BANKRUPTCY LAWS AND 'ZOMBIE' COMPANIES IN EMERGING MARKETS

The term ‘zombie’ refers to companies whose financial expenses exceed the profits they are able to generate, and this phenomenon has been growing globally, especially in emerging markets. This paper examines how Bankruptcy Laws influence ‘zombie’ companies in 25 emerging markets between 2002 and 2021, using quantitative methods and difference-in-differences modeling. The results showed that, on average, ‘zombie’ companies represent 7.58% (static) and 5.49% (dynamic) in emerging markets. Between 2002 and 2021, there was growth, with Brazil standing out as the country with the largest share of ‘zombie’ companies. Bankruptcy laws helped stabilize and reduce this share in China, Brazil, and India, improving bankruptcy process indicators. Aggregated, the laws reduced the likelihood of companies becoming ‘zombies’ by 21% (static) and 41% (dynamic), decreasing the share of ‘zombie’ companies in emerging markets by up to 2% (static) and 1% (dynamic).
Keywords: ‘Zombie’ Companies, Emerging Markets, Determinants.

1. INTRODUTION

An emerging global issue is the rise, growth, and maintenance of the fraction of 'zombie' irms, their determinants, consequences, and catalysts over time, including during the pandemic (ALTMAN et al., 2024; BANERJEE; HOFFMAN, 2018; HALLAK; HARASZTOSI; SCHICK, 2018). The literature on ‘zombie’ firms has grown in recent years, referring to companies that are unable to generate enough profits to cover the costs of their debt, leading to the need to refinance or issue new debt to remain operational (ALTMAN et al., 2024; BANERJEE; HOFFMAN, 2018; HALLAK; HARASZTOSI; SCHICK, 2018).

The term ‘zombie’ was originally used by Caballero et al. (2008), who coined it in their analysis referring to the Japanese ‘lost decade’ in the 1990s. The recent attention and effort point to the growth of ‘zombie’ firms and the resulting misallocation of resources when governments and financial institutions keep them alive even when insolvent. This phenomenon of companies kept artificially alive (i.e., Walking Dead) by regulators, banks, investors, and lawmakers has been increasing in several countries, as observed in this research (CABALLERO; HOSHI; KASHYAP, 2008; BANERJEE; HOFMANN, 2018; ACHARYA; EISERT; EUFINGER; HIRSCH, 2019; ALTMAN et al., 2024).

Generally, the term ‘zombie firm’ refers to companies that are kept 'alive' artificially in a specific credit environment, where, empirically, they are classified as such if their financial expenses exceed the profits they can generate (ALTMAN, 2020; BANERJEE; HOFFMAN, 2018). Additionally, these companies, under normal conditions, would face financial constraints and higher interest rates, but they can more easily access credit due to the low interest rates offered by the positive credit cycle from 2009 to 2019 (ALTMAN, 2020).

According to Banerjee and Hofmann (2018) and Sharma (2020), the number of ‘zombie’ firms (zombie fraction) has been growing globally since the 2000s and, prior to the COVID-19 pandemic, represented nearly 20% of listed companies in the U.S. ‘zombies’ are also spreading across other continents/countries such as Europe, China, and Japan, where this phenomenon has become evident (BANERJEE; HOFMANN, 2018).

The discussion around ‘zombie’ firms presents a trade-off. On one side, the main argument ‘in defense’ of ‘zombie’ firms is maintaining employment levels, as well as the possibility of renegotiation or restructuring by the borrower given the difficulties and uncertainties during financial recessions (ALTMAN et al., 2024). Alternatively, the global economy would increase its productivity if ‘zombie’ firms entered default to be reorganized or liquidated, as through these processes, their assets could be allocated to more productive sectors/industries/companies, and recovery would occur for creditors (SCHUMPETER, 1934; ALTMAN et al., 2024).

As mentioned, ‘zombie’ firms are spreading, becoming a global phenomenon. According to Hallak et al. (2018), there was an increase in the participation of ‘zombie’ firms in Europe, particularly in Greece, Spain, and Portugal, between 2010 and 2013. Ireland also has a high participation, although it is decreasing. Slovenia, Belgium, and Sweden have lower ‘zombie’ fractions, and Hungary and Bulgaria have the lowest fractions among the countries in the sample (HALLAK et al., 2018).

Based on the above and with the aim of better understanding and contributing to this recent literature, this paper aimed to analyze how Bankruptcy Laws influence the fraction of ‘zombie’ firms in emerging markets and also whether these laws have influenced the bankruptcy process. The motivation for this analysis is to understand whether Bankruptcy Laws repress the evolution of ‘zombie’ firms, i.e., if these legal frameworks support more efficient legal mechanisms for corporate default processes. Thus, in an attempt to improve the restructuring and liquidation processes of defaulting firms, as well as companies' access to external financing, emerging economies like Brazil, China, and India have introduced new Bankruptcy Laws increasing creditor legal protections.

Recent studies in this literature have focused on country-level data to understand the effect of the specialization and efficiency of Bankruptcy Laws on economic-financial outcomes and on creditor rights' effect on bank lending decisions (ALTMAN et al., 2021; MARTINS, 2019; ARAÚJO et al., 2012; PONTICELLI; ALENCAR, 2016; LI; PONTICELLI, 2021; LIN, 2018; TAN et al., 2017; DAI et al., 2021; VIG, 2013; DEB; DUBE, 2021; BOSE; FILOMENI; MALLICK, 2021; BRANCH; KHIZER, 2016). As

bankruptcy procedures improve, financially troubled companies seek judicial restructuring or are triggered by their creditors, and as a result, the number of ‘zombie’ firms could be reduced.

Regarding emerging markets, the justification for this proposition is related to the connection between emerging markets and factors that influence the survival of ‘zombie’ firms. Specifically, it can be identified that emerging markets, compared to developed markets, have experienced higher corporate debt growth from 2010 to 2020 (DUGGAR et al., 2021), contributing to 64% of the increase after the 2008 global financial crisis (DUGGAR et al., 2021), significant growth in their interest rates (DUGGAR et al., 2021), significant issuance of High Yield Debt (GOROZPE et al., 2021), the highest spikes in High Yield Debt spreads during the COVID-19 recession (KRAEMER et al., 2021), as well as having the lowest default rates and High Yield Debt rates during the COVID-19 recession, among other factors that provide/will provide an ideal environment for the survival of low-productivity businesses, leading to the growing number of ‘zombie’ firms.

As a result, the research identified that, on average, ‘zombie’ firms represent 7.58% (static) and 5.49% (dynamic). Between 2002 and 2021, a significant growth was observed, with Brazil standing out as having the highest fraction of ‘zombie’ firms. The research also examined the impact of Bankruptcy Laws, identifying that they helped stabilize and reduce the fraction of ‘zombie’ firms in China, Brazil, and India, improving bankruptcy process indicators. Aggregated, the bankruptcy laws reduced the likelihood of firms becoming ‘zombies’ by 21% (static) and 41% (dynamic), reducing the fraction of ‘zombie’ firms in emerging markets by up to 2% (static) and 1% (dynamic).

Finally, the present research is structured, first, by the introduction, where the study is contextualized, followed by the problem statement, objective, and the factors justifying the proposal. The discussion begins with the institutional determinants of ‘zombie’ firms in emerging markets. The estimation methodology, data collection aspects, and variable construction are also presented. The results section is divided into four parts, discussing ‘zombie’ firms in emerging markets and the relationship between bankruptcy laws and ‘zombie’ fractions in emerging markets. Finally, the conclusion section includes final considerations, limitations, and suggestions for further research.

2. THEORETICAL-EMPIRICAL FRAMEWORK AND FORMULATION OF HYPOTHESES

This section presents the theoretical-empirical framework that serves as the basis for the formulation of the theoretical hypotheses of this article.

2.1 BANKRUPTCY LAWS AND ‘ZOMBIE’ COMPANIES

After outlining the main determinants of ‘zombie’ companies and their key consequences, this study aimed to analyze how the enactment of Bankruptcy Laws has impacted the fraction of ‘zombie’ companies in emerging markets. The motivation for this analysis is to understand whether Bankruptcy Laws are catalysts for ‘zombie’ companies, that is, if these legal framework provide more efficient legal mechanisms for the default processes of companies. According to Altman et al. (2021), if the rise and proliferation of the ‘zombie’ company fraction are related to an inefficient default process, the enactment of new Bankruptcy Laws may substantially impact these companies.

Specifically, some emerging markets have enacted new Bankruptcy Laws in recent years, such as Brazil (Law 11,101/2005), China (Order of the President of the People's Republic of China No. 54/2007), and India (IBC, 2016/2019). Through these enactments, the legal environment of the default process may have been impacted due to the proposed changes, as discussed below.

Some recent studies in this literature have aimed to analyze the efficiency of Bankruptcy Laws on economic-financial outcomes, as well as the effect on creditor rights in bank loan decisions (ALTMAN et al., 2021; MARTINS, 2019; ARAÚJO et al., 2012; PONTICELLI; ALENCAR, 2016; LI; PONTICELLI, 2021; LIN, 2018; TAN et al., 2017; DAI et al., 2021; VIG, 2013; BOSE et al., 2021; DEB; DUBE, 2021; BRANCH; KHIZER, 2016). The following will discuss in more detail the Bankruptcy Laws of these three emerging countries

2.1.1 Brazilian 'Zombie' Companies and the 2005 Bankruptcy Law

The Brazilian Bankruptcy Law No. 11.101/2005, which regulates judicial and extrajudicial recovery as well as the bankruptcy of entrepreneurs and business corporations, implemented several changes, such as the primacy of creditor rights during the default process and the introduction of the 'recovery' legal mechanism (MARTINS, 2019). These changes were based on the U.S. Bankruptcy Code, specifically Chapter 11, aiming to resolve the financial difficulties of Brazilian companies without harming (or less harming) their creditors (ARAÚJO et al., 2012; MARTINS, 2019).

According to Ponticelli and Alencar (2016), this law sought to achieve two main objectives. The first was to increase the total amount recovered from companies in default,

and the second was to improve the recovery rate for secured creditors, such as banks that provide loans backed by collateral (PONTICELLI; ALENCAR, 2016). To achieve these two objectives, Araújo et al. (2012, p. 4) point out that "the Bankruptcy Law introduced six fundamental changes: i) Labor credits were limited to an amount equal to 150 times the minimum monthly wage of each worker, and the remaining labor credits have priority along with unsecured credits; ii) Secured credits have priority over tax credits; iii) Unsecured credits have priority over certain tax credits; iv) The distressed company may be sold, preferably in its entirety, before the constitution of the creditor list. As a result, the resolution time can be reduced, and the value of the company during default may increase; v) Suspension of concordata, meaning that tax, labor, and other obligations are no longer transferred to the buyer of an asset sold during default; vi) If new funds are raised during the default process, they will have priority if the company is liquidated.

According to Araújo et al. (2012), the first two changes (1 and 2) directly increased the priority of secured creditors, thus raising the expected recovery rates for these creditors. The justification for this increase is that, unlike in the old Bankruptcy Law, secured creditors had priority only after all labor and tax actions. The third change (3) increased the priority of unsecured creditors. Finally, the fourth, fifth, and sixth changes (4, 5, and 6) increased the value of bankrupt companies (ARAÚJO et al., 2012).

According to the World Bank (2021), at the time of the reform, Brazilian creditors with guarantees could recover only 0.2% of their unpaid credits from a company in default. In the same year, secured creditors in the United States could expect a recovery of 80.2%, in China 31.7%, and in India 24.6% (WORLD BANK, 2021). The basic reason for this low recovery of Brazilian creditors, according to Araújo et al. (2012), was the structure of the priority of receiving credits, as creditors did not have priority over labor and tax actions.

Thus, consequently, the financial recovery derived from the default process used to reimburse creditors was generally insignificant or even null (i.e., 0.2%). As this fact was known ex-ante by creditors, they increased the interest rate charged to companies, justifying the high interest rate spread in Brazil before the enactment of the 2005 Law (ARAÚJO et al., 2012). After the enactment of this law, the recovery of Brazilian creditors rose to 12.1% between 2006 and 2007, an increase of 5,950% compared to 2004 and 2005 (WORLD BANK, 2021).
Moreover, in 2015, the recovery reached its historical maximum, culminating in 25.8% (WORLD BANK, 2021).

This aligns with the statement made by Ponticelli and Alencar (2016), who suggested that the new law changed the priority of creditor payments during the default process, giving more priority to secured claims. The structure of priorities now followed the order: labor actions, tax actions, secured creditors' actions, and unsecured creditors' actions (ARAÚJO et al., 2012).

Even after the Brazilian Bankruptcy Law impacted the recovery rate for secured creditors, there is still a significant difference when compared to recovery rates in the U.S. (80.2% in 2004 and 81% in 2020), for instance (WORLD BANK, 2021). Ponticelli and Alencar (2016) suggest that a possible explanation for this difference lies in the differing levels of efficiency in the judicial systems of these two countries, as discussed in subsections 2.1.5 and 2.1.7. In addition to the impact on creditors' recovery, the time to resolve defaults, which captures the time for creditors to recover their claims, fell from 10 years to 4 years after the enactment of the Law in 2005 in Brazil (WORLD BANK, 2021).

Another point of relevance is that, before 2005, the Bankruptcy Law established guidelines for liquidation and reorganization that distressed companies could rely on (MARTINS, 2019). Specifically, judicial reorganizations were referred to as concordata and aimed to avoid the liquidation of still viable companies. According to Araújo et al. (2012), the concordata process only postponed debt payments, justified by the fact that any debt before the default process had to be transferred to any potential buyer of its assets. After the Brazilian Bankruptcy Law, concordata was banned, facilitating the sale of distressed companies on a going-concern basis, meaning as an ongoing business (WORLD BANK, 2021).

Therefore, this issue was addressed by removing successor liability, meaning that if a Brazilian company was sold on a going-concern basis during liquidation, only the tax and labor obligations would be transferred to the buyer (MARTINS, 2019). Prior to the enactment of the 2005 Law, the default process for financially distressed companies was weakened, as there were incentives for piecemeal asset sales due to the concordata mechanism (MARTINS, 2019).

By eliminating successor liability, the new law aimed to increase the total value recovered from the sale of distressed companies as a whole (PONTCELLI; ALENCAR, 2016).

According to the World Bank (2021), if the business continues operating (i.e., on-going), 100% of the company's value is preserved, but if assets are sold piecemeal, the maximum value that can be recovered is 70% of the company's value. Thus, after 2005, the main process that began to prevail in Brazil was the going-concern process.

Finally, other benefits are highlighted as consequences of the Bankruptcy Law, as evidenced by Araújo et al. (2012), who identified an approximate 8% reduction in debt costs and increases of 10% and 23% in total debt and long-term debt value, respectively.

The authors point out that, as secured creditors benefited more from the new law than unsecured creditors, the effect was more pronounced in long-term debt, which is commonly correlated with secured debt. Thus, if the existence of Brazilian 'zombie' companies is due to an inefficient default process, the enactment of the 2005 Bankruptcy Law may provide more efficient default processes as well as strengthen the rights of creditors to enforce their debts and increase the recoverable value of their guarantees.

Therefore, as a result, it is expected that the Brazilian Bankruptcy Law will negatively impact its fraction of 'zombie' companies. Considering the Brazilian Bankruptcy Law as an exogenous shock to the economy, this study will investigate whether this reform affected the fraction of Brazilian 'zombie' companies, since it not only provided better mechanisms for reorganization and liquidation but also aimed primarily at strengthening the rights of Brazilian creditors.

Analogously to Altman et al. (2021), Araújo et al. (2012), and Martins (2019), the strategy that supports the following hypothesis will be based on a difference-in-differences estimator with treatment and control groups for the period from 2004 to 2008. This strategy will be described in detail in the methodology section.

H1: The fraction of Brazilian 'zombie' companies is reduced by the enactment of the Brazilian Bankruptcy Law of 2005, making the bankruptcy process more efficient.

2.1.2 Chinese 'Zombie' Firms and the 2007 Bankruptcy Law

The Chinese Bankruptcy Law represented the first comprehensive bankruptcy code that includes both liquidation and corporate reorganization. Before its enactment in mid-2007, defaults in China were dealt with under the 1986 Bankruptcy Law of the People’s Republic, which focused exclusively on how to handle defaults by state-owned enterprises, while private companies could not use this Law to enter default (LI; PONTICELLI, 2021; LIN, 2018). However, the new Bankruptcy Law, promulgated on June 1, 2007, applied directly to all companies, including state-owned enterprises, financial institutions, and private firms (LIN, 2018). According to Li and Ponticelli (2021), the 2007 Bankruptcy Law brought significant changes for Chinese companies. The first change concerns the administrator.

According to Altman et al. (2019), during the default process, the borrower can request the continuation of company management, but only under the supervision of an

appointed administrator. Unlike before, the presence of an appointed administrator replaced the supervision previously carried out by the government (LIN, 2018). Therefore, the benefit of this change was to make the entire default process more independent, as well as aligned with the requirements for the development of China's market economy (LIN, 2018).

The second major change relates to creditor protection. According to Li and Ponticelli (2021), the old Bankruptcy Law stated that secured creditors had priority in the order of payment, followed by payment to workers, payment of tax claims, and general unsecured creditors. However, as mentioned by Li and Ponticelli (2021), in the 1990s, two decrees were issued establishing that for state-owned enterprises in default, the interests of the government would take precedence, as secured creditors would no longer have the first priority of payment but would instead be subordinated to payment to the workers of these companies. As noted, in 2007, the new Chinese Bankruptcy Law came into effect, which, like the Brazilian one, was inspired by Chapter 11 of the U.S. Bankruptcy Code (LIN, 2018).

The third major change refers to the introduction of the ‘recovery’ mechanism. The new Law provided a unified legal default framework for China, in which, now (in practice), secured creditors have priority over any claims by workers and must be reimbursed with assets as collateral (Art. 109) (LIN, 2018). Secured claims are followed by: a) general bankruptcy process expenses; b) labor claims; c) tax claims; and, d) general unsecured claims, such as suppliers (LIN, 2018).

In addition to the priority of payment, the new Bankruptcy Law established a creditor’s committee to protect their interests. According to the Law, the creditor’s committee would become substantially involved in the default process, such as aligning the interests between the bankruptcy administrator and the creditor(s), supervising the management, disposition, and distribution of assets when liquidated, and monitoring and taking action in case of any legal violation by the borrower (LIN, 2018).

As evidenced in the Brazilian context, the impact of the enactment of the 2007 Bankruptcy Law on the recovery rate of secured creditors, as well as the time for resolving defaults, can be analyzed for the period from 2004 to 2020, as reported by the World Bank (2021). After the enactment of this Law, the recovery rate of Chinese creditors rose to 35.9% in 2008, an increase of approximately 14% compared to 2007 (WORLD BANK, 2021). Furthermore, from 2017 to 2020, the recovery rate reached its highest value in the historical series, culminating at 36.9% (WORLD BANK, 2021). This finding aligns with what Lin et al. (2018) noted, that the new Law changed the order in which creditors are paid when a

company is liquidated, giving higher priority to secured claims. Despite the impact, compared to Brazil, the impact on the recovery rate of Chinese secured creditors was more superficial.

Furthermore, it can also be observed that the time for resolving defaults fell from 2.4 years to 1.7 years, a reduction of approximately 30%. Again, this was lower than Brazil, which saw a 60% reduction. In this context, Li and Ponticelli (2021) highlight that despite the substantial changes introduced by the Law, enforcement by traditional civil courts faces difficulties in its full application, which is partly an idiosyncratic feature in emerging countries after enacting their Bankruptcy Laws, given the legal, social, and economic complexity demanding high knowledge and resources.

A fourth point introduced by the Chinese Bankruptcy Law was the new reorganization procedure (LIN; PONTICELLI, 2021; LIN, 2018). Under this procedure, creditors can schedule meetings with the borrower and review and approve the reorganization plan presented during the default process (LIN; PONTICELLI, 2021). The implementation of reorganization, according to Lin (2018), aligns with the international trend of offering opportunities to reorganize those companies that may not be able to meet their debt obligations, contrary to the tradition where default only meant liquidation (LIN, 2018).

Despite theoretically having a more efficient mechanism to enter default, what is observed in practice is a declining trend in the number of defaults in China. According to Lin (2018), the 10 years preceding the 2007 Bankruptcy Law saw 64,311 cases accepted by the courts, averaging 6,431 cases per year. According to the author, this number is relatively low considering the total number of firms and the pace of economic development in China. After 2007, 20,770 cases were accepted by the courts, averaging 2,596 cases per year (LIN, 2018).

Thus, although many provisions of the Chinese Law resemble those observed internationally, Chinese companies in distress tend to avoid entering the default process (ALTMAN et al., 2019). Historically and predominantly, defaults in China after the enactment of the 2007 Law have been concentrated in small and medium-sized private enterprises (ALTMAN et al., 2019). It was only in 2017, 10 years after its enactment, that there was a significant number of defaults by larger companies and state-owned enterprises (SOEs).

Lin (2018) justifies the decrease in the number of defaults by the Chinese government's reluctance to 'allow' state-owned enterprises to file for bankruptcy. An example that illustrates this reluctance is that in China, there is a significant number of SOEs (DAI et al., 2021), which, in addition to creating value, play social roles, such as implementing the government's strategy of comparative advantage, maintaining workers in

the workforce, and providing pensions and other social services (DAI et al., 2021). To ensure that SOEs fulfill their political roles, the government explicitly supports them with credit subsidies during recessions and periods of economic and financial instability (TAN et al., 2017; DAI et al., 2021). Thus, there are government efforts to keep unproductive and non-profitable companies operating ‘artificially,’ which strengthens Chinese 'zombie' companies (LIN, 2018; DAI et al., 2021). Other reasons for the Chinese government’s reluctance relate to maintaining employment rates, social control stemming from the default process, and the fact that local leaders seek political promotions based on support for local businesses (LIN, 2018).

Lin (2018) concludes that, despite the various changes introduced by the Bankruptcy Law, no significant increase in the number of Chinese bankrupt companies suggests that the Chinese Bankruptcy Law has not fulfilled its intended role, leaving a significant gap as desired. Alternatively, Altman et al. (2019) complement and justify that the low utilization of default processes can be explained by the broad power of the court, the risk of the borrower losing control of the business, the exposure of management to civil liabilities, as well as (as mentioned) the lack of correct and immediate application of the 2007 Law.

Another point that adds complexity to the puzzle of the efficiency of the Chinese Bankruptcy Law is its direct relation to 'zombie' companies. Recently, Altman et al. (2021) highlighted that the fraction of 'zombie' companies in China peaked in 2006, exceeding 6%. After 2006, and concurrently with the promulgation of the 2007 Law, there was a rapid decline in the number of 'zombie' companies, which continued until mid-2017. Therefore, the timing of the decrease in 'zombies' coincides with the modernization of the Chinese Bankruptcy Law in 2007. Finally, after reaching its lowest fraction of 'zombies' in 2017, it started showing a growth trend again in 2018.

Similarly to Brazilian 'zombie' companies, if the existence of Chinese 'zombie' companies is due to government subsidies and an inefficient default process, the enactment of the 2007 Bankruptcy Law should support a more efficient default process, mitigating the fraction of Chinese 'zombie' companies. Just like Altman et al. (2021), Li and Ponticelli (2021), Lin (2018), Tan et al. (2017), and Dai et al. (2021), the strategy for testing the following hypothesis is based on a difference-in-differences estimator with treatment and control groups for the period from 2005 to 2010. This strategy is described in detail in the methodology section.

H2: The fraction of Chinese 'zombie' companies is reduced by the enactment of the 2007 Bankruptcy Law, resulting in greater efficiencies in their bankruptcy process.

2.1.3 Indian 'Zombie' Firms and the Bankruptcy Laws of 2002 and 2016

Historically, Indian firms have had numerous and different legal frameworks for the default process (ALTMAN et al., 2019), and recently, several changes have been made to the system and the procedures underlying it (BRANCH; KAIZER, 2016). According to Branch and Kaizer (2016), the Presidency Town Insolvency Act of 1909, the Provincial Insolvency Act of 1920, and the Companies Act of 1956 are important legal frameworks that established procedural guidelines for defaults in India.

According to the authors, the Companies Act of 1956 underwent numerous amendments through subsequent legislation, including the Sick Industrial Companies Act of 1985 (SICA), which was enacted to detect unviable companies that could represent systematic financial risk. Similarly, the SICA was repealed and replaced in 2003 by the Sick Industrial Companies (Special Provisions) Repeal Act of 2003, which mitigated some aspects of the original Act and addressed certain problematic factors (BRANCH; KHIZER, 2016; ALTMAN et al., 2019).

Furthermore, the SICA was completely repealed in 2016, partly because some of its provisions overlapped with those of other Laws, such as The Companies Act of 2013 (BRANCH; KHIZER, 2016; ALTMAN et al., 2019). Another point justifying the inefficiencies observed in the Indian default process relates to overlapping authorities, such as in the Higher Courts, the Corporate Law Board, the Board for Industrial and Financial Reconstruction (BIFR), and the Debt Recovery Tribunals (DRTs), creating delays and systemic complexities in the process (BRANCH; KAIZER, 2016).

According to Vig (2013), in an effort to eliminate inefficiencies and overlaps in the legal process, the Indian government enacted two significant reforms aimed at strengthening creditors' rights. The first was the Debt Recovery Tribunals Act of 1993 (DRT Act) and the second was the Securitization and Reconstruction of Financial Assets and Enforcement of Security Interest Act (SARFAESI) of 2002 (VIG, 2013).

Regarding the latter, Branch and Khizer (2016) point out that, unlike previous acts, such as the DRT Act itself, the SARFAESI Act is applicable throughout India and has a clear debt recovery system. Prior to its approval, secured creditors had no power to claim an asset outside the judicial/court process. As a result, assets were often improperly appropriated,

transferred, or simply devalued over long processes, leading to a significant reduction in recovery for secured creditors (VIG, 2013; BRANCH; KHIZER, 2016).

The SARFAESI Act proposed that the legal system in India be based on a creditor-friendly regime rather than a debtor-friendly regime, increasing the rights of secured creditors (VIG, 2013). Unlike the context before the SARFAESI Act was promulgated, creditors could now seize their collateral if borrowers failed to meet their obligations after a 60-day notice (VIG, 2013; BRANCH; KHIZER, 2016). Therefore, according to the SARFAESI Act, secured creditors have the right to take over the management of the secured assets or even the business itself, allowing them to sell the secured assets to recover the debt (VIG, 2013)

With the changes implemented by the SARFAESI Act, creditor protection in India improved substantially, given that India was among the weakest countries in terms of creditor protection (VIG, 2013). The improvement is based on three main aspects, as described by Branch and Khizer (2016). The first aspect relates to the enforcement of real guarantees given as collateral; the second concerns the recovery of non-performing assets (NPAs), which could be exercised through securitization, asset reconstruction (proper business management, debt restructuring, fragmented or whole sales...), and also through the issuance of a 60-day security notice (BRANCH; KHIZER, 2016).

Evidence suggests that the SARFAESI Act drastically increased the power of secured creditors (VIG, 2013). Similar to the Brazilian and Chinese contexts, one could analyze the impact of the 2002 Bankruptcy Law on the recovery rate of secured creditors, as well as the time for default resolution. However, the time series provided by the World Bank (2021) begins in 2004, not allowing the exact impact of the 2002 law to be identified. Even so, the available data from Graph 13 is reported. As shown, from 2004 onwards, the recovery rate for secured creditors remained stable, within a range of 22.9% to 27.4%. However, a significant improvement is observed starting in 2020, both in the recovery rate of secured creditors and in the time required to resolve defaults.

Below, potential causes for these changes will be discussed in more detail. Regarding the recovery rate of secured creditors, a growth of 170.18% is observed, jumping from 26.5% in 2019 to 71.6% in 2020. Similarly, insolvency used to take 4.3 years to resolve in India in 2019, but this dropped to 1.6 years in 2020, compared to the global average of 2.47 years in 2019 (WORLD BANK, 2021). Furthermore, Bose et al. (2021) highlight that India's creditor rights index improved from 6 in 2014 to 9 in 2019.

As mentioned, there is empirical evidence showing that the SARFAESI Act had a positive effect on secured creditors' rights. Data on recovery and NPAs suggest that the Act

had a positive impact (VIG, 2013), leading to a reduction in non-performing assets on banks' books (as a fraction of total outstanding loans). Although the current Bankruptcy system has undergone numerous changes, especially over the past three decades, the process remained excessively bureaucratic and time-consuming (BRANCH; KAIZER, 2016; BOSE et al., 2021).

Therefore, there was no efficient and swift resolution mechanism until mid-2016, despite two Bankruptcy mechanisms based on the DRT Act of 1993 and the SARFAESI Act of 2002. Thus, the Insolvency and Bankruptcy Code (IBC) was enacted (BRANCH; KAIZER, 2016). The IBC consolidated and unified the previously defined Bankruptcy Laws, as its enactment replaced the SARFAESI Act of 2002, the RBI restructuring programs, and the debt recovery tribunals (BOSE et al., 2021). With the enactment of the IBC in 2016, Indian companies now have a single law to organize and guide their default process, and creditors now have greater protection for recovering their rights (BOSE et al., 2021).

As stated earlier, the IBC is mainly creditor-oriented, meaning that once the default process begins, creditors have control over the company's management and deliberate on the possibility of a turnaround (DEB; DUBE, 2021). The IBC, unlike the SARFAESI, allows all creditors (secured, unsecured, financial, or operational) to initiate the default process. Under the 2002 Law, unsecured creditors and financial and operational creditors, including employees of the debtor company, did not have the right to seek resolution for an insolvent company (DEB; DUBE, 2021; BOSE et al., 2021).

Thus, the IBC was a revision of the entire previous structure concerning the corporate default process. Similarly to the Chinese Bankruptcy Law, if the National Company Law Tribunal (NCLT) accepts the default request, an interim resolution professional will be appointed to take over the company in default, along with the formation of a creditors' committee composed of all financial creditors (ALTMAN et al., 2019). As described by Altman et al. (2019), after the default process begins, a resolution plan must be developed within a maximum of 270 days (180 initial days extendable by 90 days).

Furthermore, according to the authors, after submission to the creditors' committee, it must be approved by more than 75% of creditors and become mandatory for all key stakeholders, including creditors, guarantors, employees, and others. If not approved, the company may be liquidated. Finally, according to Deb and Dube (2021), with NPAs growing substantially, the Indian regulator (i.e., the Reserve Bank of India - RBI) enacted a resolution in 2019 aimed at expediting and restructuring company debt.

As specified by Deb and Dube (2021), the new resolution required banks to perform a prima facie review of the borrower's account within 30 days of the default date, and one of the critical requirements of the new framework is that the Resolution Plan (RP) must be implemented, with all creditors required to reach an agreement among themselves. Essentially, the idea behind this plan is to facilitate decision-making among creditors and mitigate potential conflicts of interest (DEB; DUBE, 2021). Therefore, this resolution enables informal and extrajudicial negotiation between borrowers and their creditors, even after default, expediting an efficient resolution for non-performing assets (NPAs).

Analogous to Brazilian and Chinese ‘zombie’ companies, if the existence of Indian ‘zombie’ companies is due to an inefficient default process, the enactment of the SARFAESI Act in 2002 and the IBC in 2016 may have proven to be efficient legal mechanisms. Considering the Indian Bankruptcy Law of 2002 and the IBC of 2016 as exogenous shocks to the economy, it will be investigated whether these reforms affected the fraction of Indian ‘zombie’ firms, given that in addition to subsidizing better reorganization and liquidation mechanisms, they primarily aimed at strengthening the rights of creditors. Similarly to Altman et al. (2021), Vig (2013), and Bose et al. (2021), the strategy for testing the following hypothesis is based on a difference-in-differences estimator with treatment and control groups for the period from 2000 to 2006 (SARFAESI) and 2014 to 2019 (IBC). This strategy is described in detail in the methodology section.

H3: The 2016 Bankruptcy Law decreased the fraction of Indian ‘zombie’ firms, generating more efficiencies in their bankruptcy process.

Finally, in addition to this research addressing the relationship between bankruptcy laws and the ‘zombie’ firm fractions in Chinese, Brazilian, and Indian markets, an aggregated analysis of the impact of bankruptcy laws in all emerging markets on the fractions of ‘zombie’ firms was added. Based on this, all emerging markets that had their bankruptcy laws promulgated and in force were sought, and it was tested whether the ‘zombie’ fractions were affected by their enactment.

H4: The Bankruptcy Laws implemented in countries decrease the fraction of ‘zombie’ firms in emerging markets.

3) METHODOLOGICAL PROCEDURES

This section aims to describe the methodological procedures conducted in this study. For better presentation, the methodological procedures are divided into four sections. The first section covers the sample and data collection. The second outlines the definition of 'zombie' companies. Next, the model specification and data analysis method are described. Finally, the last section presents the constitution of the study variables. To analyze the impact of bankruptcy laws on the 'zombie' fraction and the bankruptcy process in emerging markets, an exploratory-descriptive research approach based on quantitative methods was used.

3.1 SAMPLE AND DATA COLLECTION

The selection of emerging countries for this study was based on the MSCI EM Index, which reflects emerging markets and helps investors with global and regional asset allocation. The sample includes companies with shares traded on the stock exchanges of emerging markets, covering the period from 2002 to 2021 (20 years) and countries from the following regions: (i) **Americas (LATAM):** Brazil, Chile, Colombia, Mexico, and Peru; (ii) **Europe, Middle East, and Africa (EMEA):** Czech Republic, Egypt, Greece, Hungary, Kuwait, Poland, Qatar, Russia, Saudi Arabia, South Africa, Turkey, and the United Arab Emirates; and (iii) **Asia:** China, India, Indonesia, South Korea, Malaysia, Philippines, Taiwan, and Thailand.

Argentina was excluded from the index in 2021 due to its macroeconomic context. The financial data of the companies were obtained from the S&P Global Capital IQ and Economática databases, while macroeconomic and institutional data came from the IMF, WDI, and World Bank Financial Structure Dataset. The sample period covers from 2002 to 2021, with this time frame chosen based on the availability of historical data from these sources.

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3.2 DEFINITIONS OF 'ZOMBIE' COMPANIES

The interest coverage ratio is widely used to assess a company's ability to pay off loans and financial difficulties, being a standard measure adopted by credit analysts, research firms, and rating agencies (Hallak et al., 2018). However, as some companies continue to operate even when their cash generation is lower than their interest expenses, an interest coverage ratio below 1 may not be enough to classify a company as a 'zombie'. This is because a low ratio may be associated with temporary shocks in demand, sales, or an increase in interest expenses, without indicating an imminent default risk (Altman et al., 2024).

To refine this classification, Altman et al. (2024) propose a two-stage process. The first stage involves identifying companies with a three-year moving average interest coverage ratio of less than 1. The second stage uses Altman's Z-score (1968) and its international version, the Z"-score (Altman et al., 1995), to assess default risk. Thus, a company is classified as a 'zombie' if it has an interest coverage ratio below 1 and a negative Z-score or Z"-score.

According to Altman et al. (2024), this two-stage process significantly reduces the overestimation of 'zombie' companies, and the results indicate that the average percentage of 'zombie' companies in the studied countries is 8-10% of the listed companies. Moreover, the fraction of 'zombie' companies increased from 1.5% in 1990 to 3.4% in 2007 and 7.0% in 2020.

This study follows the methodology proposed by Altman et al. (2024), using the interest coverage ratio and the Z-score to identify 'zombie' companies, which justifies the choice of these variables given their comparability with recent studies and relevance to the research.

3.3 MODEL SPECIFICATION AND DATA ANALYSIS METHOD

To achieve the proposed objective, the fraction of 'zombie' companies was first measured based on the metric mentioned earlier (Acharya et al., 2019; Altman et al., 2024; Hallak et al., 2021; Banerjee; Hofmann, 2018; McGowan et al., 2018). After identifying the 'zombie' companies (dummy = 1) and non-'zombie' companies (dummy = 0), the fraction of 'zombie' companies was measured in two ways: (i) **Static fraction**, by the ratio of static 'zombie' companies to the total number of listed companies in each country annually; (ii) **Dynamic fraction**, by the ratio of dynamic 'zombie' companies to the total number of listed companies in each country annually.

The statistical models used to analyze how bankruptcy laws influence 'zombie' companies in emerging markets were the Difference-in-Differences (Diff-in-Diff or DiD) estimator. The study used a quasi-experiment approach to evaluate the effects of the enactment of bankruptcy laws in major emerging markets, based on the comparison of effects before and after the legal frameworks (Zhang et al., 2015). This type of analysis avoids the problem of endogeneity and allows for the observation of changes in the object of study before and after an event, such as the enactment of bankruptcy laws (Campbell; Stanley, 1975; Meyer, 1995).

A quasi-experiment, as described by Meyer (1995), involves comparing a treatment group (companies affected by legal frameworks) and a control group (companies not affected) to identify the causal effects of changes in government and regulatory policies. In the case of this study, the legal frameworks are the enactments of bankruptcy laws that reorganized bankruptcy processes and increased creditor protections.

The DiD estimator measures the difference in average outcomes for the treatment and the control group after the enactment of bankruptcy laws, subtracting the difference that existed before the event (Lechner, 2011). This method, as highlighted by Roberts and Whited (2013), minimizes omitted trends problems by comparing two groups in the same period and observing the same countries before and after the event.For the analysis, the treatment group consists of emerging countries that enacted bankruptcy laws, such as Brazil, China, and India, while the control group consists of emerging countries that were not affected by these legal frameworks.

Table 1 - Definitions of treatment and control groups according to the hypotheses

H ypothesis	**Treatment Group**	**Control Group**	**Legal Framework**
H1	China	Other emerging markets (except countries with bankruptcy laws in force during these years)	2007
H2	Brazil	Other emerging markets (except countries with bankruptcy laws in force during these years)	2005
H3	India	Other emerging markets (except countries with bankruptcy laws in force during these years)	2016/ 2019

Fonte: elaborado pelo autor (2025)

The Difference-in-Differences (DiD) estimator requires the verification of fundamental theoretical assumptions to ensure the validity of its estimates. One essential assumption is the identification of an exogenous framework that divides the sample into two groups: a treatment group, exposed to the framework only in the second period, and a control group, not exposed in any period (WOOLDRIDGE, 2019; VILLA, 2016).

Another critical assumption is the existence of parallel trends (LECHNER, 2011; ROBERTS; WHITED, 2013), which assumes that, in the absence of the treatment, the outcome variable would follow similar temporal trajectories for both the treatment and control groups. Confirmation of this assumption reinforces the idea that the exogenous framework is the main cause of changes in the outcome variable's behavior for the treatment group.

According to Villa (2016), the definition of the effects of DiD estimators is based on the existence of two periods, one prior (t_0), and one after (t_1) the framework, with treatment

group $(W_p = 1)$ and control group $(W_p = 0)$. In the period before the framework, both groups should not experience changes derived from the framework $(D_{pt} = 0/(W_p = 1{,}0))$, and in the period after, only the treatment group should experience changes $(D_{pt} = 1/(W_p = 1)$. Thus, for a given outcome variable (Y_{tip}), such as the fraction of 'zombie' companies, the treatment effect estimated by DiD is given by the difference in the outcome variable between the treated and control individuals, before and after the framework, as presented in equation 1.

$$DiD = \{[E(Y_{tp=1}|D_{tp=1} = 1, W_p = 1)] - [E(Y_{tp=1}|D_{tp=1} = 0, W_p = 0)]\} - \{[E(Y_{tp=0}|D_{tp=0} = 0, W_p = 1)] - [E(Y_{tp=0}|D_{tp=0} = 0, W_p = 0)]\} \quad (1)$$

Therefore, the DiD will be estimated by creating two main variables for the model. The first, called 'Bankruptcy Law,' refers to the enactment of Bankruptcy Laws, which represents a quasi-natural experiment to identify the exogenous effect of a shock in the insolvency process as well as creditors' rights.

Based on this shock, the considered time period was Leit-3, Leit-2, and Leit-1, the 'pre-Law' period, where the value '0' is assigned; and Leit, Leit+1, and Leit+2, the period during and shortly after the enactment of Bankruptcy Laws, where the value '1' is assigned, forming the variable 'Law.' Similarly to Araújo et al. (2012), alternative dates for the 'pre-Law' and 'Law' periods were tested in order to falsify the results identified through the dates related to bankruptcies (i.e., placebo tests).

The other variable created, called 'treatment,' refers to the treatment and control groups, where the value '1' is assigned to the emerging countries Brazil, China, and India, and '0' for the other corresponding emerging countries that have not enacted Bankruptcy Laws in their countries. To estimate the expected values in equation, regressions were performed for estimating the conditional mean of the DiD regression model (ROBERTS; WHITED, 2013; VILLA, 2016), as shown in equation 2.

$$y_{pt} = \delta_0 + \delta_1 Lei_t x tratamento_p + \delta_2 Lei_t + \delta_3 tratamento_p + \varepsilon_{pt} \quad (2)$$

Where p represents the emerging markets; *t* is time; $y_{i,t}$ is the dependent variable (i.e., the fraction of 'zombie' firms), δ_1 captures the DiD coefficient of interest; δ_2 captures the permanent differences between the treatment and control groups; δ_3 represents the common trends between the treatment and control groups, and ε_{pt} is the error term. The DiD coefficient of interest (δ_1) corresponds to the difference-in-differences estimator,

calculated by the average of the difference for the treatment group before and after the event and the control group before and after the event, as shown in equation 3.

$$\delta_1 = \left[\left(Grupo_{W_p=1}\ x\ t_1\right) - \left(Grupo_{W_p=1} = 1\ x\ t_0\right)\right] - \left[\left(Grupo_{W_p=0}\ x\ t_1\right) - \left(Grupo_{W_p=0} = 0\ x\ t_0\right)\right] \quad (3)$$

For the estimation of the DiD, it was considered that the emerging countries in the treatment groups (Brazil, China, and India) and the control group (other emerging countries) have distinct observable characteristics. To address this issue, Kernel Propensity Score Matching (K-PSM) will be used, as suggested by Leuven and Sianesi (2014), to identify, through covariates, a country from the control group similar to the treatment group, except for the variable that distinguishes them (the Bankruptcy Laws in Brazil, China, and/or India).

Additionally, to validate the DiD, a robustness test will be conducted based on a placebo test, which alters the legal framework of the Bankruptcy Laws. In this test, it is assumed that the effects of the shock started in a period different from the actual framework (ROBERTS; WHITED, 2013). The structure of the DiD model remains unchanged, with only the shock year and the analyzed period being altered. The placebos will use alternative frameworks, two years prior to the enactment of the Bankruptcy Laws (ROBERTS; WHITED, 2013).

3.4 DEFINITION OF VARIABLES

After reviewing the theoretical and empirical works related to the topic of ‘zombie’ firms and other related literature, the variables used in the present study are described in Table 2. Additionally, to prevent outliers from affecting the results, the data in all analyses were winsorized at 1% in both tails of the distribution (1% and 99%).

Table 2 – Definition of Variables

***Proxy* 'Zombie' Firms**

Variables	Definition	Authors	Source
Static 'Zombie' Firms	A dummy variable that takes the value 1 if the firm is a 'zombie' firm and 0 otherwise, where a firm is classified as a 'zombie' firm in a given year if its "Interest Coverage Ratio (EBITDA/financial expenses)" is below 1 and its Z-score is below 0.	Altman et al., (2021) Hallak et al., (2018) Banerjee and Hofmann (2018)	Capital (CIQ)
Dynamic 'Zombie' Firms	A dummy variable equal to 1 if the company is a 'zombie' company and 0 otherwise. The company is classified as a 'zombie' in a given year if its 3-year average "Interest Coverage Ratio (EBITDA/financial expenses)" is less than 1 and its 3-year average Z-score is less than 0.	Altman et al., (2021) Hallak et al., (2018) Banerjee and Hofmann (2018)	CIQ
Static 'Zombie' Fraction	Ratio of the number of static 'zombie' companies to the total number of listed companies in the country per year;	Hallak et al., (2018) Dai et al., (2021) Banerjee and Hofmann (2018)	CIQ
Dynamic 'Zombie' Fraction	Ratio of the number of dynamic 'zombie' companies to the total number of listed companies in the country per year.	Hallak et al., (2018) Dai et al., (2021) Banerjee and Hofmann (2018)	CIQ
Z-Score Emergent Markets	$Z' - Score = 3{,}25 + 6{,}56 * \left(\frac{AC-PC}{AT}\right) + 3{,}26 * \left(\frac{LR}{AT}\right) + 6{,}72 \left(\frac{EBIT}{AT}\right) + 1{,}05 \left(\frac{PL}{PT}\right)$,	Altman et al., (2021).	CIQ

Bankruptcy Laws in Emerging Markets

Emergent Market	Year	Definition	Hipothesys	Authors	Law
China	2007	Order of the President of the People's Republic of China – Nº. 54	**H1**	Altman et al., (2024), Li e Ponticelli (2021), Lin (2018),	Law nº 54
Brazil	2005	Law Nº. 11,101 of February 9, 2005.	**H2**	Altman et al., (2024); Araújo et al., (2012), Martins (2019), Ponticelli e Alencar (2016)	Law 11.101/05
India	2016/2019	*Insolvency Bankruptcy Code* 2016	**H3**	Altman et al., (2019); Altman et al., (2021), Vig (2013)	Law India 2016/2019
Mercados Emergentes	Dynamic Framework	Current Laws	**H4**	Altman et al., (2024)	Current Laws

Bankruptcy Process Variables

***Score Resolving Insolvency (0-100)* (SRI)**	SRI score is the simple average of the scores for each of the component indicators: the recovery rate of insolvency proceedings involving domestic entities, as well as the robustness of the legal framework applicable to judicial liquidation and restructuring processes; insolvency resolution score between 0 and 100	**H1 a H3** +	Araújo et al., (2012), Martins (2019), Ponticelli and Alencar (2016)

Outcome (OUT)	It is recorded whether the company exits the process as a 'going concern' (1) or if its assets are sold in parts (0) ('piecemeal sale')	**H1 a H3**	+	Araújo et al., (2012), Martins (2019), Ponticelli and Alencar (2016)
Time (years)	The time required for creditors to recover their credit is recorded in calendar years.	**H1 a H3**	-	Araújo et al., (2012), Martins (2019), Ponticelli and Alencar (2016)
Cost	The cost to resolve the insolvency is recorded as a percentage of the debtor's asset value, including court fees, government taxes, insolvency administrator fees, auctioneers, appraisers, lawyers, and all other charges and costs.	**H1 a H3**	-	Araújo et al., (2012), Martins (2019), Ponticelli and Alencar (2016)
Recovery rate (0-100) (RR)	RR is recorded as cents per dollar recovered by secured creditors through judicial reorganization processes, liquidation, or debt enforcement (foreclosure or judicial administration).	**H1 a H3**	+	Araújo et al., (2012), Martins (2019), Ponticelli and Alencar (2016)
Creditor participation index (0-4) (CPI)	CPI has four components: (i) whether creditors appoint the insolvency representative or approve, ratify, or reject the appointment of the insolvency representative; (ii) whether creditors must approve the sale of substantial assets of the debtor during insolvency proceedings; (iii) whether an individual creditor has the right to access financial information about the debtor during insolvency proceedings; and (iv) whether an individual creditor can challenge a court or insolvency representative's decision to approve or reject claims against the debtor filed by the creditor itself and by other creditors.	**H1 a H3**	+	Araújo et al., (2012), Martins (2019), Ponticelli and Alencar (2016)
Reorganization proceedings index (0-3) **(RPI)**	RPI has three components: (i) whether the reorganization plan is voted on only by creditors whose rights are modified or affected by the plan; (ii) whether creditors entitled to vote on the plan are divided into classes, with each class voting separately and creditors within each class being treated equally; and (iii) whether the insolvency regulatory framework requires that dissenting creditors receive at least as much as they would in the event of liquidation	**H1 a H3**	+	Araújo et al., (2012), Martins (2019), Ponticelli and Alencar (2016)
PostReform	dummy variable equal to 1 for all annual observations after country i has reformed its bankruptcy code, and 0 otherwise	**H4**	-	Altman et al., (2024)

Note: AC = Current Assets; **PC** = Current Liabilities; **AT** = Total Assets; **LR** = Retained Earnings; **MV** = Market Value; **PT** = Total Liabilities; **PL** = Shareholders' Equity; **EBIT** = Earnings Before Interest and Taxes; **EBITDA** = Earnings Before Interest, Taxes, Depreciation, and Amortization
Source: elaborated by authors (2025)

4. RESULTS ANALYSIS

This section is divided into: 4.1 'Zombie' Companies in Emerging Markets, and 4.2 'Zombie' Companies, Bankruptcy Laws, and Bankruptcy Process, further subdivided into three subsections: i) Descriptive Statistics of 'Zombie' Fractions; ii) Descriptive Statistics of Bankruptcy Processes; ii) Difference-in-Differences (Diff-in-Diff) Analysis of the Influence of Bankruptcy Law on 'Zombie' Fractions and the Bankruptcy Process.

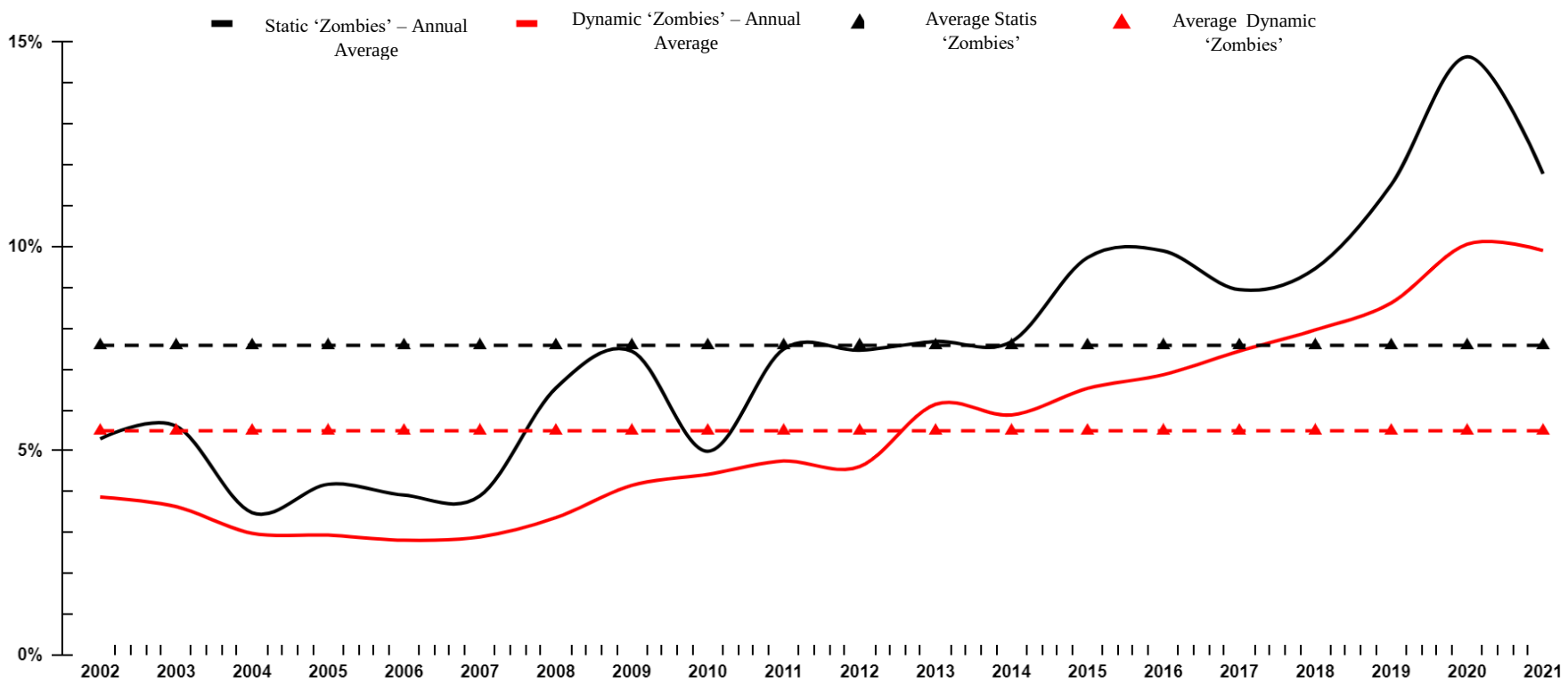
4.1 'ZOMBIE' COMPANIES IN EMERGING MARKETS

As proposed in the methodological section, the first step was to estimate the fraction of 'zombie' companies for emerging markets in an aggregated manner, followed by an analysis of the evolution of the 'zombie' fraction. As discussed earlier, regarding the existing literature on 'zombie' companies, empirical evidence still does not provide enough support to create a unified theory of 'zombie' companies due to the contemporary nature of the issue, the low number of studies, and a limited discussion on how to measure and define if a company's status is 'zombie'.

It was considered that a company was classified as a 'zombie' if its interest coverage was below one and its Z-score was below zero. Based on this, the fraction of 'zombie' companies was estimated using these two metrics for comparison ('static zombies' and 'dynamic zombies'). As shown in Graph 1, 'zombie' companies in emerging markets follow the growth trend observed in the global market, becoming a widespread phenomenon in almost all countries. The data illustrate that 'zombies' average 7.58% when using the 'static zombies' metric and 5.49% when using the 'dynamic zombies' metric during the analyzed period.

Historically, it can be observed that in 2002, 'static zombie' companies represented only 5.29% of all listed companies. By 2021, 'zombie' companies reached 11.78%, marking a significant growth of 122.68%. Of this growth, between 2002 and 2011, the increase was 41.58%, and from 2012 to 2021, the growth was 57.27%. In the historical series, the maximum observed value for the average fraction of 'zombie' companies was 14.64% in 2020, and the minimum was 3.48% in 2004.

Graphic 1 - 'Zombie' Companies: Emerging Markets



Note: Static 'Zombies' - Annual Average = The static 'zombie' fraction is the ratio between the number of static 'zombies' and the total number of companies in each country, where a static 'zombie' is a dummy variable that takes the value 1 if the company's "Interest Coverage Ratio (EBITDA/financial expenses)" is below 1 and its Z-score is below 0 in a given year, and 0 otherwise. **Dynamic 'Zombies' - Annual Average** = The dynamic 'zombie' fraction is the ratio between the number of dynamic 'zombies' and the total number of companies in each country, where a dynamic 'zombie' is a dummy variable that takes the value 1 if the company's 3-year average "Interest Coverage Ratio (EBITDA/financial expenses)" is below 1 and its 3-year average Z-score is below 0, and 0 otherwise
Source: Authors (2025)

Additionally, when analyzed by the dynamic 'zombie' metric, the 'zombie' fraction shows that, in 2002, they represented only 3.87% of all listed companies. By 2021, 'zombie' companies reached 9.90%, representing a significant growth of 155.81%. Again, it can be observed that of this growth, between 2002 and 2011 the increase was only 22.73%, and from 2012 to 2021 the growth was 114.75%. In the historical series, the maximum observed value for the average of dynamic 'zombie' companies was 10.05% in 2020, and the minimum was 2.81% in 2006.

These results align with the research of Altman et al. (2024), who show that, in many countries, the percentage of 'zombie' companies (by the two-stage definition, i.e., dynamic) is, on average, 8-10% of listed companies, significantly refining the companies initially classified. Regarding the evolution, the authors highlighted that the fraction of 'zombie' companies increased significantly from 1990 to 2020, rising from just 1.5% in 1990 to 3.4% in 2007 and 7.0% in 2020.

According to the authors, the increase was cyclical, with upward shifts linked to economic recessions, such as the Asian Crisis in the 1990s, the Dotcom Crisis in the early 2000s, and the Subprime Crisis in 2008. These increases were only partially reversed in the subsequent years (BANERJEE; HOFMANN, 2018). This result aligns with the findings, as it is observed that 'zombie' companies were in a declining trend, and after the start of the subprime crisis in 2007, they began to grow again, peaking in 2008 close to 8%, according to both interest coverage and static 'zombie' metrics. After 2008, these series reveal a partial declining trend in relation to their increase associated with the crisis.

Specifically, it was identified that China has an average of 5.37% and 3.83% for static and dynamic 'zombies', respectively. For other countries, it was identified that, on average, 'zombies' in Brazil represent 16.75% and 13.94%; in India 13.38% and 10.49%; in South Korea 10.47% and 7.88%; in Russia 8.18% and 6.22%; in Mexico 4.75% and 2.97%; and finally, in Indonesia 9.19% and 6.93%, for static and dynamic 'zombies', respectively.

Based on this information, the following can be highlighted. First, the country with the highest percentage of 'zombie' companies, and thus the highest fraction of 'zombie' companies, is Brazil, followed by Turkey, Malaysia, and India. Second, it is possible to identify the same significant growth pattern observed for emerging markets, with growth peaks around crises such as the subprime crisis.

Specifically regarding Brazil, as mentioned above, it is the emerging country with the highest fraction of 'zombie' companies. Historically, in 2002, Brazil had an average of 15.54% when measured by the static 'zombie' definition or 10.32% for dynamic 'zombies'.

Comparatively, in the same year, Brazil had a fraction of static 'zombie' companies 2.94 times higher than the average for static zombies in emerging markets, and the average for dynamic 'zombies' was 2.67 times higher than the average for dynamic 'zombies' in emerging markets.

By 2021, Brazil had an average of 18.30% when measured by the static 'zombie' definition or 17.94% for dynamic 'zombies'. Comparatively, in that year, Brazil had a fraction of static 'zombie' companies 1.55 times higher than the average for static zombies in emerging markets, and the average for dynamic 'zombies' was 1.81 times higher than the average for dynamic 'zombies' in emerging markets. This analysis shows that the difference has narrowed due to the generalized increase in other emerging markets.

4.2 Descriptive Statistics of 'Zombie' Fractions and Insolvency Processes

Initially, it is necessary to analyze the historical evolution of the 'zombie' fractions and the variables related to the insolvency process in the specified emerging markets, namely China, Brazil, and India. As reviewed in the literature, these countries have Bankruptcy Laws that are considered relevant for their legal and financial context, as they are mechanisms that enable professionalization and the achievement of higher levels of efficiency for them.

Although other emerging markets also have Bankruptcy Laws in their legal systems, this research focused on exploring the aforementioned countries based on their economic relevance, as they are the three largest real GDPs among emerging markets, as well as to study the topic in a more focused manner. In order to highlight and analyze the efficiency of Bankruptcy Laws, the present analysis segregated the analyzed markets into a treatment group and a control group in the pre- and post-effectiveness periods of the Bankruptcy Law.

The first analysis considers China as the treatment group, since its Bankruptcy Law was published on August 27, 2006, and came into effect on June 1, 2007. Thus, the analysis considered 2005, 2006, and 2007 as the pre-effectiveness period, and 2008, 2009, and 2010 as the effectiveness and post-effectiveness period. Additionally, the other emerging markets were considered as the control group, except for Brazil, Colombia, and the Czech Republic, which had their bankruptcy laws come into effect in 2005, 2006, and 2007, respectively. Based on this, the following statistics illustrate the evolution of the Chinese static and dynamic 'zombie' fractions and the variables characteristic of the insolvency process.

Regarding the Chinese static 'zombie' fraction, it is noteworthy that the average before the Bankruptcy Law was 3%, and after the Law, it remained the same, showing no difference in the fraction of 'zombie' companies. Additionally, when considering the dynamic 'zombie' fraction, it was observed that it reached an average of 1% before the Law and 3% after the

Law, indicating an increase in the 'zombie' fraction in China during this period. Preliminary, this result calls into question the efficiency of the law in acting as a mechanism to contain and resolve the 'zombie' fraction. However, it must also be considered that there is a temporal overlap between the Chinese Bankruptcy Law and the subprime crisis, which, in this context, presents opposing forces, as Bankruptcy Laws are considered mechanisms to mitigate 'zombies', while financial crises are seen as events that proliferate them. Therefore, the analysis goes beyond the 'zombie' fraction itself and includes variables characteristic of the Chinese insolvency process.

In general, the variables score resolving insolvency, time of resolving insolvency, and recovery rate of resolving insolvency (cents of dollar) show parallel trends before the Bankruptcy Law between the treatment group (China) and the control group (Emerging Markets), validating one of the requirements of the diff-in-diff method presented later. The Chinese Bankruptcy Law led to some changes in the Chinese insolvency process: (i) a 124.11% increase in the score resolving insolvency; (ii) a 29.11% decrease in the time of resolving insolvency; (iii) a 12.45% increase in the recovery rate of resolving insolvency (cents of dollar); (iv) an increase of one point in the creditor participation index; (v) an increase of 2.5 points in the reorganization proceedings index. It is also noteworthy that the outcome and cost variables (to be detailed later) did not experience any changes. Comparatively, the emerging markets maintained their post-effectiveness scores in comparison to the pre-effectiveness period, indicating that the control group remained consistent.

Subsequently, after preliminarily analyzing the relationship between the Chinese Bankruptcy Law, the Brazilian Bankruptcy Law was analyzed, along with its 'zombie' fractions and its relationship with the variables characteristic of the Brazilian insolvency process. This analysis considers Brazil as the treatment group, as its Bankruptcy Law was published on February 9, 2005, and came into effect on June 9, 2005. Temporally, the analysis considered 2003, 2004, and 2005 as the pre-effectiveness period and 2006, 2007, and 2008 as the effectiveness and post-effectiveness period.

Additionally, the other emerging markets were considered as the control group, except for China, South Korea, Russia, Indonesia, Colombia, and the Czech Republic, which had their bankruptcy laws come into effect in 2007, 2005, 2003, 2004, 2006, and 2007, respectively, or in periods very close to the Brazilian Law, and therefore could adversely influence the control group if there were variations caused by it.

Regarding the Brazilian static 'zombie' fraction, it is noteworthy that the average before the Bankruptcy Law was 10%, and after the Law, it was 12.33%. Additionally, when considering the dynamic 'zombie' fraction, it was observed that it reached 9% before the Law and remained the same at 9% after the Law, indicating stabilization of the fraction of 'zombie' companies in Brazil during this period. Preliminary, this result calls into question the efficiency of the law in acting as a mechanism to contain and resolve the 'zombie' fraction. However, similarly to China, it must be considered that there is a temporal overlap between the Brazilian Bankruptcy Law and the subprime crisis, which presents opposing forces in this context.

Regarding the insolvency process variables, in general, the following were observed: (i) a 34.59% increase in the score resolving insolvency; (ii) a 60% decrease in the time of resolving insolvency; (iii) a 4350% increase in the recovery rate of resolving insolvency (cents of dollar); (iv) a one-point increase in the creditor participation index; (v) the outcome changed to 'going concern' (= 1) instead of 'piecemeal sale' (= 0); and (vi) a 2-point increase in the reorganization proceedings index. It is also noteworthy that the cost variable did not undergo any changes.

Finally, after preliminarily analyzing the impacts of the Chinese and Brazilian Bankruptcy Laws, the relationship between the Indian Bankruptcy Law and its 'zombie' fractions, along with its relationship with the variables characteristic of the Indian insolvency process, was analyzed. This analysis considers India as the treatment group, as its Insolvency and Bankruptcy Code was published on May 28, 2016, and came into effect on December 1, 2016. Although the Code came into effect in 2016, there were significant changes in 2019, as noted in the literature review of this research, which could explain the changes only in that year. Based on this, temporally, the analysis considered 2016, 2017, and 2018 as the pre-effectiveness period and 2019, 2020, and 2021 as the effectiveness and post-effectiveness period

Table 3 - Descriptive statistics – China, Brazil e India

China										
		ZE	**ZD**	**SRI**	**OUT**	**TIME**	**COST**	**RR**	**CRI**	**RPI**
Treatment – China	**Pre Law**	0,03	0,03	24,12	0,00	2,40	22,00	33,97	0,00	0,00
	Post Law	0,03	0,03	54,90	0,00	1,70	22,00	38,20	1,00	2,50
	***Difference* (t)**	0,00	0,00	**-1,99*** **	0,00	**4,01*** **	0,00	**-17,4*** **	**-2,00*** **	**-2,70*** **
Control –Emergent Markets	**Pre Law**	0,03	0,02	44,14	1,00	3,75	15,51	31,20	1,72	0,86
	Post Law	0,06	0,03	45,68	1,00	3,29	15,70	30,20	1,77	0,90
	***Difference* (t)**	**2,81*** **	0,86	-0,53	0,00	0,00	-0,12	-0,47	-0,29	-0,25
Brazil										
		ZE	**ZD**	**SRI**	**OUT**	**TIME**	**COST**	**RR**	**CRI**	**RPI**
Treatment - Brazil	**Pre Law**	0,12	0,09	31,45	0,00	10,00	9,00	0,30	2,00	0,00
	Post Law	0,12	0,09	42,33	1,00	4,00	12,00	13,35	3,00	2,00
	***Difference* (t)**	0,00	0,00	**-2,01*** **	**3,20*** **	**2,50*** **	**-2,00*** **	**-2,01*** **	**-2,70*** **	**-2,56*** **
Control –Emergent Markets	**Pre Law**	0,04	0,03	40,32	1,00	3,66	16,26	32,30	1,70	0,81
	Post Law	0,08	0,07	43	1,00	3,30	16,12	32,73	1,74	0,90
	***Difference* (t)**	**-6,36*** **	**-5,82*** **	0,69	0,00	0,55	0,07	0,47	-0,21	-0,51
India										
		ZE	**ZD**	**SRI**	**OUT**	**TIME**	**COST**	**RR**	**CRI**	**RPI**
Treatment - Índia	**Pre Law**	17,66	15,33	35,36	0,00	4,30	22,00	33,97	1,00	0,00
	Post Law	22,00	18,00	54,00	0,00	1,60	22,00	38,20	1,00	1,00
	***Difference* (t)**	**-2,13*** **	**-2,21*** **	**-1,99*** **	0,00	**4,01*** **	0,00	**-17,35*** **	0,00	**-2,30*** **
Control –Emergent Markets	**Pre Law**	0,09	0,09	55,10	1,00	2,50	15,51	31,20	1,86	1,18
	Post Law	0,12	0,10	55,10	1,00	2,00	15,70	30,20	2 ,00	1,40
	***Difference* (t)**	**-2,26*** **	-0,58	-0,53	0,00	0,00	-0,12	-0,47	-0,98	-1,16

Note: Fraction 'Zombie' - Static (ZE) = The ratio of the number of static 'zombie' companies to the total number of listed companies in the country per year; **Fraction 'Zombie' - Dynamic (ZD)** = The ratio of the number of dynamic 'zombie' companies to the total number of listed companies in the country per year; **t** = t-test of mean differences; ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Source: Authors (2025)

Complementarily**,** the other emerging markets were considered as a control group, except for Turkey, Saudi Arabia, and Egypt, which had their bankruptcy laws enforced in 2018, 2018, and 2019, respectively. Regarding the Indian static 'zombie' fraction, it is noteworthy that the pre-bankruptcy law average was 17.66%, and post-law it was 22%. Additionally, when considering the dynamic 'zombie' fraction, it is observed that the pre-law average was 15.33%, and the post-law average remained the same at 18%, indicating a slight increase in the 'zombie' companies fraction in India during this period.

Preliminarily, this result challenges the efficiency of the law in question as a mechanism for containing and resolving the 'zombie' fraction. However, analogously to China and Brazil, it should also be considered that there is a temporal overlap between the Indian Bankruptcy Law and the COVID-19 crisis. In this context, these represent antagonistic forces, as Bankruptcy Laws are considered mechanisms for mitigating 'zombies,' but financial crises, as mentioned, are considered events that proliferate them.

Based on this, the analysis is complemented not only by the 'zombie' fraction itself but also by adding variables characteristic of the Brazilian bankruptcy process. The Indian Bankruptcy Law led to the following changes in the Indian bankruptcy process: (i) a 52.71% increase in the resolving insolvency score; (ii) a 62.79% decrease in the average time of resolving insolvency; (iii) a 39.71% increase in the recovery rate of resolving insolvency (cents of dollar). It is noteworthy that no significant differences were observed for the static and dynamic 'zombie' fractions around the enactment of the bankruptcy law.

4.4.2 Difference-in-Differences (Diff-in-Diff) Analysis of the Impact of Bankruptcy Law on 'Zombie' Fractions and the Bankruptcy Process

After analyzing the descriptive statistics regarding the changes caused in the 'zombie' fractions of the Chinese, Brazilian, and Indian markets, Difference-in-Differences (DID) models were estimated, which are presented in Table 4 for China, Table 5 for Brazil, Table 6 for India, and Table 7 for the emerging markets.

Initially, the impacts of the Chinese bankruptcy law on the 'zombie' fraction and the Chinese bankruptcy process can be analyzed. To reiterate, this analysis considers China as the treatment group and, as previously described, the other emerging countries that do not have bankruptcy laws enacted close to the same period as the control group.

Before the Chinese bankruptcy law, the difference in the 'zombie' fraction between China and the other countries was 1%, and after the law was enacted, this difference grew to 3%, indicating that the variation in the static 'zombie' fraction for the control group increased

more than the static 'zombie' fraction in China. Both pre- and post-law differences are statistically significant at the 5% and 1% levels, respectively. Finally, the Difference-in-Differences results show a negative parameter of 2% (DiD parameter), indicating that the treatment effect in relation to the control reduces China's 'zombie' fraction relative to other emerging markets, and this relationship is statistically significant at the 10% level. Next, although the same statistics are observed for the dynamic 'zombie' fraction, no statistical significance is found for this last parameter.

Regarding the variables representing the Chinese bankruptcy process, it can be highlighted that the bankruptcy law positively and significantly impacted the resolving insolvency score (SRI), the creditor participation index (CRED), and the reorganization proceedings index, with all these relationships being significant at the 1% level. Moreover, specifically, the Chinese creditor participation index before the bankruptcy law had no criteria met by the indicator. After the bankruptcy law, as can be observed, at least one of these criteria became possible (the criterion for approving the sale of the debtor's substantial assets), allowing greater creditor participation in the bankruptcy process.

This result aligns with what was presented by Li and Ponticelli (2021), as one of the main contributions of the law refers to creditor protection, with secured creditors having priority in the order of payment, followed by payment to workers, tax credits, and unsecured creditors in general. Additionally, according to Lin (2018), the new Bankruptcy Law established a creditor committee to protect their interests. The "reorganization proceedings index" variable showed that, before the bankruptcy law, China did not have adequate criteria, but after the law's implementation, it reached at least 2.5 points, nearly the maximum possible. This result corroborates Lin's (2018) idea that the Chinese law introduced a "recovery" mechanism, establishing a unified bankruptcy legal framework, prioritizing secured creditors over workers.

Additionally, a placebo test was performed to verify whether the effects observed in the study are truly due to the treatment in China or to external factors. 2015 was used as the placebo year, comparing periods before (2012-2014) and after (2015-2017). The treatment group was China, and the control group consisted of other emerging markets, excluding countries with bankruptcy laws enacted between 2014 and 2018. No significant differences were found between the groups after the placebo year, confirming that the observed effects are attributable to the treatment. The test was not included in the report for the sake of synthesis.

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Table 4 – Diffrence in Difference (Diff-in-Diff) – China Bankruptcy Law

	'Zombie' Fraction				**Bankruptcy**				
	ZE	**ZD**	**SRI**	**OUT**	**TIM**	**COS**	**RR**	**CRED**	**REOR**
Before									
Control	0,04	0,03	43,44	0,21	3,73	15,45	32,18	1,72	0,91
Treatment	0,03	0,01	39,75	0,00	2,22	22,00	35,15	0,00	0,00
Diff (T-C)	-0,01	-0,02	-3,69	-0,21	-1,51	6,55	2,96	-1,72	-0,91
T	-1,06	**-2,42*** **	-1,25	**-3,39*** **	**-4,37*** **	**4,92*** **	1,05	**-13,6*** **	**-5,78*** **
Ater									
Control	0,09	0,07	45,20	0,22	3,20	16,11	33,10	1,80	0,98
Treatment	0,06	0,049	4,90	0,00	1,70	22,00	38,37	1,00	2,50
Diff (T-C)	-0,03	-0,03	9,69	0,22	-1,50	5,88	5,27	-0,80	1,51
T	**5,08*** **	**5,04*** **	**2,84*** **	**3,08*** **	**4,30*** **	**3,83*** **	**1,62***	**5,48*** **	**8,25*** **
Diff-in-Diff	-0,02	-0,01	13,3	0,01	0,03	-0,66	2,30	0,92	2,42
t	**1,65***	0,47	**2,96 *** **	0,91	0,08	0,32	0,53	**4,78 *** **	**10,02*** **

Note: Dependent variables are: ZE = 'Zombie' Fraction – Static; ZD = 'Zombie' Fraction – Dynamic; SRI = Resolving Insolvency Score; OUT = Outcome (0 if 'piecemeal sale' and 1 if 'going concern'); TIM = Time (years); COS = Cost (% of estate); RR = Recovery rate (cents on the dollar); CRED = Creditor participation index (0-4); REOR = Reorganization proceedings index (0-3); t = t-test of mean differences; ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively

Source: Authors (2025)

In sequence, one can analyze the impacts that the Brazilian Bankruptcy Law had on the 'zombie' fraction and also on the Chinese bankruptcy process. To reiterate, this analysis considers Brazil as the treatment group and, as described earlier, the other emerging countries without recently enacted bankruptcy laws as the control group.
Before the Brazilian bankruptcy law, it is observed that the difference between the Brazil group and the other emerging markets was 8%, and after the law came into effect, this difference decreased to 7%, indicating that the variation in the 'zombie' fraction for the control group grew more than the Brazilian 'zombie' fraction, which remained constant. Both the pre- and post-law differences are statistically significant at the 1% level.

Furthermore, the difference-in-differences analysis shows a negative parameter of 1%, though it is not statistically significant. Additionally, although the same statistics were observed for the dynamic 'zombie' fraction, once again, there is no statistical significance for this last parameter. It is also noteworthy that the Brazilian dynamic 'zombie' fraction is lower post-law than pre-law, whereas the average for this variable is higher for the control group post-law.
The results suggest that, although a negative relationship was observed, the difference-in-differences analysis was not significant, questioning the efficiency of the Bankruptcy Law as a mechanism for resolving the 'zombie' fraction.

Moreover, it is considered that the temporal overlap between the Law and the subprime crisis brought antagonistic forces, as financial crises tend to proliferate 'zombie' companies. The analysis also addressed variables of the Brazilian bankruptcy process, in which significant and relevant impacts were observed. The bankruptcy law in Brazil had a positive and significant impact on all the variables analyzed, except for the 'cost' variable. The Brazilian SRI, before the law, was 10.64% below the average of emerging markets, but after the law, this difference decreased to 3.15%, indicating an improvement in Brazil's SRI. The diff-in-diff estimator shows a 13.80% difference, with 1% significance.

Regarding the 'outcome' variable, after the implementation of the law, Brazilian companies started to continue operating ("going concern") rather than being liquidated, which preserves 100% of the company's value, as opposed to the partial sale of assets. The DiD estimator shows an effect of 0.81, also significant at the 1% level, reinforcing Brazil's higher efficiency compared to other emerging markets. The result highlights an important change in the new bankruptcy law, which allows for the sale of the distressed company as a whole, before the establishment of the creditors' list.

Table 5 – Diffrence in Difference (Diff-in-Diff) – Brazil Bankruptcy Law

	'Zombie' Fraction			**Bankruptcy**					
	ZE	**ZD**	**SRI**	**OUT**	**TIM**	**COS**	**RR**	**CRED**	**REOR**
Before									
Control	0,03	0,02	42,02	0,24	2,59	16,30	35,57	1,58	0,76
Treatment	0,12	0,09	31,41	0,23	10,00	9,00	0,24	2,00	0,00
Diff (T-C)	0,08	0,06	-10,64	0,01	7,40	-7,30	-35,33	0,41	-0,76
T	**9,33*** **	**10,03*** **	**-4,11*** **	-0,15	**39,87*** **	**-5,41*** **	**-**	**3,01*** **	**-5,22*** **
Ater									
Control	0,04	0,031	44,64	0,19	3,16	16,25	34,73	1,67	1,03
Treatment	0,12	0,08	47,80	1,00	4,00	12,00	13,35	3,00	2,00
Diff (T-C)	0,07	0,057	3,15	0,80	0,83	-4,25	-21,38	1,32	0,96
T	**10,37*** **	**9,74*** **	0,77	**6,72*** **	**3,03*** **	**2,31*** **	**5,74*** **	**6,05*** **	**4,17*** **
Diff-in-Diff	-0,003	-0,01	13,80	0,81	-6,56	3,04	13,94	0,90	1,73
t	0,27	0,23	**2,85*** **	**5,76*** **	**19,70*** **	1,33	**3,02*** **	**3,50*** **	**6,32*** **

Note: Dependent variables are: ZE = 'Zombie' Fraction – Static; ZD = 'Zombie' Fraction – Dynamic; SRI = Resolving Insolvency Score; OUT = Outcome (0 if 'piecemeal sale' and 1 if 'going concern'); TIM = Time (years); COS = Cost (% of estate); RR = Recovery rate (cents on the dollar); CRED = Creditor participation index (0-4); REOR = Reorganization proceedings index (0-3); t = t-test of mean differences; ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively

Source: Authors (2025)

According to Martins (2019) and Ponticelli and Alencar (2016), before the law, the bankruptcy process favored the fragmented sale of assets (i.e., piecemeal), weakening the financial recovery of companies. By eliminating the concordat and the succession of responsibilities, the new law aims to increase the total value recovered from the sale of companies in financial distress. Furthermore, the "time" variable shows a negative and significant effect of the bankruptcy law on the time of bankruptcy resolution. Before the law, the average resolution time in Brazil was 10 years, 7.4 years longer than in other emerging markets. After the law was implemented, this difference decreased to 0.83 years, indicating a significant improvement. These differences are significant at the 1% level.

Additionally, the law had three important effects on the bankruptcy process. The first, regarding the "resolving bankruptcy recovery rate (RR)" variable, showed a difference-in-differences of 13.94, revealing that, despite the post-law difference still being negative (-21.38), the law reduced this difference compared to the pre-law value of -35.33. This reflects the goal of increasing the recovery rate for secured creditors (Ponticelli & Alencar, 2016). The second effect, on the "creditor resolving index," indicated an improvement of 3.50, signaling an increase in the power of interference and voting by creditors, preserving the value invested in companies (Martins, 2019; Ponticelli & Alencar, 2016).

The third effect was an improvement of 6.32 in the "reorganization proceedings index," highlighting progress in the reorganization process in Brazil. This result aligns with Martins (2019), who stated that the main change in the law was the creation of a mechanism called "recuperação" (recovery) to resolve a company's financial problems without harming creditors.

Additionally, a diff-in-diff placebo test for Brazil was conducted to check if the observed effect is specific to the country. The test used 2015 as the placebo year, with pre-placebo periods (2012-2014) and post-placebo periods (2015-2017).

The treatment group was Brazil, and the control group consisted of emerging markets, excluding countries with bankruptcy laws in place during the period. The test found no significant differences between the groups after the placebo-year, validating the previous results and confirming that the observed effects are attributable to the treatment and not to other factors. The results were not reported for the sake of brevity.

Next, the impacts of the Indian Bankruptcy Law on the 'zombie' fraction and also on the Indian bankruptcy process can be analyzed. To reiterate, this analysis considers India as the treatment group and, as described earlier, the other emerging countries without recently enacted bankruptcy laws as the control group. Before the bankruptcy law, it is observed that

the difference between the 'zombie' fraction in India and the other emerging markets was 8%, and after the law came into effect, this difference remained at 8%. Both the pre- and post-law differences are significant at the 1% level.

Furthermore, the DiD shows a negative parameter of 1% (DiD parameter), but it is not statistically significant. Next, although the same statistics were observed for the dynamic 'zombie' fraction, once again, there is no statistical significance for this last parameter (DiD parameter). It is also noteworthy that the Indian dynamic 'zombie' fraction is lower post-law than pre-law, while the average for this variable is higher for the control group post-law.

Overall, the results indicate that, despite the negative relationship observed, the difference-in-differences analysis was not significant. Therefore, this result questions the efficiency of the law in functioning as a mechanism to contain and resolve the Indian 'zombie' fraction. However, as previously theorized, it should also be considered that there is a temporal overlap between the Indian Bankruptcy Law and the COVID-19 crisis, which in this context, represents antagonistic forces. Based on this, the analysis is complemented not only by the relationship between the 'zombie' fraction and the bankruptcy law, but also by adding variables characteristic of the Indian bankruptcy process.

Regarding the bankruptcy process, significant and relevant impacts were observed on the variables analyzed. The bankruptcy law in India had a positive and significant impact on all variables analyzed, except for the "cost" and "creditor participation index" variables. Before the law, India's SRI was 35.36, and after the implementation of the law, it increased to 54.00. The difference between the treatment effect and the control group was -19.09 before the law, but decreased to -2.13 after, indicating that India's SRI approached the SRI of other emerging markets. The diff-in-diff estimator indicated a difference of 3.42, with 1% significance (except for the post-law period). After the implementation of the bankruptcy law, India, like Brazil, saw that companies started to exit the process as "going concern" (operating companies), rather than being liquidated and their assets sold in parts ("piecemeal sale"). The DiD estimator showed an effect of 0.95, significant at the 1% level, reflecting higher efficiency in India.

The "time" variable revealed a negative and significant effect on the resolution time of insolvency, which in India decreased from 4 years to a difference of 1.61 years before the law, dropping to 0.73 years after implementation, bringing the resolution time closer to the average of emerging markets. Furthermore, within the context of the bankruptcy process, two important effects of the Indian bankruptcy law were observed. The first is on the "resolving insolvency recovery rate (RR)" variable, with a difference-in-differences of 27.18, showing

that, despite the post-law difference being small (6.65), the law made it positive compared to the pre-law value of -20.53. The second effect was on the "reorganization proceedings index" variable, with a difference-in-differences of 0.63, indicating an improvement in the reorganization process in India.

Table 6 – Diffrence in Difference (Diff-in-Diff) – India Bankruptcy Law

	'Zombie' Fraction			**Bankruptcy**					
	ZE	**ZD**	**SRI**	**OUT**	**TIM**	**COS**	**RR**	**CRED**	**REOR**
Before									
Control	0,08	0,05	54,45	0,44	2,38	15,67	46,5	1,87	1,28
Treatment	0,17	0,15	35,36	0,00	4,00	9,00	26,03	1,00	0,33
Diff (T-C)	0,08	0,09	-19,09	-0,44	1,61	-6,67	-20,53	-0,87	-0,95
T	**6,11*** **	**7,30*** **	**-5,77*** **	**-4,63*** **	**7,93 *** **	**-5,03*** **	**-4,02*** **	**-6,16*** **	**-4,18*** **
Ater									
Control	0,12	0,08	56,13	0,48	2,25	15,19	49,91	1,95	1,32
Treatment	0,22	0,18	54,00	1,00	3,00	10,50	56,56	1,00	1,00
Diff (T-C)	0,08	0,09	-2,13	0,51	0,74	-4,69	6,65	-0,95	-0,32
T	**5,86*** **	**6,78*** **	0,58	**4,84*** **	**2,99 *** **	**2,89*** **	1,16	**6,05*** **	1,40
Diff-in-Diff	- 0,00	-0,01	16,95	0,95	-0,87	1,98	27,18	-0,08	0,63
t	0,76	0,36	**3,42*** **	**6,69*** **	**2,70*** **	0,94	**3,55*** **	0,40	**1,96** **

Note: Dependent variables are: ZE = 'Zombie' Fraction – Static; ZD = 'Zombie' Fraction – Dynamic; SRI = Resolving Insolvency Score; OUT = Outcome (0 if 'piecemeal sale' and 1 if 'going concern'); TIM = Time (years); COS = Cost (% of estate); RR = Recovery rate (cents on the dollar); CRED = Creditor participation index (0-4); REOR = Reorganization proceedings index (0-3); t = t-test of mean differences; ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively

Source: Authors (2025)

The diff-in-diff placebo for India was conducted to verify whether the observed effect is specific to the country. The test considered 2012 as the placebo year, with pre-placebo periods (2009-2011) and post-placebo periods (2012-2014). The treatment group was India, and the control group was the emerging markets, excluding the Philippines and Chile, which implemented their bankruptcy laws in 2010 and 2014, respectively. The placebo test found no significant differences between the groups before and after the threshold, validating that the observed effects are attributable to the treatment and not other factors.

Finally, in addition to the individual analysis challenging China, Brazil, and India, Table 7 reports the effect of bankruptcy laws on emerging markets in aggregate form. To conduct this analysis, all bankruptcy laws in effect in emerging markets were identified. Following the research of Altman et al. (2024), the post reform variable was created to temporally segregate markets before and after their bankruptcy laws came into effect. Based on this, the initial test was to assess the impact of the post reform on the likelihood of a company entering or exiting a 'zombie' status, as well as the impact on the 'zombie' fractions.

In general, it was found that the post reform reduces the likelihood of a company becoming a 'zombie' by 21% for the static 'zombie' status and 41% for the dynamic 'zombie' status, with all these relationships being significant at the 1% level. As for the fraction of 'zombie' companies, a negative and significant impact of the post reform was again identified, indicating that bankruptcy laws have, in aggregate, reduced the 'zombie' fraction both statically, with an approximate decrease of 2%, and dynamically, with an estimated decrease of 1% in emerging markets. This result highlights the importance of bankruptcy laws, as these reductions counterbalance the rapid growth of 'zombielands', exposing that this decrease represents, at most, 28% fewer static 'zombies', since the average of emerging markets is around 7%, or 33.33% fewer dynamic 'zombies', since the average of emerging markets is around 6%.

Comparatively, this result aligns with the findings of Altman et al. (2024), who reported that countries that enact bankruptcy laws decrease their 'zombie' fraction by 1.4%. The authors argue that inefficient bankruptcy processes play an important role in zombie loans in European countries, and thus bankruptcy laws serve as mechanisms to curb this growth.

Table 7 - Aggregate Analysis of Bankruptcy Laws and 'Zombie' Companies in Emerging Markets

		‘Zombie’ Status			‘Zombie’ Fraction	
Model	**Probit**	**Probit**	**Tobit**	**Tobit**	**Multilevel**	**Multilevel**
	ZE	**ZD**	**ZE**	**ZD**	**ZE**	**ZD**
Post Reform	-0,21	-0,19	-0,43	-0,41	-0,02	-0,01
t	-27,07	-22,24	-27,33	-22,60	-2,32	-2,40
p-valor	**0,00*** **	**0,00*** **	**0,00*** **	**0,00*** **	**0,02** **	**0,01*** **
Constant	-1,74	-0,83	-3,15	-3,16	0,03	0,02
t	-45,39	-55,03	-80,63	-80,63	2,66	0,33
p-valor	**0,00*** **	**0,00*** **	**0,00*** **	**0,00*** **	**0,00*** **	**0,00*** **
Institutional Determinants	Yes	Yes	Yes	Yes	Yes	Yes
Observações	350mil	350mil	350mil	350mil	500	500
LR Test	**-**	**-**	**-**	**-**	**253,36*** **	**88,76*** **

Note: Post Reform = dummy equal to 1 for all annual observations after country i has reformed its bankruptcy code and 0 otherwise; 'Zombie' Status (ZE) = dummy variable that takes the value 1 if the firm is a static ‘zombie’ firm and 0 otherwise; 'Zombie' Status (ZD) = dummy variable that takes the value 1 if the firm is a dynamic ‘zombie’ firm and 0 otherwise; 'Zombie' Fraction (ZE) = Ratio of the number of static 'zombie' companies to the total number of listed companies in the country per year; 'Zombie' Fraction (ZD) = Ratio of the number of dynamic 'zombie' companies to the total number of listed companies in the country per year; Institutional Determinants: interest rate, real GDP, real GDP growth, size, economic freedom, origin, legal, financial development, creditor rights, and debt enforcement. ***, **, and * denote statistical significance at 1%, 5%, and 10%, respectively

Source: Authors (2025)

5. CONCLUSIONS AND FINAL CONSIDERATIONS

The research analyzed the evolution of 'zombie' company fractions in emerging markets, identifying that, on average, these companies represent 7.58% (static) and 5.49% (dynamic). Between 2002 and 2021, a significant growth was observed, with Brazil standing out as having the highest fraction of 'zombie' companies. The research also examined the impact of bankruptcy laws, identifying that they helped stabilize and reduce the fraction of 'zombie' companies in China, Brazil, and India, improving indicators of the bankruptcy process. In aggregate, bankruptcy laws reduced the likelihood of companies becoming 'zombies' by 21% (static) and 41% (dynamic), decreasing the fraction of 'zombie' companies in emerging markets by up to 2% (static) and 1% (dynamic).

The research contributed to the financial field by providing a comprehensive analysis of the factors that determine 'zombie' fractions and their economic-financial consequences, as well as examining the relationship between these fractions and bankruptcy laws. The study investigated the role of reforms in bankruptcy legislation as potential catalysts for solving the 'zombie' company problem, showing how changes in the laws can promote more efficient restructuring or facilitate the liquidation of these companies, thus contributing to the understanding of how these reforms impact 'zombie' fractions.

One limitation of the research is the measurement of 'zombie' fractions due to the lack of consensus on the criteria used to classify these companies, such as interest coverage and the Z-score. The research attempted to address this by using static and dynamic metrics. Another limitation is the absence of private companies, whose 'zombie' fractions may differ from public companies. The research attempted to compensate for this with a broad sample of emerging markets. Additionally, the temporal overlap with economic crises makes it difficult to isolate the impact of bankruptcy laws on the 'zombie' fraction, but the study analyzed the largest emerging economies individually to mitigate this limitation. For future studies, it is suggested to investigate 'zombie' companies that filed for bankruptcy before and after the implementation of bankruptcy laws in emerging markets, assessing the effectiveness of legal reforms.

REFERENCES

ACHARYA, V. T.; CROSIGNANI, M.; EISERT, T.; EUFINGER, C. Zombie credit and (dis)-inflation: Evidence from Europe, Working paper, Liberty Street Economics**, Federal**
ALTMAN, E. I. Financial ratios, discriminant analysis and the prediction of corporate bankruptcy, **Journal of Finance**, v. 23, p. 189–209, 1968.
ALTMAN, E. I. Covid-19 and the credit cycle, **Journal of Credit Risk**, v. 16, n. 2, p. 67–94, 2020.
ALTMAN, E. I.; DAI, R.; WANG, W. Global zombie companies: measurements, determinants, and outcomes. **Journal of International Business Studies**, v. 55, p. 1234-1256, 2024.
ALTMAN, E. I., HOTCHKISS, E.; WANG, W. **Corporate Financial Distress, Restructuring, and Bankruptcy.** 4. ed. New Jersey: Wiley, 2019.
ALTMAN, E. I.; HARZELL, J.; PECK, M. A scoring system for emerging market corporate bonds, **Salomon Brothers,** 1995.
ARAUJO, A. P.; FERREIRA, R. V. X.; FUNCHAL, B. The Brazilian bankruptcy law experience. **Journal of Corporate Finance**, v. 18, n. 4, p. 994–1004, 2012.
BANERJEE, R.; HOFMANN, B. The rise of zombie firms: causes and consequences. **BIS Quarterly Review**, 67–78, 2018.
BOSE, U.; FILOMENI, S.; MALLICK, S. Does bankruptcy law improve the fate of distressed firms? The role of credit channels**. Journal of Corporate Finance**, v. 68, p. 1-24, 2021.
BRANCH, B.; KHIZER, A. Bankruptcy practice in India. **International Review of Financial Analysis,** v. 47, p. 1–6, 2016.
CABALLERO, R.; H1OSHI, T.; KASHYAR, A. K. Zombie lending and depressed restructuring in Japan. **American Economic Review,** v. 98, p. 1943–1977, 2008.
DAI, Y. et al. Throwing good money after bad: Zombie lending and the supply chain contagion of firm exit. **Journal of Economic Behavior and Organization**, v. 189, p. 379–402, 2021.
DEB, S.; DUBE, I. Insolvency and Bankruptcy Code 2016: revisiting with market reality. **International Journal of Law and Management**, v. 63, n. 1, p. 125-146, 2021.
DUGGAR, E. et al. Rising Debt Burdens – Global: Debt after COVID – June 2021. Moody's Investor Service, 7 de junho de 2021.
GOROZPE, J. P. et al. Emerging Markets Monthly Highlights: Rising Yields Could Expose Pockets Of Funding Constraints. **S&P Global Rating**, 10 de novembro de 2021.
HALLAK, I.; HARASZTOSI, P.; SCHICK, S. Fear the walking Dead? incidence and effects of Zombie Firms in Europe**. Journal of Economic Science Research**, v.01, n. 01, p. 24-40, 2018.
KRAEMER, AN.W. et al. Default, Transition, and Recovery: 2020 Annual Global Corporate Default And Rating Transition Study. **S&P Global Ratings**, 7 de Abril de 2021.
LECHNER, M. The estimation of causal effects by difference-in-difference methods. **Foundations and Trends in Econometrics,** v. 4, n. 3, p. 165–224, 2011.
LEUVEN, E.; SIANESI, B. **PSMATCH2**: Stata module to perform full Mahalanobis and propensity score matching, common support graphing, and covariate imbalance testing. Boston, MA: Statistical Software Components, Boston College Department of Economics, 2014.
LI, B.; PONTICELLI, J. Going bankrupt in China, Review of Finance forthcoming. **Review of Finance,** p. 1–38, 2021.
LIN, S. The Empirical Studies of China's Enterprise Bankruptcy Law: Problems and Improvements**. International Insolvency Review,** v. 27, p. 77–109, 2018.
LU, J.; SHI, Z. Does improved disclosure lead to higher executive compensation? Evidence

from the conversion to IFRS and the dual-class share system in China. **Journal of Corporate Finance,** v. 48, p. 244–260, 2018.
MARTINS, H. C. The Brazilian bankruptcy law reform, corporate ownership concentration, and risk-taking. **Management Decision Economic**., v. 41, p. 562–573, 2020.
MCGOWAN, M.A., ANDREWS, D., MILLOT, V. The walking dead? Zombie firms and productivity performance in OECD Countries. Economic Policy, v. 33, n. 96, p. 685–736, 2018.
MSCI. Msci Emergent Markets, 2022. Disponível em: https://www.msci.com/our-solutions/indexes/emerging-markets. Acesso em: 12 de fevereiro de 2022.
MEYER, B. D. Natural and Quasi-Experiments in Economics. **Journal of Business and Economic Statistics**, v. 13, n. 2, p. 151–161, 1995.
PONTCELLI, J.; ALENCAR, L. S. Court enforcement, bank loans, and firm investment: Evidence from a bankruptcy reform in Brazil. **Quarterly Journal of Economics,** v. 131, p. 1365–1413, 2016.
SHARMA, RUCHIR. The Rescues Ruining Capitalism. **Wall Street Journal,** New York, July 24 de julho de 2020.
SCHUMPETER, J.A. **The Theory of Economic Development**. Harvard University Press, Boston, 1934.
ROBERTS, M. R.; WHITED, T. M. Endogeneity in empirical corporate finance. In G.M. Constantinides, M. Harris, R. M. Stulz (Eds.), **Handbook of the economics of finance,** v. 2, p. 493-572, 2013.
TAN, Y. et al. The crowding-out effect of zombie firms: evidence from China's industrial firms**. Economic Research Journal**, v. 52, n. 5, 175– 88.
VIG, V. Access to collateral and corporate debt structure: Evidence from a natural experiment, **Journal of Finance**, v. 68, n. , p. 881–928, 2013.
VILLA, J. M. diff: Simplifying the estimation of difference-in-differences treatment effects. **Stata Journal,** v. 16, n. 1, p. 52–71, 2016.
WOOLDRIDGE. **DifferenceinDifferences Estimation**. p. 1–19, 2019.
WORLD BANK. Doing Business Database, 2021.
ZHANG, H.; YANG, F.; LONG, F. Credit Crunch and Target Capital Structure: Empirical Studies Based on Natural Experiment in China. **Emerging Markets Finance & Trade,** v. 50, p. 229–244, 2015.