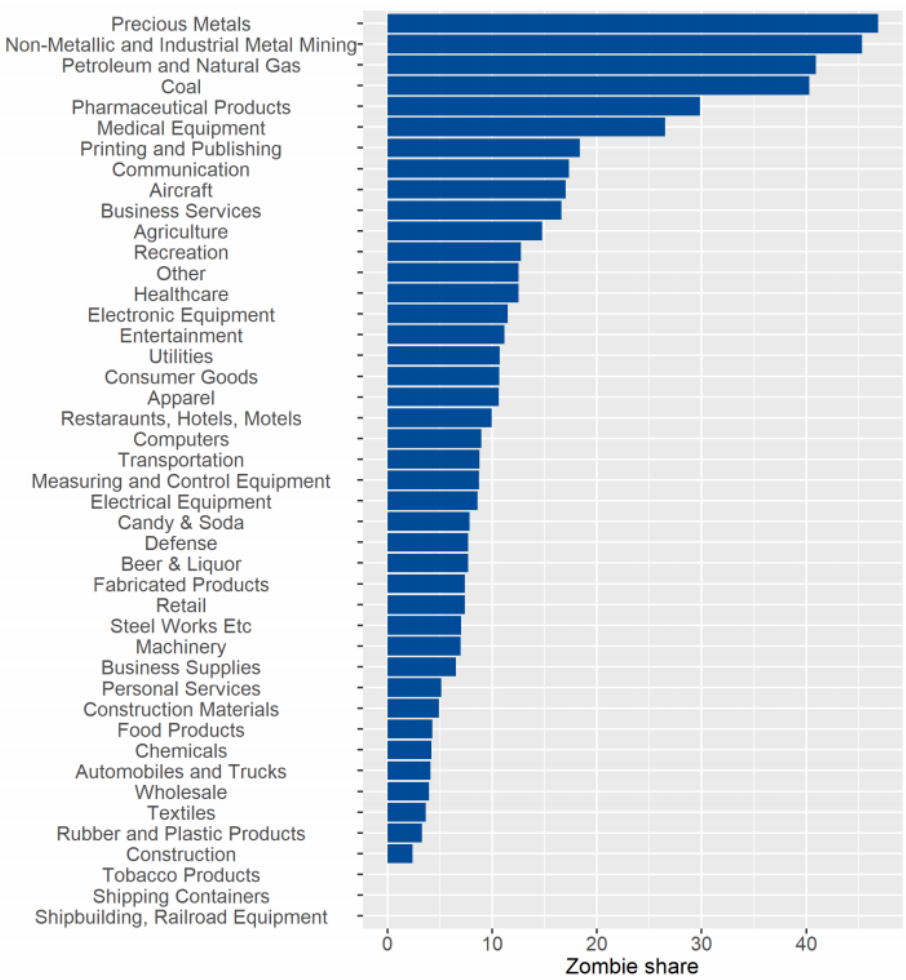
An important discovery noticed by the analysis of the authors is that not only the zombie share reached its highest value in 2016 and reached again 15% in 2017, but also firms are not changing the status of zombie. Indeed, the probability of remaining a zombie from one year to the next one increased to 80% in 2017.



Share of Zombie Firms across Countries (in percentage)

Source: Banerjee and Hofmann (2020) – Figure 15

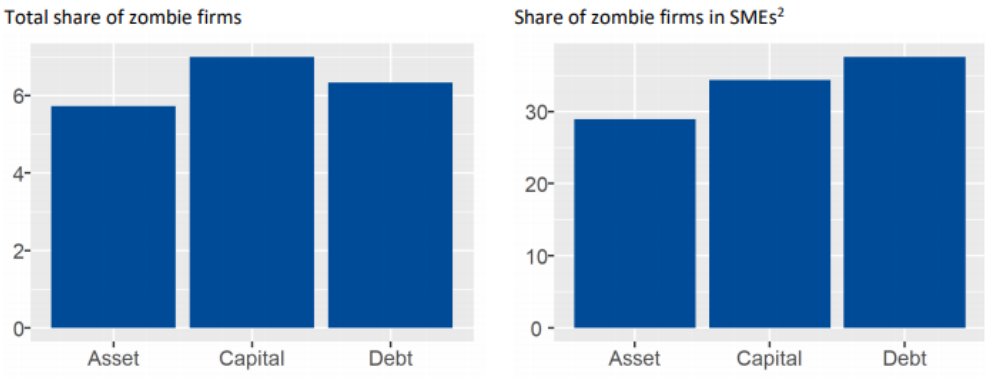
It has to be noticed that the share of zombie firms changes significantly across sectors: more specifically, commodity sectors are the ones characterized by a large share of zombie firms, which is around 40%, and this is also aligned with the high share of zombie firms in countries such as Australia, Canada, and the US since they have a key role in the commodity industry. The sectors listed based on the share of zombie firms are shown in Figure 16**,** where it can be noticed that the most asset-intensive sectors exhibit the highest share of zombie companies.



Share of Zombie Firms by Sector (in percentage)

Source: Banerjee and Hofmann (2020) – Figure 16

It is important to recognize the real impact that the increasing zombie share has on the economy, and this is why authors computed the economic weight of zombies according to their assets, capital stock, and debt amount. The economic weight is lower than their share, averaging to 6%-7% only, meaning that zombie firms are normally smaller than healthy firms. In particular, by taking into account only the listed SMEs, the amount in assets, capital stock, and debt of zombie firms are significantly larger, peaking to 50%. Since the main drawback of the analysis is that it doesn't take into consideration non-listed SMEs, and as demonstrated, SMEs have a higher tendency to become zombies, the weight of these zombies in the total economy might be underestimated (Figure 17).



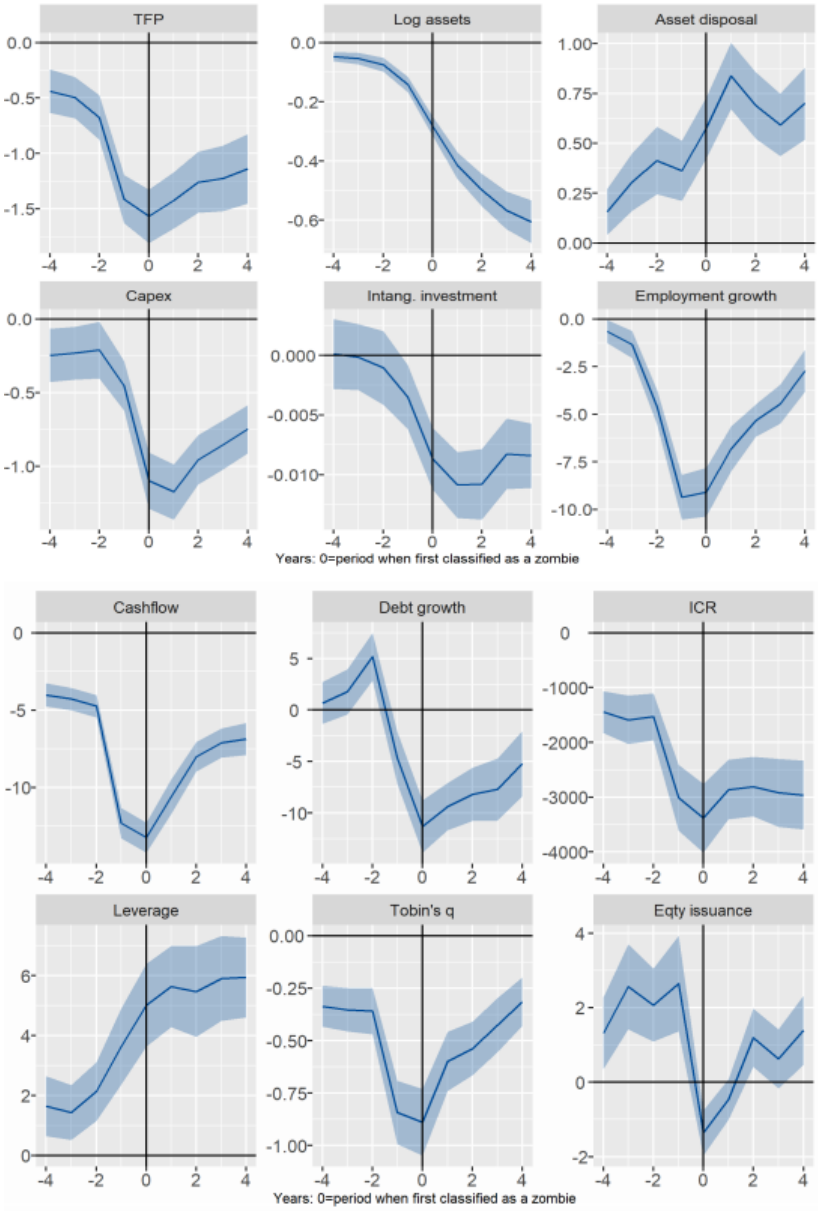
Share of Zombie per Assets, Capital Stock and Debt in 2017 (in percentage)

Source: Banerjee and Hofmann (2020) – Figure 17.

From the analysis of Banerjee and Hofmann (2020) emerged several characteristics of zombie firms, in particular looking to the financial statements of the companies:

1. The size: zombie companies tend to have a smaller size compared to non-zombie companies. For the size, the authors mean the number of assets, capital stock, and employment, which are around three times smaller than normal, and this is aligned with the previous statement that SMEs have a higher tendency to become weak firms.
2. Investments of zombie firms are significantly lower than non-zombie firms, considering that they have a lower CAPEX, and their investments are significantly lower in intangible assets.
3. Asset disposal in zombie firms is 0.5% higher than non-zombie firms, since those companies are gradually reducing their operations, and this is why also the reduction in employment is around 6% per year, compared to the employment growth of 3% of healthy companies.
4. The productivity level of zombie firms is halved and is around half of the normal companies
5. Negative cash flows, interest coverage ratio, and a low Tobin's Q are other financial measures that identify zombie firms, reflecting their lower profitability
6. Normally these companies receive subsidized credit since the interest rate they pay on credit is lower than what they should be supposed to pay for their risk profile
7. Lastly, zombie companies exhibit a high leverage

All these indicators are grouped in Figure 18, showing the gradually decreasing performance of zombie firms overtime



Performance Measurements in Zombie Lifecycle

Source: Banerjee and Hofmann (2020) – Figure 18

When it comes to the so-called "zombification" process, the problem is that recovered firms' performance remains weak, it does not come back to original average levels.

Since the 1980s, authors showed that the major part of zombie firms, around 60%, recovered from the status and less than 25% exited the market. Moreover, recovered zombies face a higher probability to fall back into the zombie status in the next period around 17%, which has raised massively compared to 5% in 2005. Instead, for a company that has never been classified as zombie before, the probability of turning into a zombie is around 3%, and it has remained constant in recent years.

As previously mentioned, the performance of recovered firms is poor compared to the average, since these firms turn out to be smaller than healthy companies, less dynamic, and with lower productivity.
The data are shown more precisely in Figure 19.

	Never zombie firms	Recovered zombie firms	Kolmogorov-Smirnoff stat
Total assets	25023.8	14418.1***	0.29
Capital stock	17535.81	10934.46***	0.24
Employees	7541.85	4754.24***	0.25
Capex	5.73	5.02***	0.15
Intangible investment	6.87	5.6***	0.07
Employment growth	3.4	1.45***	0.27
Labour productivity	3.53	3.11***	0.38
TFP	7.32	5.6***	0.26

Recovered Zombies Performance

Source: Banerjee and Hofmann (2020) – Figure 19

The problem with recovered firms is that they are a signal that the damage created by zombie firms implies long-term consequences on the economy.

c. Financial statement Analysis of a Zombie Firm

The company analysed in this work is Mattel Inc, an American company in the Consumer Good industry famous for the production of toys and owner of brands such as Barbie and Fisher-Price Core.

The company was founded in 1945 and it is headquartered in El Segundo, California.

This company was chosen for the analysis since it is one of the 31 companies of the S&P 1500, overall valuing $850 million, with interest expenses exceeding cash flows generated in the last three years. Within this small list of companies, just two are in Consumer discretionary industry, while most of them belong to Real Estate or Healthcare sector. For sure, Mattel Inc is the most well-known.

Looking to the S&P 1500, it presents 31 companies that can be classified as zombie, according to Investor's Business Daily, but the major part of these are small cap., cheap stocks.

Mattel was a perfect example a low-price stock with an increasing leverage and with positive cash flow generation: despite this, in last years cash flows were not sufficient to pay neither the interest expenses on its huge debt of $193 million (2019).

The definition of zombie and the previously mentioned criteria to identify a zombie have been applied, and Mattel Inc fully respected all the "requirements" to be classified as "zombie according to the three definitions of Rodano and Sette (2019), and Storz et al. (2017).

The data showed in Figure 20 are taken from Mattel Inc official financial statements, choosing a three-year period including 2017, 2018 and 2019.

zombie status 1 *(Rodano and Sette (2019))*

variable	2019	2018	2017
EBIT/OF	0,20	-1,16	-9,94

zombie status 2 *(Rodano and Sette (2019))*

variable	2019	2018	2017
EBITDA/OF	0,74	-0,97	-7,29

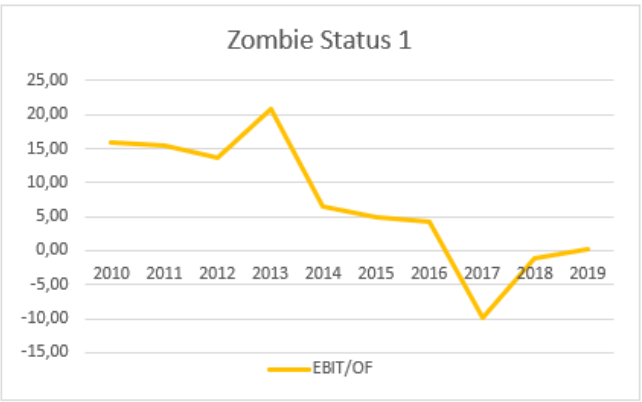
zombie status 3 *(Storz et al. (2017))*

variable	2019	2018	2017
ROA(%)	0,03	-0,04	-0,04
ROIC(%)	-5,3%	-12,3%	-24,2%
EBITDA/tot DEBT	0,04	-0,06	-0,07

Figure 20

Source: Mattel Inc Financial Statements & Eikon

The graphs in Figure 21 give an overview of the company's trend from 2010 to 2019, exhibit all the changings in the different parameters expressed in the criteria.



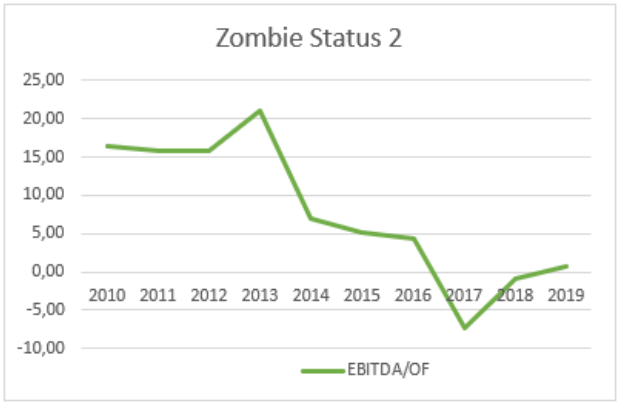


Figure 21a *Figure 21b*

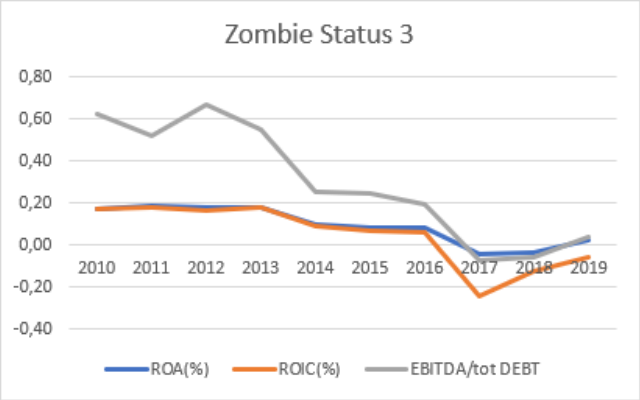


Figure 21c

Source: Mattel Inc Financial Statements & Eikon

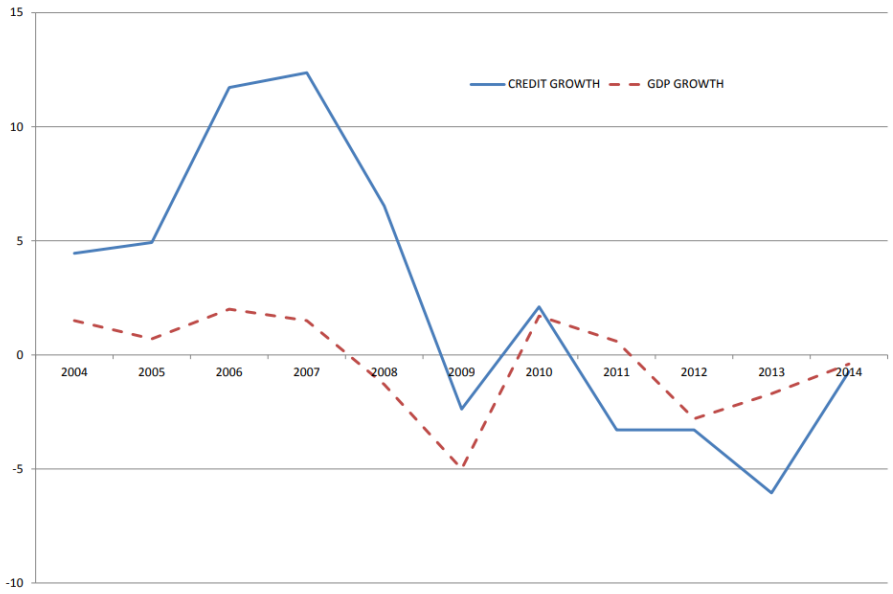
For what concerns the third zombie status, total financial debt has been calculated as the sum of short-term borrowings and non-current liabilities

V. Zombie Firms in Italy

One of the main outcomes of the financial crisis was the undermining of the banking sector. As it has been shown for Japan, during recession periods undercapitalized banks might enhance the problem of misallocation of resources and prevents capital to be invested in more productive firms.

Essentially, this phenomenon has been taking place also in Europe, even if according to certain authors, the effect of zombie firms during recession period might not be necessarily damaging healthy firms: indeed, giving credit to troubled and weak firms means keeping them alive, preventing massive layoffs and companies' closures that might disrupt input-output relationships.

The study of Schivardi, Sette, and Tabellini (2017) is focused in Italy, precisely in the period from 2004 to 2013 covering the pre and post-crisis periods. The reason why authors picked Italy is that it is a country that has been massively hit by the financial crisis and that went through an extensive period of recession that caused an overall drop in GDP of around 10%, an increase in the amount of NPLs from 5.8% in 2006 to 16% in 2013, and also an extended credit crunch, as shown in Figure 22.



Credit Growth and GDP Growth in Italy between 2004 and 2014

Source: Schivardi, Sette and Tabellini (2017) – Figure 22

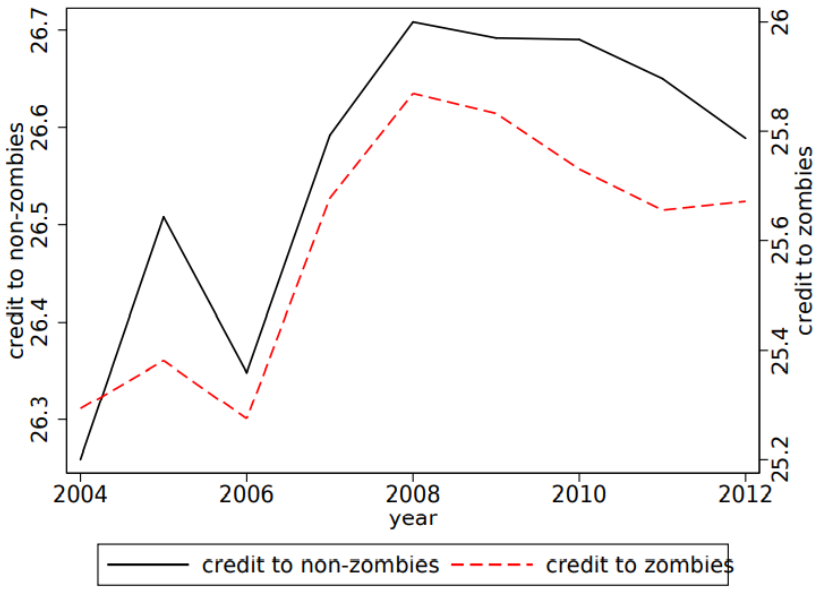
The motivation for which Italy was particularly hit by the crisis is that it did not proceed with the injection of public funds aimed to recapitalize banks, and also it did not create an entity, so-called "bad bank", to absorb all the losses coming from the NPLs. Indeed, Italian banks remained stuck with a relevant portion of bad

loans, so that a lot of banks encountered difficulties in meeting the more stringent capital requirements set by regulators after the crisis.

Unlike previous studies of literature that were considering only listed firms, authors observed the situation particularly in Italy taking into account a database that included both listed and non-listed firms, considering also small firms, to have a more comprehensive outcome from the analysis. Moreover, they identified a new definition of zombie firm which considers both the efficiency (i.e., return on assets) and financial fragility (i.e., indebtedness before the financial crisis).

The main outcomes of the research of Schivardi, Sette, and Tabellini (2017) were that undercapitalized banks had a higher probability to keep lending to troubled firms during the crisis period, compared to stronger banks. Of course, this has a direct influence on the companies' survival and exit from the market, and in particular, it has been noticed that in a sector where lending is predominantly done by weak banks, the probability of troubled firms to survive is higher, like the one of healthy firms to go bankrupt.

Moreover, Figure 23 highlights how credit given to zombie firms declined quicker than the credit given to healthy firms at the beginning of the crisis, and how after 2011 the situation reversed, when banks were subject to stricter capital requirements. This, in particular, means that credit has not been reallocated to healthy banks from zombie firms.

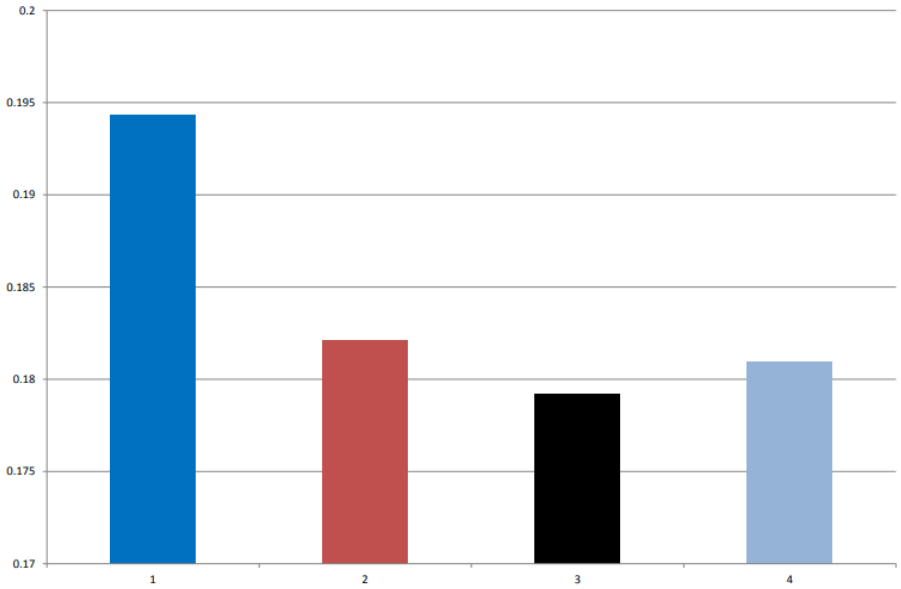


Credit to Zombie and Non-Zombie Firms in Italy

Source: Schivardi, Sette and Tabellini (2017) – Figure 23

From a bank perspective, undercapitalized banks were more likely to be involved in zombie lending with respect to other banks, especially from 2008 since regulators started to put more pressure on the regulatory

capital requirements for banks. Capital requirements started to become more demanding during the crisis and then afterward, considering also that there was in place a shift in bank supervision from national to European authorities. The main measure of a bank's strength is the regulatory capital ratio, which is identified as the ratio of total capital (meaning both Tier 1 and Tier 2) over risk-weighted assets. Normally, according to regulations, the regulatory capital should not be under 8%, and the average capital ratio was about 11%, remaining stable throughout the crisis**.** Figure 24 shows the distribution of zombie firms according to the capital ratio of banks.



Share of Zombie Firms by Quartile of Bank Capital

Source: Schivardi, Sette and Tabellini (2017) – Figure 24

From the graph, it is evident that banks with the lower quartile in the distribution exhibit the highest number of zombie firms as borrowers, while the portion is decreasing going towards the median level of capital requirements.

The graph shows that the type of link that there is between zombie lending and the regulatory capital ratio is not linear, since as the capital ratio raises over the threshold, the relationship between zombie lending and capital ratio fades away. Aligned to what is suggested by the graph, undercapitalized banks aim to avoid incurring losses, in particular in case of a recession, and so they are more likely to keep extending credit to troubled firms, allowing them to survive in the market. The results from the graph and the analysis exhibit that the misallocation of credit towards troubled firms might have been a response to the stricter regulations from weak banks, that were trying to reduce the risk of supervisory to not being forced to reduce their capital. To quantify better the situation, on average from 2008 to 2013 bank credit declines yearly by around 8%, and undercapitalized banks provided 2% of additional yearly credit growth to zombie firms, which corresponds

to 25% more compared to the average. Another detail is that from 2008, the likelihood of closing a credit relationship with any company decreased by 1% if the regulatory capital was lower than the average, and also if the borrower was a zombie firm, the likelihood decreased by a further 0.7%. Moreover, undercapitalized banks, as shown, are more likely to be involved in forbearance policies, and so they are more likely to not re-classify or downgrade their toxic loans.

These findings brought further to the conclusion that weak banks were highly involved in the misallocation of credit.

Differently from other studies, an important consideration made by the authors is in contrast with the common idea of literature about how zombie lending impacts the performance of non-zombie firms: the main result of Schivardi, Sette, and Tabellini (2017) is that undercapitalized banks had only negligible effects on the growth of healthy firms during recession times. The previous conclusion was because undercapitalized banks reduce the availability of credit to non-zombie firms, and at the same time, the credit given to troubled firms could be seen as a subsidy, so that it creates distortions in the competition by favoring only certain companies. On the other side, the impact of zombie lending during a recession helps firms to remain alive and not exit the market, avoiding massive layoffs and mitigating the adverse aggregate demand.

Following the credit misallocation reasoning, another consequence of weak banks is that they affect the composition of bankruptcy. This is because, with the support of weak banks, zombie firms have a higher probability to survive, while instead by misallocating resources not to healthy firms, these have a higher likelihood to fail, especially in sectors where lending is mainly done by undercapitalized banks. Hypothetically, the authors stated that if an injection of capital had restored the weak banks to an average level of capital, the failure rate of zombie firms would have risen by 0.4% and that of non-zombie firms would have fallen by the same percentage.

Lastly, referring also to a study of Hsieh and Klenow (2009), authors showed a positive correlation between under-capitalization of banks and TFP dispersion: in normal conditions, revenue TFP should be equalized across firms because factors of production would be allocated to companies so that the marginal value product of inputs is equalized, but the dispersion can be considered as a sign of distortions in the allocation of capital. Zombie lending practices lower the efficiency in the capital distribution process, because inefficiencies are not removed and because healthy firms' growth is inhibited. The results of the analysis pointed out that there is a positive correlation between undercapitalized banks and aggregate TFP dispersion, but only in the sector where the presence of zombies is relevant.

Overall, the weakness of the banking sector can be identified as one of the major causes of low economic growth in Southern Europe and

Italy after the financial crisis, and indeed, after 2012 the output considered in the sample fell by around 2% per year, and the contribution of zombie firms to this output decline is between 10% and 20%.

By using Schivardi, Sette, and Tabellini (2017) definition of a zombie firm, these are the main conclusions that emerged from the analysis:

- If a firm has been classified as a zombie in period t, it has a 72% probability of remaining in that status in the next period.
- The portion of closed relationships with firms by average banks is 14% for zombie firms and 9% for non-zombie firms, meaning that the average bank is more likely to cut credit to zombies rather than to healthy firms.
- The share of zombie firms that exited the market by declaring default or bankruptcy is 12.8%, while for non-zombie is 3.3%
- Revenue growth is much lower for zombie firms, averaging -3.53% compared to revenue growth of 1.70% yearly for non-zombie firms.

On the whole, the analysis carried out by authors suggested that the recapitalization of weaker banks would impact positively output growth through the extensive margin, and in the study, a capital injection of 4 billion to weaker institutions would have brought to a rise in the output growth between 0,2 and 0,35 between 2008 and 2013. This is because it would enlarge the survival rate of non-zombie firms, and simultaneously raise the failure rate of zombie firms.

Taking into account the crisis period, and considering the yearly output growth of -3,7% on average, zombie lending was only responsible for around 10% of the whole value. This means that even if zombie loans contributed a significant portion to the GDP decline in Italy during the recession, they are probably not the major cause. Moreover, the credit misallocation could have taken time to show the effects, and also the reallocation of factors from low-productivity to high-productivity firms implies that there are healthy firms ready to use such resources: thought, during the recession period even the demand for productive firms declined, and as consequence, the demand for input should have been lower and probably not able to absorb all the freed-up resources from zombies.

VI. Unconventional Monetary Policies and Zombie Firms in Germany

For the moment, the research has analyzed the consequences of unconventional monetary policies in Europe on countries that were heavily affected by the financial crisis of 2008 and the debt sovereign crisis, but in this section, the focus will be on a country where macro-economic conditions were not significantly altered: Germany.

This section is based on the study of Bitter, Fecht, and Georg (2021) which suggested that undercapitalized banks utilized the European Central Bank's very long-term (i.e., with a maturity of more than one year) refinancing operations (VLTROs) at the end of 2011 to evergreen exposure to zombie firms, and furthermore, they looked at how zombie firms obtained additional funding and trade credit.

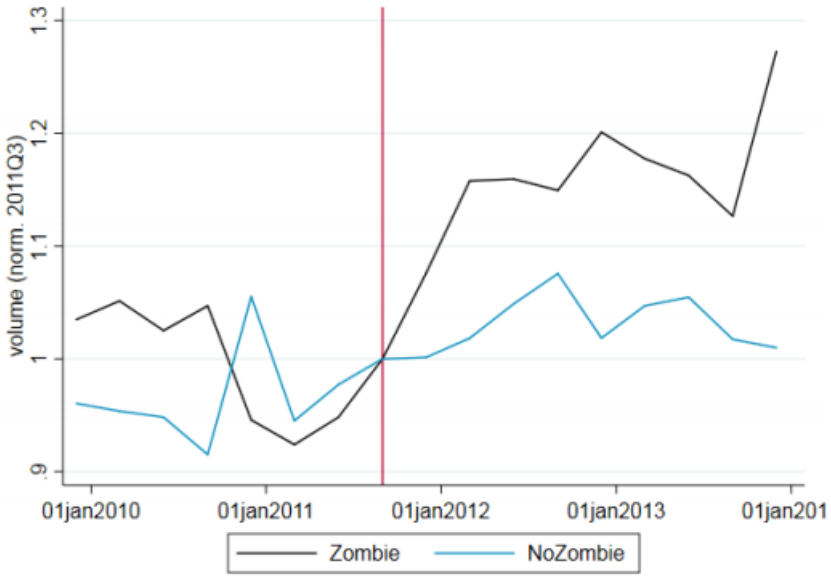
After the Great Financial Crisis, European policymakers decided to shift to a fixed-rate full-allotment policy, meaning that banks could obtain for one week at a certain fixed rate as much credit as they required through the ECB's weekly refinancing operations, given that they had a sufficient amount of collateral to pledge. The VLTROs program was announced on the 8th of December 2011 and conducted as repurchase agreements with a maturity of three years. The interest rate on the program was dictated by the average interest rate of the main refinancing operations, thus, the VLTROs did not grant banks cheaper access to ECB fundings but alleviated the tensions concerning the access to fundings. The European decision to carry out this program was not as the answer to the situation in Germany, but a measure taken over all the Euro area since the German economy in 2011 was booming.

As previously stated, zombie lending practices reduce the supply of credit to healthy firms favouriting unproductive firms and delaying their exit from the market. Also, zombie lending practices can affect the upstream and downstream firms in the supply chain of a zombie company. Moreover, distressed companies that were given bank funds and trade credits after the VLTROs had a higher expected default probability than the average zombie firms.

When different countries in Europe were experiencing hard financial times during the debt sovereign crisis, Germany instead benefitted from the weak euro and the low rates, bringing the GDP growth to 3.7% in 2011 against the 10-year average of 1.2%. At the same time, the unemployment rate was declining, and corporations were having sales growth and great cash inflows allowing them to increase their equity ratios and investments. On the other hand, the banking sector was overall well-capitalized even if some banks were still suffering losses incurred in the crisis due to their exposure to the Greek sovereign debt crisis.

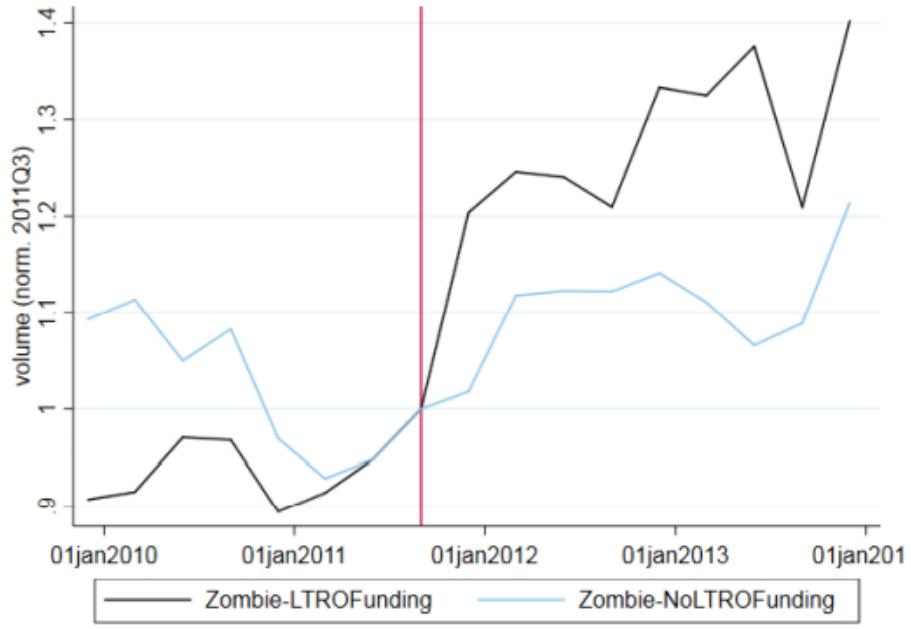
The study by Bitter, Fecht, and Georg (2021) firstly wanted to discover if, indeed, the introduction VLTROs unconventional operations pushed banks to be involved in zombie lending practices or to changes in their

lending policies. The results from the research using a panel approach showed that banks which significantly increased their ECB borrowings from 2011 were more inclined to give credit to distressed companies.
Even in this case, the authors defined as zombie a company exhibiting an interest coverage ratio below one for over three years.
In particular, banks were more inclined to utilize ECB fundings for zombie lending with non-listed, small-sized firms unable to raise debt, and so fully relying on bank debt. Indeed, one bank obtaining more VLTROs fundings tends to be involved significantly in evergreening practices with one zombie company if the exposure is relevant into the bank's loan portfolio, to avoid large write-offs.
It is evident in Figures 25 and 26 an increase in zombie lending after the three-year implementation of the VLTRO program, while credit to healthy firms remained quite stable. The increasing trend is mainly due to banks extensively using the ECB's funding opportunity.



Lending volume prior to the VLTRO by banks to zombie and non-zombie firms

Source: Bitter, Fecht and Georg (2021) – Figure 25



Lending volume by banks using three-year VLTRO funding to zombie firms compared to the lending by non-VLTRO funding banks to zombie firms.

Source: Bitter, Fecht and Georg (2021) – Figure 26

The results of the analysis showed that a zombie firm obtained relatively larger credit amounts from a bank that was extended significant amount of funding from the ECB's VLTROs: indeed among different banks with one receiving additional Eur 1 billion in VLTROs funding, the difference in lending to a zombie corresponded to a 5.6% rise in lending to zombie companies.

One important clarification to make is that many banks used the additional extraordinary fundings to replace other short-term ECB fundings. Authors demonstrated that fundings received from the central bank, not VLTROs related, did not influence in a relevant way the lending policies of banks.

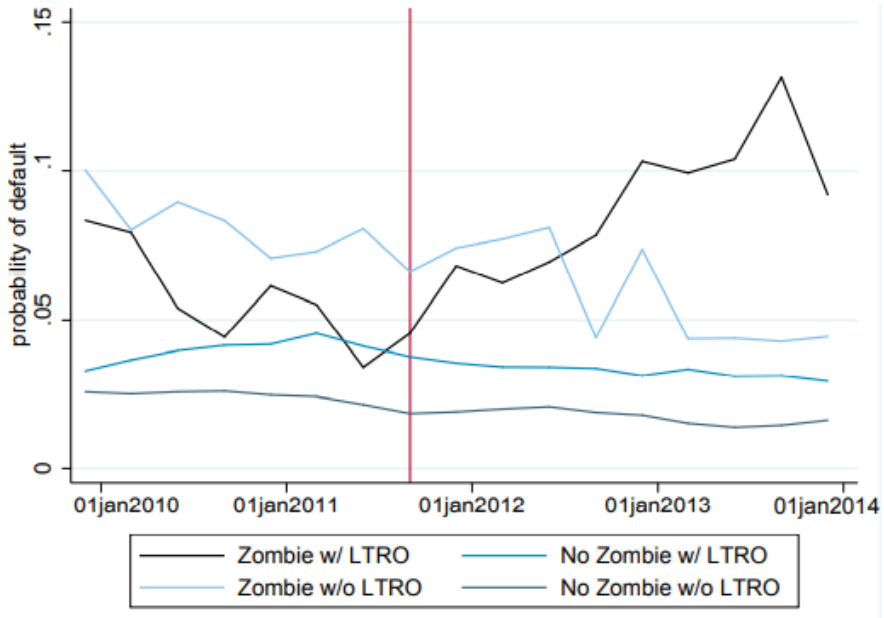
Moreover, the authors decided to assess whether unconventional monetary policy measures affect banks' relationship with distressed firms: banks that borrowed more from ECB's VLTROs were more inclined to engage in credit relationships with zombies. Each Eur 1 billion increase in VLTROs funding meant a 9.81% rise in the probability for the bank to have credit outstanding with a zombie company.

It has been noticed previously that evergreening practices were attractive for banks since they allow banks to not recognize losses in their balance sheet, and these practices become even more attractive the closer the bank is to the regulatory capital requirements. Authors showed that banks exhibiting an equity ratio under the median of the sample increased funding from the ECB VLTROs and were more inclined to give credit to zombies. Only poorly capitalized banks were more likely to use VLTROs funding to extend credit to existing zombie clients, while well-capitalized banks reduced the share of zombie clients.

One striking discovery in the study is different from the article of Schivardi et al. (2017) analyzed previously. Indeed, previously in Italy was shown that evergreening practices helped firms to reduce the failure rate, and also was assumed that banks were managing the increasing credit risk by simultaneously adapting the number of collaterals required. Before the VLTRO program, institutions were lending to distressed firms that, as consequence, had a lower default probability. Also, normally the bank, if aware of a high default probability of the borrower, might just adapt the credit risk premium, based on a credit risk assessment made at the time when the loan was given.

Instead, after the VLTROs introduction, zombie firms that were extended credit from banks receiving the ECB fundings exhibited a higher expected default probability than the average zombie companies. In normal conditions, banks should have used this criterion to select only those zombie firms that could have eventually recovered from that status, but after unconventional monetary policy measures, banks were no longer extending credit based on that information.

It turned out that those banks using VLTROs credit to lend to zombie firms were not increasing the required collaterals from those borrowers, so they were not alleviating the potentially detrimental effects. Banks that were utilizing VLTROs fundings to lend to zombies might have partially covered the high credit risk by asking the borrowers to increase the amount of pledged collateral. In Figure 27 it is possible to see the probability of default for zombie and non-zombie companies over time, considering if the firm is taking credit from a bank included in the VLTROs program.



Probability of Default for Zombie and Non-Zombie Firms Over Time.

Source: Bitter, Fecht and Georg (2021) – Figure 27

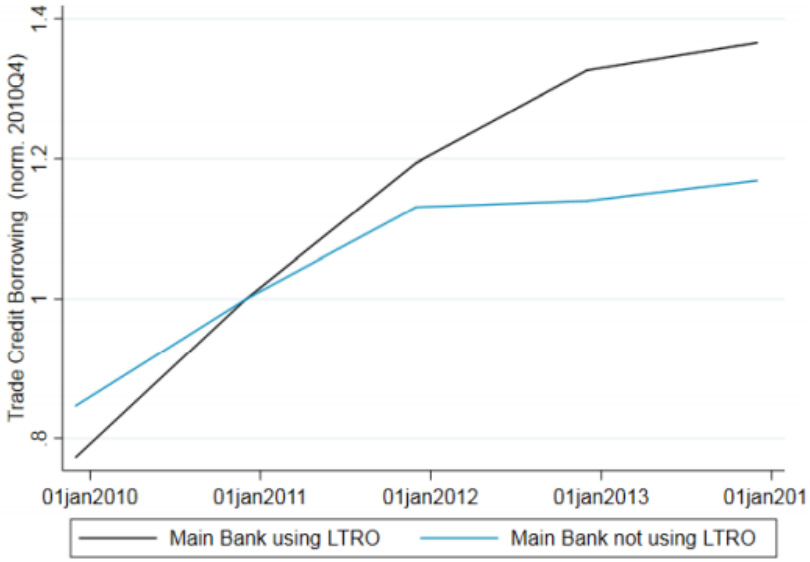
This implicates that evergreening practices induced by unconventional monetary policy measures increased both the probability of loss on credit exposure and the loss given default.

Another implication is on the trade credit and credit risk exposure of suppliers to zombie firms: distressed companies get less trade credit than healthy firms, but after the VLTROs program, it was the opposite. In particular, this is true for those companies who obtained more credit from banks, and that consequently got more trade credit from suppliers.

When it comes to bank-client relationships, banks obtain private information about their borrowers to execute a credit risk assessment: investors acknowledge this information asymmetry, and for this reason interpret as a positive signal the decision of the bank to give credit to a certain client. Usually, along the supply chain, upstream and downstream companies are better informed about the business conditions of a firm than the other market players. Despite this, banks have complementary information on the firm and suppliers might entrust banks' decisions to grant further trade credit.

For this reason, suppliers carefully monitor banks' lending decisions and interpret those as a positive or negative signal on the credit quality for the extension of trade credit to a certain borrower.

Suppliers might or might not have more private information on the borrowers' credit quality and ability to liquidate collateral in addition to banks' signals, and for this reason, they might choose to extend or not additional trade credit to those firms they think able to recover. To rephrase it, only those zombie companies for which suppliers had a positive credit risk assessment might have been capable to get more trade credit. Figure 28 shows the firms' trade-credit borrowing trend over time.



Firms' Trade Credit Borrowing Overtime.

Source: Bitter, Fecht and Georg (2021) – Figure 28

As mentioned before, with the introduction of the VLTROs program, banks were extending more credit to zombie firms, placing a higher credit risk. The results of the study showed that zombie firms generally increased their trade credit before the VLTROs measures only if they were not able to obtain larger loans from their main banks. After the unconventional monetary policy introduction, trade credit extension from suppliers and loan extension from banks because complements, and not substitutes. Zombie companies that were extended credit from a bank with VLTROs access obtained 5% more trade credit, and they had a significantly higher average expected default probability, experiencing larger deterioration in credit quality.

So, the results of the study exhibited that zombies were getting more credit from banks and simultaneously more trade credit from suppliers, exposing them to high credit risk. These results have major consequences because they showed that unconventional monetary policy measures, even in a country not affected

VII. Policies for Productivity Revival

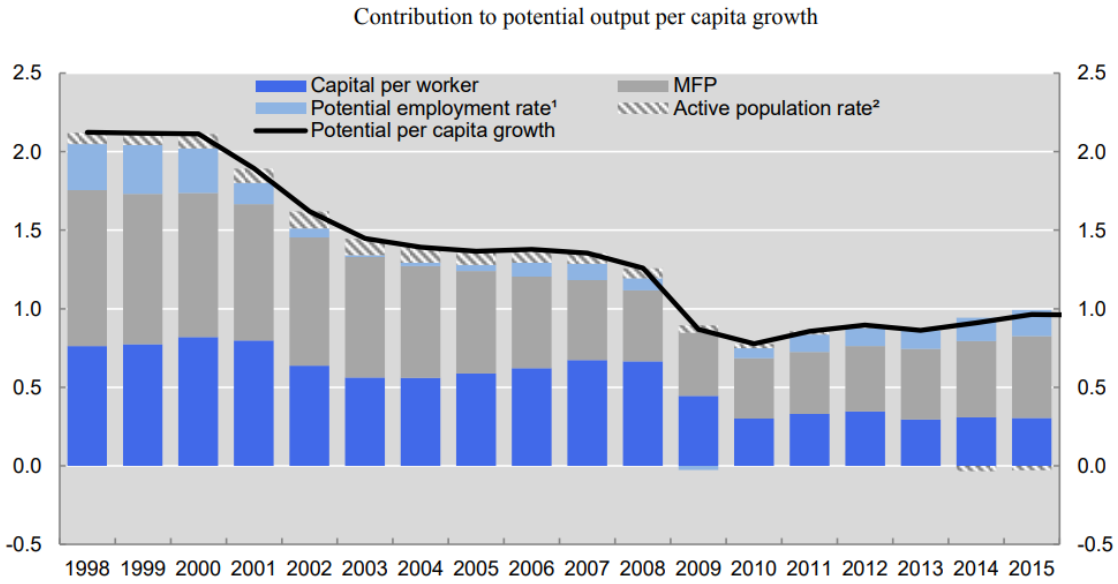
In well-developed economies, productivity growth is supported by constant firm experimentations, improvements in R&D and new advanced technologies, business practices, and a good allocation of resources. Lately, productivity experienced a declining trend, and one of the main causes was the increasing presence of zombie firms, that should be either exiting the market or going through internal restructuring procedures. From this perspective, the recovery of productivity growth will be linked to the policies made to ease the restructuring or the exit in the market of troubled companies.

According to the study of McGowan, Dan Andrews, and Millot (2017), there is evidence that weak companies are inhibiting productivity growth and there is scope for raising growth by promoting the exit or the restructuring of these firms. The second important finding of the research was concerning the potential of insolvency, financial reforms to recover productivity growth by focusing on three key detrimental factors for labour productivity: the increasing presence of zombie firms, capital misallocation, and stagnation of technological diffusion.

Indeed, there is a lot of room for improvement to revive productivity growth through reforms specifically aimed at implementing insolvency and financial policies, and the financial sector health: the most important elements involve lowering the barriers to restructuring troubled firms, the personal cost of failed entrepreneurs, and good addressing of the NPLs issue. This is why to get the best productivity benefits, it is necessary to implement also policies to ease firms to enter into the market, like the development of private equity markets, and policies that manage the cost of worker displacement.

It is evident how the output growth has declined around 1 percent per year across OECD countries since the 1990s, due to the lower market dynamism (i.e., entry and exit of companies), as shown in Figure 29. The fact is that not so much attention has been paid to the policy determinants of the exit or restructuring of troubled companies. Figure 29 shows the impact of the increasing number of firms with poor performance on aggregate productivity.

The consequences in OECD countries of the productivity slowdown are enlarging the gap between more productive and less productive companies: this is not just due to frontier firms improving technology and pushing up the boundary, but also due to stagnating productivity of firms that are not able to adopt best practices from the frontier.



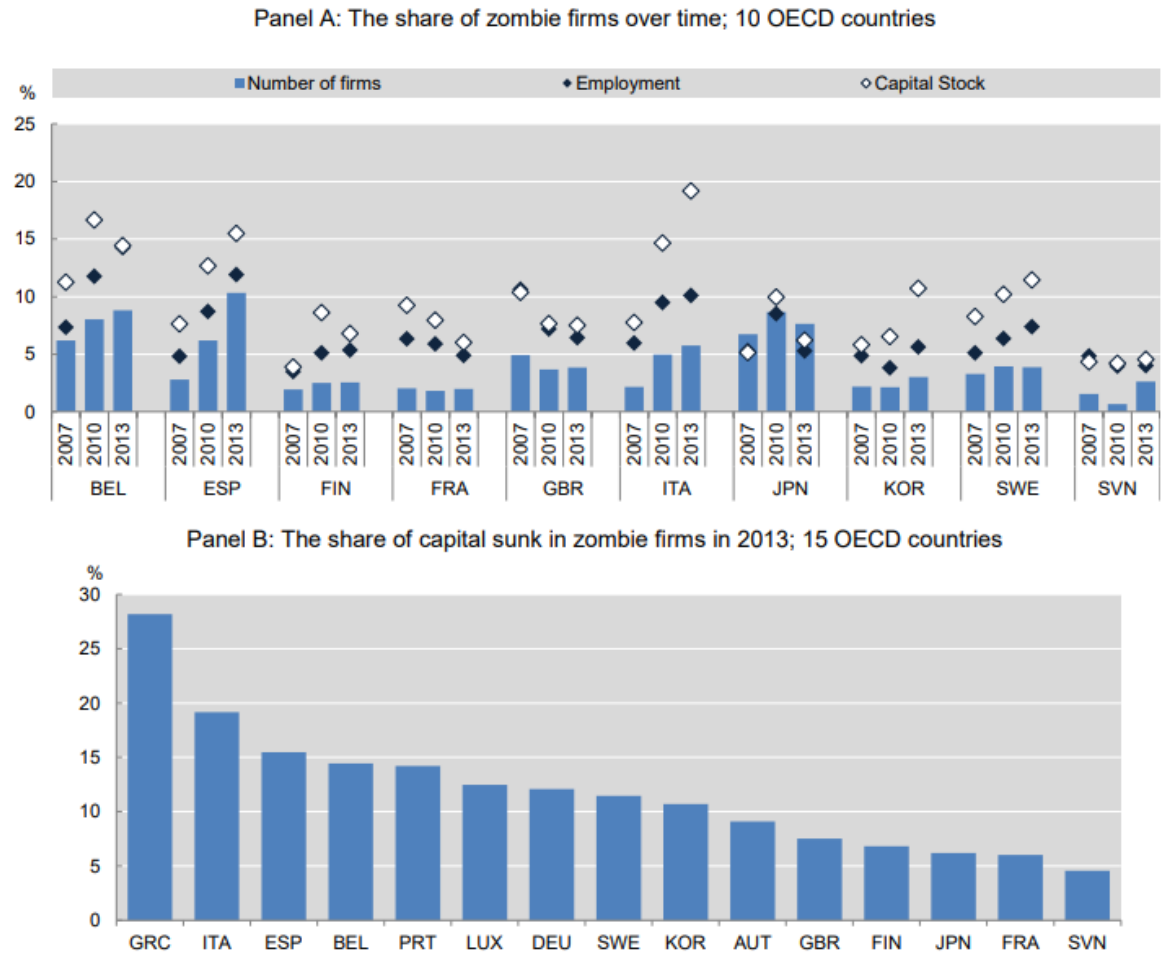
Decomposition of the growth rate of OECD potential output per capita

Source: Dan Andrews, McGwan, Millot (2017) – Figure 29

Moreover, the rising divergence in productivity might yield incentives for productive companies to expand, chasing away less productive firms: despite this trend, it has been noticed that the tendency of high productivity firms to expand and low productivity firms to resign has decreased. Evidence can be found in southern Europe, where the scarcity of certain resources has been misallocated to low productivity firms.

Lastly, OECD countries experienced not only a reduced number of entrants in the market, but a rising survival probability of weak firms that would have been chased away from the market in normal conditions. To sum up, these three consequences of the productivity slowdown, meaning increased productivity gap, capital misallocation, and decreased business dynamism, are benefitting weak firms and implying that it has become easier for them to remain in the market without adopting or developing cutting-edge technologies.

Based on the study previously analyzed by McGowan (2017a), the increasing number of zombie firms and the implications on the aggregate productivity, increased during the decade 2003-2013: Figure 30 shows the portion of resources sunk in zombie firms in different countries, and how it has evolved during the mid-2000s. For example, in Italy, the amount of capital sunk in zombie firms arrived at 19% in 2013, compared to 7% in 2007.



The rise of zombie congestion

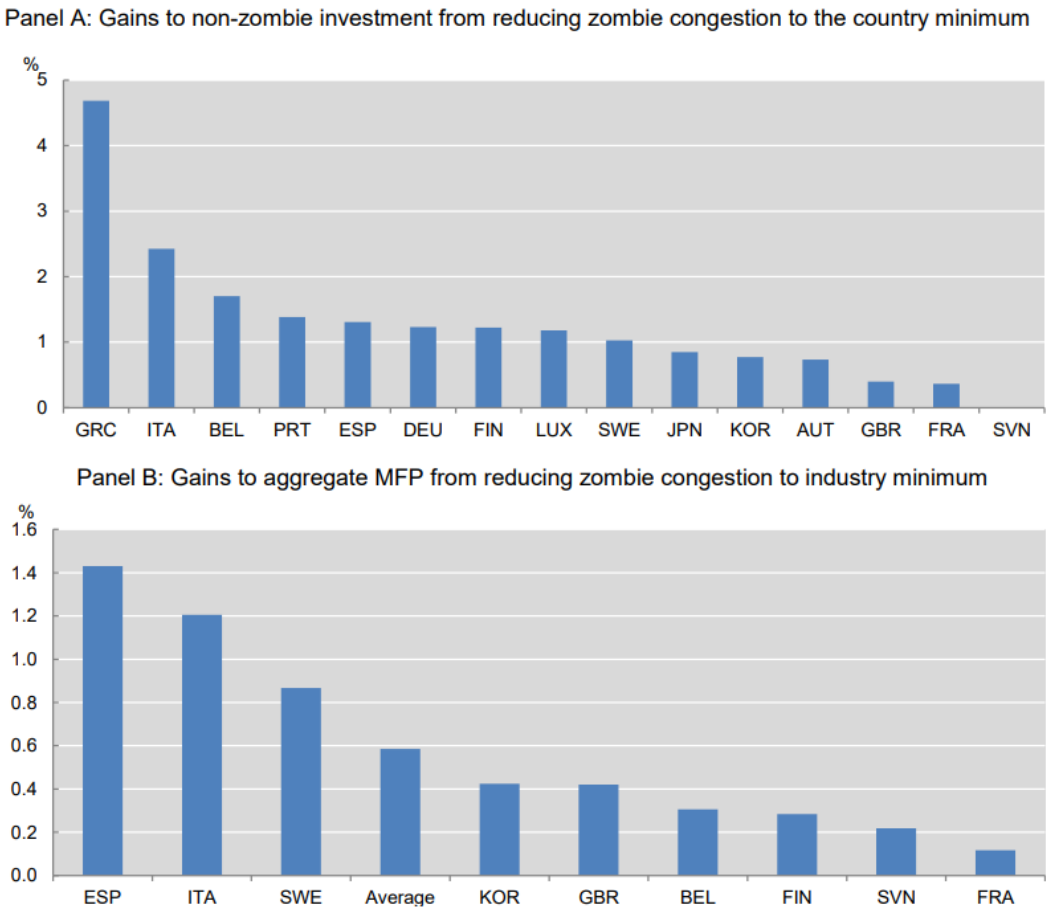
Source: Dan Andrews, McGwan, Millot (2017) – Figure 30

The problem is that zombie firms capture resources, and their delayed restructuring or exit from the market inhibits the growth of other profitable firms: indeed, researches showed that the more industry capital is addressed to zombie firms, the less the investments and employment of the average non-zombie companies. This happens in two ways: firstly, zombie firms could reduce the potential return on investment projects, by depressing market prices and offering higher salaries related to productivity, and by doing so, projects of expansion for healthy firms result as less attractive. These barriers to entry created by zombie congestion discourage new entrants in the market since they should reach a higher productivity threshold to offset the reduced profitability of the sector.

Moreover, another consequence of the increasing presence of zombies in the market is the "crowd out" of credit, meaning that banks extend less credit to sound businesses than otherwise, as their financials are strained by zombie lending. Also, from a European Central Bank research, it came up that healthy firms tend

to have more restricted access to credit of banks in sectors where there is a high portion of industry capital held by zombie firms, showing a potential link between productivity, policies regarding bank health and troubled companies.

Overall, after all the studies conducted on the phenomenon of zombie firms, the increasing presence can be directly linked to the reduced OECD potential output, though both diminishing business investments and lower multi-factor productivity growth. There is evidence of this in the analysis conducted by McGowan et al. (2017a), where they pointed out that in Italy the investments of non-zombie firms in 2013 could have been potentially higher of 6%, and also the aggregated multi-factor productivity might have been up until 0,7%, and 1% in Spain. Figure 31 exhibits the differences in labour productivity growth for several OECD countries that would have been achieved by reducing the congestion of zombie firms to the sample minimum.



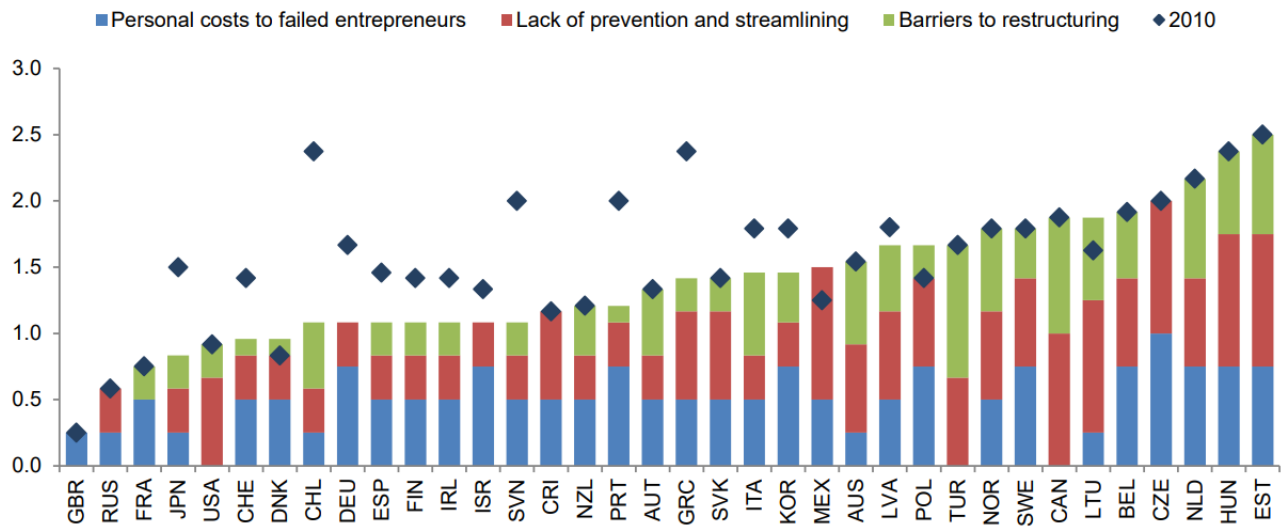
Potential scope to boost aggregate labor productivity from reducing zombie congestion, 2013

Source: Dan Andrews, McGwan, Millot (2017) – Figure 31

All these studies bring to the conclusion that there is room for improvement in policy reforms that are related to the potential exit and restructuring of zombie firms, aiming to restore the original aggregate labour productivity and its growth.

All these studies bring to the conclusion that there is room for improvement in policy reforms that are related to the potential exit and restructuring of zombie firms, aiming to restore the original aggregate labour productivity and its growth.

After these premises, it is clear how insolvency regimes are important to determine the policies for companies' exit and restructuring, since normally the market presents some blemishes, which make quite harder the processes of exit of non-viable companies or the restructuring of viable companies temporary in financial distress. For example, when a company is presumed to be insolvent, investors get worried and start to run to retrieve their investment or recoverable assets, so there is no official and enforced private contract between creditors and debtors that guarantees an optimal result ex-ante.
Insolvency regimes are designed differently across several countries, and are based on key features that have been grouped under three components by the authors.
Firstly, the treatment of failed entrepreneurs is taken into account since it highly impacts the ability to start a new business, meaning the exemption of future earnings from the obligation to repay past debt due to financial distress. This might be one of the reasons impacting productivity growth by diminishing firm entry and engage in risky business strategies. Another one is the fact that insolvency regimes might lack features aimed to prevent and facilitate the resolution of debt distress for viable firms exhibiting temporary situations of financial distress and before going into formal insolvency proceedings. Indeed, all the delays and the costs raised from formal proceedings might reduce the final value of the firm and inhibit a quick and efficient reallocation of resources, slowing further business dynamism. Lastly, design features that constrain corporate restructuring may influence productivity growth: indeed, in the case when only debtors can start restructuring and, on the other side, minority shareholders have the power to block it, the period in which the distressed firm might be successfully restructured is expanding significantly.
Based on these set of features, insolvency regimes have different design across countries, as exhibited in Figure 32. It is noticeable how low are the personal costs for failed entrepreneurs and high barriers to restructuring in the United Kingdom, as opposed to countries like Hungary and Estonia where delays in the restructuring of troubled firms will inevitably slow down the reallocation of resources.



The design of insolvency regimes across countries, 2016

Source: Dan Andrews, McGwan, Millot (2017) – Figure 32

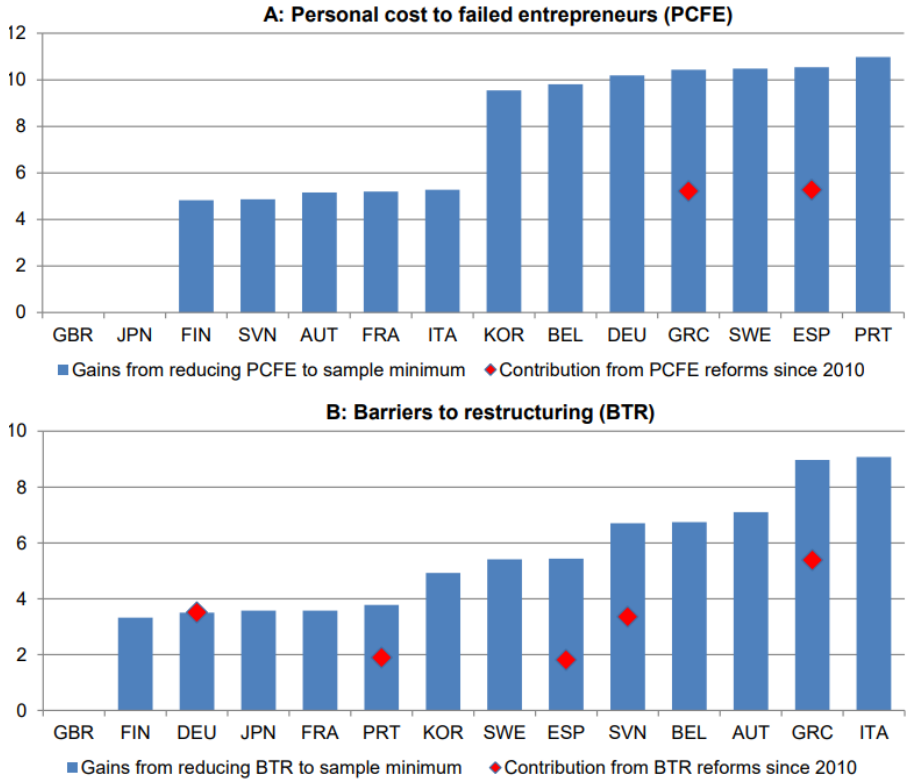
Looking at data of 2010 and 2016 across 11 countries, particularly in Europe, the outcomes indicate that the changes in reforms had p a positive impact on prevention and streamline of insolvency procedures, and barriers to restructuring have been declining in 10 countries on the overall 36 considered.

Despite the improvements, OECD studies showed that there is room in insolvency regime reforms to promote aggregate productivity through three channels: the contraction of capital and resources sunk in zombie firms, the reallocation of these to more productive and efficient applications, and a larger spread of technology.

Indeed, insolvency regimes that are unable to facilitate the restructuring, exit, or downsizing of firms, are also part of the reason why the zombie congestion varies across countries: as an example, according to McGowan (2017b), high personal costs for failed entrepreneurs and barriers for restructuring are often connected with higher zombie congestion in sectors where firm turnover is larger compared to other industries. Moreover, from the analysis, it has been shown that higher barriers to restructuring are linked to a reduced probability for zombie firms to recover their financial health. This suggests also that the difference in zombie congestion across countries might be a consequence of the insolvency regimes' efficiency in restructuring poor firms, and this is fundamental to understand the phenomenon for two reasons. It involves, firstly, a smaller social cost of changing jobs than in the case insolvency reforms only increased overall productivity by liquidating troubled companies, and it also entails the prospect that insolvency reforms might eventually bring productivity gains to the firm.

Overall, insolvency reforms have the potential to significantly lower the zombie congestion cross-countries. Given this assumption and looking at Figure 33, countries such as Greece, Spain, and Italy where the portion of capital held by zombie firms was 28%, 16%, and 19%, might exhibit a decrease of almost 9% each of capital

sunk in zombie firms by reducing barriers to restructuring in Greece and Italy, and the personal expenses to failed entrepreneurs in Spain.

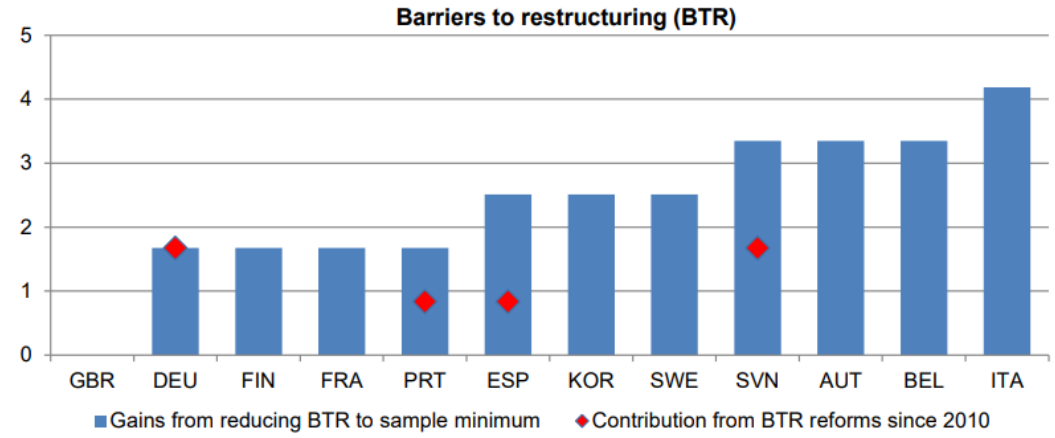


Potential reduction of aggregate zombie congestion due to improvements in insolvency reforms

Source: Dan Andrews, McGwan, Millot (2017) – Figure 33

Recently since 2010, insolvency reforms have improved in these countries in terms of reduction of barriers to restructuring in Greece, and the personal costs for failed entrepreneurs in Spain, bringing the potential decline of zombie capital to almost 5%.

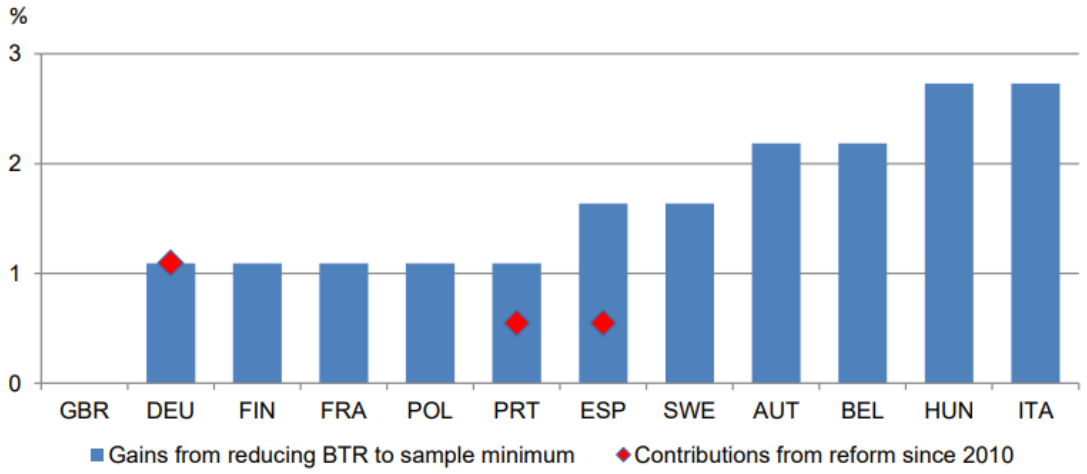
Since zombie firms are one of the main causes of misallocation of resources, the direct consequence of improving insolvency regimes to reduce zombie congestion would be a more correct distribution of capital. From the analysis of McGowan (2017b), countries that increase their barriers to restructuring are less efficient in capital allocation, meaning the ability of more productive firms to attract capital. Shreds of evidence are showing in the graph of Figure 34 which shows the potential boost of almost 4% in capital allocation given by lowering the barriers to restructuring to the minimum level in the sample in countries like the United Kingdom and Italy.



Insolvency reforms might encourage productivity-enhancing capital allocation

Source: Dan Andrews, McGwan, Millot (2017) – Figure 34

Lastly, improvements in insolvency regimes might ease technological diffusion, allowing less advanced firms to reach the global technological frontier, and this is particularly important given the thesis according to which the stagnation of technological diffusion had a role in the productivity slowdown. The recent OECD studies of Mcgowan (2017) showed that lower barriers to restructuring are linked to a major MFP growth of laggard companies. The graph in Figure 35 shows the potential improvements of MFP growth for laggard firms if barriers to corporate restructuring would be brought to the sample minimum, represented by the United Kingdom.



Insolvency reforms might promote the productivity growth of laggard firms

Source: Dan Andrews, McGwan, Millot (2017) – Figure 35

Usually, countries presenting lower barriers to restructuring exhibit significantly larger laggard companies productivity growth especially in sectors that tend to rely more on external financing, compared to other

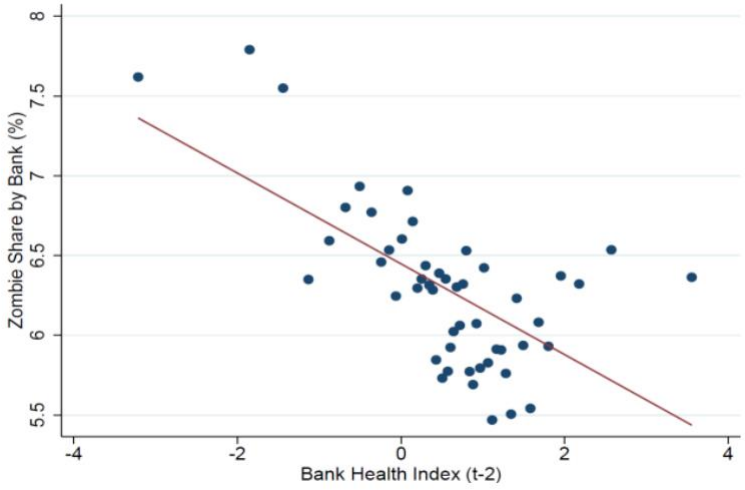
industries. Indeed, several studies have been demonstrated that the financial sector plays a role in the connections among insolvency regimes and productivity, since favorable regimes can encourage companies towards more risky projects and technologies, implying a higher cost and lower availability of credit.

Insolvency reforms can help to diminish zombie congestion, and so a larger credit availability that could potentially stimulate investment, efficient capital allocation, and productivity growth in laggard firms relying on external financing. Despite this conjecture, the link is not direct because the efficiency of the financial sector is another important factor to take into account when considering the link between barriers to corporate restructuring and productivity growth. The issues of the banking sector and the link to corporate restructuring will be explained in the two following sections.

A. Banking sector distortions affecting the efficiency of corporate restructuring

During the financial crisis, the banking sector's health has been significantly damaged, and even recently banks did not completely recover turning back to pre-crisis levels, given the great amount of NPLs on banks' balance sheets. Previous studies in different countries showed how the presence of zombies might have been amplified by forbearance policies of banks lacking incentives to directly deal with their NPLs. In this scenario, one consequence of the persistently low-interest-rate decisions is that banks are incentivized to extend credit to troubled firms based on the hope of a future recovery.

The previous study of Andrews and Petroulakis (2017) showed an effective causal correlation between weak banks and zombie firms, where actually zombie firms exhibit a higher probability to be linked to weak banks: indeed, it has been demonstrated, as in Figure 36**,** that weak banks have up to 24% more probability to be in relationship with zombie companies, compared to normal healthy banks.



Average zombie firm share for each bin of bank health

Source: Dan Andrews, McGwan, Millot (2017) – Figure 36

The graph considers banks' health in 11 European countries.

The problem now is to understand, given this causal link, how bank health indirectly affects capital allocation. Indeed, according to analyses' results, the degree to which more productive companies can attract more capital is related to bank health, since, in industries where the number of weak banks is relatively high, the capital tends to flow less easily to more productive firms.

All these findings highlight the importance of policies to solve the NPLs situation of banks, for example gradually reducing the NPLs amount by imposing periodical targets, or even creating a new public specialized asset management entity capable to purchase the NPLs from banks at a sufficiently high price to convince banks to sell those toxic assets. This ultimate solution might be possible by loosening or allowing more flexibility in European regulations.

However, there is inevitably a link between financial and insolvency reforms and their impact on the zombie phenomenon, capital reallocation, and aggregate productivity decline. Characteristics in insolvency regimes that encompass constraints to corporate restructuring or reduction in recovery rates for creditors might discourage banks to initiate insolvency proceedings. According to Petroulakis (2017), the developments in banks health are linked to a reduction in zombie share in certain countries where the regimes are not a constraint to restructuring: considering the example of Estonia, which presented high barriers to corporate restructuring, by bringing the barriers to the sample minimum level, the reduction in zombie share associated with an improvement of one standard deviation in bank health might be around 1.3% higher.

One major problem present in some OECD countries is the over-reliance on bank financing, which brings even more importance to the need or simultaneously initiatives in countries aimed to diversify the methods of financing more towards equity financing and debt issues on the market. Indeed, policy reforms to develop equity-based financing by simplifying the equity listing process, or to make the corporate bond market more liquid, might help in the goal to diversify the source of financing for companies. Also, policies for improving the efficiency in the market will benefit venture capitalists, providing a way to exit from their investments.

Several studies have been conducted on venture capital financing, in particular in the United States, exhibiting a positive impact on innovation and growth: this was confirmed also by other cross-countries studies in more developed venture capital markets where it has been noticed an increase in productivity and size of national firms. Also, it has been shown that venture capital investments foster the productivity catch-

up of laggard firms: for example, by enlarging VC financing in Poland to the sample maximum level there might be a 2% increase in the annual productivity growth of laggard firms.

In conclusion, venture capital financing is considered to be higher in countries with insolvency regimes that encourage a timely commencement and resolution of proceedings.

Conclusion

Starting from the origin of the phenomenon found in the Japanese economic recession during 1990s, until nowadays with studies conducted in OCSE countries, Europe and Italy, literature had been demonstrating the importance and the impact of zombie firms on real economy at national and global level.

The mentioned and discussed studies helped to delineate the main characteristics and peculiarities of the zombie firms' phenomenon in different time interval and across different countries. Thanks to those studies, it has been highlighted also the importance in analysing the difficult situation of banks, the issues, the different policies in place, the crisis they were facing and finally, the policies implemented to recover.

The thesis has covered several studies with different models implemented to analyse the consequences of zombie firms on the economic growth and on other healthy companies, but given the relevance of the topic particularly in recent years, the discussion will be further studied by literature to better quantify the real effects on the global economy.

This work has been discussing the main definition and identification methods for zombie firms, but more in general, nowadays the definition of zombie firm has been identifying those companies whose cash flows is insufficient to cover interest expenses , necessitating an increase in debt.

The origin of the phenomenon of zombie companies can be found in the progressively weakening of the banking system, which generated a perverse mechanism of credit allocation to companies. Indeed, it has been shown by studies that forbearance policies were aligned with banks' interests and in favour of distressed companies, aiming to avoid carrying losses on their balance sheets fiscal pressure.

With the actual expansionary monetary policies and with the pandemic downturn, governments and central banks had acted quickly in order to ease corporations' access to money, but policymakers are also concerned that the economic recovery will be held back by a proliferation of debt-laden companies.

According to Deutsche Bank Securities estimates, after 2008 leverage in the corporate sector has increased, and since the financial crisis the zombie congestion in United States has increased reaching up to 18%: the pandemic has even deteriorated further the situation. Indeed, the proliferation of zombie companies partly reflects the continuous growth of liquidity and cheap money since the financial crisis. This allowed teetering companies to survive in the market and depressed the productivity.

Future research could therefore be geared toward understanding whether and to what extent the financial and the pandemic crisis may contribute to the proliferation of zombie firms globally. This is an open point already at the centre of many economic and political debates. While on the one hand some economists argue

that the crisis may be an opportunity to let low-growing businesses having long been on the verge of bankruptcy finally exit the market, on the other hand, some scholars argue that economic aid from governments will inevitably encourage the phenomenon of zombie companies.

Therefore, policy makers are faced with a trade-off between higher unemployment rates in the short term and higher public spending in the long term. In fact, limiting economic support to financially distressed businesses and the severe economic impact of shutting down businesses to combat the spread of the COVID-19 virus would imply an increase in unemployment. At the same time, the provision of excessive amounts of loans could result in the creation of new zombie enterprises unable to service their debts, causing a massive increase in government spending and hindering economic growth

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