

Carreira, Carlos; Teixeira, Paulino; Nieto-Carrillo, Ernesto

Article

Recovery and exit of zombie firms in Portugal: A remake

Aussenwirtschaft

Provided in Cooperation with:

University of St.Gallen, School of Economics and Political Science, Swiss Institute for International Economics and Applied Economics Research

Suggested Citation: Carreira, Carlos; Teixeira, Paulino; Nieto-Carrillo, Ernesto (2023) : Recovery and exit of zombie firms in Portugal: A remake, Aussenwirtschaft, ISSN 0004-8216, Universität St.Gallen, Schweizerisches Institut für Aussenwirtschaft und Angewandte Wirtschaftsforschung (SIAW-HSG), St.Gallen, Vol. 73, Iss. 1, pp. 91-108

This Version is available at:

<https://hdl.handle.net/10419/290127>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

Recovery and exit of zombie firms in Portugal: A remake

Carlos Carreira, Paulino Teixeira and Ernesto Nieto-Carrillo¹
University of Coimbra and CeBER

Encouraged by the forbearance of creditors and exit barriers (e.g., inefficient insolvency regimes), the zombie phenomenon has weakened business dynamism and, as a consequence, has slowed economic growth in most economies in recent decades. In this paper, we examine the recovery and exit of zombie firms, as well as the determinants of these transitions. Based on a panel of Portuguese firms' population covering the period 2004–2020, we find a widespread prevalence of zombie firms, which are relatively less productive than non-zombies. Moreover, industries with a higher share of zombies have lower productivity levels. Finally, we find that the probability of transition into recovery and exit is relatively small. However, operational and technological restructuring, as well as financial restructuring, are shown to be key drivers of zombie firms' recovery. The insolvency environment is also found to be a strong factor in stimulating business restructuring.

Key words: zombie firms, exit, recovery, restructuring, downsizing

JEL codes: D24, G32, G33, L25, O47

1 Introduction

Zombie firms – that is, mature firms that are insolvent and kept alive only with the help of creditors – crowd out investment opportunities for more productive firms and discourage innovative firms from entering the market. Aggregate productivity is therefore harmed not only by the existence of zombie firms, but also by the negative externalities they generate on the entry and growth of healthy firms (CABALLERO et al., 2008). A reduction in the share of zombies is therefore expected to generate important economic gains.

Portugal is one of the European countries most affected by the proliferation of zombies (ADALET MCGOWAN et al., 2017a; CARREIRA et al., 2022). Exit barriers play an important role in this zombie prevalence. In addition to evergreen loans that arise when banks make additional credits to problematic borrowers to avoid reporting losses on their own balance sheets, inefficient insolvency regimes have also been identified as a barrier to reallocation (PEEK and ROSENGREN, 2005; ADALET MCGOWAN et al., 2017b; ANDREWS and PETROULAKIS, 2017, STORZ et al., 2017; NIETO-CARRILLO et al., 2022).

¹ Corresponding author: Carlos Carreira (email: ccarreir@fe.uc.pt). We would like to thank the participants at the 2023 SNB and SIAW-HSG Aussenwirtschaft workshop “Corporate Distress as Financial Conditions Tighten” and our discussant for their helpful comments. This work has been funded by the FCT – Fundação para a Ciência e a Tecnologia, I.P., R&D unit CeBER (UIDB/05037/2020).

In this paper, we contribute to this strand of literature by analyzing why most zombie firms recover rather than exit the market, and the determinants of these transitions. To study the transitions out of the zombie state, we use a multinomial logistic model where “non-transition”, “recovery” and “exit” are treated as distinct and unordered categories. The analysis is based on the population of Portuguese firms over the period 2004–2020.

2 Related literature

Industry productivity growth is expected to be enhanced by the Schumpeterian process of “creative destruction”, wherein innovations introduced by new and incumbent firms can be taken as business experiments subject to the market test and the shrink and exit of firms as a necessary selection mechanism through which non-competitive technologies (and products) are excluded. How does this process change when there are zombies? When there are zombies, new and healthy firms have to compete with zombies in the markets for finished products, labor, and funds. This may congest product markets and make it difficult to access workers and financial resources for non-zombie firms (for example, through depressed product prices and higher wages). As a consequence, innovative investments by new entrants and healthy firms may be depressed. Moreover, the congestion caused by the zombies can drive healthy incumbents into trouble, forcing them to exit. Aggregate productivity is therefore harmed not only by the existence of zombie firms per se, but also by the negative externalities they generate on both entry of new firms, and growth and exit of healthy incumbents (CABALLERO et al., 2008).

ADALET MCGOWAN et al. (2017a) showed high prevalence of resources sunk in zombie firms in several European countries over the period 2003–2013. In 2013, the highest share (in the sample) of zombies in terms of the number of firms was found in Spain at 10%, while the highest shares of the capital stock and employment sunk in zombie firms were observed in Italy (19%) and in Belgium (14%), respectively. From 2007 to 2013, the prevalence of zombies has increased in general (the exceptions being the United Kingdom and France). The previous shares are broadly confirmed by other studies using different methodologies to identify zombie firms, including ANDREWS and PETROULAKIS (2017) for 11 European countries (2001–2014); STORZ et al. (2017) for seven European countries (2010–2014); GOUVEIA and OSTERHOLD (2018) for Portugal (2006–2015); HALLAK et al. (2018) for 19 EU countries (2008–2013); ACHARYA et al. (2019) for five European countries (2010–2014); CARREIRA et al. (2022) and NIETO-CARRILLO et al. (2022) for Portugal (2004–2017); and SCHIVARDI et al. (2022) for Italy (2004–2013).

The zombie problem is severe in the periphery of Europe (Greece, Italy Spain, and Portugal), countries that were particularly affected by the global financial crisis and the subsequent European sovereign debt crisis (STORZ et al., 2017; HALLAK et al., 2018; ACHARYA et al., 2019). Indeed, in the case of Portugal, CARREIRA et al. (2022) and NIETO-CARRILLO et al. (2022) found that, on average, about 11% of firms were classified as zombies between 2005 and 2016, with a peak of 12.7% in 2012 (see also STORZ et al., 2017; GOUVEIA and OSTERHOLD, 2018; HALLAK et al., 2018).

Why do creditors of zombie firms continue supporting them instead of claiming their debts? It is to be expected that lenders facing with troubled borrowers will stop making new loans, hastening their death. However, PEEK and ROSENGREN (2005) have shown that Japanese banks, especially undercapitalized ones, misallocated loans in the 1990s. This was due to regulatory forbearance and perverse incentives that led them to make additional loans to severely impaired borrowers (so called “evergreening” loans) to avoid having to declare the loans as nonperforming and record losses on their own balance sheets.

This seminal study from Japan seems to provide insights into the proximate causes of zombie prevalence in Europe. Indeed, using data on bank lending to individual enterprises in Croatia during the Global Financial Crisis and subsequent sovereign debt crisis, BROZ and RIDZAK (2017) concluded that banks grant loans to zombie firms only when it is in their self-interest. Likewise, ACHARYA et al. (2019) and SCHIVARDI et al. (2022) provide some evidence that undercapitalized banks during the crisis period directed loans to zombie firms to avoid the recognition of loan losses. Relatedly, ANDREWS and PETROULAKIS (2017) and STORZ et al. (2017) have found that zombie firms tend to be associated with weak banks, suggesting that the zombie problem is at least partly due to bank forbearance.

BLATTNER et al. (2019) observed that, following an unexpected increase in capital requirement imposed by the European Banking Authority in 2011, affected Portuguese banks significantly decreased lending. However, consistent with the evergreen lending to zombie firms, they also found that these banks reallocated credit to borrowers with previously underreported loan loss. Relatedly, BONFIM et al. (2022) found that Portuguese banks were less likely to refinance firms with negative equity after bank inspections of the credit portfolio, implying a significant reduction in the unconditional probability of refinancing.

When considering sources of financing, it is important to also consider other funding options besides bank credit, especially trade credit. Indeed, trade credit is widely used and represents an important funding source for several firms (CUÑAT and GARCÍA-APPENDINI, 2012). LU et al. (2020), using a sample of listed firms

in China over the period 2005–2015, found that equity markets and suppliers provide substantial financing support to zombie firms, while banks are less important. In turn, SHIRAIISHI and YANO (2021) verified that zombie (private) firms in China from 2002 to 2009 avoided exiting the market by accessing trade credit. In contrast, CARREIRA and LOPES (2022) found that Portuguese suppliers are more cautious in lending to zombie firms than banks. In this paper, we consider all forms of forbearance from creditors.

The prevalence of zombie firms is not only associated with evergreen loans. ADALET MCGOWAN et al. (2017b) found that greater barriers to restructuring (e.g., insolvency regimes and personal costs of the entrepreneur) are associated with a lower probability of recovery of zombie firms, as well as with a higher probability of healthy firms becoming zombies. The emphasis of this paper is on the determinants of the recovery and exit of zombie firms, which have rarely been examined in this context.

3 Data and methodology

3.1 The dataset

We originally compiled the dataset used in this study in CARREIRA et al. (2022), extracting the raw data from the Integrated Business Accounts System (SCIE, Portuguese acronym), administered by the Portuguese Statistical Office (INE). The SCIE covers the universe of Portuguese non-financial firms and contains information on structural firm characteristics and economic/financial activity. In particular, our sample covers the whole population of firms operating in Portugal, except the financial sector, and education, health and cultural services, from 2004 to 2020. We excluded from our sample firms that never exceeded the threshold of microenterprise over the sample period (i.e., fewer than ten employees and an annual turnover or total assets of up to €2 million).²

After this preliminary filtering, the information obtained was refined. Observations with unreasonable values (e.g., non-strictly positive values for gross output and total net assets) were corrected or discarded. In addition, since the identification of zombie firms depends on meeting a low profitability criterion for three consecutive years (see the next section), we linearly interpolate one-year gaps in missing values. Finally, we truncated 1% of the extreme ratios (percentiles 1 and 99) presented by the variables defined in next section. Our final sample

² Most of these businesses are “family” firms, thus profit generation is not likely to be their main motivation.

comprises an unbalanced panel of 136,342 firms, making up 1,473,837 year-firm observations.

3.2 Defining zombie firms

We define zombie firms as mature firms that are indebted and have no potential to repay their debts over an extended period due to lack of profitability. Several strategies have been proposed in the literature to identify which firms can be classified as zombies. A common approach is to use the *profitability* and *evergreen lending* criteria proposed by FUKUDA and NAKAMURA (2011). In addition, SCHIVARDI et al. (2022) and ADALET MCGOWAN et al. (2017a) suggest using the criteria of *default risk* and *maturity*, respectively.

In this study, a firm is flagged as a zombie whenever (i) its return-on-assets is lower than the low-risk interest rate for at least three consecutive years; (ii) its leverage is higher than the industry mean (at the two-digit NACE level) of the low return-on-assets exiting group;³ and (iii) it is more than five years old (CARREIRA et al., 2022). The rationale is that firms that are already indebted and have no potential to repay their debts are likely to be on the verge of exit unless their creditors tolerate their continuation. The three-consecutive-year criterion ensures that the firms are persistently unviable. The age criterion serves to distinguish true zombie firms from young, innovative start-ups (ADALET MCGOWAN et al., 2017a). The age threshold of five years was chosen because this is the age limit used in several studies to define young, high-growth firms (DECKER et al. 2016).

The return-on-assets is defined as the ratio of earnings before interests, taxes, depreciations and amortizations (EBITDA) to total assets. EBITDA is what is left to remunerate capital after paying labor and intermediates inputs. We compare return-on-assets to the average Euribor 12-month interest rate, the indexing interest rate most commonly used by Portuguese banking system. The leverage is defined as the ratio of the sum of debt in current liabilities and long-term debt to total assets. That is, we assume that the financial protection of zombie firms does not come only from banks' forbearance, but also from all types of creditors – a key issue in the context of the Portuguese economy (CARREIRA and LOPES, 2022). Firm exit is flagged when a unit ceases production; some firms are economically inactive (i.e., with gross output equal to zero) while still legally active (CARREIRA and TEIXEIRA, 2011).

³ We use the criterion “low return-on-assets” because the SCIE data do not distinguish whether the exit is due to bankruptcy, voluntary closure or a merger or acquisition (M&A). Nevertheless, previous evidence suggests that M&As are rare events in the Portuguese economy, not exceeding 1% of the total number of business closures (MATA and PORTUGAL, 2004).

Finally, to avoid potential misidentifications of zombie firms, we exclude one-shot zombie firms (i.e., one-off zombies) and include one-shot restructuring firms (i.e., zombies that become non-zombies in $t+1$ and zombies again in $t+2$).

3.3 Productivity measure and other independent variables

Firm-level productivity is measured by revenue total factor productivity (TFP) obtained as the residual of a production function in log form (i.e., the difference between firms' output and the weighted sum of inputs). To overcome the well-known simultaneity and selection bias problem, the three-input Cobb-Douglas production function was estimated using the method of LEVINSOHN and PETRIN (2003) controlling for endogenous exit (ROVIGATTI and MOLLIS, 2018).

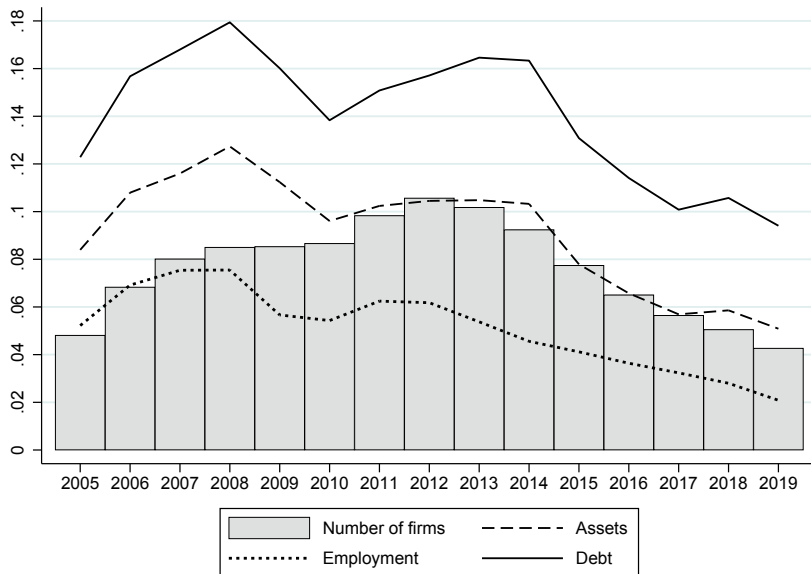
Production is measured as the value of sales of goods and services, less the value of purchases of goods for resale, adjusted for changes in inventory of final goods, self-consumption of own production and other operating revenues, and was deflated by the producer price index at the two-digit industry level. Materials include the cost of materials and services purchased, and were deflated by the GDP deflator index. Capital was computed by applying the perpetual inventory method to the change in total real assets (i.e., it includes not only tangible and intangible assets but also current assets, all important to the operation of the firm).

4 Empirical analysis

4.1 Prevalence of zombie firms

Zombie firms are quite prevalent in the Portuguese economy. Figure 1 shows the share of zombies in terms of the number of firms and financial resources sunk into zombies. On average, about 7.6% of the firms in the sample were classified as zombies between 2005 and 2019, while the share of employment and assets sunk in zombie firms is 5.1% and 9.1%, respectively. Unsurprisingly, the debt-weighted zombie share (thus, the implied bad debt ratio) is larger than the share in terms of number of firms, at 14.0% on average. These shares broadly confirm the pattern observed in other European countries (e.g., ADALET MCGOWAN et al., 2017a). They are also similar to those reported by GOUVEIA and OSTERHOLD (2018), whose estimates range from 6.5% in 2008 to 8.5% in 2013, but lower than those of CARREIRA et al. (2022) for a sample that includes microenterprises in the period 2005–2016.⁴

⁴ The share of zombie firms is about 6.3 percentage points larger for microenterprises than for small and medium-sized enterprises (SMEs) (CARREIRA et al., 2022). Moreover, about 40% (46%) of labour (capital) sunk in zombie firms is done by microenterprises (NIETO-CARRILLO et al., 2022).

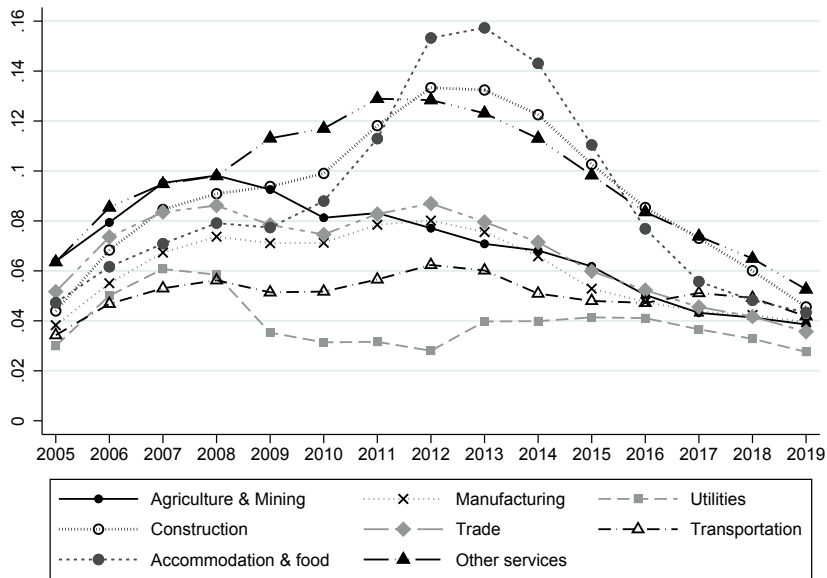
Figure 1: Share of zombie firms, 2005–2019

Notes:

Zombies are defined as firms older than five years with a return-on-assets below the low-risk interest rate for three consecutive years and a leverage ratio higher than the industry median of the low return-on-the-assets exiting group. Assets, debt and employment refer to the respective weighted averages of the zombies.

Cyclical fluctuations clearly emerge from Figure 1. The share of zombie firms rises to a peak in 2012, at 10.6%, possibly due to greater forbearance during the 2007–2008 global financial crisis and the subsequent European sovereign debt crisis (the Great Recession). After 2012, the percentage of zombie firms declines, probably due to the implementation of measures by the European Central Bank to strengthen the prudential supervision of credit institutions and the reform of the Portuguese insolvency regime (NIETO-CARRILLO et al., 2022).

Figure 2 shows the prevalence of zombie firms by industry. While there are some differences across industries, the general pattern holds. The exceptions are *Accommodation and food*, *Construction*, and *Other services*, where the percentage of zombie firms rose sharply during the Great Recession, following the austerity measures adopted after the 2011 international financial assistance program (the “Memorandum of Understanding” negotiated between the Portuguese government and the European Commission, the European Central Bank and the International Monetary Fund). It appears that non-performing firms in these industries are relatively more exposed in bad times to the personal costs associated with failed entrepreneurship and barriers to restructuring, which foster the survival of firms that would otherwise exit the market.

Figure 2: Share of zombie firms by industry, 2005–2019**Table 1:** Descriptive statistics of zombie and non-zombie firms

Variable	Non-zombies		Zombies	
	Mean	Std. dev.	Mean	Std. dev.
Productivity (TFP deviation)	0.0346	0.6306	-0.4914	1.0577
Production (real)	2 182.71	31 260.58	1 039.08	7 211.94
GVA (real)	758.60	8 154.48	209.22	1 686.64
Number of employees	24.60	171.82	15.89	100.48
Assets	5 538.40	103 964.60	6 661.34	118 364.90
Profitability rate (ROA)	0.0707	0.1906	-0.1405	0.2589
Leverage	0.6483	0.2720	0.9537	0.0727

Notes:

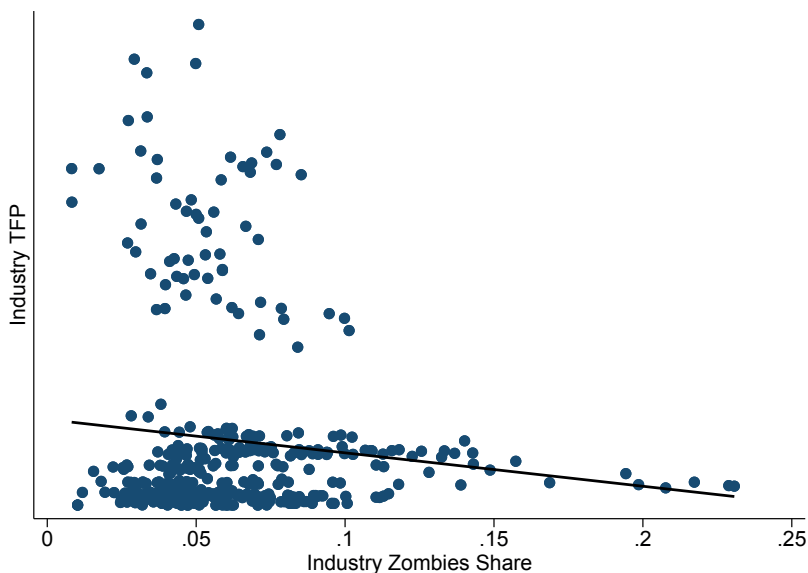
TFP (total factor productivity) is the log deviation from the industry-year mean, which in turn is computed as the log difference between output and the weighted sum of inputs. Production is the (real) sales of goods and services, adjusted for changes in inventory of final goods, self-consumption of own production and other operating revenues. GVA is the (real) gross value added. Assets is the book value of total (net) assets. ROA (return-on-assets) is the ratio of earnings before interests, taxes, depreciations and amortizations to assets. Leverage is the ratio of total debt to assets. Monetary variables are in constant 2004 103 euros. Pooled yearly values, 2005–2019.

Table 1 shows the main economic and financial indicators of zombie versus non-zombie firms. Notice that the average zombie is less productive, smaller (both in terms of production and number of employees), relatively more indebted and less profitable than its non-zombie counterpart. About 56% of zombies have negative equity (i.e., liabilities greater than assets) and 83% have losses, indicating that most of them were on the verge of insolvency.

4.2 Industry productivity and the share of zombie firms

Zombie firms tend to hinder competition and the efficient allocation of resources, leading to lower industry (i.e. weighted aggregate) productivity growth. Figure 3 and Table 2 appear to confirm this hypothesis. As can be seen in Figure 3, there is a negative relationship between the share of zombie firms and industry productivity (at the two-digit NACE Rev. 2). Moreover, a 1% decrease in the share of zombie firms leads to a 0.78% increase in the level of industry TFP (Table 2).

Figure 3: Correlation between industry productivity and the share of zombie firms, 2005–2019



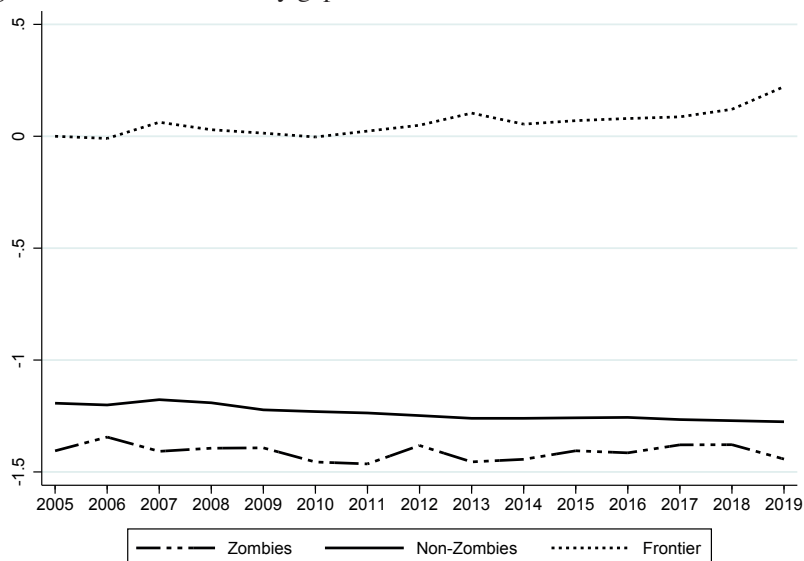
Note: Each dot reports industry productivity and zombies share at the industry-year level, at two-digit NACE Rev.2 level, 2005–2019.

Table 2: Industry productivity and the share of zombie firms

Variable	Industry TFP
Industry zombies share	-0.7974*** (0.0366)
Industry dummies	Yes
Year dummies	Yes
R ²	0.961
F-test	216.20
No. of observations	405

Notes: OLS regression of (log) industry productivity on (log) zombies shares at industry-year level (two-digit NACE Rev. 2). Standard errors are given in parentheses. ***Statistical significance at the 0.01 level.

By eliminating poorly performing firms in a well-functioning market economy, we should expect the productivity gap between frontier and zombie firms to narrow. But instead of zombie firms catching-up the technological frontier, Figure 4 shows a persistent (and widening) productivity gap. Their TFP falls by 0.6% per year on average, while the TFP of frontier firms (the top 5% most productive firms in each industry) rises by 1.6% per year, resulting in a productivity gap divergence of 2.2 percentage points per year.

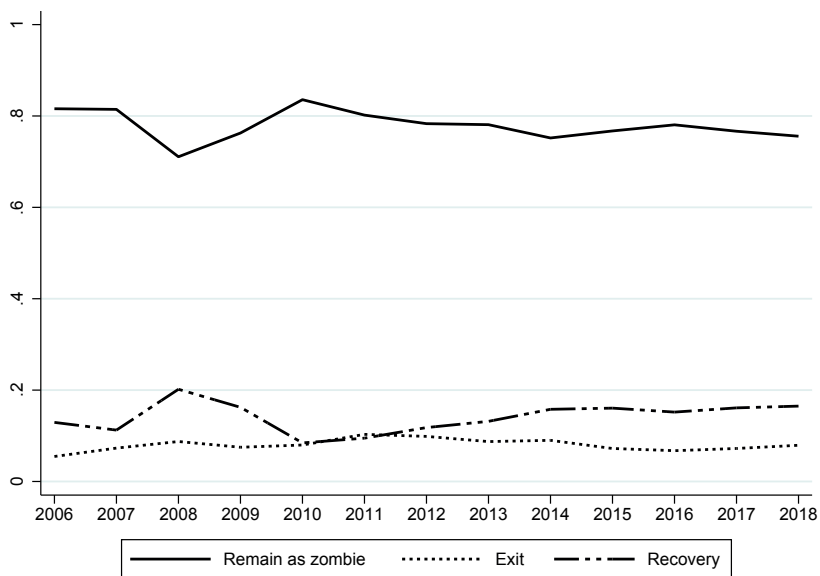
Figure 4: Productivity gap across frontier, non-zombie and zombie firms

Notes: Zombies and non-zombies lines give the weighted average (log) TFP. The global frontier is defined as the productivity of the top 5% most productive firms per each industry (two-digit NACE Rev.2 level). Unweighted averages across industries normalised to 0 for the frontier in the starting year (2005).

4.3 Recovery and exit of zombie firms

Poorly performing firms should be compelled to restructure or exit in a well-functioning market economy. However, forbearance lending by banks and other creditors can lead to zombie firms maintaining their status over time. Actually, as can be seen in Figure 5, the (conditional) probability of recovering or exiting zombie status is relatively low, which means that the likelihood of remaining as a zombie is quite high (on average 77.9% over the entire period), while recovery and exit rates are 14.1% and 8.0%, respectively. During the crisis period, the likelihood of exiting zombie status rose to maximum values of around 10% in 2011 and 2012, while the recovery probability fell to minimum values. After the crisis and with the reform of the insolvency framework, there was a growing and sustained trend in the recovery rate, and a slight decrease in the exit rate. However, the likelihood of remaining a zombie falls about 8.0 percentage points from 2010 to 2018.

Figure 5: Conditional probability of recovering, exiting, or remaining in zombie status



Notes:

The graph shows the conditional probability of a zombie firm recovery, exit or remains a zombie in the following year. It is computed as the ratio of the number of remaining/exiting/recovering zombies in $t+1$ to the number of zombies that have “survived” up to t .

To investigate the determinants of zombie firm transitions into the three destinations (i.e., the binary outcomes of “remain as a zombie”, “recover” or “exit the market”), we use a multinomial logistic model, following CARREIRA et al. (2022). We consider three subsets of covariates as explanatory variables. First, to proxy the operational and technological restructuring of zombie firms, we use the change in the number of employees, the change in assets and the change in productivity, all computed in log differences. Second, to capture financial restructuring capacity, we use financial variables related to external and internal resources, leverage ratio and the return-on-assets, respectively (in log form). Finally, we include firm-level control variables (zombie duration, firm age, employment and assets) and the external environment (industry and year dummies). We also consider a binary variable to control for the new insolvency environment (i.e., the strengthening of the prudential supervision of credit institutions by the European Central Bank and reform of the Portuguese insolvency regime; see NIETO-CARRILLO et al., 2022), which has a value of one for the period after 2012 and zero otherwise. The explanatory variables are lagged one year to avoid the simultaneous bias problem (FUKUDA and NAKAMURA, 2011).

Table 3 presents the results of the multinomial logit regression with remaining as a zombie the base category. The null hypothesis that all coefficients are jointly equal to zero is rejected at the 0.01 level of significance (the Wald test at the bottom of the table). Given the reference category, the sign of each coefficient can be interpreted as the effectiveness of each explanatory variable in the transition into recovery or exit.

Technological restructuring seems to be an effective way to promote recovery of troubled firms, while it reduces the likelihood of exit. Indeed, the coefficients on the *change in assets* and *change in productivity* in recovery category are significantly positive. In particular, all else constant, a one-unit increase in $\Delta \text{Log Assets}$ and $\Delta \text{Log TFP}$, respectively, which we assume as a consequence of new technological investments, results in an increase in relative odds of recovery vis-à-vis remaining zombie of 8.0% and 4.1% (the odds ratios are $1.080=e^{0.077}$ and $1.041=e^{0.040}$, respectively). Notice that the *change in the number of employees* (i.e. downsizing) coefficient is not statistically significant.

Table 3: Multinomial logit regression

Variable	Recovery	Exit
<i>ΔLog Employment</i>	0.005 (0.025)	-0.567*** (0.024)
<i>ΔLog Assets</i>	0.077*** (0.023)	-0.472*** (0.026)
<i>ΔLog TFP</i>	0.040*** (0.009)	-0.159*** (0.012)
<i>Log Leverage</i>	-0.359*** (0.119)	2.575*** (0.232)
<i>Log Return-on-assets</i>	0.099*** (0.006)	-0.041*** (0.009)
<i>Log Zombie duration</i>	0.862*** (0.017)	0.559*** (0.022)
<i>Log Age</i>	-0.162*** (0.020)	-0.194*** (0.024)
<i>Log Employment</i>	0.106*** (0.010)	-0.024* (0.013)
<i>Log Assets</i>	-0.059*** (0.007)	-0.137*** (0.009)
Insolvency regime (new=1)	0.563*** (0.062)	0.037 (0.078)
Constant	-0.968*** (0.138)	-1.540*** (0.185)
Industry dummy	Yes	Yes
Year dummy	Yes	Yes
No. of observations		86,130
Wald chi-square		7226.91***
Log pseudolikelihood		-55105.88
Pseudo R2		0.0700

Notes:

The base category for the dependent variable is the remaining zombie status. The variables were winsorised at the 1st and 99th percentiles. Firm-cluster robust standard errors are given in parentheses. ***, ** and * denote statistical significance at the 0.01, 0.05 and 0.10 levels, respectively.

In the case of exit, the *change in assets*, *change in the number of employees* and *change in productivity coefficients* are all significantly negative – the odds ratios are $0.624=e^{-0.472}$, $0.567=e^{-0.567}$ and $0.853=e^{-0.159}$, respectively. Specifically, the technological restructuring seems to reduce the likelihood of exit – a one-unit increase in $\Delta\text{Log Assets}$ ($\Delta\text{Log TFP}$) makes the outcome of exit 37.6% (14.7%) less likely, *ceteris paribus* – while downsizing promotes exit – the relative risk of exit vis-à-vis remaining zombie increases by 43.3% ($=e^{-0.567}-1$) with a one-unit decrease in $\Delta\text{Log Employment}$.

Regarding financial restructuring capacity, the *Log Leverage* coefficient is significantly negative and positive, that is, firms that reduce their debt are more likely to recover and at less risk of exit. In contrast, rising cash flows (*Log Return-on-assets*) are associated with recovery and a lower probability of exit (10.4% and 4%, respectively).

The *Zombie duration* coefficient is significantly positive, that is, the chance of a firm remaining a zombie decreases, an expected effect related to the fact that most zombies stay alive only due to forbearance lending and information asymmetry decreases over time. The larger (measured by the number of employees) the zombie, the higher (lower) the probability of transition to recovery (exit). Conversely, firms with more assets and older firms have a higher likelihood of remaining zombies. Apparently, managers of these firms have considerable power to turn the tables on hostile creditors, as their failure has adverse consequences for creditors and perhaps the whole financial system (“too big to fail”; see MOOSA, 2010).

Finally, regarding the new insolvency environment, the dummy seems to suggest that the relative probability of recovery is higher, which is in line with results found by NIETO-CARRILLO et al. (2022).

5 Conclusion

Encouraged by the forbearance of creditors and inefficient insolvency regimes, the zombie phenomenon has weakened business dynamism and, as a consequence, has slowed economic growth in most economies in recent decades. Using the population of Portuguese firms over the period 2004–2020, our approach focuses largely on the transitions into recovery and exit, as well as on the corresponding determinants.

We find a widespread presence of zombie firms. We also confirm that they are relatively less productive than non-zombies. Moreover, industries with a higher share of zombies have lower productivity levels.

Recovery and exit are expected to lead to higher industry productivity growth, but the probability of transition into recovery and exit has been relatively small in the data. However, the regression results show that operational and technological restructuring, as well as financial restructuring, are crucial to promoting the recovery of zombie firms. The strengthening of the prudential supervision of credit institutions by the European Central Bank and the reform of the Portuguese insolvency regime, in particular, have been proved to stimulate business restructuring.

These results have non-trivial implications for managers and policymakers. Not all zombies are unviable firms, and therefore dealing with this subset of firms requires a holistic and coordinated strategy that includes operational and technological restructuring and debt restructuring. Governments should also implement an appropriate institutional framework to strengthen the restructuring or the exit of unhealthy firms.

References

- ACHARYA, VIRAL V., TIM EISERT, CHRISTIAN EUFINGER and CHRISTIAN HIRSCH (2019), Whatever it takes: The real effects of unconventional monetary policy, *Review of Financial Studies* 32 (9), pp. 3366–3411.
- ANDREWS, DAN and FILIPPOS PETROULAKIS (2017), Breaking the shackles: Zombie firms, weak banks and depressed restructuring in Europe, OECD Economics Department Working Papers No. 1433.
- BLATTNER, LAURA, LUISA FARINHA, and FRANCISCA REBELO (2019), When losses turn into loans: The cost of weak banks, ECB Working Paper No 2228.
- BONFIM, DIANA, GERALDO CERQUEIRO, HANS DEGRYSE, and STEVEN ONGENA (2022), On-site inspecting zombie lending, forthcoming in *Management Science*.
- BROZ, TANJA and TOMISLAV RIDZAK (2017), Lending activity and credit supply in Croatia during the crisis, *Journal of Policy Modeling* 39, pp. 1102–1116.
- CABALLERO, RICARDO, TAKEO HOSHI and ANIL KASHYAP (2008), Zombie lending and depressed restructuring in Japan, *American Economic Review* 98 (5), pp. 1943–1977.
- CARREIRA, CARLOS and JOANA LOPES (2022), The role of different types of creditors on zombie firm creation, *Notas Económicas* 55, pp. 129–140.

- CARREIRA, CARLOS and PAULINO TEIXEIRA (2011), The shadow of death: Analysing the pre-exit productivity of Portuguese manufacturing firms, *Small Business Economics* 36(3), pp. 337–351.
- CARREIRA, CARLOS, PAULINO TEIXEIRA and ERNESTO NIETO-CARRILLO (2022), Recovery and exit of zombie firms in Portugal, *Small Business Economics* 59 (2), pp. 491–519.
- CUÑAT, VICENTE and EMILIA GARCÍA-APPENDINI (2012), Trade credit and its role in entrepreneurial finance, in DOUGLAS CUMMING (ed.), *The Oxford Handbook of Entrepreneurial Finance*, Oxford University Press, pp. 526–557.
- DECKER, RYAN A., JOHN HALTIWANGER, RON S. JARMIN, and JAVIER MIRANDA (2016), Where has all the skewness gone? The decline in high-growth (young) firms in the U.S, *European Economic Review* 86, pp. 4–23.
- FUKUDA, SHIN-ICHI and JUN-ICHI NAKAMURA (2011), Why did ‘zombie’ firms recover in Japan?, *World Economy* 34 (7), pp. 1124–1137.
- GOUVEIA, AVA F. and CHRISTIAN OSTERHOLD (2018), Fear the walking dead: Zombie firms, spillovers and exit barriers, OECD Productivity Working Paper No. 2018-13.
- HALLAK, ISSAM, PETER HARASZTOSI, and SEBASTIAN SCHICH (2018), Fear the walking dead? Incidence and effects of zombie firms in Europe, JRC Technical Report No. 111915, Publications Office of the European Union.
- LEVINSOHN, JAMES and AMIL PETRIN (2003), Estimating production functions using inputs to control for unobservables, *Review of Economic Studies* 70 (2), pp. 317–341.
- LU, LIPING, XIAOYANG LI and ZONGXIN QIAN (2020), Monetary policy, financial development and the financing of zombie firms: Evidence from China, *Economic and Political Studies* 8 (2), pp. 141–164.
- MATA, JOSÉ and PEDRO PORTUGAL (2004), Patterns of entry, post-entry growth and survival, *Small Business Economics* 22 (3–4), pp. 283–298.
- ADALET MCGOWAN, MÜGE, DAN ANDREWS and VALENTINE MILLOT (2017a), The walking dead? Zombie firms and productivity performance in OECD countries, *Economic Policy* 33 (96), pp. 685–736.
- ADALET MCGOWAN, MÜGE, DAN ANDREWS and VALENTINE (2017b), Insolvency regimes, zombie firms and capital reallocation, OECD Economics Department Working Paper No. 1399.
- MOOSA, IMAD (2010). The myth of too big to fail, *Journal of Banking Regulation* 11 (4), pp. 319–333.
- NIETO-CARRILLO, ERNESTO, CARLOS CARREIRA, and PAULINO TEIXEIRA (2022), Giving zombie firms a second chance: An assessment of the reform of the Portuguese insolvency framework, *Economic Analysis and Policy* 76, pp. 156–181.
- PEEK, JOE and ERIC S. ROSENGREN (2005), Unnatural selection: Perverse incentives and the misallocation of credit in Japan, *American Economic Review* 95(4), pp. 1144–1166.

- ROVIGATTI, GABRIELE and VINCENZO MOLLIS (2018), Theory and practice of total-factor productivity estimation: the control function approach using Stata, *Stata Journal* 18 (3), pp. 618–662.
- SCHIVARDI, FABIANO, ENRICO SETTE, and GUIDO TABELLINI (2022), Credit misallocation during the European financial crisis, *Economic Journal* 132 (641), pp. 391–423.
- SHIRAIISHI, MAHO and GO YANO (2021), Do ‘zombie firms’ emerge among private firms in China? A survival analysis approach that pays attention to the reception of trade credit, *Journal of Chinese Economic and Business Studies* 19 (1), pp. 1–34.
- STORZ, MANUELA, MICHAEL KOETTER, RALPH SETZER and ANDREAS WESTPHAL (2017), Do we want these two to tango? On zombie firms and stressed banks in Europe, ECB Working Paper No. 2104.

