U.PORTO

MASTER
IN ECONOMICS OF BUSINESS AND STRATEGY

Wage Rigidity and Firm Survival: Evidence from Portugal

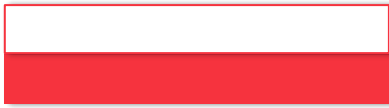
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2026



FACULDADE DE **ECONOMIA**



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Dissertation
Master in Economics of Business and Strategy

Supervised by
Professor Anabela Carneiro

2026

Acknowledgments

First and foremost, I would like to express my sincere gratitude to Professor Anabela Carneiro for her invaluable guidance, unwavering support, and constant availability throughout the development of this dissertation. Her expertise, insightful feedback, and encouragement were fundamental to the completion of this work.

I would also like to thank the Instituto Nacional de Estatística (INE) for granting me access to the Quadros de Pessoal database, without which this research would not have been possible. The opportunity to work with such a valuable source of information was essential to the realization of this dissertation.

My heartfelt thanks go to my friends, whose friendship, encouragement, and support have accompanied me throughout this journey and many other stages of my life. Their presence contributes greatly to my personal growth and well-being.

Finally, and most importantly, I would like to express my deepest gratitude to my family. They have always believed in me, supported my academic aspirations, and taught me the value of education as one of the most powerful tools for personal development. Their unconditional support has been a constant source of strength and motivation. A special word of appreciation goes to my two younger sisters. I hope to continue serving as a positive example and guiding presence in their lives, just as they have been a source of joy and inspiration in mine.

Abstract

Firm survival is an important dimension of economic adjustment, yet the role of wage-setting and contractual structures in firm exit remains comparatively less explored. This dissertation examines whether the wage cushion, minimum-wage incidence, and temporary-contract share are associated with firm exit in Portugal during 2008-2021.

Using matched employer-employee data from Quadros de Pessoal, a longitudinal firm-year panel is constructed. Firm exit probabilities are estimated using Logit models with firm, sectoral, regional, and crisis-period fixed effects. Estimates are interpreted as conditional associations rather than causal effects.

Minimum-wage incidence and temporary-contract share are positively associated with firm exit: a 1-percentage-point increase corresponds to approximately 0.6 and 0.8 percentage-point higher predicted exit probabilities, respectively. Controlling for firm's productivity, a positive association is found between the wage-cushion and the probability of firm exit. The sovereign-debt crisis increases predicted exit, whereas the COVID-19 period reduces it.

The findings indicate that wage-setting and contractual structures are associated with firm survival through distinct mechanisms. The results indicate that holding other factors constant, including productivity, firms that, on average, pay higher wages (measured by the wage cushion) are more likely to exit. Potential endogeneity, including reverse causality between firms' survival prospects and labour-market decisions, limits causal interpretation of the estimated relationships.

JEL classification: J31, J41, L25.

Keywords: Wage Rigidity; Wage Cushion; Firm Survival; Firm Dynamics; Portuguese Labour Market

Resumo

A sobrevivência das empresas é uma dimensão importante do ajustamento económico, contudo, o papel da fixação de salários e das estruturas contratuais no encerramento das empresas permanece comparativamente menos explorado. Esta dissertação examina se a margem salarial, a incidência do salário mínimo e a percentagem de contratos temporários estão associados ao encerramento de empresas em Portugal entre 2008 e 2021.

Utilizando dados correspondentes de empregadores e empregados dos Quadros de Pessoal, foi construído um painel longitudinal de empresas-ano. As probabilidades de encerramento das empresas foram estimadas através de modelos Logit com controlos de empresa, sectoriais, regionais e de período de crise. As estimativas são interpretadas como associações condicionais em vez de efeitos causais.

A incidência do salário mínimo e a percentagem de contratos temporários estão positivamente associadas ao encerramento das empresas: um aumento de 1 ponto percentual corresponde a probabilidades de encerramento previstas aproximadamente 0,6 e 0,8 pontos percentuais mais elevadas, respetivamente. Controlando a produtividade da empresa, observa-se uma associação positiva entre a margem salarial e a probabilidade de encerramento da empresa. A crise da dívida soberana aumenta a previsão de saída, enquanto o período da COVID-19 a reduz.

Os resultados indicam que a definição de salários e as estruturas contratuais estão associadas à sobrevivência das empresas através de mecanismos distintos. Em particular, o resultado da margem de segurança salarial realça a importância da produtividade para a interpretação da flexibilidade salarial. A potencial endogeneidade, incluindo a causalidade inversa entre as perspetivas de sobrevivência das empresas e as decisões do mercado de trabalho, limita a interpretação causal das relações estimadas.

Códigos JEL: J31, J41, L25.

Palavras-chave: Rigidez salarial; Margem de segurança salarial; Sobrevivência da empresa; Dinâmica empresarial; Mercado de trabalho português.

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1. Introduction

Firm survival is an important dimension of economic dynamics, as the entry and exit of firms shape productivity, employment, and the reallocation of resources across the economy. While some firms are able to adapt to changes in demand, costs, competition, and macroeconomic conditions, others exit the market. Understanding the factors associated with firm exit is therefore relevant both for economic research and for policy design, particularly during periods of crisis or structural adjustment. Against this background, the main objective of this dissertation is to examine whether different dimensions of wage-setting and contractual rigidity are associated with firm exit in Portugal.

The literature on firm survival has identified firm size, age, productivity, ownership structure, sector, and economic conditions as important correlates of market exit. Larger, older, and more productive firms generally exhibit greater survival probabilities, whereas younger and less productive firms tend to be more exposed to market selection (Evans, 1987; Foster et al., 2008; Jovanovic, 1982). However, comparatively less attention has been devoted to the role of labour-market institutions and firms' labour-cost adjustment mechanisms in shaping survival. This dimension is particularly relevant in Portugal, where collective bargaining, the statutory minimum wage, and different forms of employment contracts influence firms' ability to adjust labour costs.

Wage rigidity may affect the margins through which firms respond to adverse economic conditions. When wages cannot adjust sufficiently to changes in productivity, demand, or profitability, firms may rely more heavily on alternative forms of adjustment, including lower hiring, employment reductions, or, in more severe circumstances, market exit. Theoretical and empirical contributions show that wage-setting constraints can influence employment adjustment and job destruction (Dickens et al., 2007; Mortensen & Pissarides, 1994), while Portuguese evidence indicates that downward wage constraints may also be associated with firm closure (Carneiro et al., 2014; Carneiro & Portugal, 2003). This dissertation builds on this literature by examining whether differences in firms' wage-setting and contractual structures are systematically associated with their probability of market exit.

The empirical analysis focuses on three firm-level indicators that capture distinct margins of labour-cost adjustment. The first is the wage cushion, defined as the difference between the wage actually paid and the contractual wage floor established through

collective bargaining. In Portugal, firms frequently pay wages above collectively negotiated minima, meaning that actual wages are not fully determined by contractual wage floors (Cardoso & Portugal, 2005). A larger wage cushion may therefore provide firms with greater discretion to adjust wages, although it may also reflect higher productivity and higher wage commitments. The second indicator is minimum-wage incidence, measured as the share of full-time workers receiving the statutory minimum wage. Firms with a larger concentration of workers at the wage floor have less scope for downward wage adjustment because these wages are already constrained by the legal minimum. The third indicator is the share of temporary contracts. Unlike the previous two measures, this variable primarily captures a contractual margin of employment adjustment: firms relying more heavily on temporary employment may be able to modify workforce levels more easily when facing adverse economic conditions.

Based on these mechanisms, the empirical analysis tests whether firms with larger wage cushions exhibit higher probabilities of exit, whether greater minimum-wage incidence is associated with higher exit probabilities, and whether a larger share of temporary contracts is associated with lower exit probabilities through greater contractual flexibility. The analysis additionally examines whether firm-exit probabilities differ during two periods of severe economic disruption: the 2010-2013 sovereign-debt crisis and the COVID-19 crisis. The hypotheses are tested using firm-level Logit models, with Probit specifications used as robustness checks. Given the observational nature of the data and the possibility that wage-setting and contractual decisions are themselves related to firms' underlying survival prospects, the estimates are interpreted as conditional associations rather than causal effects.

This dissertation contributes to the literature by examining several dimensions of wage-setting and contractual rigidity within a common firm-survival framework. Previous Portuguese research has established links between wages, minimum-wage constraints, nominal wage rigidity, and firm closure, while the literature on wage cushions has concentrated primarily on wage formation and the flexibility retained by firms within collective bargaining systems. This study extends these strands of research by analysing whether the wage cushion itself, together with minimum-wage incidence and contractual workforce composition, is associated with market exit. By combining worker-level information with firm-level characteristics from Quadros de Pessoal, the analysis provides evidence on how different margins of labour-cost adjustment relate to firm survival in the Portuguese labour market.

2. Literature review

2.1. Wage rigidity and economic adjustment

The ability of wages to adjust to changing economic conditions has long occupied a key position in labour economics and macroeconomic theory. Early contributions by Keynes (1939) argued that wages do not adjust instantaneously to labour market conditions, helping to explain persistent unemployment during economic downturns. In competitive labour markets, wages are expected to respond to variations in labour demand and supply, allowing firms and workers to adapt to changing economic conditions. However, empirical evidence has consistently shown that wages often exhibit significant rigidity, preventing or delaying this adjustment process. Dickens et al. (2007) document the widespread presence of wage rigidity across a large number of countries, showing that this is not an isolated feature of specific labour markets. More recently, Grigsby et al. (2021), using administrative payroll data, provide further evidence of substantial downward nominal wage rigidity, showing that nominal base-wage reductions are particularly uncommon among workers who remain with the same employer.

Wage rigidity generally refers to the limited adjustment of wages in response to changing economic conditions. A distinction is commonly made between nominal and real wage rigidity. Downward nominal wage rigidity refers to the limited ability or willingness of firms to reduce nominal wages. Such rigidity may arise from both institutional and behavioural constraints. In particular, statutory minimum wages and collectively negotiated wage floors may impose lower bounds on wage adjustment, while nominal wage reductions may also be costly for firms when they negatively affect worker morale, effort, or retention. In the Portuguese context, Carneiro et al. (2014) emphasise that statutory and collectively negotiated wage floors, together with restrictions on nominal wage reductions, substantially constrain downward nominal wage adjustment. This constraint becomes particularly relevant in low-inflation environments, since firms have less scope to achieve reductions in real labour costs through inflation when nominal wages cannot be reduced. Real wage rigidity, in turn, refers to a limited response of real wages to changes in productivity and labour market conditions. Consequently, nominal and real wage rigidities can affect the mechanisms through which firms and labour markets respond to economic shocks.

Several theoretical explanations have been proposed to account for wage rigidity. Efficiency-wage models suggest that firms may deliberately pay wages above market-

clearing levels when higher wages improve worker effort and reduce shirking (Shapiro & Stiglitz, 1984). Other explanations emphasise fairness considerations and firms' concerns that wage reductions may damage worker morale and productivity (Bewley, 1999). Empirical evidence supports the relevance of these mechanisms. Using survey evidence from firms in European countries, Du Caju et al. (2015) find that concerns about retaining productive workers and the adverse effects of wage cuts on morale and effort are among the main reasons reported by firms for avoiding nominal wage reductions. They also show that collective bargaining restrictions are particularly relevant in Western European economies. Buchanan and Houser (2022) provide experimental evidence that worker effort declines following nominal wage cuts, providing additional support for morale-based explanations of downward wage rigidity. These mechanisms help explain why firms may prefer to maintain or freeze nominal wages even when deteriorating economic conditions would otherwise call for downward wage adjustment.

The economic consequences of wage rigidity become particularly relevant when firms face adverse shocks. When wages cannot adjust downward, firms may rely more heavily on alternative margins of adjustment, including reductions in hiring, increases in separations, lower employment growth, or reductions in output. Mortensen and Pissarides (1994) provide an important theoretical framework for understanding this relationship through the interaction between productivity, wage determination, and job creation and destruction. In their matching model, the continuation of an employment relationship depends on the surplus generated by the match, and sufficiently adverse productivity shocks can lead to job destruction. Although their framework does not model wage rigidity directly, it illustrates how wage determination and productivity jointly influence the profitability and continuation of employment relationships. This provides a theoretical basis for understanding why restrictions on wage adjustment may shift firms' responses to adverse shocks towards employment adjustment.

More recent empirical evidence provides direct support for this mechanism. Ehrlich and Montes (2024), using linked employer-employee administrative data, find that establishments characterised by greater downward nominal wage rigidity exhibit higher layoff rates and lower hiring rates, indicating that restrictions on wage adjustment affect firms' employment decisions. Evidence for Portugal points in the same direction. Carneiro et al. (2014) find that measures of downward wage rigidity, including the incidence of minimum-wage workers and wage freezes, are negatively associated with net job creation. Furthermore, both measures are positively and significantly associated with the probability

of firm closure, suggesting that wage rigidity may affect adjustment not only through employment changes within surviving firms but also through the extensive margin of firm exit. The Portuguese evidence is particularly relevant because firm shutdowns represented an important component of employment destruction during the economic crisis.

The macroeconomic relevance of wage rigidity is also emphasised by Blanchard and Galí (2005), who show that real wage rigidities can amplify the effects of macroeconomic shocks and create a trade-off between stabilising inflation and stabilising economic activity. When wages do not adjust in line with deteriorating economic conditions, labour costs may remain high relative to productivity, increasing the effects of adverse shocks on employment and output. More recent research, however, suggests that the magnitude of this mechanism depends on how real wage rigidity is measured. Ellington et al. (2024) show that estimates of real wage rigidity differ substantially when wage responses to productivity shocks are distinguished from responses to other shocks, and question whether real wage rigidity alone can account for observed unemployment volatility. This evidence suggests that, although wage rigidity remains an important element of economic adjustment, its effects depend on the nature of the shock and on the specific margin of wage adjustment considered.

Overall, the literature indicates that wage rigidity influences the margins through which firms and labour markets respond to economic disturbances. When wages are more flexible, part of the adjustment to adverse shocks can occur through changes in labour costs while existing employment relationships are maintained. When wage adjustment is constrained, a greater share of the response may instead occur through hiring reductions, separations, employment contraction, or, in more severe circumstances, firm exit. The relationship between wage rigidity and firm survival is therefore consistent with a broader framework in which firms choose among different margins of adjustment when confronted with adverse economic conditions. Building on this literature, the following sections examine whether differences in wage-setting flexibility are associated with the probability of firm exit in Portugal.

2.2. Firm survival

Firm survival and market exit are central topics in the literature on firm dynamics. The continuous entry and exit of firms constitute an important component of market selection and resource reallocation, as labour and capital are reallocated across producers with different levels of efficiency and market performance. Firm exit, however, should not

necessarily be interpreted as synonymous with business failure. Exit may occur through different routes and for different reasons, including closure, bankruptcy, acquisition, or voluntary withdrawal from the market. Literature increasingly recognises firm exit as a heterogeneous phenomenon rather than a single outcome reflecting economic failure (Cefis et al., 2022). Understanding the characteristics associated with firms' ability to remain active in the market has consequently become an important dimension of research on firm dynamics.

The theoretical foundations of firm survival are closely related to Schumpeter's (1942) concept of creative destruction. According to this perspective, economic development involves a continuous process of market selection in which new and more efficient activities replace less competitive ones. Firm exit can therefore constitute part of the normal functioning of competitive markets rather than necessarily reflecting market failure. Through this process, resources are reallocated across firms and activities, contributing to changes in productivity and the structure of industries over time.

Subsequent theoretical contributions formalised the relationship between firm heterogeneity and survival. Jovanovic (1982) developed a model in which firms enter the market with incomplete information regarding their own efficiency and gradually learn about their productivity through market experience. Firms that receive unfavourable information about their efficiency are more likely to contract and eventually exit, whereas more efficient firms tend to survive and expand. Firm age and survival are therefore related through a process of learning and market selection.

Building on these theoretical foundations, a large empirical literature has examined the firm characteristics associated with market survival. Two of the most consistently studied characteristics are firm size and age. Evans (1987) finds that firm survival varies systematically with firm size and age, while evidence for Portugal by Mata and Portugal (1994) shows that the probability of failure among newly created manufacturing firms decreases with initial firm size. Their analysis also demonstrates the importance of industry conditions for the duration of new firms, providing early evidence that survival reflects both firm-specific and market-level characteristics. More broadly, recent reviews of the firm-exit literature continue to identify the liabilities associated with smallness and newness as recurrent explanations for differences in survival probabilities across firms (Cefis et al., 2022).

Firm age is particularly relevant because newly created firms face substantial uncertainty regarding their productivity, market demand, production processes, and competitive position. As firms remain in the market, they acquire information about their efficiency and accumulate experience and organisational capabilities. Consistent with Jovanovic's (1982) learning framework, the probability of survival generally increases as firms move beyond the earliest stages of their life cycle. Nevertheless, recent evidence also indicates that the relationships between size, age, and survival may depend on how firm size is measured and on the stage of the firm life cycle, suggesting that these relationships are not necessarily uniform across all firms (Giannoulakis & Sakellaris, 2022).

Productivity constitutes another central dimension of market selection. More productive firms are generally better positioned to withstand competitive pressures and adverse economic conditions, whereas low-productivity producers are more exposed to exit. Foster et al. (2008) provide important evidence on this relationship by distinguishing between physical productivity and revenue productivity. Their results show that both technical efficiency and demand conditions play important roles in producer survival, highlighting that observed market selection cannot be understood exclusively through measured revenue productivity. Productivity and demand conditions should therefore be considered jointly when analysing differences in firm survival.

Ownership structure and international exposure may also influence survival outcomes, although the relationship is not necessarily straightforward. Evidence for Portugal is particularly relevant in this respect. Mata and Portugal (2002) compare new domestic and foreign-owned firms and find that survival is associated with characteristics such as ownership advantages, initial size, growth strategies, internal organisation, and industry conditions. Once these characteristics are taken into account, they find no intrinsic survival disadvantage or advantage associated simply with foreign ownership. More recent Portuguese evidence by Silva and Moreira (2021) similarly shows that domestic firms exhibit worse unconditional survival prospects than multinational firms, but that much of this difference reflects firm-level characteristics rather than foreign or multinational ownership per se. Their results also indicate substantial sectoral heterogeneity in the relationship between ownership and exit. This evidence suggests that foreign ownership should be treated as one dimension of firm heterogeneity rather than as an unambiguously protective factor.

In addition to firm-specific characteristics, the economic environment in which firms operate affects their survival prospects. Industries differ in competitive intensity, technological requirements, minimum efficient scale, entry conditions, and exposure to aggregate shocks. Bartelsman et al. (2005), using harmonised evidence for several OECD economies, document substantial differences in firm demographics and post-entry performance across both countries and sectors, indicating that sectoral and national conditions are important for explaining firm dynamics. Regional characteristics may also shape survival by affecting local demand, access to labour and finance, agglomeration economies, infrastructure, and exposure to economic shocks. Consequently, controlling for sectoral and regional heterogeneity is important when analysing firm exit.

Periods of economic crisis further reinforce the importance of the external environment for firm survival. Adverse macroeconomic conditions may reduce demand, restrict access to finance, and place pressure on firms' profitability, potentially accelerating market exit among more vulnerable firms. This mechanism is particularly relevant in the Portuguese case. Carneiro et al. (2014) show that firm closures accounted for a substantial share of employment destruction during the economic and sovereign-debt crisis and emphasise the importance of analysing both employment adjustment within continuing firms and adjustment through the exit margin. Their evidence also shows that firms facing stronger financial pressures exhibited higher exit rates during the crisis.

Therefore, the literature indicates that firm survival reflects the interaction of multiple dimensions of firm heterogeneity and economic conditions. Size, age, productivity, ownership structure, industry characteristics, regional conditions, and macroeconomic shocks have all been identified as relevant correlates of market exit. However, the role of labour-cost adjustment within this process has received comparatively less systematic attention. Existing Portuguese evidence already establishes links between wages, minimum-wage constraints, wage rigidity, and firm closure, meaning that the relevant gap is not the complete absence of research connecting wages to survival. Rather, considerably less is known about how different dimensions of firms' wage-setting flexibility, particularly the wage cushion created within the collective bargaining system, are associated with firm exit when considered jointly with other forms of wage and contractual rigidity. This provides the motivation for examining wage-setting mechanisms as an additional dimension of firm heterogeneity in the analysis of survival.

2.3. Collective bargaining and wage cushion

Labour market institutions play an important role in the wage-determination process. Among these institutions, collective bargaining represents a major mechanism through which wages and working conditions are established in many European labour markets. Collective bargaining is particularly relevant in Portugal, where wage setting has traditionally been dominated by sectoral agreements rather than firm-level bargaining. These agreements establish minimum conditions for workers within specific sectors and occupational categories and can be extended beyond the firms and workers directly represented in the bargaining process. As a result, collective bargaining has historically covered a large share of Portuguese employees.

Collective bargaining agreements typically establish wage floors for different occupations, skill levels, and professional categories. These floors define minimum contractual wages, while firms remain free to pay wages above the negotiated levels. Collective bargaining therefore introduces an institutional component into wage determination that may constrain the downward adjustment of labour costs. However, the relationship between collective bargaining and wage rigidity is not necessarily straightforward. The effects of bargaining institutions depend partly on the structure and level at which bargaining takes place (Calmfors & Driffill, 1988), and collectively negotiated wages need not determine actual wages completely. Firms may retain some discretion over remuneration even when they operate under binding collective agreements.

This distinction is especially important in the Portuguese institutional setting. Cardoso & Portugal (2005), using matched information on workers, firms, and collective bargaining agreements, show that contractual wages do not fully determine the wages actually paid by firms. Firms frequently pay above the collectively negotiated wage floor, allowing firm-specific wage-setting arrangements to partially offset the constraints imposed by collective bargaining. The authors also emphasise that Portuguese collective agreements generally establish minimum conditions, particularly base wages for specific occupational categories, while firms remain free to pay higher remuneration according to their own economic circumstances.

The difference between the wage actually paid and the corresponding contractual wage is referred to as the wage cushion. Cardoso and Portugal (2005) use this concept to distinguish the level of wages paid above the collectively negotiated benchmark from the related concept of wage drift, which is generally used to describe differences in wage

growth. The wage cushion therefore captures the component of remuneration over which firms retain discretion after the contractual wage floor has been established. Its existence implies that firms operating under the same collective bargaining framework may nevertheless follow different wage policies.

The economic relevance of the wage cushion extends beyond its contribution to wage dispersion. Since firms cannot individually reduce collectively negotiated wage floors, the portion of remuneration paid above those floors can constitute an additional margin of adjustment. Firms with larger wage cushions may therefore have greater scope to modify labour costs in response to changes in firm-specific economic conditions than firms whose wages are concentrated close to contractual minimum. This mechanism is particularly relevant during adverse shocks, when reductions in the discretionary component of wages can partially absorb pressures that might otherwise be transmitted to employment or other margins of adjustment.

Several theoretical mechanisms may contribute to the existence of wages above contractual minimum. Rent-sharing models suggest that firms with higher profitability may share part of their rents with workers through higher wages (Blanchflower et al., 1996), while efficiency-wage theories argue that employers may voluntarily pay wages above externally determined benchmarks in order to increase effort, reduce turnover, or improve productivity (Akerlof & Yellen, 1986). Wage cushions may therefore reflect both firm performance and deliberate wage-setting strategies. This also implies that their interpretation is not unambiguous: a larger cushion may represent greater potential wage flexibility, but it may simultaneously be associated with higher productivity or higher wage commitments.

More recent evidence for Portugal substantially develops this interpretation. Card and Cardoso (2022) using data linked to collective bargaining agreements, show that a typical worker earns approximately 20% above the applicable contractual wage floor, with larger wage cushions among workers employed by more productive firms. They also find that wage cushions allow actual wages to covary with firm-specific productivity even within the same sectoral bargaining agreement. When contractual wage floors increase, actual wages do not rise one-for-one: part of the increase is absorbed through a compression of the existing wage cushion, producing an average passthrough of approximately 50%. During the Portuguese financial and sovereign-debt crisis, real wage adjustment occurred through several margins, including reductions in real contractual wage floors, reductions in real

wage cushions, and the reallocation of workers towards lower contractual wage categories. These findings reinforce the interpretation of the wage cushion as an important source of within-firm wage flexibility under sectoral bargaining.

The relevance of this mechanism is strengthened by the continuing importance of collective bargaining in Portugal. Recent official data indicate that coverage remains high despite some gradual erosion over time. According to the most recent annual report of the Direção-Geral do Emprego e das Relações de Trabalho (2024), the proportion of employees covered by collective agreements in force declined from 91.4% in 2011 to 83.3% in 2023. The same data show that the rate of updating collective agreements was substantially lower, at 33.5% in 2023, reflecting the distinction between workers covered by an agreement that remains legally in force. This distinction is important because Portugal combines broad institutional coverage with considerable heterogeneity in the degree to which contractual wages are actively updated and in the wage cushions paid by individual firms.

Despite the growing literature on wage cushions, existing research has concentrated mainly on wage determination, the interaction between contractual and actual wages, and the extent to which firms retain wage-setting discretion under collective bargaining. Much less evidence directly examines whether differences in the wage cushion are associated with firm survival or market exit. Existing Portuguese studies establish that wage rigidity more broadly, including constraints associated with minimum wages and wage freezes, can be related to firm closure, but they do not directly estimate whether the wage cushion itself predicts firm exit. This distinction provides the specific motivation for analysing whether firms with different wage cushions exhibit different probabilities of survival after accounting for other dimensions of wage rigidity and firm characteristics.

2.4. Research gap and hypothesis

Existing research linking wage rigidity to firm closure has focused mainly on wage levels, minimum-wage constraints, and nominal wage freezes. Considerably less is known about whether firm-specific wage-setting flexibility within collective bargaining systems, particularly the flexibility represented by the wage cushion, is associated with firm survival. The wage-cushion literature has primarily examined wage determination and the interaction between contractual and actual wages rather than subsequent firm exit. Moreover, limited evidence considers different dimensions of labour-cost rigidity jointly at the firm level. This dissertation addresses this gap by examining the wage cushion

together with minimum-wage incidence and the share of temporary contracts in a common empirical framework. The central question of this dissertation is therefore not whether wage rigidity affects employment adjustment, which is already well established in the literature, but whether differences in the degree and form of rigidity faced by firms are systematically associated with their probability of market exit.

A larger wage cushion is initially expected to be associated with a lower probability of firm exit. Firms paying wages further above contractual wage floors potentially have greater scope to absorb adverse shocks by adjusting the discretionary component of wages before resorting to more extensive forms of adjustment. However, wage cushions may also reflect higher productivity and higher wage commitments, making their relationship with survival theoretically less straightforward. The empirical hypothesis nevertheless follows the conventional flexibility interpretation developed in the wage-cushion literature. By contrast, a higher incidence of minimum-wage employment is expected to be associated with a greater probability of exit. When a larger share of a firm's workforce is already paid at the statutory wage floor, the possibility of downward wage adjustment is constrained.

The expected relationship between temporary contracts and firm exit reflects a different margin of adjustment. Temporary employment may allow firms to modify employment levels more easily in response to adverse conditions, reducing the need to undertake more severe adjustments. Portuguese evidence shows that temporary workers represent an important margin of employment adjustment, with worker flows responding more strongly among temporary than permanent workers. Under this interpretation, firms with a larger share of temporary contracts may possess greater capacity to adjust before reaching the point of market exit.

The analysis also examines whether firm exit is associated with periods of severe economic disruption. Economic crises may reduce demand, constrain access to finance, and place pressure on firms' profitability and liquidity, thereby increasing exit pressures. Nevertheless, different crises may generate different observed exit patterns because of their distinct origins, sectoral incidence, duration, and policy responses.

Based on these arguments, the empirical analysis is guided by the following hypotheses:

H1: Firms characterised by greater wage flexibility are less likely to exit the market.

More specifically:

H1a: Firms with larger wage cushions are expected to exhibit higher probability of market exit.

H1b: Firms with a higher incidence of minimum-wage workers are expected to exhibit higher probability of market exit.

H1c: Firms with a higher share of temporary contracts are expected to exhibit lower probabilities of market exit.

H2: Periods of economic crisis are associated with differences in the probability of firm exit relative to non-crisis periods.

More specifically:

H2a: Firms operating during the 2010-2013 sovereign-debt crisis are expected to exhibit higher probabilities of market exit than firms operating during non-crisis periods.

H2b: Firms operating during the COVID-19 crisis are expected to exhibit higher probabilities of market exit than firms operating during non-crisis periods.

3. Data description

3.1. Quadros de Pessoal

The microdata used in this dissertation comes from Quadros de Pessoal (QP) - a mandatory annual survey of workers and firms in the Portuguese labour market conducted by Gabinete de Estratégia e Planeamento (GEP) from Minister of Labour, Solidarity, and Social Security, and made available by Instituto Nacional de Estatística (INE). The use of QP is justified by the nature of the object of study. The analysis of wage rigidity requires detailed information on the worker, firm, and contractual framework. QP is a longitudinal, employer-employee matched database, allowing workers to be linked to their respective firms. This characteristic makes the database particularly suitable for constructing wage rigidity indicators. Furthermore, information on professional categories and collective labour agreements allows for the calculation of bargained wages, an essential element for distinguishing between wages actually paid and wages determined by institutional mechanisms. QP microdata is also suitable for studying business survival, since the longitudinal structure of the data allows for the construction of a firm-year panel and the identification of the survival or exit of firms from the database over the analysed period.

3.2. Methodology

Using information from QP, the data panel constructed for analysis results from combining information at the firm and worker levels, considering the period from 2008 to 2021. The result is a longitudinal firm-year panel that allows monitoring the survival or exit of firms from the market. The construction of this panel required the processing of data from QP's worker and firm files. The firm data files contain relevant information related to the structural characteristics of the firms, such as number of employees, sector of activity, among others. On the other hand, the worker data files contain salary and contractual information that is necessary for calculating measures of wage rigidity. After processing each of the files, the relevant variables were aggregated at the firm-year level and subsequently integrated into a single panel with the final data.

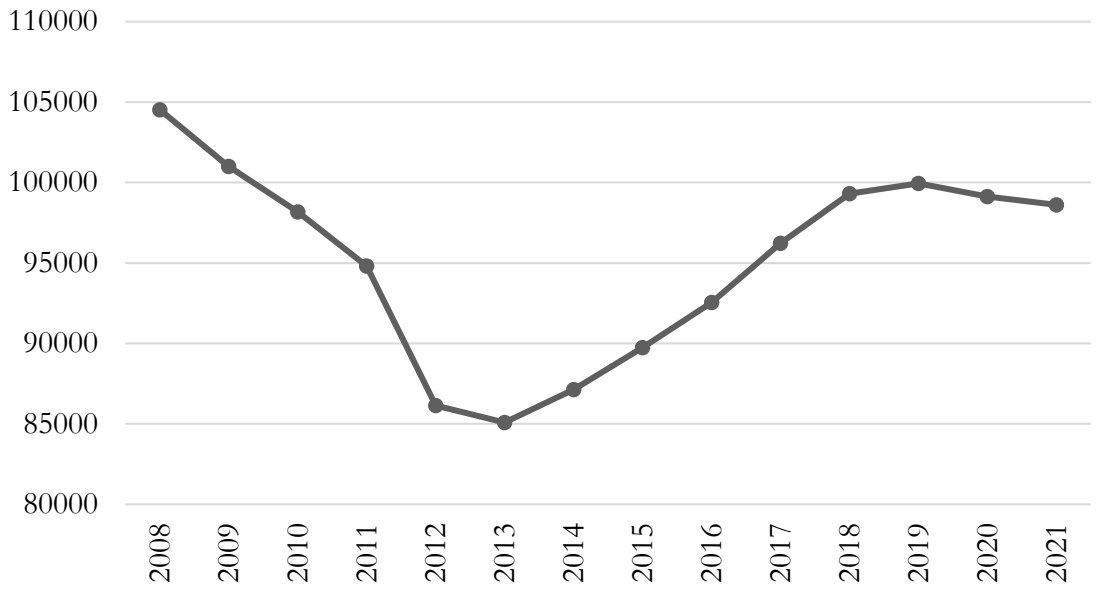
The construction of the data panel required a harmonization of the unique identifiers of the firms. QP presented a change in the identification system in 2010, which makes it difficult to monitor firms over time. To overcome this problem, a unique identifier was created that allowed each firm to be tracked throughout the period analysed. This procedure ensured that the same firm is observed across the different analysed years and allows for the correct identification of its survival or exit from the market. Harmonization

was carried out by matching the identifiers that existed before 2010, using the observed continuity of firms in the database. In cases where it was not possible to establish a direct match, specific identifiers were assigned to ensure the uniqueness of the panel.

The construction of the final sample involved the application of several selection criteria throughout the data treatment process. The analysis was restricted to firms with five or more employees. This restriction reduces problems associated with calculating wage rigidity measures in very small companies where there is not much wage variation. Missing observations in the main variables used in the regressions were also excluded.

Figure 1 presents the evolution of the number of firms included in the final sample between 2008 and 2021. The number of firms decreases substantially during the period associated with the sovereign debt crisis, reaching its lowest value in 2013. After this period, the sample shows a gradual recovery in the number of observed firms.

Figure 1. Number of firms, in thousands, in Portugal (2008-2021)



Source: *Quadros de Pessoal*

3.3. Wage rigidity measures

The analysis of wage rigidity is based on three measures that aim to capture different mechanisms through which wages may exhibit less adjustment flexibility.

The first measure corresponds to the wage cushion. Cardoso and Portugal (2005) define this measure as the difference between the wage actually paid by the firm and the

wage defined by collective bargaining agreements. This difference represents the existing wage margin above the contractually established level and can be interpreted as an additional source of wage flexibility. Firms with a higher wage cushion have a greater capacity for adjustment during periods of economic recession, since part of the wage paid results from components above the institutionally negotiated minimum. This measure is used to analyse wage adjustment mechanisms in Portugal and argue that firms operating under the same collective agreement may still exhibit different levels of wage flexibility because firms frequently pay wages above the negotiated contractual minimum. Card and Cardoso (2022) reinforce the relevance of this measure by showing that wage adjustment in Portugal occurs not only through changes in collectively negotiated wage floors, but also through variations in the wage cushion itself. This evidence suggests that the distance between actual wages and negotiated contractual wages constitutes an important mechanism of wage adjustment within firms.

The construction of the wage cushion followed the methodology proposed by Cardoso and Portugal (2005). First, the effective hourly wage received by each worker was calculated using the base salary plus regular payments divided by the normal number of hours worked. This allows the wage actually paid to be expressed in hourly terms. Second, the contractual wage associated with each professional category and collective agreement was identified. Since QP does not directly report the negotiated contractual wage for each worker, this value was approximated using the modal base salary observed within each professional category covered by the respective collective agreement. To ensure comparability with the effective hourly wage, the contractual wage proxy was also converted into hourly terms by dividing it by the normal working time. Subsequently, the effective hourly wage received by the worker was compared with the contractual hourly wage associated with their professional category and collective agreement. The individual wage cushion indicator corresponds to the difference between the logarithm of the effective hourly wage and the logarithm of the contractual hourly wage proxy. Higher values indicate that the worker receives a wage above the reference wage defined by collective bargaining, reflecting a greater margin for wage adjustment. The calculation was restricted to full-time workers to avoid distortions associated with differences in working time. After the calculation at the individual level, the indicator was aggregated at the firm-year level using the average wage cushion of the workers belonging to each firm. The result corresponds to the average wage cushion observed in each firm-year throughout the analysed period.

The second rigidity measure used corresponds to the incidence of the minimum wage within the firm. Firms with a higher proportion of workers receiving the minimum wage have less room to reduce wages during periods of economic crisis, since wages are at the legally imposed institutional limit. In this context, the incidence of the minimum wage acts as a proxy for wage rigidity at the firm level. Portugal and Cardoso (2006) show that changes in minimum wage legislation in Portugal significantly affected wage distributions and labour market adjustment mechanisms, particularly among workers concentrated around the statutory minimum wage. Their findings suggest that firms with a higher concentration of minimum wage workers face lower wage flexibility because wages are constrained by the legal minimum wage, supporting the use of minimum wage incidence as an indicator of wage rigidity.

The construction of this measure was based on identifying workers whose base remuneration corresponded to the legal national minimum wage in each year of the analyzed period. The annual minimum wage values were obtained from Direção-Geral do Emprego e das Relações do Trabalho (DGERT). The analysis considered only full-time workers, defined as individuals with a weekly working time equal to or greater than 35 hours. This restriction avoids comparability problems associated with part-time workers, whose monthly salaries may fall below the monthly minimum wage without representing a legal breach. The use of full-time workers leads to a more precise identification of the effective incidence of the minimum wage in firms. After identifying the workers covered by the minimum wage, the proportion of these workers relative to the total number of full-time employees in each firm was calculated for each year. The final indicator corresponds to the proxy of the percentage of workers paid at the national minimum wage level within the firm.

The third rigidity measure considered corresponds to the proportion of workers with temporary contracts within each firm. Literature suggests that the use of temporary contracts can function as an additional mechanism to overcome wage rigidity. Blanchard and Landier (2002) argue that fixed-duration contracts emerged as mechanisms that increased firms adjustment flexibility in labour markets characterized by stronger employment protection for permanent workers. In this context, firms with a higher proportion of temporary workers tend to have a greater capacity for adjustment during periods of economic recession, since they can more easily alter the level of employment, reducing the costs associated with human capital, without the need for permanent wage adjustments.

The construction of this measure was based on the identification of the type of contractual relationship observed in QP. Workers were classified according to the permanent or temporary nature of their employment contract in each year. Subsequently, the proportion of temporary contract workers in relation to the total number of workers in each company was calculated. The final indicator corresponds to the percentage of temporary workers within the firm.

Table 1 presents the descriptive statistics of the wage rigidity measures used in the analysis. The results show significant heterogeneity among Portuguese firms regarding different wage and employment adjustment mechanisms. The wage cushion has an average value of 0.316, indicating that, on average, actual hourly wages are above the contractual hourly wage proxy. The dispersion observed in this variable suggests that firms differ in the wage margins paid above collectively negotiated reference wages, reflecting different degrees of wage-setting flexibility. The average incidence of the minimum wage corresponds to approximately 17.6% of workers per firm, showing that minimum wage employment represents a relevant share of the workforce in the sample. Finally, the average proportion of workers with temporary contracts is around 30.7%, indicating that temporary employment is also an important feature of firms' workforce composition in the Portuguese labour market.

Table 1. Descriptive statistics for wage rigidity variables

	Mean	SD	Min.	Max.	N
Wage Cushion	0.316	0.286	-2.536	6.006	1332395
Minimum Wage Incidence	0.176	0.245	0	1.000	1332395
Temporary Contracts Share	0.307	0.315	0	1.000	1332395

Source: *Quadros de Pessoal*

3.4. Firm exit definition

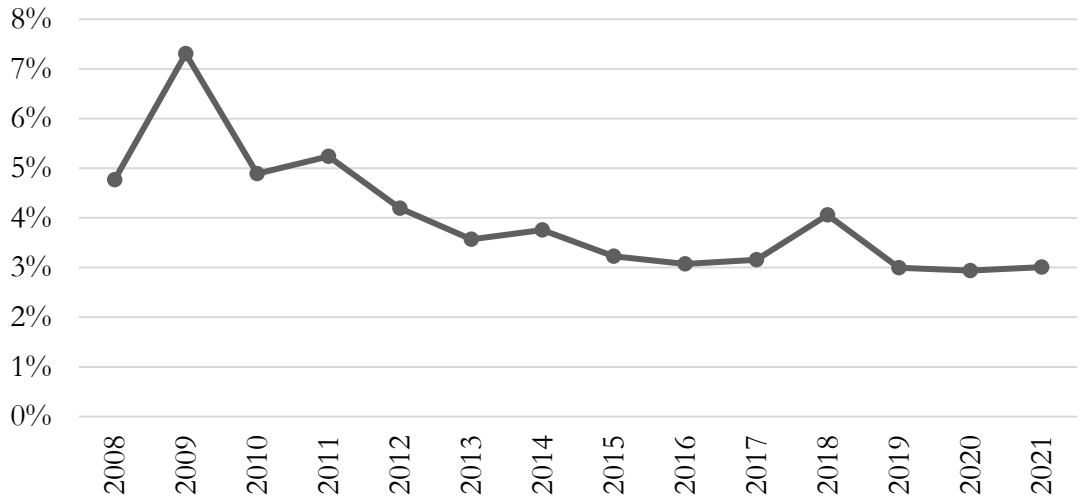
The definition of exit adopted is based on the observed continuity of firms in the database throughout the period analysed. A firm is considered to have left the market when it ceases to be observed in QP and does not reappear in subsequent years, within the analysed period. Thus, an exit corresponds to the last available observation of the firm in the panel.

Although the empirical analysis covers the period from 2008 to 2021, information from 2007, 2022 and 2023 was used to accurately identify exits. The year 2007 is used only

to verify firm presence before the beginning of the analysis period, while 2022 and 2023 are used to check whether firms that disappear from the database reappear in subsequent years. This procedure reduces the risk of classifying temporary absences from Quadros de Pessoal as permanent exits. Therefore, the dependent variable is analysed for firms observed between 2008 and 2021, but its construction relies on a wider observation window to identify firm exit more accurately.

Figure 2 presents the evolution of firm exit rates throughout the analysed period. For example, the exit rate reported for 2008 corresponds to the number of firms observed in 2007 that do not appear in 2008 and subsequent years, divided by the total number of firms observed in 2007. The results show that firm exit rates increased substantially during the 2008 financial crisis. The highest exit rate is observed in 2009, when approximately 7.3% of firms left the market. After 2013, exit rates gradually declined and stabilized at lower levels.

Figure 2. Evolution of exit rate, in percentage (2008-2021)



Source: *Quadros de Pessoal*

3.5. Firm characteristics

A set of firm characteristics that are frequently used in literature and that allow controlling for structural differences between firms that can influence wage rigidity and the probability of going out of business was also included.

Table 2 presents the descriptive statistics for the firm characteristics and control variables used in the analysis. The average firm size, measured as the logarithm of employment, is 2.438, indicating that the sample is mainly composed of relatively small firms. The average firm age is approximately 18 years, suggesting that the panel includes

both young and more established firms. Foreign capital represents, on average, 3.2% of firm capital, although the low mean indicates that most firms in the sample have small or no foreign ownership. The average value of log productivity is 10.791, with considerable dispersion across firms.

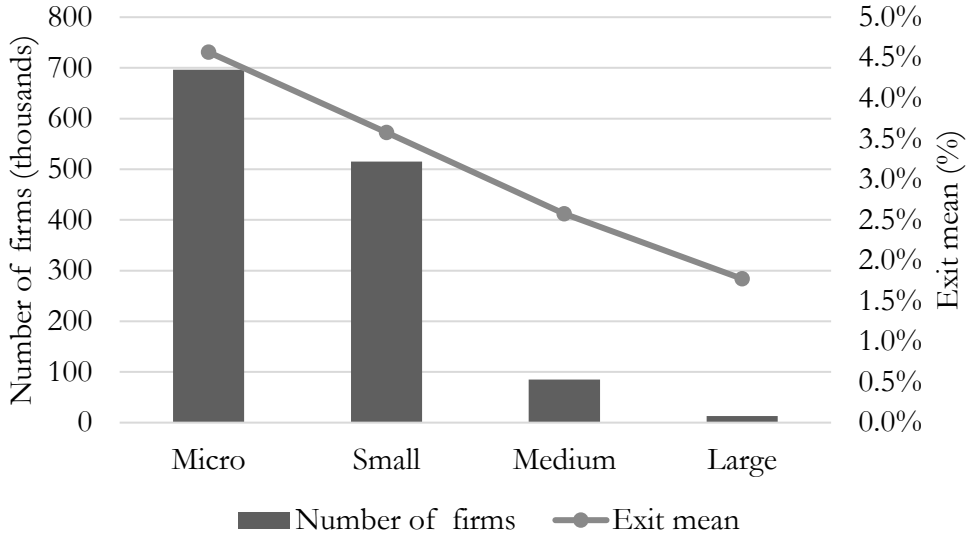
Table 2. Descriptive statistics of firm characteristics

Variable	Mean	SD	Min.	Max.	N
Firm size	2.438	0.893	1.609	10.152	1332395
Firm age	18.041	18.919	0	557	1332395
Foreign capital share	0.032	0.172	0	1	1332395
Productivity (in logs)	10.791	1.093	-4.457	19.894	1332395

Source: *Quadros de Pessoal*

The firm size, calculated as the logarithm of the number of workers employed by the firm, was included because the literature shows that larger firms tend to have lower chances of going out of business. Evans (1987) demonstrates that large firms tend to exhibit lower probabilities of going out of business, suggesting that firm size is an important determinant of business survival. Larger firms generally possess greater financial resources, economies of scale, and stronger market positions, which increase their capacity to withstand adverse economic shocks. Figure 3 shows this pattern as the exit mean decreases progressively with firm size, ranging from 4.57% in micro-firms to 1.77% in large firms.

Figure 3. Number of firms (thousand) and exit rates (%) by firm size category



Source: *Quadros de Pessoal*

The firm's age was also considered as a control variable. The literature identifies a negative relationship between age and the probability of a firm leaving the market. Jovanovic (1982) argues that surviving firms accumulate knowledge and efficiency over time, increasing their probability of remaining in the market. The data presented in Table 3 shows that firms that leave the market are, on average, younger than surviving companies. The percentage of foreign capital was included to control for differences in the ownership structure of the firms. Helpman et al. (2004) show that internationalized firms tend to have higher levels of productivity and greater competitive capacity. In Table 3 is possible to observe that firms that leave the market have a lower presence of foreign capital compared to surviving firms.

Productivity is another relevant variable in the analysis of business survival. Foster et al. (2008) show that differences in productivity explain a significant part of the dynamics of firms entering and exiting. More productive firms have lower probability of exit, given that they have greater competitive capacity and a greater margin to accommodate cost increases during periods of crisis. In this case, the productivity proxy was calculated from the logarithm of the ratio between the firm's turnover and the number of workers employed by it. The firm's revenue for each year was deflated using the Consumer Price Index (CPI), with 2012 as the base year, allowing monetary values to be expressed in real terms and eliminating the effect of inflation over the analysed period. Table 3 shows that surviving firms have higher average productivity levels than those observed in firms that leave the market. The average productivity of the sample also shows a reduction during periods of economic crisis, as seen in Figure 4, particularly in 2010 and 2011, reflecting the impact associated with the Sovereign-Debt Crisis on business activity. Also, the reduction between 2019 and 2020 highlights the impact of the COVID-19 pandemic on productivity.

Table 3. Descriptive statistics of firm characteristics by survival and exit, Average (2008-2021)

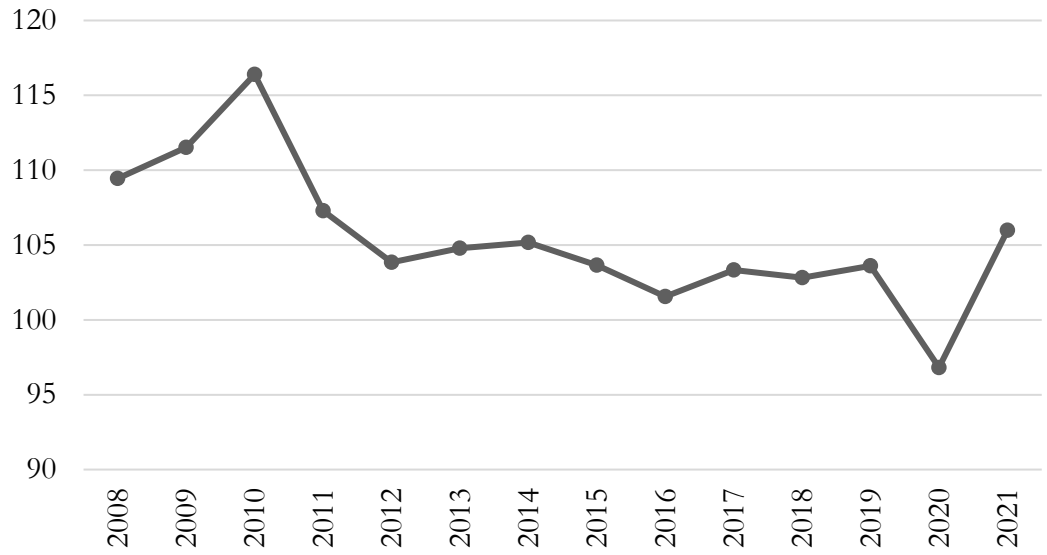
	Variable	Mean	SD	N
Surviving firms	Firm size (in logs)	2.444	0.897	1278166
	Firm age	18.235	19.052	1278166
	Foreign capital share	0.032	0.172	1278166
	Productivity (in logs)	10.805	1.090	1278166
Exiting firms	Firm size (in logs)	2.275	0.768	54229
	Firm age	13.459	14.728	54229
	Foreign capital share	0.026	0.155	54229
	Productivity (in logs)	10.446	1.115	54229

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Total	Firm size (in logs)	2.438	0.893	1332395
	Firm age	18.041	18.919	1332395
	Foreign capital share	0.032	0.172	1332395
	Productivity (in logs)	10.791	1.093	1332395

Source: *Quadros de Pessoal*

Figure 4. Productivity per employee, in thousand euros, Portugal (2008-2021)

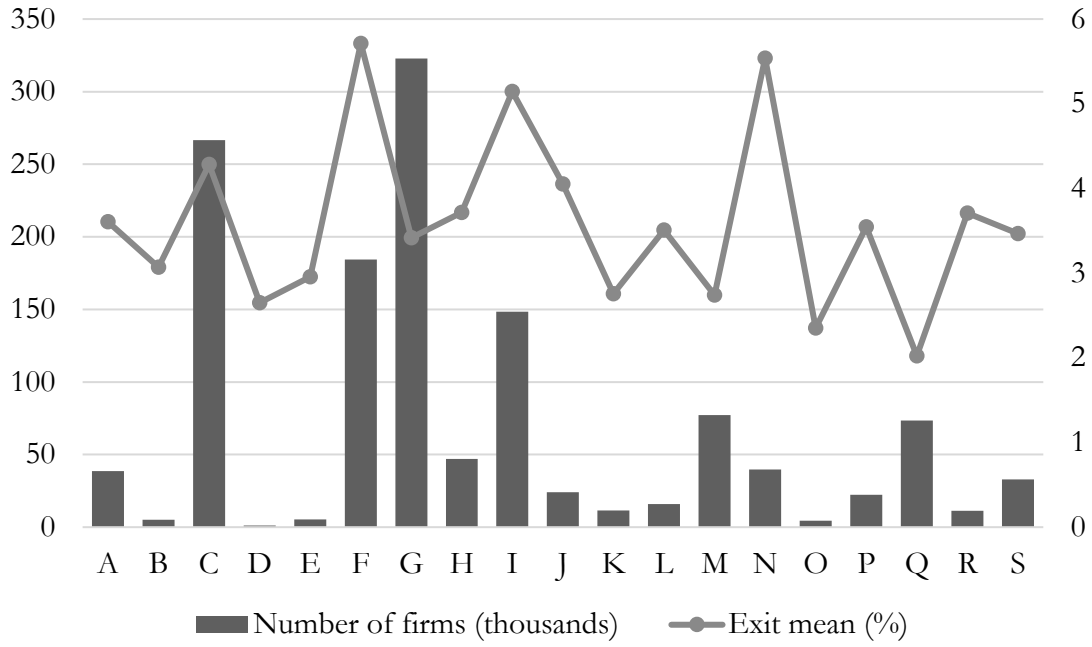


Source: *Quadros de Pessoal*

Sectoral and regional controls were also included. Bartelsman et al. (2005) argue for the importance of controlling for sectoral heterogeneity in business dynamics studies. The probability of exiting varies significantly between sectors of activity due to technological differences, competitive intensity, and exposure to macroeconomic shocks. Sectorial variable was constructed based on the Portuguese Classification of Economic Activities. Figure 5 shows relevant differences between sectors. Activities related to commerce have the greatest representation in the sample, followed by manufacturing industries. Exit rates also differ between sectors. The analysis also includes regional controls at the NUTS II level. The northern region concentrates the largest proportion of companies in the sample, followed by the Lisbon metropolitan area and the central region, as seen in

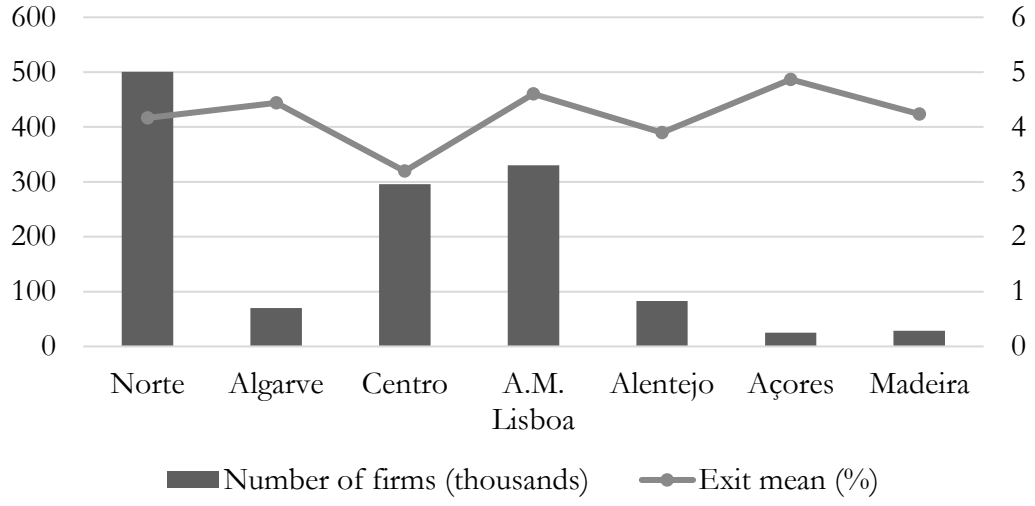
Figure ***6***. Exit rates also show differences between regions, with the highest occurring in the Azores Autonomous Region.

Figure 5. Number of firms (thousands) and exit rates (%) by sector[1]



Source: *Quadros de Pessoal*

Figure 6. Number of firms (thousands) and exit rates (%) by NUTS II, Average (2008-2021)



Source: *Quadros de Pessoal*

[1] The CAE sector correspondent to the letter T (activities of households as employers; undifferentiated goods and services producing activities of households for own use) has zero observations and was not included given the fact that firms with less than 5 employees were removed.

4. Econometric approach

4.1. Wage rigidity and firm exit

Table 4 presents the averages of the wage rigidity measures by firm status - exit or survival. The results show differences between surviving and exiting firms during the analysed period.

Firms that exit the market exhibit, on average, a lower wage cushion than surviving firms. The average wage cushion is 0.318 among surviving firms and 0.280 among exiting firms. This suggests that firms that remain active tend to have slightly larger wage margins above the contractual wage benchmark, which may indicate greater room for wage adjustment.

The incidence of the minimum wage is higher among firms that exit the market. On average, minimum wage incidence is 20.8% among exiting firms, compared with 17.4% among surviving firms. This pattern is consistent with the idea that firms with a higher concentration of workers at the minimum wage may have less room for downward wage adjustment, since these wages are already close to the legal lower bound.

Similarly, firms that exit the market have a higher average share of temporary contracts. The average share of temporary contracts is 35.6% among exiting firms, compared with 30.5% among surviving firms. This difference suggests that a greater reliance on temporary employment may be associated with more fragile or unstable firm structures, rather than necessarily reflecting greater resilience.

Table 4. Wage rigidity measures by firm status, Average (2008-2021)

	Surviving firms (N=1278166)	Exiting firms (N=54229)
Wage Cushion	0.3177 (0.285)	0.2797 (0.288)
Minimum Wage Incidence	0.1744 (0.243)	0.2082 (0.276)
Temporary Contracts Share	0.3045 (0.312)	0.3556 (0.364)

Source: *Quadros de Pessoal*

4.2. Econometric model

The main objective is to analyse how different wage rigidity mechanisms influence the probability of survival of Portuguese firms. Since the dependent variable used assumes only two possible outcomes, i.e., the company remains active in the market or exits the market, the use of traditional linear models is not suitable. In this context, the literature recommends the use of discrete choice models, namely Logit models, which allow estimating the probability of occurrence of a given event as a function of a set of observable characteristics.

The dependent variable corresponds to the binary variable $Exit_{it}$, which assumes the value 1 when the firm i exits the market in period t and 0 otherwise. The probability of exit is modeled as a function of wage rigidity measures and a set of control variables associated with the firm's characteristics. Therefore, the econometric model is given by equation 1:

$$Prob(Exit_{it}) = F(\beta_0 + \beta_1 WageCushion_{it} + \beta_2 MWIncidence_{it} + \beta_3 TempContracts_{it} + \gamma \boldsymbol{X}_{it} + \delta_s + \theta_r \lambda_t) \quad (1)$$

where F is the cumulative logistic function, with i and t denoting each firm and year, respectively. $WageCushion_{it}$ represents the firm's average wage cushion, $MWIncidence_{it}$ corresponds to the incidence of the minimum wage in the firm, and $TempContracts_{it}$ represents the proportion of workers with temporary contracts. $\boldsymbol{X}_{it}$ corresponds to the vector of control variables, while δ_s represents sectoral fixed effects, θ_r represents regional fixed effects, and λ_t represents year fixed effects.

The control variables include firm size, firm age, percentage of foreign capital, and productivity. These variables are frequently used in the literature on business survival and allow for controlling structural differences between firms that can simultaneously influence wage flexibility and the probability of exiting the market.

The main model estimated is the Logit model. This choice is justified by the fact that the dependent variable is binary and by the ease of interpreting the results in terms of probabilities and odds ratios. Additionally, the Logit model is widely used in the empirical literature that analyzes firm entry and exit phenomena.

4.3. Results

Table 5 reports the results of the Logit model estimating the probability of firm exit as a function of the wage-rigidity indicators, firm characteristics, industry and region controls, and crisis-period dummies. Given the sensitivity of the wage-cushion coefficient to the inclusion of productivity, two specifications are reported: one including firm-level productivity and one excluding it. This comparison allows us to assess how conditioning on productivity changes the estimated relationship between the wage cushion and firm exit. The specification including productivity contains 1,332,395 firm-year observations and 226,273 firm clusters, while the specification excluding productivity contains 1,379,740 observations and 232,487 firm clusters. The pseudo-R^2 is 0.037 and 0.027, respectively.

The wage cushion presents the most specification-sensitive result. In the specification including productivity, its coefficient is positive and statistically significant at the 1% level, with the value 0.071 and an average marginal effect of 0.0027. Thus, conditional on the remaining covariates, a larger wage cushion is associated with a higher predicted probability of firm exit. The interpretation of this result should take into account the close relationship between wage cushions and firm productivity. More productive firms have, on average, greater flexibility to adjust wages upwards. Once productivity is controlled for, the results indicate that, all else being equal, firms with similar characteristics, including productivity, that pay relatively higher wages have a higher probability of exiting the market. Therefore, the results provide evidence of a strong correlation between productivity and the wage cushion. Card and Cardoso (2022) show that wage cushions are larger in more productive Portuguese firms and that they allow wages to covary with firm-specific productivity even within the same sectoral collective agreement. Consequently, once productivity is included in the model, the wage-cushion coefficient compares firms with more similar observed productivity levels but different wage cushions. In this setting, a larger cushion may reflect not only greater scope for wage adjustment but also higher wage commitments relative to contractual wage benchmarks. This interpretation is also compatible with the broader evidence of Carneiro and Portugal (2003), who find that, conditional on firm characteristics and a measure of productivity, higher-paying firms exhibit higher rates of firm closure. Mortensen and Pissarides (1994) provide a complementary theoretical perspective by emphasising the joint importance of productivity, wage determination and the profitability of employment relationships in job-destruction decisions. Although their framework concerns job destruction rather than firm exit, and the present estimates do

not identify a causal mechanism, it provides a possible theoretical interpretation for why relatively high wage commitments, conditional on productivity, may be associated with weaker firm survival.

The result changes substantially when productivity is excluded. In this specification, the wage-cushion coefficient is negative and statistically significant, with the value -0.178 and an average marginal effect of approximately -0.007. Larger wage cushions are therefore associated with lower predicted firm-exit probabilities before conditioning on firm-level productivity. This negative association is consistent with the conventional interpretation of the wage cushion as a source of wage-setting flexibility. One possible interpretation is that, during recessionary periods, when these firms are confronted with increases in the minimum contractual wages established through collective bargaining, they may be less affected in terms of wage-bill growth if their wages are further above the contractual minimum than firms whose wages are closer to that minimum. Cardoso and Portugal (2005) show that firm-specific wage cushions partially offset the constraints imposed by collective bargaining and provide firms with additional discretion in setting wages. A closely related mechanism is discussed by Guimarães et al. (2017), who argue that firms paying wages above externally determined wage floors may have greater room to adjust wages following adverse shocks, whereas firms whose wage policies are more constrained by external wages have less room for manoeuvre. Their empirical evidence also shows that greater dependence on externally determined wages is associated with higher probabilities of firm failure.

The negative coefficient obtained in this specification is, therefore, consistent with this wage-adjustment mechanism. However, the reversal from -0.178 to 0.071 once productivity is introduced highlights the correlation between productivity and the wage cushion. Accordingly, hypothesis H1a receives only partial support: the expected negative association is observed in the specification excluding productivity but not once productivity is controlled for. Importantly, the positive coefficient in the productivity specification should not be described as contradicting previous direct empirical evidence on wage cushions and firm exit, since the studies discussed above do not estimate the same relationship using the wage cushion itself as a predictor of firm closure.

Minimum wage incidence is positively and statistically significantly associated with firm exit. In the specification including productivity, the coefficient is 0.153 and the average marginal effect is approximately 0.0059. The result indicates that firms with a larger share

of workers concentrated at the minimum wage exhibit higher predicted probabilities of exit, conditional on the remaining covariates. This finding is closely aligned with previous evidence for Portugal. Carneiro and Portugal (2003) find that firms with a greater incidence of minimum-wage workers face higher failure rates and interpret this relationship in terms of the reduced possibility of downward wage concessions when workers are already at the statutory wage floor. Similarly, Carneiro, Portugal and Varejão (2014) treat the incidence of minimum-wage employment as a proxy for downward wage rigidity and find it to be positively and significantly associated with firm closure. The present result is therefore consistent with the argument that a greater concentration of workers at the wage floor is associated with reduced scope for wage adjustment in response to adverse conditions. The evidence consequently supports hypothesis H1b.

The share of temporary contracts is also positively and statistically significantly associated with firm exit. In the specification including productivity, the coefficient is 0.209 and the average marginal effect is approximately 0.0080. Firms with a higher share of temporary contracts therefore exhibit higher predicted exit probabilities, conditional on the remaining controls. In the present analysis, the temporary-contract share is considered within the wage-rigidity framework rather than as an indicator of employment flexibility. Differences in contractual arrangements may be associated with differences in firms' wage-setting structures and in the way labour costs are distributed and adjusted through wages. The positive coefficient indicates that a greater incidence of temporary contractual arrangements is associated with higher, rather than lower, firm-exit probabilities. Since the available literature considered here does not provide a directly comparable firm-exit estimate that interprets the share of temporary contracts specifically as a wage-rigidity indicator, the underlying mechanism should be interpreted cautiously. Therefore, the result does not provide support for hypothesis H1c.

The control variables generally display economically plausible associations. Firm size, measured by log employment, is negatively and statistically significantly associated with exit, with an average marginal effect of approximately -0.0069 in the specification including productivity. Larger firms therefore exhibit lower predicted exit probabilities. Firm age is also negatively associated with exit, indicating greater survival among older firms. The negative associations of firm size and age with exit are consistent with the broader firm-survival literature. Evans (1987) documents systematic differences in survival according to firm size and age, while Mata and Portugal (1994) find that larger Portuguese entrants face

lower probabilities of failure. The negative association with age is also consistent with Jovanovic's (1982) learning framework, according to which firms that survive and accumulate information about their efficiency become progressively less exposed to market exit.

Productivity presents a particularly strong negative association with firm exit. Its coefficient is -0.338 and its average marginal effect is approximately -0.0130. Firms with higher productivity therefore exhibit lower predicted probabilities of exit, conditional on the other characteristics included in the model. This result is also consistent with Carneiro and Portugal (2003), where sales per worker, used as a productivity proxy, is negatively related to firm closure. The magnitude and statistical significance of the productivity coefficient further reinforce the importance of accounting for productivity when interpreting the wage-cushion estimates. This association between productivity and exit is also consistent with Foster et al. (2008) results that show that less productive producers are disproportionately exposed to exit, while more productive firms are better positioned to survive competitive pressures.

Foreign capital presents a less robust association with firm exit. In the specification including productivity, its coefficient is positive and statistically significant, whereas it becomes small and statistically insignificant when productivity is excluded. This instability is consistent with the more nuanced evidence reviewed above. Mata and Portugal (2002) find no intrinsic survival advantage or disadvantage associated with foreign ownership once relevant firm and industry characteristics are accounted for, while Silva and Moreira (2021) show that differences in survival between domestic and multinational firms are substantially explained by firm-level characteristics and vary across sectors. The present results therefore provide no robust evidence of a systematic relationship between foreign capital and firm exit.

The crisis-period indicators are also statistically significant. The Sovereign-Debt Crisis dummy for 2010-2013 has a positive coefficient in both specifications and an average marginal effect of approximately 0.006 in the specification including productivity. Firms observed during this period therefore exhibit higher predicted exit probabilities, conditional on the other covariates. This result is consistent with Carneiro, Portugal and Varejão (2014) who document the particularly strong contribution of firm shutdowns to job destruction during the Portuguese economic crisis and find wage-rigidity indicators to

be positively associated with firm failure. The positive crisis-period association consequently provides support for hypothesis H2a.

By contrast, the COVID-19 crisis dummy is negative and statistically significant in both specifications. In the specification including productivity, the average marginal effect is approximately -0.011, while it reaches approximately -0.014 when productivity is excluded. Thus, conditional on the observed firm characteristics, the pandemic period is associated with lower observed exit probabilities. This result does not support hypothesis H2b. One possible interpretation is that the exceptional support measures introduced during the pandemic may have temporarily limited or postponed observed firm exits despite the severity of the economic shock. However, the present model does not allow this particular mechanism to be identified directly.

As a robustness check, the models were also estimated using a Probit specification. The full Probit estimates and corresponding average marginal effects are reported in Table C.5, Table C.6, Table C.7 and Table C.8. Overall, the results for the main variables of interest are consistent with those obtained from the Logit models. In particular, minimum-wage incidence and the share of temporary contracts remain positively and statistically significantly associated with firm exit, while the wage cushion exhibits the same sensitivity to the inclusion of productivity: its association is positive when productivity is included and negative when productivity is excluded. These results indicate that the main findings regarding the wage and contractual rigidity measures are not driven by the choice between the Logit and Probit functional forms.

Overall, the Logit estimates indicate that the different dimensions of wage rigidity are not uniformly associated with firm exit. Minimum wage incidence is consistently positively associated with exit, in line with previous Portuguese evidence on downward wage constraints. The temporary-contract share is also positively associated with exit, although its interpretation as a wage-rigidity indicator should remain cautious given the more limited directly comparable literature. The wage cushion presents the most nuanced result: its negative association in the specification excluding productivity is consistent with the interpretation of the cushion as providing additional scope for wage adjustment, whereas its positive association once productivity is controlled for suggests that, among firms with similar observed productivity, larger cushions may also capture higher wage commitments relative to contractual wages. The substantial sign reversal highlights the importance of

productivity for the interpretation of the wage cushion and indicates that H1a is sensitive to model specification rather than uniformly supported.

Table 5. Logit model results

Dependent variable: firm exit (=1 if firm exits the market)

	Including productivity		Excluding productivity	
	Coefficients	Marginal effects	Coefficients	Marginal effects
Wage Cushion	0.071***	0.003***	-0.178***	-0.007***
	(3.32)	(3.32)	(-8.85)	(-8.84)
Minimum Wage Incidence	0.153***	0.006***	0.260***	0.011***
	(7.86)	(7.86)	(13.66)	(13.65)
Temporary Contract Share	0.209***	0.008***	0.337***	0.014***
	(13.81)	(13.80)	(22.36)	(22.29)
Firm Size	-0.179***	-0.007***	-0.179***	-0.007***
	(-27.09)	(-26.92)	(-28.19)	(-28.02)
Firm Age	-0.017***	-0.001***	-0.017***	-0.001***
	(-34.64)	(-34.45)	(-30.02)	(-29.91)
Foreign Capital	0.165***	0.006***	0.031	0.001
	(5.30)	(5.30)	(1.02)	(1.02)
Productivity (in logs)	-0.338***	-0.013***		
	(-61.92)	(-60.73)		
Sovereign-Debt Crisis (2010-2013)	0.167***	0.006***	0.149***	0.006***
	(16.92)	(16.90)	(15.73)	(15.72)
COVID-19 Crisis (2020-2021)	-0.295***	-0.011***	-0.347***	-0.014***
	(-20.31)	(-20.25)	(-24.65)	(-24.54)
Constant	0.760***		-2.700***	
	(11.70)		(-80.11)	
Observations	1,332,395		1,379,740	
Pseudo R^2	0.037		0.027	
Industry dummies	Yes		Yes	
Region dummies	Yes		Yes	

Note: *** denotes significance at 1% level. Robust z-statistics based on standard errors clustered at the firm level are reported in parentheses. Region and industry fixed effects are included but not reported.

5. Conclusion

This dissertation examined the relationship between wage and contractual rigidity and firm survival in Portugal using matched employer-employee data from Quadros de Pessoal for the period 2008-2021. The analysis focused on three firm-level dimensions of labour-cost adjustment: the wage cushion, minimum-wage incidence, and the share of temporary contracts.

The empirical evidence indicates that these dimensions are associated with firm survival in different ways. Minimum-wage incidence displays the most consistent relationship: firms with a larger proportion of workers at the statutory wage floor exhibit higher predicted probabilities of exit across the alternative specifications. This finding is consistent with the argument that firms whose wage structures are concentrated at the legal minimum have less scope for downward wage adjustment when adverse conditions arise. It also reinforces previous Portuguese evidence linking minimum-wage constraints to greater vulnerability to firm closure.

The wage cushion produces a more nuanced result. Its association with firm exit depends substantially on whether productivity is included in the model. Without conditioning on productivity, larger wage cushions are associated with lower exit probabilities, in line with the interpretation of the cushion as a discretionary margin through which firms can adjust wages above collectively negotiated floors. One possible interpretation is that, during recessionary periods, firms whose wages are further above contractual minima may be less affected by increases in collectively bargained minimum wages, since they have greater scope to absorb those increases within the existing wage cushion than firms whose wages are closer to the contractual minimum. Once productivity is controlled for, however, the association becomes positive. More productive firms tend, on average, to have larger wage cushions and greater flexibility to set wages above contractual floors. Controlling for productivity therefore compares firms with more similar observed characteristics, including productivity, and the results indicate that, all else being equal, firms paying relatively higher wages exhibit higher predicted probabilities of exit. The change in sign consequently highlights the strong relationship between productivity and the wage cushion and the importance of accounting for productivity when interpreting its association with firm survival. The sensitivity of this result to model specification therefore constitutes an important finding in itself and highlights the close relationship between productivity, wage-setting practices, and firm survival.

The share of temporary contracts is also positively associated with firm exit, contrary to the initial expectation that greater contractual flexibility would be associated with lower exit probabilities. This finding suggests that the ability to adjust employment through temporary contracts does not necessarily translate into greater firm resilience. Instead, a high reliance on temporary employment may also characterise firms operating under more unstable demand conditions or with greater underlying vulnerability. The result should therefore be interpreted as an association rather than evidence that temporary employment increases the probability of firm failure.

The remaining results are broadly consistent with the firm-survival literature. Larger, older, and more productive firms exhibit lower probabilities of exit, reinforcing the importance of firm heterogeneity in explaining survival. The two crisis periods also display markedly different patterns. The sovereign-debt crisis is positively associated with firm exit, consistent with the severe adjustment experienced by Portuguese firms during that period. In contrast, the COVID-19 period is associated with lower observed exit probabilities conditional on firm characteristics. Although exceptional policy support may have contributed to this pattern, the empirical strategy used in this dissertation does not allow this mechanism to be identified directly.

Taken together, the findings suggest that the relationship between labour-market rigidity and firm survival cannot be summarised by a simple distinction between flexible and rigid firms. Different institutional and contractual margins capture different economic mechanisms. The particularly stable association between minimum-wage incidence and exit indicates that constraints at the statutory wage floor are relevant for firm survival, while the wage-cushion results show that firm-specific wage discretion is closely intertwined with productivity and that its estimated relationship with exit changes substantially once productivity differences across firms are taken into account. Similarly, the temporary-contract results illustrate that contractual flexibility may coexist with, or reflect, greater underlying firm vulnerability. The main contribution of this dissertation is therefore to extend the analysis of wage rigidity beyond its well-established implications for employment adjustment and examine its relationship with the extensive margin of adjustment represented by firm exit.

An important limitation of the analysis concerns endogeneity. The estimated models identify conditional associations and should not be interpreted as establishing causal effects. This concern is particularly relevant for the wage cushion, since wage-setting

decisions and the probability of firm exit may be jointly determined. Firms facing deteriorating economic conditions or anticipating a higher risk of closure may adjust wages and wage cushions, while wage costs may themselves influence profitability and survival. Carneiro and Portugal (2003) explicitly recognise this two-way relationship between wages and firm-closure risk and address it through a simultaneous-equations framework. A similar concern applies to the share of temporary contracts. Firms facing greater uncertainty or weaker expected performance may choose to rely more heavily on temporary employment, implying that a high temporary-contract share may partly reflect pre-existing firm vulnerability rather than independently determine subsequent exit. Unobserved characteristics that simultaneously influence workforce composition and survival may further contribute to this endogeneity. Consequently, the coefficients estimated in this dissertation should be interpreted as associations conditional on observed firm characteristics rather than causal effects.

Several additional limitations provide directions for future research. Firm exit is identified from permanent disappearance from Quadros de Pessoal within the available observation window and may therefore not perfectly distinguish business closure from mergers, administrative identifier changes, or other forms of disappearance. Combining QP with additional administrative information could improve the identification of genuine market exits. Future research could also address the potential endogeneity of wage-setting and contractual variables more directly, for example through suitable instrumental-variable strategies, simultaneous-equations approaches, or research designs exploiting exogenous changes in wage-setting institutions. Extending the analysis to duration models could additionally account more explicitly for the timing of firm exit. Finally, more detailed contractual wage information and analyses of heterogeneity across sectors, firm sizes, regions, and crisis periods could clarify whether the relationship between wage rigidity and survival differs across economic environments.

In conclusion, this dissertation provides evidence that wage-setting constraints and contractual structures are systematically related to firm survival in Portugal, while also showing that these relationships are more complex than a simple flexibility hypothesis would imply. In particular, the results emphasise the importance of distinguishing between different margins of labour-cost adjustment and of accounting for productivity and potential endogeneity when interpreting their relationship with firm exit.

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Annexes

A. Variables of interest

Table A.1. Interest Variables

Variable	Description	Source
Dependent Variable		
Firm Exit	Dummy variable equal to 1 when a firm is observed in year t but is no longer present in the dataset in year t+1, t+2, …, and 0 otherwise.	QP
Wage Rigidity		
Wage Cushion	Firm-year mean of the difference between each worker's actual hourly wage and the corresponding contractual hourly wage. The contractual wage is proxied by the mode base wage of workers in the same occupational category and collective agreement within each year.	QP
Minimum Wage Incidence	Share of full-time workers in the firm whose hourly base wage is equal to or below the statutory hourly minimum wage applicable in the corresponding year.	QP
Temporary Contract Share	Share of workers in the firm employed under fixed-term contracts, including fixed-term and uncertain-term contracts, in each firm-year.	QP
Firm Characteristics		
Firm Size (in logs)	Total number of employees in the firm in each year.	QP
Firm Age	Number of years elapsed between the firm's year of establishment and the current observation year.	QP
Foreign Capital	Measure of foreign ownership in the firm. In the regressions, it captures the firm's foreign-capital participation according to the ownership information available in QP.	QP
Productivity (in logs)	Natural logarithm of the firm-level productivity measure.	QP
Industry	Categorical variable based on the firm's CAE Rev. 2 section. Sector dummy variables are included in the regressions, with one category omitted as the reference group.	QP
Region	Categorical variable identifying the firm's NUTS II region.	QP
Norte	Dummy variable for Norte region. Takes value 1 if firm belongs to Norte, 0 otherwise.	

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Variable	Description	Source
Sovereign-Debt Crisis (2010-2013)	Dummy variable equal to 1 for observations from 2010 to 2013, and 0 otherwise.	QP
COVID-19 Crisis (2020-2021)	Dummy variable equal to 1 for observations in years 2020 and 2021, classified as belonging to the COVID-19 crisis period, and 0 otherwise.	QP

B. Supplementary results underlying the figures

Table B.1. Number of firms and exit rate by year

Year	Number of firms	Number of firms (year-1)	Exits	Exit rate (%)
2008	104532	104409	4977	4.767
2009	100999	104532	7636	7.305
2010	98167	100999	4936	4.887
2011	94816	98167	5143	5.239
2012	86132	94816	3976	4.193
2013	85086	86132	3076	3.571
2014	87142	85086	3197	3.757
2015	89742	87142	2811	3.226
2016	92545	89742	2756	3.071
2017	96228	92545	2922	3.157
2018	99319	96228	3903	4.056
2019	99947	99319	2974	2.994
2020	99135	99947	2938	2.940
2021	98605	99135	2984	3.010

Source: *Quadros de Pessoal*

Table B.2. Firm size distribution

Size category	Number of firms	Share (%)	Exit mean
Micro (<10)	696316	52.268	4.569
Small (10-49)	514853	38.641	3.577
Medium (50-249)	84753	6.361	2.575
Large (>=250)	12743	0.956	1.774

Source: *Quadros de Pessoal*

Table B.3. Productivity by year at constant prices

Year	Productivity	Log productivity
2008	109,445.83	10.764
2009	111,529.78	10.823
2010	116,393.65	10.830
2011	107,276.04	10.768
2012	103,840.33	10.732
2013	104,794.21	10.752
2014	105,171.11	10.756
2015	103,647.71	10.765
2016	101,565.73	10.778
2017	103,334.81	10.806
2018	102,813.63	10.819
2019	103,614.63	10.851
2020	96,818.25	10.755
2021	105,979.92	10.848

Source: *Quadros de Pessoal*

Table B.4. Sectorial distribution

CAE	Sector description	Number of firms	Share (%)	Exit rate (%)
A	Agriculture, forestry and fishing	38709	2.905	3.606
B	Mining and quarrying	5212	0.391	3.070
C	Manufacturing	266611	20.010	4.285
D	Electricity, gas, steam and air conditioning	1170	0.088	2.650
E	Water supply, sewerage, waste management	5377	0.404	2.957
F	Construction	184352	13.836	5.714
G	Wholesale and retail trade; repair of vehicles	322734	24.222	3.418
H	Transport and storage	47031	3.530	3.717
I	Accommodation and food service activities	148440	11.141	5.146
J	Information and communication	24104	1.809	4.053
K	Financial and insurance activities	11395	0.855	2.756
L	Real estate activities	15879	1.192	3.508
M	Professional, scientific and technical activities	77199	5.794	2.742
N	Administrative and support service activities	39736	2.982	5.539
O	Public administration and defense	4462	0.335	2.353
P	Education	22272	1.673	3.547
Q	Human health and social work activities	73493	5.516	2.025
R	Arts, entertainment and recreation	11347	0.852	3.710
S	Other service activities	32867	2.467	3.465

Source: *Quadros de Pessoal*

Table B.5. Regional distribution

Region	Number of firms	Share (%)	Exit rate (%)
Norte	500301	37.549	4.163
Algarve	69979	5.252	4.437
Centro	296022	22.217	3.194
Área Metropolitana de Lisboa	330122	24.777	4.603
Alentejo	82638	6.202	3.899
Açores	24919	1.870	4.868
Madeira	28394	2.131	4.237

Source: *Quadros de Pessoal*

C. Regression results

Table C.1. Logit estimates for firm exit (full results), 2008-2021

Variable	Coefficient	Robust std. err.	z	P>|z|	95% CI lower	95% CI upper
Wage Cushion	0.071	0.021	3.320	0.001	0.029	0.113
Minimum Wage Incidence	0.153	0.019	7.860	0.000	0.115	0.191
Temporary Contract Share	0.209	0.015	13.810	0.000	0.179	0.238
Firm Size	-0.179	0.007	-27.090	0.000	-0.192	-0.166
Firm Age	-0.017	0.000	-34.640	0.000	-0.018	-0.016
Foreign Capital	0.165	0.031	5.300	0.000	0.104	0.225
Productivity (in logs)	-0.338	0.005	-61.920	0.000	-0.349	-0.328
Region						
Algarve	0.008	0.021	0.390	0.697	-0.033	0.050
Centro	-0.167	0.013	-12.560	0.000	-0.193	-0.141
Lisboa	0.289	0.012	23.510	0.000	0.265	0.313
Alentejo	0.030	0.021	1.470	0.142	-0.010	0.071
Açores	0.259	0.033	7.910	0.000	0.195	0.323
Madeira	0.062	0.032	1.920	0.054	-0.001	0.125
Sector						
Mining And Quarrying	0.118	0.088	1.350	0.178	-0.054	0.290
Manufacturing	0.316	0.031	10.370	0.000	0.257	0.376
Electricity And Gas	0.379	0.187	2.030	0.042	0.013	0.746
Water Supply And Waste Management	0.125	0.087	1.430	0.154	-0.047	0.296
Construction	0.395	0.031	12.910	0.000	0.335	0.455
Wholesale And Retail Trade	0.253	0.031	8.260	0.000	0.193	0.313
Transportation And Storage	0.231	0.038	6.020	0.000	0.155	0.306
Accommodation And Food Services	0.221	0.031	7.060	0.000	0.160	0.282
Information And Communication	0.095	0.045	2.140	0.032	0.008	0.183
Financial And Insurance Activities	-0.063	0.066	-0.960	0.338	-0.193	0.066
Real-Estate Activities	-0.130	0.053	-2.450	0.014	-0.235	-0.026

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Variable	Coefficient	Robust std. err.	z	P>|z|	95% CI lower	95% CI upper
Professional, Scientific And Technical Activities	-0.358	0.037	-9.770	0.000	-0.430	-0.287
Administrative And Support-Service Activities	0.296	0.037	8.040	0.000	0.224	0.368
Public Administration And Defence	-0.034	0.113	-0.300	0.763	-0.255	0.187
Education	-0.232	0.048	-4.820	0.000	-0.326	-0.138
Human Health And Social Work	-0.681	0.040	-17.110	0.000	-0.759	-0.603
Arts, Entertainment And Recreation	-0.078	0.059	-1.320	0.185	-0.193	0.037
Other Service Activities	-0.373	0.043	-8.740	0.000	-0.457	-0.290
Sovereign-Debt Crisis (2010-2013)	0.167	0.010	16.920	0.000	0.147	0.186
COVID-19 Crisis (2020-2021)	-0.295	0.015	-20.310	0.000	-0.323	-0.266
Constant	0.760	0.065	11.700	0.000	0.633	0.888
Observations						1332395
Wald $\chi^2(35)$						12874.93
Prob > χ^2						0
Pseudo R^2						0.0371
Log pseudo-likelihood						-218315.63
Firm clusters						226273

Table C.2. Average Marginal Effects of Logit estimates for firm exit (full results), 2008-2021

Variable	dy/dx	Robust std. err.	z	P>|z|	95% CI lower	95% CI upper
Wage Cushion	0.003	0.001	3.320	0.001	0.001	0.004
Minimum Wage Incidence	0.006	0.001	7.860	0.000	0.004	0.007
Temporary Contract Share	0.008	0.001	13.800	0.000	0.007	0.009
Firm Size	-0.007	0.000	-26.920	0.000	-0.007	-0.006
Firm Age	-0.001	0.000	-34.450	0.000	-0.001	-0.001

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Variable	dy/dx	Robust std. err.	z	P>|z|	95% CI lower	95% CI upper
Foreign Capital	0.006	0.001	5.300	0.000	0.004	0.009
Productivity (in logs)	-0.013	0.000	-60.730	0.000	-0.013	-0.013
Region						
Algarve	0.000	0.001	0.390	0.698	-0.001	0.002
Centro	-0.006	0.000	-12.840	0.000	-0.007	-0.005
Lisboa	0.012	0.001	22.780	0.000	0.011	0.013
Alentejo	0.001	0.001	1.450	0.146	0.000	0.003
Açores	0.011	0.002	7.150	0.000	0.008	0.014
Madeira	0.000	0.001	0.390	0.698	-0.001	0.002
Sector						
Mining And Quarrying	0.004	0.003	1.290	0.197	-0.002	0.010
Manufacturing	0.012	0.001	11.490	0.000	0.010	0.014
Electricity And Gas	0.015	0.009	1.730	0.083	-0.002	0.032
Water Supply And Waste Management	0.004	0.003	1.360	0.173	-0.002	0.011
Construction	0.016	0.001	14.580	0.000	0.014	0.018
Wholesale And Retail Trade	0.009	0.001	8.960	0.000	0.007	0.011
Transportation And Storage	0.008	0.001	6.040	0.000	0.006	0.011
Accommodation And Food Services	0.008	0.001	7.530	0.000	0.006	0.010
Information And Communication	0.003	0.002	2.120	0.034	0.000	0.006
Financial And Insurance Activities	-0.002	0.002	-0.970	0.330	-0.006	0.002
Real-Estate Activities	-0.004	0.002	-2.510	0.012	-0.007	-0.001
Professional, Scientific And Technical Activities	-0.010	0.001	-9.240	0.000	-0.012	-0.008
Administrative And Support-Service Activities	0.011	0.001	8.150	0.000	0.009	0.014
Public Administration And Defence	-0.001	0.004	-0.310	0.760	-0.008	0.006
Education	-0.007	0.001	-4.930	0.000	-0.010	-0.004
Human Health And Social Work	-0.017	0.001	-15.710	0.000	-0.019	-0.015
Arts, Entertainment And Recreation	-0.002	0.002	-1.350	0.178	-0.006	0.001
Other Service Activities	-0.010	0.001	-8.690	0.000	-0.013	-0.008

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Variable	dy/dx	Robust std. err.	z	P>|z|	95% CI lower	95% CI upper
Sovereign-Debt Crisis (2010-2013)	0.006	0.000	16.900	0.000	0.006	0.007
COVID-19 Crisis (2020-2021)	-0.011	0.001	-20.250	0.000	-0.012	-0.010

Table C.3. Logit estimates for firm exit, excluding productivity, 2008-2021

Variable	Coefficient	Robust std. err.	z	P>|z|	95% CI lower	95% CI upper
Wage Cushion	-0.178	0.020	-8.850	0.000	-0.217	-0.138
Minimum Wage Incidence	0.260	0.019	13.660	0.000	0.222	0.297
Temporary Contract Share	0.337	0.015	22.360	0.000	0.308	0.367
Firm Size	-0.179	0.006	-28.190	0.000	-0.191	-0.166
Firm Age	-0.017	0.001	-30.020	0.000	-0.018	-0.016
Foreign Capital	0.031	0.030	1.020	0.307	-0.028	0.089
Region						
Algarve	-0.013	0.021	-0.650	0.517	-0.054	0.027
Centro	-0.210	0.013	-16.420	0.000	-0.235	-0.185
Lisboa	0.212	0.012	17.860	0.000	0.189	0.235
Alentejo	-0.007	0.020	-0.340	0.733	-0.046	0.032
Açores	0.281	0.031	8.970	0.000	0.220	0.343
Madeira	0.042	0.031	1.330	0.182	-0.019	0.103
Sector						
Mining And Quarrying	0.104	0.084	1.250	0.212	-0.060	0.268
Manufacturing	0.295	0.030	9.930	0.000	0.237	0.353
Electricity And Gas	-0.079	0.174	-0.450	0.651	-0.421	0.263
Water Supply And Waste Management	-0.097	0.085	-1.130	0.257	-0.264	0.070
Construction	0.434	0.030	14.530	0.000	0.375	0.492
Wholesale And Retail Trade	-0.042	0.030	-1.410	0.158	-0.100	0.016
Transportation And Storage	0.093	0.037	2.510	0.012	0.021	0.166
Accommodation And Food Services	0.220	0.031	7.230	0.000	0.161	0.280
Information And Communication	0.153	0.043	3.550	0.000	0.069	0.237

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Variable	Coefficient	Robust std. err.	z	P>|z|	95% CI lower	95% CI upper
Financial And Insurance Activities	0.006	0.060	0.090	0.926	-0.112	0.123
Real-Estate Activities	-0.111	0.051	-2.200	0.028	-0.211	-0.012
Professional, Scientific And Technical Activities	-0.261	0.036	-7.340	0.000	-0.330	-0.191
Administrative And Support-Service Activities	0.398	0.036	11.130	0.000	0.328	0.468
Public Administration And Defence	1.613	0.064	25.030	0.000	1.486	1.739
Education	0.526	0.042	12.640	0.000	0.444	0.607
Human Health And Social Work	-0.491	0.038	-13.100	0.000	-0.565	-0.418
Arts, Entertainment And Recreation	0.045	0.056	0.790	0.427	-0.065	0.154
Other Service Activities	-0.089	0.040	-2.240	0.025	-0.166	-0.011
Sovereign-Debt Crisis (2010-2013)	0.149	0.009	15.730	0.000	0.131	0.168
COVID-19 Crisis (2020-2021)	-0.347	0.014	-24.650	0.000	-0.375	-0.320
Constant	-2.700	0.034	-80.110	0.000	-2.766	-2.634
Observations						1379740
Wald $\chi^2(35)$						10227.6
Prob > χ^2						0
Pseudo R^2						0.0273
Log pseudolikelihood						-237018
Firm clusters						232487

Table C.4. Average Marginal Effects of Logit estimates for firm exit, excluding productivity, 2008-2021

Variable	dy/dx	Robust std. err.	z	P>|z|	95% CI lower	95% CI upper
Wage Cushion	-0.007	0.001	-8.840	0.000	-0.009	-0.006

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Variable	dy/dx	Robust std. err.	z	P>|z|	95% CI lower	95% CI upper
Minimum Wage Incidence	0.011	0.001	13.650	0.000	0.009	0.012
Temporary Contract Share	0.014	0.001	22.290	0.000	0.012	0.015
Firm Size	-0.007	0.000	-28.020	0.000	-0.008	-0.007
Firm Age	-0.001	0.000	-29.910	0.000	-0.001	-0.001
Foreign Capital	0.001	0.001	1.020	0.307	-0.001	0.004
Region						
Algarve	-0.001	0.001	-0.650	0.515	-0.002	0.001
Centro	-0.008	0.000	-16.850	0.000	-0.009	-0.007
Lisboa	0.009	0.001	17.480	0.000	0.008	0.010
Alentejo	0.000	0.001	-0.340	0.732	-0.002	0.001
Açores	0.013	0.002	8.040	0.000	0.010	0.016
Madeira	0.002	0.001	1.310	0.189	-0.001	0.004
Sector						
Mining And Quarrying	0.004	0.003	1.200	0.230	-0.002	0.010
Manufacturing	0.012	0.001	10.940	0.000	0.010	0.014
Electricity And Gas	-0.003	0.006	-0.470	0.640	-0.014	0.009
Water Supply And Waste Management	-0.003	0.003	-1.170	0.241	-0.009	0.002
Construction	0.019	0.001	16.590	0.000	0.017	0.021
Wholesale And Retail Trade	-0.001	0.001	-1.390	0.164	-0.003	0.001
Transportation And Storage	0.003	0.001	2.520	0.012	0.001	0.006
Accommodation And Food Services	0.009	0.001	7.700	0.000	0.006	0.011
Information And Communication	0.006	0.002	3.500	0.000	0.003	0.009
Financial And Insurance Activities	0.000	0.002	0.090	0.926	-0.004	0.004
Real-Estate Activities	-0.004	0.002	-2.240	0.025	-0.007	0.000
Professional, Scientific And Technical Activities	-0.008	0.001	-7.070	0.000	-0.010	-0.006
Administrative And Support-Service Activities	0.017	0.001	11.300	0.000	0.014	0.020
Public Administration And Defence	0.122	0.008	15.890	0.000	0.107	0.137
Education	0.024	0.002	11.900	0.000	0.020	0.028

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Variable	dy/dx	Robust std. err.	z	P>|z|	95% CI lower	95% CI upper
Human Health And Social Work	-0.014	0.001	-12.300	0.000	-0.016	-0.012
Arts, Entertainment And Recreation	0.002	0.002	0.790	0.432	-0.002	0.006
Other Service Activities	-0.003	0.001	-2.240	0.025	-0.006	0.000
Sovereign-Debt Crisis (2010-2013)	0.006	0.000	15.720	0.000	0.005	0.007
COVID-19 Crisis (2020-2021)	-0.014	0.001	-24.540	0.000	-0.015	-0.013

Table C.5. Probit estimates for firm exit (full results), 2008-2021

Variable	Coefficient	Robust std. err.	z	P>|z|	95% CI lower	95% CI upper
Wage Cushion	0.035	0.009	3.710	0.000	0.017	0.054
Minimum Wage Incidence	0.074	0.009	8.290	0.000	0.057	0.092
Temporary Contract Share	0.099	0.007	14.020	0.000	0.085	0.113
Firm Size	-0.081	0.003	-27.920	0.000	-0.086	-0.075
Firm Age	-0.007	0.000	-28.170	0.000	-0.007	-0.006
Foreign Capital	0.079	0.014	5.760	0.000	0.052	0.106
Productivity (in logs)	-0.149	0.002	-59.860	0.000	-0.154	-0.144
Region						
Algarve	0.002	0.010	0.200	0.841	-0.017	0.021
Centro	-0.074	0.006	-12.610	0.000	-0.086	-0.063
Lisboa	0.131	0.006	23.120	0.000	0.120	0.142
Alentejo	0.015	0.009	1.570	0.117	-0.004	0.033
Açores	0.125	0.015	8.300	0.000	0.095	0.154
Madeira	0.029	0.015	1.970	0.048	0.000	0.058
Sector						
Mining And Quarrying	0.046	0.038	1.210	0.225	-0.029	0.121
Manufacturing	0.138	0.014	10.110	0.000	0.111	0.165
Electricity And Gas	0.187	0.081	2.320	0.021	0.029	0.346
Water Supply And Waste Management	0.064	0.038	1.660	0.096	-0.011	0.139
Construction	0.180	0.014	13.100	0.000	0.153	0.207

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Variable	Coefficient	Robust std. err.	z	P>|z|	95% CI lower	95% CI upper
Wholesale And Retail Trade	0.112	0.014	8.230	0.000	0.086	0.139
Transportation And Storage	0.103	0.017	6.020	0.000	0.069	0.136
Accommodation And Food Services	0.093	0.014	6.670	0.000	0.066	0.121
Information And Communication	0.044	0.020	2.180	0.029	0.004	0.083
Financial And Insurance Activities	-0.008	0.029	-0.270	0.787	-0.065	0.049
Real-Estate Activities	-0.053	0.024	-2.260	0.024	-0.100	-0.007
Professional, Scientific And Technical Activities	-0.159	0.016	-9.850	0.000	-0.190	-0.127
Administrative And Support-Service Activities	0.137	0.017	8.170	0.000	0.104	0.170
Public Administration And Defence	0.015	0.049	0.310	0.755	-0.080	0.111
Education	-0.100	0.021	-4.710	0.000	-0.142	-0.059
Human Health And Social Work	-0.293	0.017	-17.120	0.000	-0.326	-0.259
Arts, Entertainment And Recreation	-0.038	0.026	-1.450	0.148	-0.089	0.013
Other Service Activities	-0.171	0.019	-9.010	0.000	-0.208	-0.133
Sovereign-Debt Crisis (2010-2013)	0.075	0.005	16.630	0.000	0.066	0.084
COVID-19 Crisis (2020-2021)	-0.131	0.006	-20.550	0.000	-0.143	-0.118
Constant	-0.016	0.030	-0.550	0.584	-0.074	0.042
Observations						1332395
Wald $\chi^2(35)$						11782.22
Prob > χ^2						0

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Pseudo R^2	0.0359
Log pseudolikelihood	-218582.93
Firm clusters	226273

Table C.6. Average Marginal Effects of Probit estimates for firm exit (full results), 2008-2021

Variable	dy/dx	Robust std. err.	z	P>|z|	95% CI lower	95% CI upper
Wage Cushion	0.003	0.001	3.710	0.000	0.001	0.005
Minimum Wage Incidence	0.006	0.001	8.280	0.000	0.005	0.008
Temporary Contract Share	0.008	0.001	14.000	0.000	0.007	0.010
Firm Size	-0.007	0.000	-27.780	0.000	-0.007	-0.006
Firm Age	-0.001	0.000	-28.180	0.000	-0.001	-0.001
Foreign Capital	0.007	0.001	5.760	0.000	0.004	0.009
Productivity (in logs)	-0.013	0.000	-59.320	0.000	-0.013	-0.012
Region						
Algarve	0.000	0.001	0.200	0.842	-0.001	0.002
Centro	-0.006	0.000	-12.820	0.000	-0.007	-0.005
Lisboa	0.012	0.001	22.540	0.000	0.011	0.013
Alentejo	0.001	0.001	1.550	0.120	0.000	0.003
Açores	0.011	0.001	7.580	0.000	0.008	0.014
Madeira	0.002	0.001	1.930	0.053	0.000	0.005
Sector						
Mining And Quarrying	0.004	0.003	1.170	0.240	-0.002	0.010
Manufacturing	0.012	0.001	11.010	0.000	0.010	0.014
Electricity And Gas	0.017	0.008	2.010	0.045	0.000	0.033
Water Supply And Waste Management	0.005	0.003	1.590	0.111	-0.001	0.011
Construction	0.016	0.001	14.490	0.000	0.014	0.018
Wholesale And Retail Trade	0.009	0.001	8.830	0.000	0.007	0.011
Transportation And Storage	0.008	0.001	6.050	0.000	0.006	0.011
Accommodation And Food Services	0.008	0.001	7.010	0.000	0.005	0.010
Information And Communication	0.003	0.002	2.170	0.030	0.000	0.006
Financial And Insurance Activities	-0.001	0.002	-0.270	0.786	-0.005	0.004

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Variable	dy/dx	Robust std. err.	z	P>|z|	95% CI lower	95% CI upper
Real-Estate Activities	-0.004	0.002	-2.300	0.021	-0.007	-0.001
Professional, Scientific And Technical Activities	-0.010	0.001	-9.370	0.000	-0.012	-0.008
Administrative And Support-Service Activities	0.012	0.001	8.230	0.000	0.009	0.014
Public Administration And Defence	0.001	0.004	0.310	0.757	-0.006	0.008
Education	-0.007	0.001	-4.810	0.000	-0.010	-0.004
Human Health And Social Work	-0.017	0.001	-15.800	0.000	-0.019	-0.015
Arts, Entertainment And Recreation	-0.003	0.002	-1.470	0.141	-0.006	0.001
Other Service Activities	-0.011	0.001	-8.980	0.000	-0.013	-0.009
Sovereign-Debt Crisis (2010-2013)	0.006	0.000	16.610	0.000	0.006	0.007
COVID-19 Crisis (2020-2021)	-0.011	0.001	-20.500	0.000	-0.012	-0.010

Table C.7. Probit estimates for firm exit, excluding productivity, 2008-2021

Variable	Coefficient	Robust std. err.	z	P>|z|	95% CI lower	95% CI upper
Wage Cushion	-0.078	0.009	-8.810	0.000	-0.095	-0.060
Minimum Wage Incidence	0.126	0.009	14.390	0.000	0.109	0.143
Temporary Contract Share	0.161	0.007	23.050	0.000	0.147	0.174
Firm Size	-0.083	0.003	-29.920	0.000	-0.088	-0.078
Firm Age	-0.006	0.000	-24.060	0.000	-0.007	-0.006
Foreign Capital	0.017	0.013	1.310	0.192	-0.009	0.043
Region						
Algarve	-0.009	0.009	-0.900	0.366	-0.027	0.010
Centro	-0.095	0.006	-16.590	0.000	-0.106	-0.083
Lisboa	0.096	0.005	17.590	0.000	0.085	0.107
Alentejo	-0.003	0.009	-0.280	0.780	-0.020	0.015
Açores	0.131	0.015	8.960	0.000	0.102	0.159
Madeira	0.021	0.014	1.510	0.131	-0.006	0.049
Sector						

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Variable	Coefficient	Robust std. err.	z	P>|z|	95% CI lower	95% CI upper
Mining And Quarrying	0.038	0.037	1.030	0.301	-0.034	0.110
Manufacturing	0.130	0.013	9.790	0.000	0.104	0.156
Electricity And Gas	-0.031	0.074	-0.410	0.680	-0.176	0.115
Water Supply And Waste Management	-0.035	0.037	-0.930	0.353	-0.107	0.038
Construction	0.198	0.013	14.800	0.000	0.172	0.225
Wholesale And Retail Trade	-0.021	0.013	-1.590	0.111	-0.047	0.005
Transportation And Storage	0.039	0.017	2.370	0.018	0.007	0.072
Accommodation And Food Services	0.096	0.014	7.000	0.000	0.069	0.122
Information And Communication	0.072	0.019	3.720	0.000	0.034	0.110
Financial And Insurance Activities	0.010	0.026	0.380	0.707	-0.042	0.061
Real-Estate Activities	-0.050	0.022	-2.230	0.026	-0.094	-0.006
Professional, Scientific And Technical Activities	-0.116	0.016	-7.420	0.000	-0.147	-0.085
Administrative And Support-Service Activities	0.184	0.016	11.280	0.000	0.152	0.216
Public Administration And Defence	0.759	0.032	23.800	0.000	0.697	0.822
Education	0.246	0.019	12.870	0.000	0.208	0.283
Human Health And Social Work	-0.215	0.016	-13.330	0.000	-0.247	-0.184
Arts, Entertainment And Recreation	0.018	0.025	0.730	0.464	-0.031	0.067
Other Service Activities	-0.051	0.018	-2.900	0.004	-0.085	-0.016
Sovereign-Debt Crisis (2010-2013)	0.333	0.235	1.420	0.157	-0.128	0.794

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Variable	Coefficient	Robust std. err.	z	P>|z|	95% CI lower	95% CI upper
COVID-19 Crisis (2020-2021)	0.068	0.004	15.610	0.000	0.059	0.077
Constant	-0.155	0.006	-25.030	0.000	-0.167	-0.143
Observations						1379740
Wald $\chi^2(35)$						9730.19
Prob > χ^2						0
Pseudo R^2						0.0265
Log pseudolikelihood						-237210.6
Firm clusters						232487

Table C.8. Average Marginal Effects of Probit estimates for firm exit, excluding productivity, 2008-2021

Variable	dy/dx	Robust std. err.	z	P>|z|	95% CI lower	95% CI upper
Wage Cushion	-0.007	0.001	-8.810	0.000	-0.008	-0.005
Minimum Wage Incidence	0.011	0.001	14.380	0.000	0.010	0.013
Temporary Contract Share	0.014	0.001	22.980	0.000	0.013	0.016
Firm Size	-0.007	0.000	-29.760	0.000	-0.008	-0.007
Firm Age	-0.001	0.000	-24.090	0.000	-0.001	-0.001
Foreign Capital	0.002	0.001	1.310	0.192	-0.001	0.004
Region						
Algarve	-0.001	0.001	-0.910	0.364	-0.002	0.001
Centro	-0.008	0.000	-16.930	0.000	-0.009	-0.007
Lisboa	0.009	0.001	17.290	0.000	0.008	0.010
Alentejo	0.000	0.001	-0.280	0.780	-0.002	0.001
Açores	0.013	0.002	8.160	0.000	0.010	0.016
Madeira	0.002	0.001	1.490	0.137	-0.001	0.004
Sector						
Mining And Quarrying	0.003	0.003	1.010	0.313	-0.003	0.009
Manufacturing	0.012	0.001	10.600	0.000	0.009	0.014
Electricity And Gas	-0.002	0.006	-0.420	0.672	-0.013	0.009
Water Supply And Waste Management	-0.003	0.003	-0.950	0.341	-0.008	0.003
Construction	0.019	0.001	16.510	0.000	0.017	0.021
Wholesale And Retail Trade	-0.002	0.001	-1.570	0.116	-0.004	0.000
Transportation And Storage	0.003	0.001	2.370	0.018	0.001	0.006

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Variable	dy/dx	Robust std. err.	z	P>|z|	95% CI lower	95% CI upper
Accommodation And Food Services	0.008	0.001	7.360	0.000	0.006	0.011
Information And Communication	0.006	0.002	3.670	0.000	0.003	0.009
Financial And Insurance Activities	0.001	0.002	0.370	0.708	-0.003	0.005
Real-Estate Activities	-0.004	0.002	-2.260	0.024	-0.007	-0.001
Professional, Scientific And Technical Activities	-0.008	0.001	-7.170	0.000	-0.011	-0.006
Administrative And Support-Service Activities	0.017	0.002	11.370	0.000	0.014	0.020
Public Administration And Defence	0.113	0.007	16.530	0.000	0.099	0.126
Education	0.024	0.002	12.180	0.000	0.020	0.028
Human Health And Social Work	-0.014	0.001	-12.530	0.000	-0.016	-0.012
Arts, Entertainment And Recreation	0.001	0.002	0.730	0.468	-0.003	0.006
Other Service Activities	-0.004	0.001	-2.890	0.004	-0.007	-0.001
Sovereign-Debt Crisis (2010-2013)	0.035	0.032	1.110	0.267	-0.027	0.098
COVID-19 Crisis (2020-2021)	0.006	0.000	15.590	0.000	0.005	0.007