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Government-led regulatory proportionality and market development: Evidence from Spain's funeral insurance under Solvency II

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ABSTRACT

This study examines how government-led regulatory design shapes market outcomes when harmonised frameworks are applied to locally specific financial products. Focusing on Spain's funeral insurance market, it quantifies the effects of a national proportionality-based adaptation within the Solvency II regime by applying both the simplified Spanish approach and the standard Solvency II framework to the same real insurer portfolio.

Maintaining actuarial, demographic and financial assumptions constant, the results show that the adapted regime reduces Solvency Capital Requirements by more than 80% in key modules, indicating that observed solvency margins are driven primarily by regulatory architecture rather than underlying risk. These differences alter competitive conditions by lowering entry and operating costs for providers qualifying for the adapted treatment, thereby creating incentives based on regulatory classification rather than technical efficiency.

At the same time, Spain's experience suggests that a well-calibrated adaptation can foster the consolidation of a stable and socially widespread market that remains resilient under adverse shocks, including the COVID-19 mortality surge. The findings highlight a central governance trade-off: while regulatory harmonisation enhances transparency and comparability, excessively uniform implementation may constrain specialised products with social value. The study therefore argues for proportionality mechanisms that preserve supervisory consistency while allowing governments sufficient flexibility to support market development and financial inclusion.

1. Introduction

The 2007 global financial crisis marked a turning point in the design and implementation of financial regulation by governments. In response to its systemic effects, international bodies and national supervisors began promoting common regulatory frameworks aimed at strengthening the solvency of financial institutions, reducing contagion risks between markets, and ensuring the overall stability of the financial system—particularly in the face of adverse scenarios that could once again threaten a sector that remains essential to modern societies (Garayeta et al., 2014). One of the clearest examples of intergovernmental regulatory coordination in response to financial crises can be found in the insurance sector, where the European Union adopted Directive, 2009/138/EC, commonly known as Solvency II, which came into effect in 2016 as a harmonised prudential standard for all Member States.

Solvency II is considered an advanced model built upon quantitative risk measurement, strong internal governance, and harmonised supervisory practices. Its implementation has been interpreted by the European Insurance and Occupational Pensions Authority (EIOPA) (ICS: The Time to Engage Is Now!, 2021) and other supervisory bodies as a significant step toward global regulatory convergence, consistent with initiatives such as the Insurance Capital Standard (ICS), promoted by the International Association of Insurance Supervisors. In this context, the European framework aims not only to ensure insurers' technical solvency but also to promote competitive neutrality across jurisdictions, thereby reducing regulatory arbitrage.

However, the application of a common framework such as Solvency II to markets with highly specific local structures can create significant tensions between the objectives of regulatory harmonisation and the need for risk-sensitive supervision. This study does not aim to criticise Solvency II per se, but rather to use it as a representative case through which to highlight the structural limitations that may arise when standardised regulatory models agreed upon by different governments are applied to insurance products with unique features. Specifically, we analyse the case of funeral insurance in Spain—a line of business with strong social penetration, but with operational and cultural characteristics that make it difficult to replicate elsewhere in the world.

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Spanish funeral insurance is defined by its service-based delivery (as opposed to the indemnity-based model typical of life insurance), high policyholder retention over long periods, and level premium structures that give rise to the accumulation of specific technical provisions. Following the implementation of Solvency II, the Spanish insurance supervisor (DGSFP) established a simplified regime for the calculation of the Solvency Capital Requirement (SCR) in this segment, explicitly considering its unique structural features and departing from the standard parameters of the European regulatory framework. This adaptation was formalised through Ministerial Order ECC/730/2015.

The existence of this special regime, as well as the existence of diverse regulatory regimes across the globe, raises several key questions concerning regulatory adequacy and supervisory effectiveness: Does it significantly reduce capital requirements? How does such a reduction affect the financial stability of the entities involved? Does it introduce an asymmetric treatment compared to insurers under the general regime? And ultimately, is this level of regulatory flexibility compatible with the principles of proportionality and convergence as promoted at the European level?

This study aims to empirically assess the actual effects of this regulatory adaptation, using real data from one of the largest Spanish insurers specialising in funeral insurance. We compare the capital requirements calculated under both the standard and simplified regimes, evaluating the quantitative impact of the latter as well as its potential implications for competitive fairness and regulatory consistency.

While the funeral insurance sector does not pose systemic risk to the European insurance market, it constitutes a paradigmatic case of how common regulatory frameworks, increasingly adopted by different governments, may encounter substantial limits when applied to local products with distinct structures. This tension between regulatory uniformity and structural specificity is an increasing challenge for governments and supervisors, particularly in contexts where proportionality becomes a tool for simplification that may inadvertently result in weakened oversight or competitive imbalances.

2. Theoretical and regulatory framework

2.1. Global relevance of funeral insurance: heterogeneity and solvency

Funeral insurance, which exists across a wide range of countries and socioeconomic settings, serves as a strong foundation for analysing the limitations of common regulatory frameworks accepted by governments when applied to structurally diverse markets. It not only illustrates the need for regulatory adaptation—as in the Spanish case under Solvency II (Ministerial Order, 2015)—but also provides empirical evidence that the same insurance product can take markedly different forms depending on the cultural, institutional, and economic context in which it operates.

Several studies, such as that by Berg (2018), have highlighted the global significance and structural diversity of funeral insurance. Berg conceptualises it as an intergenerational commitment device that not only covers funeral expenses but also promotes financial and social sustainability by ensuring that financial resources are preserved and used solely for their intended purpose.

A widely cited typology that illustrates this diversity is provided by Hougaard and Chamberlain (2011), who classify funeral service providers based on their formal or informal status and their mutual or collective nature (Table 1).

In many cases, funeral insurance is offered as microinsurance, defined by Churchill and Matul (2012) as the provision of coverage for low-income individuals against specific risks in exchange for affordable premium payments.

Africa is one of the most illustrative regions in this regard. A report by the ILO (Matul et al., 2009) found that in 32 African countries, 14.7 million people were covered by microinsurance products, of which over 8 million—approximately 56%—were covered specifically for funeral-related risks in South Africa. More recent data from The Micro Insurance Network (2022) confirms that funeral insurance remains the leading product in terms of premiums earned within the African microinsurance market (Graph 1).

Table 1
Funeral service providers.

	Formal	Informal
Mutual	Cooperative Insurers Examples: Solidaria https://aseguradorasolidaria.com.co/ ¬ La Equidad in Colombia http://www.laequidadseguros.coop	Community risk-sharing groups Examples: Iddir, damayan funds, funeral societies or associations
Collective	Comercial Insurance Firms Examples: SINAF (Brazil http://www.sinaf.com.br), Sanlam Sky (South Africa), AIC (Haiti), Ocaso (https://www.ocaso.es/esSpain)	Funeral Entities Examples: funeral establishments in Brazil or Colombia, undertakers in South Africa or some pre-need companies in the Philippines.

Source: Own elaboration based on data from the International Labour Organization (2011)

In addition to formal microinsurance, informal funeral insurance also plays a critical role in financial protection, particularly in low-income communities. However, it introduces significant challenges for regulation, supervision, and risk assessment. Although such schemes are typically outside the direct scope of international frameworks like the Insurance Capital Standard (ICS), they are highly relevant to financial inclusion and systemic resilience in many IAIS member countries.

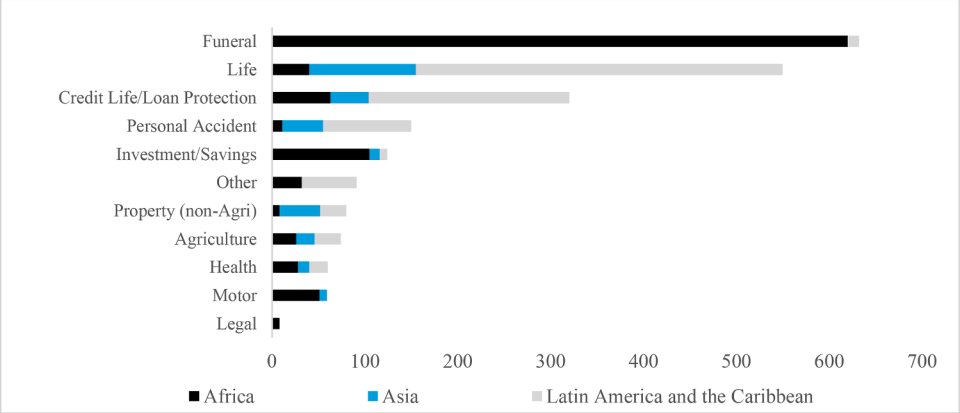
For example, in Zimbabwe, 8% of funeral insurance is linked to traditional burial societies (FinScope Zimbabwe, 2022). In Ethiopia, up to 80% of households participate in funeral associations (iddirs), as reported by Dercon et al. (2004, 2006, 2008). In Tanzania, similar services are offered by indigenous voluntary associations with structured internal governance (Dercon et al., 2004).

Beyond Africa, the significance of funeral insurance is also evident in Latin America and Asia. In Colombia, more than two million people are covered by formal funeral insurance (Cruz, 2022). In Brazil, a substantial portion of the market consists of unregulated prepaid funeral services (Sheirin & Wenner, 2012). In Venezuela, funeral insurance accounted for 1.07% of total premiums and 0.91% of total claims in the insurance sector in 2021 (Orozco, 2021). In the Philippines, where informal insurance models are widely present, the Insurance Commission has reported difficulties in measurement and supervision. According to Llanto et al. (2009), approximately 22.000 financial cooperatives in the country offered informal funeral insurance, representing around 41% of the total microinsurance market.

Within the European context, subject to the common solvency regime established by Solvency II, the coverage of funeral expenses exhibits heterogeneous institutional and regulatory configurations, in some cases even partially located outside the common prudential perimeter. In countries such as France (Giraud, 2023; Xerfi Precepta, 2023) and Germany (BaFin, 2024, 2025), this coverage is predominantly embedded within the life insurance line and structured as a capital-provision product aimed at financing funeral costs, which limits its functional differentiation and reduces its commercial attractiveness relative to life insurance products offering broader coverage.

In Italy, this approach coexists with direct service provision contracts offered by funeral service providers, resulting in hybrid arrangements that blur the insurance perimeter and hinder the uniform application of prudential supervisory mechanisms (IVASS, 2023). The Netherlands represents a distinctive case due to the high level of social penetration of funeral insurance; however, the coexistence of insurers, cooperatives and funeral associations translates into differentiated regulatory regimes, including exemption schemes for certain operators, thereby introducing asymmetries in supervisory requirements (De Nederlandsche Bank, 2017; Mathijssen & Venhorst, 2019).

A different approach can be observed in Portugal, where the



Graph 1. Premiums earned by product line in Africa (USD million).
Source: Micro Insurance Network (2022), own elaboration.

existence of public death benefits and social assistance schemes reduces the need for specific insurance solutions (European Commission, 2012). In United Kingdom, the funeral expense coverage is primarily channelled through traditional life insurance policies and prepaid funeral plans, without the presence of an autonomous funeral insurance market (Financial Conduct Authority, 2022; Woodthorpe et al., 2013).

Consequently, this comparative evidence shows that the application of a common and general-purpose regulatory framework, primarily designed for life insurance, is insufficient to ensure the appropriate development of a structurally heterogeneous product such as funeral insurance. By contrast, the Spanish case highlights how product-specific regulatory recognition, grounded in the principle of proportionality, can foster the consolidation of a stable funeral insurance market, widely extended across society and fully integrated within the common prudential supervisory system.

This increasingly global vision adopted by many governments underscores a key limitation in the design and application of common regulatory frameworks: funeral insurance is structurally heterogeneous, embedded in local cultural practices, and fragmented across formal and informal delivery systems. Therefore, any attempt to apply standardised solvency or supervisory regulations must account for this diversity to avoid both the overregulation of vulnerable models and the creation of regulatory blind spots that undermine oversight and risk control.

2.2. *A singular application of proportionality: funeral insurance in Spain*

Against the backdrop of the global heterogeneity of funeral insurance, the Spanish case represents a paradigmatic example of regulatory adaptation within a supranational framework such as Solvency II. Funeral insurance in Spain is a traditional product, widely adopted, and with a distinctive technical structure, which has required a flexible interpretation of the European solvency framework.

As defined in Article 6 of Law 50/1980 on Insurance Contracts, this type of insurance obliges the insurer to provide the agreed funeral services upon the death of the insured. Although it shares technical similarities with life insurance—such as level premiums and long-term accumulation of technical provisions—the Spanish regulator classifies it as non-life insurance due to its ultimate purpose as a service-based product. This conceptual divergence clashes with the standardized logic of Solvency II, which does not explicitly recognize funeral insurance and tends to incorporate it under life insurance parameters by default.

To address this mismatch, the Spanish Directorate General of Insurance and Pension Funds (DGSFP) enacted Order ECC, 2841/2015, establishing a simplified regime for calculating the Solvency Capital Requirement (SCR) tailored to the specific characteristics of funeral insurance. Among other adjustments, the regulation allows for the consideration of future management decisions—such as premium readjustments—and the application of a time-diluted risk approach in modules such as biometric, underwriting, and interest rate risk.

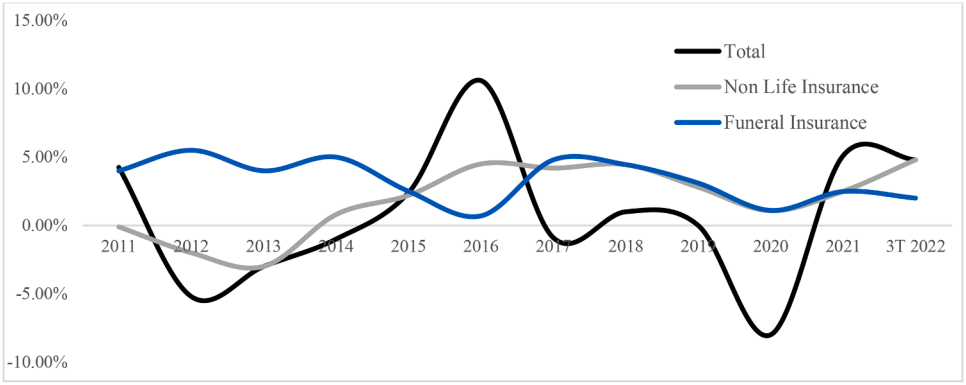
From a regulatory design perspective, risk dilution should not be interpreted merely as a technical adjustment, but as an institutional mechanism that reshapes the allocation of prudential burdens. By explicitly recognising insurers' capacity to implement future management actions -such as the gradual adjustment of premiums within contractual limits- the simplified regime operates as a commitment device, allowing capital requirements to be reduced in the present insofar as part of the risk can be absorbed progressively over time. At the same time, this design raises a classical type-revelation issue, as such treatment is only coherent for products and undertakings with a broad mutualised risk base, portfolio stability, and sufficient operational capacity to execute these actions without undermining policyholder protection. In this sense, risk dilution does not eliminate the underlying risk but rather transforms the way it is managed and supervised, reinforcing the need for clearly defined regulatory perimeters and effective oversight to prevent strategic use of the mechanism

Moreover, the regulation permits the projection of future premiums below those contractually stipulated, reflecting common commercial practices. This adaptation aligns risk assessment with the operational reality of the product, without compromising supervisory standards. The Spanish case thus highlights the tensions between regulatory harmonization and structural adequacy.

Despite its regulatory singularity, funeral insurance in Spain cannot be regarded as a marginal product. On the contrary, it holds significant weight both in terms of market penetration and financial relevance. According to the latest data published by ICEA (2022), this line of business grew by 3.2% in 2021, consolidating its position as the non-compulsory insurance product with the highest market penetration, covering approximately 22 million people—nearly half of the Spanish population. Moreover, each policy includes an average of 2.5 insured individuals, reflecting its family-oriented and multigenerational nature.

The number of non-life insurers operating in this segment has also increased, rising from 12 in 2012 to 18 in 2022, with only two companies not including this product in their portfolios. It is particularly noteworthy that the sector's year-on-year growth has remained consistently positive over the past decade, with annual variations always below 8%, even during periods of significant uncertainty, such as the COVID-19 pandemic (Graph 2).

The observed evolution is particularly relevant when considering the regulatory context in which it occurs. The entry into force of the common Solvency II framework did not interrupt the growth trajectory of funeral insurance in Spain. On the contrary, following the adaptation of the national regime to the technical specificities of this product, premium volumes continued to grow steadily, market penetration remained



Graph 2. Percentage variation in premium volume by insurance product in Spain.
Source: ICEA (2022).

high and the number of insurers offering this line increased progressively.

This pattern is not replicated to a comparable extent in other European markets. In countries such as France (Giraud, 2023; Xerfi Precepta, 2023), Germany (BaFin, 2024, 2025) or Italy (IVASS, 2023), coverage for funeral expenses remains embedded within the life insurance line and represents a relatively small share of the insurance market, without having exhibited growth dynamics or penetration levels comparable to those observed in Spain. The absence of a product-specific regulatory recognition limits its development as an autonomous insurance product and reinforces its marginal role within the broader life insurance sector.

Therefore, funeral insurance in Spain should be understood not only as a traditionally embedded product, but also as a relevant component of the national insurance system, whose solvency supervision is essential, even if conducted through adapted regulatory mechanisms.

Given the context outlined above, the general objective of this study is to analyse the limitations of common regulatory frameworks when different governments must apply them to insurance products with specific local structures, using the simplified application of Solvency II to funeral insurance in Spain as a case study. Based on this general objective, the following specific objectives are proposed:

SO1. To empirically evaluate the solvency outcomes resulting from the application of both the standard Solvency II framework and the simplified regime used for funeral insurance in Spain. This is carried out by analysing capital requirements (SCR) applied to the same real-life portfolio of insured individuals under both regulatory scenarios, incorporating descriptive metrics and inferential statistical testing.

SO2. To examine whether this regulatory adaptation generates systemic asymmetries or inequalities in capital requirements, raising broader questions about fairness, competition, and regulatory coherence within harmonised governance systems.

Both objectives are addressed through a rigorous empirical approach, combining actuarial modelling, portfolio segmentation by management unit, and statistical hypothesis testing applied to regulatory impact indicators. This framework allows for a data-driven examination of whether the proportionality applied by regulatory authorities in this case contributes to adequate supervision or, conversely, introduces structural distortions within the common solvency system.

The existing literature has increasingly questioned the suitability of common regulatory frameworks such as Solvency II when applied to insurance products with differentiated structural characteristics. Biener and Eling (2012) and Noordhoek et al. (2022) emphasize the need for proportional approaches in specialized lines of business, where standardized models fail to adequately capture local dynamics. Along these lines, Sid et al. (2025) analyse the partial application of Solvency II in Algeria, highlighting its potential adaptability in emerging markets. However, their findings are based on simulations, whereas our study provides empirical evidence from a simplified regime that has already been implemented and applied to a real insurance portfolio.

In parallel, recent discussions on Solvency II equivalence post-Brexit, such as the analysis by Müller and Reuse (2023), reflect a growing trend toward national regulatory adjustments even within harmonized frameworks. Sector-specific studies, including those on German life insurers (Paetzmann, 2011) and Italian cooperative banks (Barra and Ruggiero, 2023), also show how regulatory pressures can lead to strategic responses such as the discontinuation or restructuring of certain products.

Despite its economic and social relevance, funeral insurance has received little attention in the academic literature, particularly from a regulatory and financial perspective. However, some recent studies, such as that by Lledó et al. (2025), have begun to explore its specific features and its role within the Spanish insurance market.

Our contribution lies in demonstrating how the adaptation of a unified regulatory framework to heterogeneous market environments can generate substantial —and at times unforeseen— alterations in solvency balances, competitive dynamics, and sectoral development. Through the case study of funeral insurance in Spain—a segment defined by its cultural specificity, the unique design of its products, and a historically differentiated regulatory treatment—this study provides an empirical and replicable example of the institutional trade-offs involved in tailoring common rules to structurally distinct markets.

Far from validating or rejecting any specific regime, the analysis aims to contribute to broader debates on regulatory governance by empirically assessing how certain adaptations—although grounded in the principle of proportionality—may unintentionally affect the principles of fairness, efficiency, and stability. At the same time, the Spanish experience also illustrates how a well-calibrated use of regulatory flexibility can enhance solvency, resilience, and social coverage in ways that a strictly uniform framework might fail to achieve. In doing so, the article provides concrete evidence to inform the study of institutional design and regulatory convergence, highlighting not only the limitations and risks of uniform approaches but also the potential benefits of preserving measured flexibility within harmonised systems.

3. Methodology and data

3.1. Data and sample characteristics

To empirically evaluate the solvency outcomes resulting from the application of both the standard Solvency II regulatory framework and the simplified regime for funeral insurance implemented by the government of Spain (SO1), and to assess whether this adaptation results in significant differences indicative of potential regulatory inequity (SO2), this study analyses a Spanish insurer whose portfolio consists exclusively of funeral insurance, including some complementary coverages. Operating under the simplified regime approved by the national supervisor,

the company offers an ideal case to assess the practical effects of regulatory proportionality in a structurally unique market. The fact that the company operates exclusively in the funeral insurance line allows for a precise isolation of the effects derived from the regulatory framework, without interference from other lines of business.

The analysis comprises three methodological levels: (i) a global descriptive comparison of the Solvency Capital Requirement (SCR) under both regulatory frameworks; (ii) a disaggregated comparison by management units using absolute and relative capital requirement metrics; and (iii) an inferential statistical analysis (Student's t-test) to determine the significance of the observed differences from a technical-actuarial perspective. This alignment ensures that the conclusions drawn are relevant to the entire national market, thereby enhancing the external validity of the study.

The sample includes over 500.000 policyholders. To ensure representativeness, its age distribution was compared to national market data for 2021 published by Funeral insurance in Spain (2024). The alignment between both distributions, shown in Table 2, supports the validity and broader applicability of the results.

In relation to market risk, an important part of an insurance company's risk, the capital requirements are calculated on a portfolio of assets like the standard insurance market portfolio for non-life entities (Table 3), published by the Directorate General of Insurance and Pension Funds (Insurance and Pension Funds, 2023).

3.2. Regulatory frameworks and capital requirement estimation

This study adopts an empirical and comparative approach to estimate the Solvency Capital Requirement (SCR) under two regulatory scenarios; both applied to the same real-life portfolio of insured individuals:

Table 2
Data of the Spanish Funeral Insurance and the data sample.

Age Groups	Insured Population %	Total insured persons by age %	Insured persons in the sample by age %
under 5 years	17.56	1.39	1.48
from 5 to 9 years	26.31	2.61	3.11
from 10 to 14 years	31.73	3.58	4.02
from 15 to 19 years	37.45	4.38	5.11
from 20 to 24 years	39.22	4.51	5.34
from 25 to 29 years	39.36	4.61	5.24
from 30 to 34 years	42.27	5.37	5.91
from 35 to 39 years	43.46	6.02	6.42
from 40 to 44 years	44.65	7.41	7.41
from 45 to 49 years	47.30	8.67	8.68
from 50 to 54 years	49.52	8.54	8.52
from 55 to 59 years	52.30	8.50	8.47
from 60 to 64 years	55.55	7.98	7.97
from 65 to 69 years	58.51	7.05	7.11
from 70 to 74 years	59.29	6.06	5.54
from 75 to 79 years	60.74	5.30	4.36
from 80 to 84 years	61.16	3.60	2.65
over 85 years	61.67	4.43	2.63

Source: Own elaboration based on data from UNESPA (2024)

Table 3
Classification of assets of non-life entities.

Asset Classification	Average percentage of Non-Life Insurers 2022
1- Public Debt	26.00%
2- Corporate Debt	24.00%
3- Equities	14.10%
4- Collective investment institutions	16.10%
5- Structured financial assets	1.20%
6- Asset securitizations	0.20%
7- Cash and deposits	6.90%
8- Mortgages and other credits	1.80%
9- Real estate investments	9.70%
10- Derivatives	0.00%

Source: DGSFP (2023)

- Scenario 1 (observed): application of the simplified regime specific to funeral insurance in Spain, as established by Government Order ECC/2841/2015.
- Scenario 2 (counterfactual): simulation of the general Solvency II framework, as defined by Delegated Regulation (EU) 2015/35 and adopted by the central governments of various countries, without applying any risk-dilution factors.

Both scenarios are applied to the same real-life portfolio of policyholders, allowing actuarial, demographic, and financial variables to remain constant, thereby isolating the purely regulatory effect.

The Solvency II regulation establishes, by means of Delegated Regulation (EU) 2015/35, the capital requirements that assess the solvency of European insurers. This framework has a direct impact on insurers' management, influencing a wide range of critical areas — from investment strategies to product marketing — and illustrates why the role of governments in this type of regulation is increasingly emphasised, as well as what its transposition implies in terms of the competitive boundaries defined within the market.

The Regulation drafted by the European Commission in, 2014, aims to complete Directive, 2009/138/EC and implement the concept created in this Directive, the SCR, defined as the amount of own funds that would allow an insurance company to absorb theoretical and unforeseen significant losses, with a confidence level of 99.5% over a time horizon of one year. In a simple way, without analysing internal models or simplifications based on proportionality, we can subdivide this SCR into three items:

- Basic SCR: consisting of at least the non-life underwriting risk, life underwriting risk, health underwriting risk, market risk and counterparty default risk modules, correlated by means of a matrix set out in the standard formula, where the standard formula shall include a risk module for intangible assets:

$$BasicSCR = \sqrt{\Sigma_{i,j}\ \mathrm{Corr}_{i,j} \cdot \mathrm{SCR}_i \cdot \mathrm{SCR}_j} + \mathrm{SCR}_{\ intangibles} \quad (1)$$

- Operational risk component.
- Loss-absorbing capacity adjustment, related to technical provisions and deferred tax.

Thus far, the application of the regulation would be common to all entities, with many of the modules being homogeneous for funeral or life insurers. The problem arises when the Spanish regulator adapts this generic rule based on the vicissitudes of funeral insurance discussed above, considering the future decision-making capacity of the institutions and allowing for the dilution of certain risk modules.

The resulting amount of the capital charges for the simplified regime for each of the risk modules or sub-modules or stresses with dilution capacity will be the present value of the stressed annual premiums multiplied by the annual factors of the table included in Article 5 of Governmental Order ECC/2841/2015 (Table 4). This calculation mechanism reflects how the Spanish regulation translates the logic of proportionality into decreasing factors over time horizons.

Where %PN (percentage of premiums net of expenses) is the amount of each stress without applying any future management decision and divided by the present value of the corresponding stressed premiums and %PB (percentage of gross premiums) is equal to the %PN divided by one minus the percentage of the variable expenses that depend on the premiums over the premiums themselves.

This regulation naturally limits the application of risk dilution to institutions according to the maximum dilution capacity, stipulated by the following formula:

$$SCRfinal\_module = SCRdiluted + (SCRnot\_diluted - SCRdiluido) \cdot (1 - \%CU) \quad (2)$$

Where SCR_{final_module} is the SCR of the sub-modules suitable for the application of dilution, $SCR_{diluted}$ is the SCR of the sub-modules suitable with the application of dilution and $SCR_{not\_diluted}$ is the SCR of the sub-modules suitable without the application of dilution.

Based on this global formulation of the SCR and the specific adapted case of the funeral insurance model in Spain, we have to highlight those risk modules and sub-modules where this differentiation is allowed (Graph 3), all of them related to direct premium pricing (life underwriting module) and the interest rate sub-module included in market risks (due to the impact of the discount rate on the premium collected). It should be noted that the regulation allows, due to the correlation between the different modules, risk compensation according to the established limits.

All these risks, supported by the projection of the policyholders' portfolio cash flow, highlight the importance of the formulation and the calculation process carried out through statistical programming using open-source software such as R or Python. The assumptions used in the model —summarised in Table 5— are based on real industry data and reflect technical parameters currently used by funeral insurance providers in Spain. These parameters ensure that the projections are aligned with realistic practices in the sector.

The formulation of this process begins with the calculation of premiums, using the following formula. Although funeral insurance is classified as non-life insurance in Spain due to its focus on service delivery, its actuarial methodology is similar to that used in life insurance (in terms of cash flow projection, mortality assumptions, and expenses), making the formula technically analogous from an actuarial standpoint:

$$CP(a) = RP(a) + CP(a) \cdot B_e + CP(a) \cdot Ex_e + Pr'' * Acq_e + CP(a) \cdot \beta \quad (3)$$

Where B_e is the expenses charged to benefits, Acq_e is the acquisition expenses, Ex_e is the company's operating expenses, β is the underwriting profits, RP(a) is the risk premium for a policyholder of variable age (a) and CP(a) is the commercial or tariff premium for a policyholder of variable age (a). This simplified regime allows the application of initial discounts, reducing the premium amount obtained through this formula, with the company assuming the risk associated with that discount. However, the ability to increase the premium up to the maximum set by the previous formula grants insurers the power to dilute potential future risks.

Table 4
The amount of capital charge calculation factors for the simplified regime.

Year	Factor for calculation of the capital charge
1st	100% · %PN
2nd	(80% · %PN + 20% · %PB) · 80%
3rd	(60% · %PN + 40% · %PB) · 60%
4th	(40% · %PN + 60% · %PB) · 40%
5th	(20% · %PN + 80% · %PB) · 20%
6th and subsequent	0

Source: Order ECC/2841/2015

Although funeral insurance is classified as non-life in Spain due to its service-oriented purpose, its actuarial methodology is aligned with that of life insurance, based on long-term cash flow projections. This similarity justifies the divergence between the general and simplified regimes, especially in modules where the pricing structure directly impacts capital requirements.

The parameters used in this formulation are based on sectoral technical assumptions, detailed in Table 5, which include variables such as entry age, average policy duration, mortality, acquisition expenses, and average claim costs. These assumptions enable the projection of future cash flows and the calculation of net and gross premiums under both regulatory regimes.

For the projection of cash flows, we first estimate the probable claims flow PCF_t of our sample.:

$$PCF_t = \sum (IC_t \cdot D_t) \quad (4)$$

Where IC_t is the insured sum at each maturity per individual and Dt is the estimated number of deaths according to the assumptions established above.

Then, the probable premium flows PPP_t are projected. In reverse, the number of living insured individuals at each date is estimated, and the premium collected is projected based on the assumptions established in Table 5.:

$$PI_t = PI_{t-1} + [(IA_t - IA_{t-1}) \cdot r_{pa} \cdot cr_{pa} \quad (5)$$

$$PPP_t \sum PI_t \quad (6)$$

Where PI_t is the premium for each insured person, r_{pa} is the rate per product and per age of the insured person and c_{pa} is the rate compliance per product and age.

To these two flows, we must add the fixed expense flows derived from the management of said portfolio (PEP_t). We use an assumption of actual expenses established for the entity, grouped by office (E_c)

$$PEP_t = \sum (PPP_t \cdot E_c) \quad (7)$$

The estimation of the business flow to which risk dilution is applied is established in the following formula:

$$V = \sum_{t=1}^{125} ((PPC_t + PEP_t) - PPP_t) \cdot (1 + i_t)^{-t} \quad (8)$$

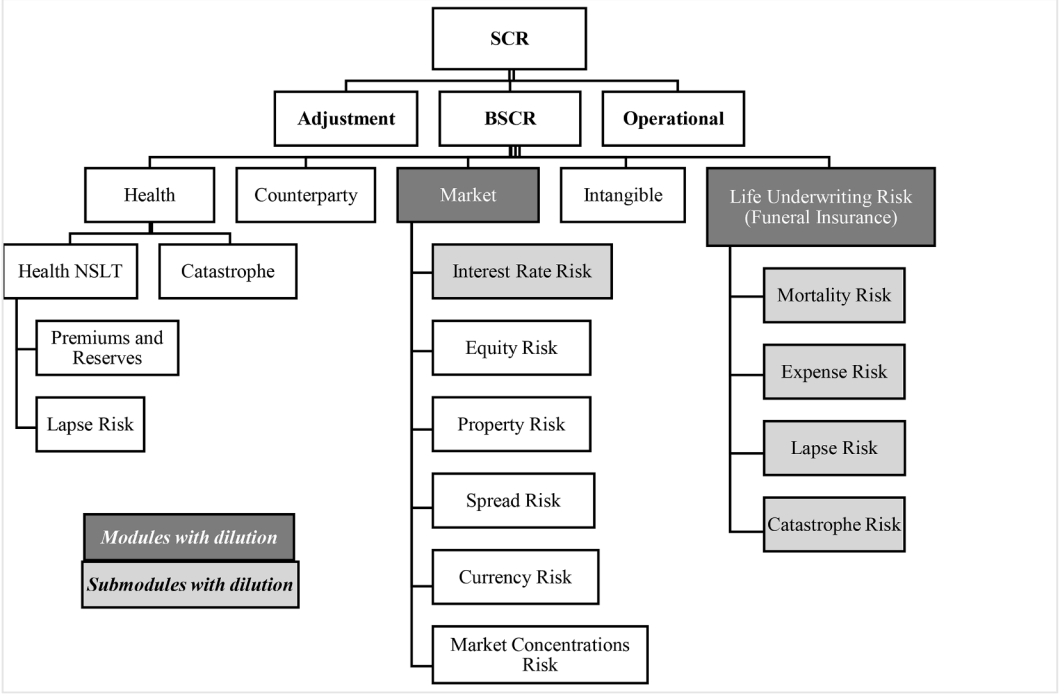
Where i is the flow discount rate set in the yield curve published by EIOPA.

Once the formulas have been defined and the maximum dilution capacity has been set, we can make the risk calculations for each of the sub-modules involved in this process by determining the company's best estimate and, in contrast, the stressed flow. The stress applied is different depending on the type of risk and is set by Delegated Regulation 2015/35:

The final stage of the regulatory impact evaluation involves computing the stressed SCR, applying shocks as defined in the Solvency II framework:

- Mortality risk: 15% increase in mortality rates.
- Expense risk: 10% increase in forecasted expenses.
- Lapse risk: worst case among three scenarios, including a 40% mass lapse in the first year for insureds under 65.
- Catastrophe risk: 0.15% increase in first-year mortality.
- Interest rate risk: application of a falling interest rate curve (fall shock).

This model enables a detailed estimation of the impact of each



Graph 3. SCR structure of the funeral insurer under study.
Source: Own elaboration.

Table 5
Hypotheses used to estimate sample flows.

Hypotheses	Description
Biometric tables	DGSFP published biometric tables
Service cost increase	2.50%
Premium discount	35% discount based on the average of the sample used
Lapse Rate	Lapse table used by a company that operates in death insurance in Spain based on own experience, by age and type of product
Expense	Expense table used by a company that operates in death insurance in Spain based on the actual expenses for each management unit
Interest rates	Maturity interest rates published by EIOPA

Source: Own elaboration

regulatory scenario on capital requirements, both in aggregate terms and disaggregated by management units. The empirical comparison between the two regimes allows for the identification of significant variations in capital requirements that may result in structural regulatory inequities within the harmonised European governmental framework.

3.3. Empirical evaluation of regulatory impact

This study adopts a two-phase empirical strategy to assess the impact of regulatory adaptation from a quantitative and statistically robust perspective, using real data from a portfolio of over 500,000 policyholders.

In the first phase, capital requirements (SCR) were calculated under two regulatory regimes: the simplified regime, currently in force for funeral insurance in Spain, and the general regime, simulated in accordance with Delegated Regulation (EU) 2015/35, without applying any dilution factors. The affected modules include life underwriting risk (mortality, expenses, lapse, and catastrophe) and the interest rate submodule within market risk. Applying both regimes to the same real-life portfolio ensures consistency in actuarial, demographic, and financial assumptions, thereby isolating the purely regulatory effect.

Since the simplified regime is already applied to the entire portfolio and the general regime is constructed as a counterfactual scenario, the unit of analysis is the management unit (previously referred to as commercial office), each responsible for a defined group of policyholders. The insurer operates through 122 management units distributed geographically across Spain, each with its own portfolio and financial data, providing a robust sample of independent observations ($n > 120$) for conducting both descriptive and inferential analyses. From a regulatory governance perspective, the design of tests based on organisational units (management units) makes it possible to identify how a single regulatory norm can produce differentiated impacts within the same institution.

For each unit, two indicators were calculated:

- The absolute difference in SCR between both regimes (in euros).
- The relative percentage difference, defined as:

$$\Delta SCR_{rel} = \frac{SCR_{general} + SCR_{\ simplified}}{SCR_{\ simplified}} \cdot 100 \quad (9)$$

This second indicator enables a normalized comparison between management units with different business volumes.

In the second phase, a one-sample t-test was applied to the distribution of relative differences in SCR to statistically assess whether the application of the general regime leads to a significant deviation from the simplified regime. The test was performed independently for:

- The life underwriting module (as a whole), and
- The interest rate sub-module.

The null hypothesis (H_0) posits that the mean relative difference is equal to zero, implying no regulatory effect. The alternative hypothesis (H_1) assumes that the mean is significantly different from zero, indicating a regulatory impact.

$$t = \frac{x + \mu 0}{S \,/\, \sqrt{n}} \tag{10}$$

Where x is the sample mean of the relative differences, μ0 is the hypothesized mean under the null, S is the sample standard deviation, and n is the number of management units. This test allows us to determine whether the observed differences are statistically significant or could be attributed to sampling variability.

In addition, the weighted mean, standard deviation, and 95% confidence interval were calculated for each group of relative differences, using weights based on the technical provisions of each management unit. This weighting approach ensures that the aggregate statistics reflect the economic materiality of each unit, minimizing the potential distortion caused by small units with extreme or idiosyncratic outcomes—especially under interest rate shocks, where the impact on SCR is nonlinear and sensitive to portfolio characteristics.

This combined use of normalization, statistical inference, and economic weighting ensures a robust and comprehensive evaluation of the regulatory effect, directly addressing the methodological concerns related to empirical validity and sector-wide generalizability.

4. Results and discussion: proportional regulation within a common governance framework

4.1. Impact on solvency: effects of proportional regulation in the funeral insurance sector

The results are analysed in accordance with the stated research objectives. First, in order to empirically assess the impact that the adaptation of a common regulatory framework established by European intergovernmental agreement—Solvency II—has on capital requirements in the Spanish funeral insurance sector (SO1), a combination of descriptive metrics and inferential statistical techniques was applied. This included hypothesis testing based on real portfolio data, serving as a basis for evaluating potential asymmetries or disparities in such requirements.

Since the remaining risk modules are calculated according to a unified capital requirement applicable to all entities subject to Solvency II, the analysis focuses on those components of the standard model that have been subject to specific regulatory adaptation. Specifically, the life underwriting module—which includes the mortality, expense, lapse, and catastrophe sub-modules—and the interest rate sub-module within market risk. These components allow for a precise identification of the regulatory effect stemming from the application of a harmonised logic to a product with structurally unique characteristics.

The maximum management capacity of the company is almost 290 million euros, i.e. the difference between the projection of the premiums of the policyholder portfolio applying the initial discount rate of the policies and the projection of the premiums of the policyholder portfolio with the application of the contract premium. The result (Graph 4) represents the maximum dilution that the company can apply.

This dilution capacity has a direct impact on capital requirements. Graph 5 shows the SCR for each of the sub-modules and the result after applying risk dilution for the marketing capacities of funeral insurance. The following graphs show the difference be-tween the scenarios under the adapted funeral insurance regulation (in grey) and the ap-plication of the global standard (in black).

Therefore, the impact on capital requirements is significant, reducing the amount of capital requested by between 82% and 86% in all sub-modules. With the application of the simplified funeral insurance regime, the capital required by the common rules is diluted over a time horizon of 6 years (Table 4); the premiums incorporated into the risk set out in Delegated Regulation (EU) 2015/35 reduce the risk of each sub-module as shown in Graph 6.

This leads to a considerable reduction in the SCR imposed on institutions that market funeral insurance and, therefore, to a considerable increase in the solvency ratio of institutions, calculated in relation to their own funds, which is the main indicator of the level of solvency of an insurance institution.

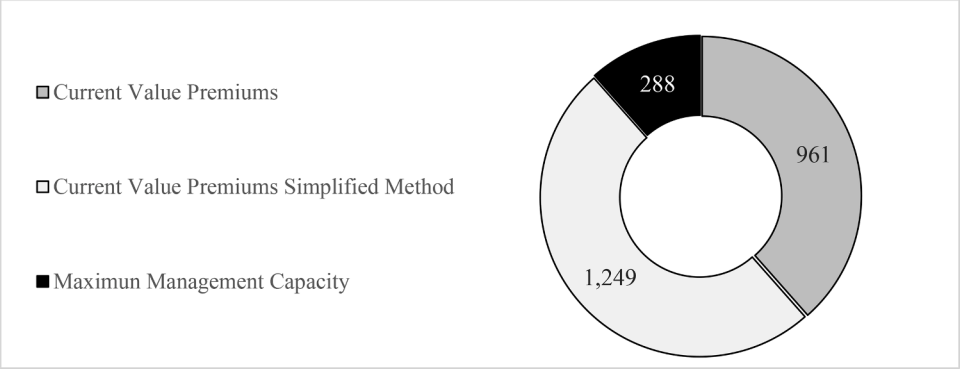
In our analyses, the reduction in the modules for life and market underwriting im-plies a reduction in the basic SCR of the institution, established in the common rules, of around 60%, a reduction that similarly affects the final SCR after application of the deferred tax adjustments (Graph 7).

The impact of this risk dilution on the solvency ratio exceeds 170%. This ratio is the most relevant indicator when assessing the solvency of an institution, as it reflects the amount of own funds available to meet the Solvency Capital Requirement (SCR). Although the entity remains solvent, its operational flexibility is significantly reduced. This situation could force any company in the sector to undertake substantial internal changes to ensure resilience in the face of potential adverse scenarios. The funeral insurance sector in Spain has historically demonstrated its solvency, even during periods of social crisis and increased mortality. However, as the number of insurers offering this product has risen—-driven by its profitability—it is likely that many would fall below minimum solvency thresholds if the standard regulatory framework were to be strictly applied.

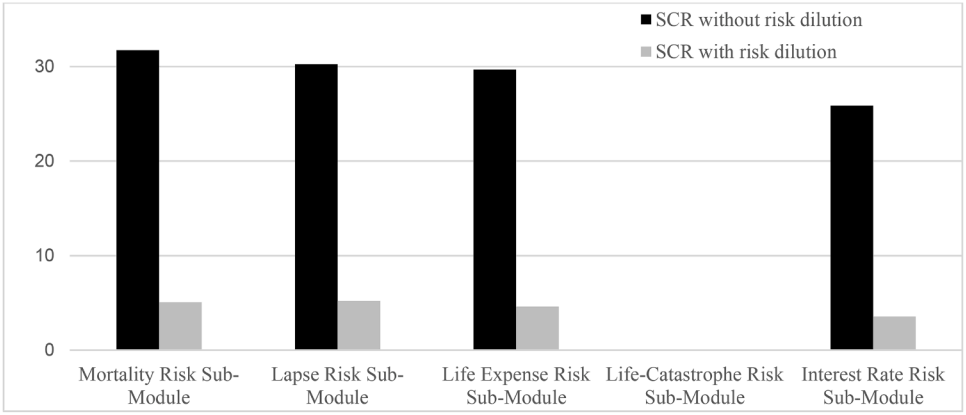
This highlights the critical role of governments and regulatory authorities in designing frameworks that, while safeguarding financial stability, incorporate proportionality mechanisms to preserve market diversity and prevent unintended exclusionary effects.

Undoubtedly, the analysis demonstrates a substantial reduction in capital requirements resulting from the challenges of applying a common regulatory framework. This issue is becoming increasingly relevant as markets continue to globalise, and governments seek to standardise regulatory norms through harmonisation processes.

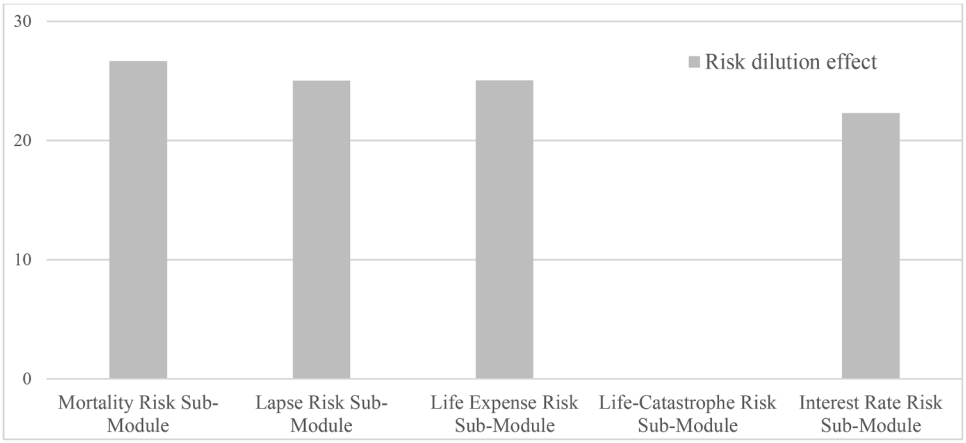
From the perspective of the second specific objective (SO2), it is



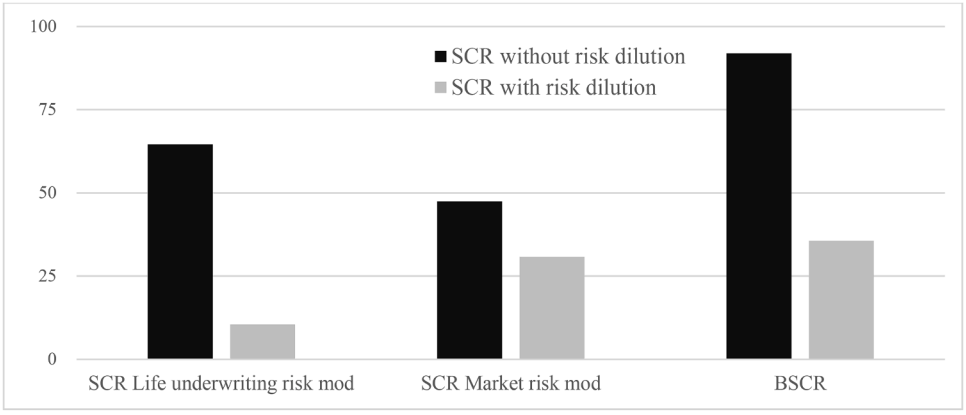
Graph 4. Maximum management capacity (EUR million).
Source: Own elaboration.



Graph 5. Risk scenarios for modules depending on the application of the simplified regime (in EUR million).
Source: Own elaboration.



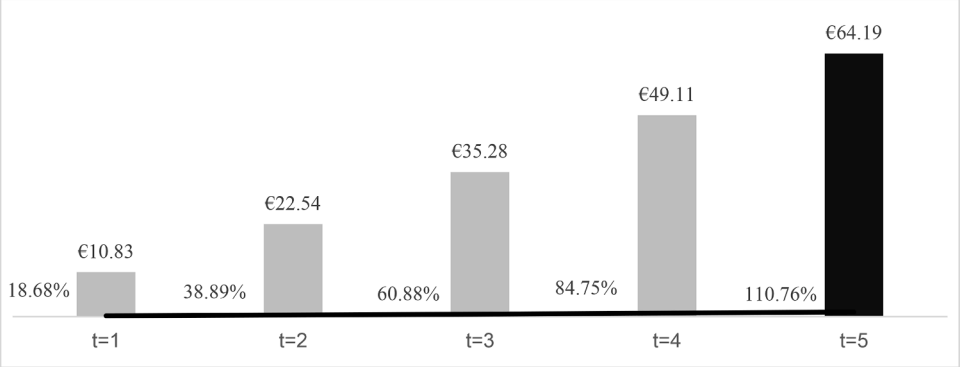
Graph 6. Dilution of capital requirements by sub-module (EUR million).
Source: Own elaboration.



Graph 7. Final risk scenarios based on the application of the simplified regime (in EUR million).
Source: Own elaboration.

essential to examine how the regulatory flexibility introduced through the risk-dilution mechanism affects financial stability and competitive fairness in the market. To this end, a technical-actuarial model was applied to a representative funeral insurance policy—covering five insured individuals aged 65, 63, 41, 35, and 2 years, each with a sum insured of €5,400. Assuming a 2.5% annual increase in funeral service costs and the gradual removal of premium discounts under the simplified regime, the results—presented in Graph 8—show a cumulative increase in the monthly premium of over 100% within a six-year horizon. While this outcome is legally permissible, it may become financially unsustainable for many policyholders, significantly increasing the risk of policy lapses.

Although early termination eliminates claim risk for the insurer, it also leads to a reduction in premium income and undermines the long-



Graph 8. Cumulative monthly increase (percentage and in euros) of a funeral insurance policy under the simplified regime.
Source: Own elaboration.

term stability of cash flows and solvency margins. These effects extend beyond internal management concerns and highlight how regulatory adaptation based on proportionality can generate substantial structural asymmetries within a common regulatory framework, favouring certain operators without a risk-based justification.

In this regard, the simplified regime, while technically effective, raises important concerns about its resilience under adverse scenarios and its alignment with the principles of harmonised regulatory governance in Europe. The following section addresses these issues through a granular empirical analysis across management units and the application of inferential statistical techniques to assess the consistency and significance of the observed effects.

4.2. Disaggregated comparison by management units and inferential analysis

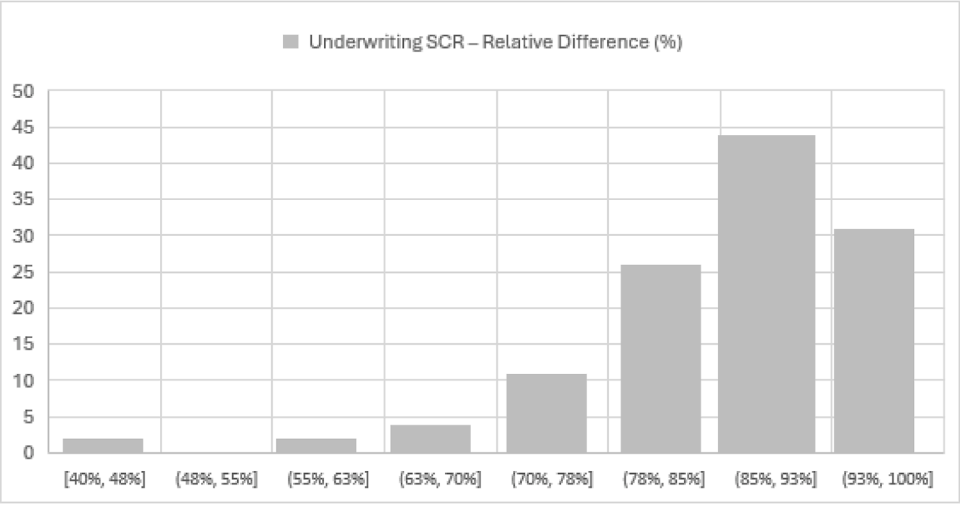
To complement the deterministic analysis presented in the previous section, this part focuses on assessing the variability of the impact generated by government-led regulatory decisions within the insurance entity itself through a disaggregated analysis by management unit.

The choice of the management unit (formerly referred to as the commercial office) as the level of analysis is particularly relevant in this context, as each unit manages a specific portfolio of policyholders with distinct demographic, biometric, and technical characteristics. In addition, the maturity of the business (newly opened versus consolidated units) and its financial sensitivity vary significantly across units. This heterogeneity produces a sample of independent and representative observations that allows for a more granular evaluation of the concrete effect of regulatory adaptations driven by governments on the solvency requirements applied at the operational level. This approach demonstrates that the results do not reflect an isolated case but rather a structural dynamic that can be extrapolated to an entire market.

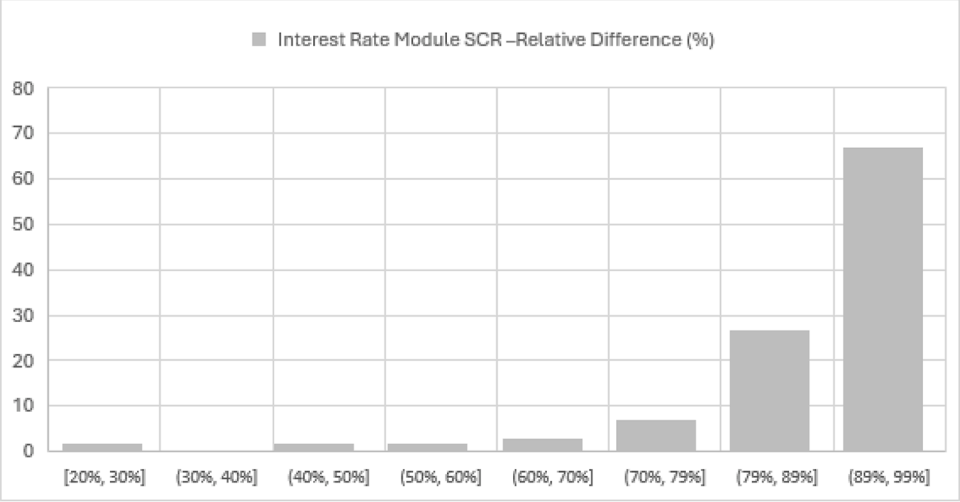
For each of the 122 management units, two key indicators were calculated: the absolute and relative differences in the Solvency Capital Requirement (SCR) under the two regulatory scenarios analysed (general regime and simplified regime), applied to the modules specifically affected by differentiated regulation.

The results, presented in the following histograms (Graphs 9 and 10), reveal a clear pattern: the application of the general regime systematically increases capital requirements in virtually all management units. In the life underwriting module, most units experience relative increases above 80%. In the case of the interest rate sub-module, the dispersion is even greater, partly due to the existence of small portfolios, portfolios in the process of closure, or portfolios with non-standard technical structures that are not representative or fully generalizable to the sector.

These results show that the impact of a common regulatory framework—when not adapted to the structural characteristics of the insurance product—affects the sector transversally, creating potential distortions in competition and in supervisory criteria. This evidence strengthens the case for integrating the principle of proportionality into harmonised regulatory frameworks, not only as a simplification mechanism but also as a governance tool to ensure fairness and regulatory



Graph 9. Histogram of relative differences in life underwriting SCR across management units.
Source: Own elaboration.



Graph 10. Histogram of relative differences in interest rate SCR across management units.
Source: Own elaboration.

coherence in heterogeneous markets.

To assess whether these differences are statistically significant, a one-sample t-test was applied to the distribution of relative SCR differences (Table 6).

The results, summarized in Table 6, show that the mean relative difference is 85% for the life underwriting module and 96% for the interest rate sub-module. In both cases, the t-tests yield high test statistics (74.97 and 9.61, respectively), accompanied by extremely low p-values, below 10^{-15}. This allows us to confidently reject the null hypothesis of no effect (mean equal to zero) and confirm that the observed regulatory impact is not due to random variation.

Moreover, the 95% confidence intervals provide key insight into the magnitude of the effect. For the life underwriting module, the interval ranges from 82.89% to 87.39%, indicating strong consistency around the estimated mean. For the interest rate sub-module, the interval is broader (76.58% to 116.32%), reflecting the high dispersion previously identified and the presence of outlier units with atypical behaviour.

These results confirm, with robust statistical evidence, that the general regime implies a significant increase in required capital, with relevant implications in terms of solvency and internal management. Furthermore, the difference in the width of the confidence intervals reinforces the value of combining inferential analysis with the segmented approach described in the previous section, allowing for the capture of both the average effect and its internal variability.

4.3. Sectoral implications: governance challenges and regulatory asymmetries

The results obtained allow us to draw relevant implications not only for the analysed entity but also for the broader insurance sector operating in markets with specialised products such as funeral insurance. In line with the first research objective (SO1), our analysis demonstrates that the simplified regime currently in force in Spain significantly reduces Solvency Capital Requirements (SCR), directly impacting insurers' solvency ratios and internal management capacity.

Table 6
Summary statistics and one-sample t-test results for relative differences in SCR under the general vs. simplified regimes (by module).

Indicator	Underwriting SCR	Interest Rate Module SCR
Mean (%)	85%	96%
Standard derivation	0.13	1.11
Number of observations (n)	122	122
t-statistic	74.97	9.61
p-value (two-tailed)	2.81×10^{-103}	1.36×10^{-16}
95% confidence interval	[82.89% - 87.39%]	[76.589% - 116.32%]

Source: Own elaboration

However, consistent with the second objective (SO2), this reduction is not neutral from a systemic perspective. By allowing lower capital charges for entities operating under a regime tailored to a structurally distinct product, a competitive advantage is introduced over firms that, in the absence of such an adaptation, would be required to hold higher capital for offering products with similar or even lower complexity. This regulatory asymmetry can lead to market distortions, incentivising market entry or persistence based on regulatory arbitrage rather than technical efficiency or actual solvency strength.

This risk, identified above, constitutes one of the main concerns associated with differentiated regulatory regimes. A key issue in this context is the potential strategic modification of product design in order to qualify for more favourable prudential treatment. Nevertheless, the Spanish case illustrates how this risk can be mitigated when a clearly defined regulatory perimeter and active supervision are in place. In Spain, the marketing of funeral insurance is subject to a specific regulatory framework. That is, the Directorate General for Insurance and Pension Funds together with the insurance sector itself through codes of good practice (Spanish Association of Insurance and Reinsurance, 2017), contribute to preserving homogeneous conditions of access to the product and to preventing the proliferation of functionally equivalent coverages designed to circumvent the applicable requirements. Moreover, the existing legal framework (Law 20/, 2015, of 14 July, on the Regulation, Supervision and Solvency of Insurance and Reinsurance Undertakings (Law 20/, 2015; Royal Decree 1060/, 2015, of 20 November, Approving the Regulation on the Regulation, Supervision and Solvency of Insurance and Reinsurance Undertakings (Royal Decree 1060/, 2015) establishes a clear demarcation between life insurance and funeral insurance, preventing purely financial or life insurance products from benefiting from a prudential regime conceived for a product with differentiated technical characteristics. This approach reduces incentives for regulatory arbitrage and reinforces supervisory coherence. By contrast, in other countries subject to the Solvency II framework, the absence of a clearly delineated funeral insurance market blurs the boundaries with other products, potentially generating tensions in terms of competitive fairness and regulatory consistency.

At the same time, in the Spanish case, the existence of this adapted framework has also generated clear positive effects. The simplified regime has decisively contributed to the development and expansion of funeral insurance, supporting the consolidation of a solvent, stable

market with broad social reach. In this sense, regulatory flexibility has facilitated the growth of a product that, in other countries subject strictly to the Solvency II life module, has not achieved a comparable level of maturity.

Thus, while such differentiated regimes may create tensions with the principles of fairness and competition, they also highlight the value of proportionality as a tool to tailor supervision to the specific features of each market. In a context of increasing international harmonisation in financial supervision, the Spanish experience suggests the need to balance regulatory coherence with the flexibility required to foster innovation, inclusion, and the development of specialised products without compromising financial stability.

Considering these results, it seems necessary to reconsider how governmental authorities implement regulatory adaptations within a framework that increasingly tends toward harmonisation. While proportionality remains a fundamental principle, it should be understood not only as a requirement of fairness but also to promote diversity and resilience in specialised markets, in line with the broader objectives of Solvency II: transparency, stability, and policyholder protection.

5. Conclusions

This study has empirically evaluated the effects of applying two regulatory frameworks—the standard Solvency II model (imposed by common European regulators) and the simplified regime currently in force for funeral insurance in Spain (established by the Spanish central government)—on the capital requirements of a real-life insured portfolio. In line with the first research objective (SO1), the analysis shows that the application of the simplified regime produces a substantial reduction in the Solvency Capital Requirement (SCR), directly increasing insurers' solvency ratios and providing them with greater internal management capacity. This difference is not explained by technical, financial, or actuarial assumptions—which were held constant across both scenarios—but rather by the structural logic embedded within each regulatory framework. The observed reductions exceed 80% in key risk modules (Graph 5), along with a reduction of over 150 percentage points in the required solvency ratio.

Although this result aligns with the principle of regulatory proportionality, it raises important questions related to the second research objective (SO2). The divergence in capital requirements—arising solely from the application of a differentiated regulatory approach to an identical portfolio—reveals a potential structural inequity in regulatory design. In practice, it allows insurers offering specialised products such as funeral insurance to operate under significantly lower capital burdens—not due to reduced risk exposure, but due to a regulatory categorisation that grants competitive advantages over other operators.

The implications of this asymmetry are highly relevant from a regulatory governance perspective. First, it may alter the competitive dynamics of the sector by encouraging the entry or continued operation of insurers whose competitive advantage is based on favourable regulatory treatment rather than superior technical efficiency. In fact, the number of companies offering this product in Spain has increased notably. Second, this distortion may influence the strategic behaviour of insurers, encouraging the development of products that are formally aligned with the simplified regime but conceptually close to other lines of business, potentially hindering effective supervision and discouraging innovation in segments not benefiting from such favourable treatment.

At a systemic level, the existence of divergent solvency requirements within a supposedly harmonised regulatory framework—such as the European one—generates tensions with the fundamental principles of fairness, competition, and financial stability. While regulatory proportionality is a valid and necessary principle, its application must ensure coherence and transparency to avoid unintended consequences on market balance. Nevertheless, the Spanish case also demonstrates that such flexibility can play a constructive role: the simplified regime has proven its resilience and solvency even during periods of severe economic and demographic stress, such as the COVID-19 crisis. It is therefore striking that funeral insurance holds such importance within the Spanish market while remaining marginal—and often embedded within life insurance—in the rest of Europe.

Empirically, the robustness of the observed effect has been confirmed through a combination of descriptive metrics and inferential statistical tests. The disaggregated analysis by management unit demonstrates that the impact is not an isolated phenomenon, but a structural trend present across the portfolio. This reinforces the notion that regulatory decisions—even when grounded in principles of flexibility—can generate unintended effects if not properly calibrated.

Moreover, the study provides both methodological and policy-related contributions. From a methodological standpoint, it demonstrates the value of combining real-world data with counterfactual simulations and inferential analysis to assess institutional regulatory design. From a policy perspective, it questions the assumption that a uniform regulatory framework can be applied without adjustment to markets with structurally distinct products. The Spanish funeral insurance case illustrates how regulatory adaptation—far from undermining solvency—can strengthen market stability and expand coverage, while highlighting the risk that excessive regulatory uniformity may constrain innovation and market development.

It is worth noting that this regulatory easing has coincided with the significant expansion of the funeral insurance market in Spain, as reflected in the growth of premium volumes and the number of providers operating in this line (Graph 2). While such growth may partly result from improved operational efficiency, the evidence suggests that it has also been driven by a regulatory adaptation that lowers entry barriers and operating costs. This raises legitimate concerns about the long-term competitiveness of national markets if growth is primarily supported by regulatory advantage rather than solid technical foundations—but it also shows that flexibility, when properly designed, can enhance resilience and inclusion.

This work offers several key contributions:

- Empirical originality: By applying a counterfactual analysis to a real and representative portfolio, the study provides rare quantitative evidence on the structural effects of proportionality-based regulatory adjustments.
- Regulatory insight: It highlights the tension between the harmonised design of European regulatory frameworks and the operational reality of niche insurance markets, with direct implications for fairness and coherence in regulation.
- Sectoral relevance: It shows how a seemingly minor technical adjustment in capital requirements can have substantial effects on competition, product strategy, and overall market structure.

Nevertheless, the study is subject to certain limitations. The data come from a single insurer, albeit one highly representative of the national market. While the demographic representativeness of the sample was validated, any extrapolation to other countries or insurance lines should be approached with caution. Additionally, the modelling of premium management capacity was conducted under a deterministic approach, without incorporating macroeconomic volatility or behavioural uncertainty, which could affect the actual effectiveness of the risk dilution mechanism. These limitations open avenues for future research, particularly comparative studies across EU member states or the use of stochastic models to capture more complex market dynamics.

In conclusion, this study provides robust empirical evidence that the uniform application of solvency frameworks to structurally unique insurance products can generate unintended and potentially inequitable outcomes. It underscores the need for regulatory adaptations to be not only proportionate to the specificities of products and markets, but also consistent with core public policy objectives. The Spanish case demonstrates that regulatory flexibility can coexist with solvency and stability, even under crisis conditions, suggesting that an excessively rigid

harmonised model may limit the capacity of national markets to develop efficient and socially valuable products. In a context of growing European and international regulatory integration, these findings reinforce the importance of designing frameworks that balance flexibility with fairness, ensuring financial stability without constraining diversity, innovation, or competitiveness across operators.

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Jorge Rubio-Herranz: Writing – original draft. **María-Jesús Segovia-Vargas:** Writing – review & editing.

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The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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