THE MUTUAL GUARANTEE SYSTEM IN PORTUGAL

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SOCIEDADE DE GARANTIA MÚTUA

THE MUTUAL GUARANTEE SYSTEM IN PORTUGAL

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Economic and financial additionality over the 2011-2016 period

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Porto, 28th December 2018
Vasco Rodrigues

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Executive Summary

This report analyses the economic impact of the Portuguese Mutual Guarantee System over the 2011-2016 period. The analysis proceeds in three steps, corresponding to chapters 3, 4, and 5. In chapter 3, the impact of mutual guarantees on the firms that resort to them is studied. Estimates are provided both for the financial benefits that these firms obtain, and for consequent changes in their economic activity. Chapter 4 analyses the interaction between users and other firms, to come up with estimates of the total impact on the Portuguese economy, in terms of production and employment. Finally, chapter 5 discusses the impact of the Portuguese Mutual Guarantee System on the financial sector.

Before looking into its impact, chapter 2 provides an overview of the Portuguese Mutual Guarantee System. The system is composed by four Mutual Guarantee Societies – three with preferential geographical areas of operation (Garval, Lisgarante, and Norgarante), and one with a sectoral specialization (Agrogrante) – and their common shareholder SPGM, which acts as a *de facto* holding and provider of shared services, besides managing the Portuguese counterguarantee fund. Over the 2011-2016 period, the system issued some 125 thousand guarantees amounting to 6.3 billion euros.

Chapter 3 presents our estimates of the impact of mutual guarantees on their users, in Portugal, from 2011 to 2016. We take an "additionality" perspective: these estimates measure how users' observable post-guarantee situation differs from the unobservable situation they would be in had they not resorted to the mutual guarantee system. To determine this, we use econometric differences-in-differences methods that we apply to a panel of data drawn from the publicly available accounts of all Portuguese firms in the 2011-2016 period which we link to an exhaustive database of all mutual guarantee operations provided by SPGM.

Mutual guarantees are expected to improve their users' financing conditions and the results presented confirm this. According to our basis model, the use of mutual guarantees lowers the cost of debt to the median firm by 0.57 percentage points. This impact is stronger, though, for young and small firms, and also for those with a low proportion of tangible assets in their balance sheets. Measured for the median firm, the use of mutual guarantees has allowed Portuguese firms savings of 186 million euros in financial expenses over the 2011-2016 period.

Mutual guarantees have also improved their users' access to debt. The use of mutual guarantees increases the ratio of debt on firms financing by 5 percentage points. This effect is stronger for small firms but is increasing on firms' age and availability of tangible assets. Overall, we estimate that the use of mutual guarantees has increased access to external debt by 7.9 billion euros in the period studied.

The use of mutual guarantees not only changes the amount and cost of debt of its users, but also the term structure of that debt, increasing the proportion of medium- and long-term debt, in total debt, by almost 2 percentage points. Overall, in 2011-2016, users of mutual guarantees had access to 677 million euros of additional medium- and long-term debt than they would have had they not used them.

Improvement of firms' financing terms is not an end in itself, it is expected to lead to improved economic performance. This study investigates whether this happens along several dimensions. We find that firms that benefit from mutual guarantees increase their total investment rate by 7.5 percentage points. This effect is stronger for smaller firms but also for firms with a higher proportion of tangible assets, being independent of firms' age. It is also stronger for manufacturing firms than to commercial or construction firms. We estimate the total additional investment due to mutual guarantees in 2011-2016 at 3.8 billion euros. Only part of this corresponds to investment in tangible assets: the additional tangible investment is estimated at 1.7 billion euros.

There is also evidence that mutual guarantees increase firms' export rates by 0.14 percentage points. In this case, the impact is stronger for larger and older firms, possibly because size and age facilitate penetration in export markets. The additional exports due to mutual guarantees in the 2011-2016 period are estimated at 805 million euros, mostly (83%) in manufacturing industries.

Mutual guarantees increase job creation at the firms that use them by 0.6 percentage points. This effect is stronger in the case of young firms but also larger firms. Overall, approximately 14 thousand additional jobs were created in the period under scrutiny due to mutual guarantees. This impact was particularly strong in manufacturing industries.

Results are less favourable in what concerns the impact on profitability, measured at the level of EBITDA. Our estimates suggest a negative impact of 1.3 percentage points on the year firms take on mutual guarantees, but results are better for small firms. It is possible that this short-run negative impact is compensated by a positive longer-term effect, but the short time period covered in this study did not allow for a proper test of this hypothesis.

The last issue analysed in Chapter 3 is the relation between mutual guarantee use and survival. Descriptive evidence is presented that users of mutual guarantees reveal a higher rate of survival than non-users. A preliminary econometric analysis of the impact of the use of mutual guarantees on survival suggests that a firm having had access to mutual guarantees in 2010 increased its probability of survival to 2013 by some 17 to 19 percentage points.

Chapter 3 focus on the direct impact of the mutual guarantee system on its users. Chapter 4 considers the relations between those users and other firms in the economy to estimate the aggregate impact on the Portuguese economy. Input-output analysis is used to estimate the impact on total Portuguese Gross Value Added that would result from the variation in final demand implied by users' additional investment and exports induced by access to the mutual guarantee system and, subsequently, the labour needed to produce that variation in GVA.

The total impact on Portuguese Gross Value Added for the 2011-2016 period is estimated at 5.1 billion euros. The annual figures correspond to 0.43% to 0.69% of total Portuguese GVA. Roughly one third of this impact occurs in trade activities, with manufacturing representing 21%. A variety of service activities also benefit from a significant impact.

This chapter also provides an estimate of the labour needs that the increased production induced by mutual guarantees in the whole economy – not to be confounded with the jobs created directly at the guarantee users – implies. These are in the order of 20 to 30 thousand jobs annually, corresponding to 0.50% to 0.78% of total Portuguese employment.

The last chapter of the report addresses the interaction between the mutual guarantee system and the rest of the financial system. The chapter starts with an analysis of the positioning of mutual guarantee providers in the value chain of financial intermediation and discusses how it could facilitate the emergence of new forms and channels of directing savings for investment.

For the financial sector, the mutual guarantee service has value for two main reasons. First, because it reduces the risk of the credit portfolio, through pooling that limits potential losses. Second, it allows the broadening of the lending base by releasing own funds, under the current regulatory framework. But, for universal financial intermediaries - such as banks - mutual guarantee seems to have the added advantage of providing a more competitive price for risk and thus benefiting customers by reducing the cost of loans, i.e.

reducing credit risk spreads. This can only be done if risk valuation can be separated from the remaining activities of the value chain. Mutual guarantee operators are well positioned to perform this task. And, above all, mutual guarantee coverage includes SMEs which are often forgotten on these matters. Mutual guarantee also provides conditions to eliminate some of the perverse effects associated with risk aversion of financial intermediaries and with the asymmetries of information, in the forms of adverse selection and moral hazard behaviour, which afflict loan markets.

The empirical results presented in this chapter - obtained now from the accounts of financial institutions and not, as in Chapter 3, on the side of users - suggest that mutual guarantee fulfils the hypotheses formulated, especially regarding the expansion of the customer base eligible for credit and reducing the cost of financing. The evidence is particularly significant for the period that began and followed the last financial crisis. Notwithstanding these positive results, the potential of the mutual guarantee service still seems far from fully exploited. Whether it is with the banks, for whom it still usually covers a very limited part of the loan portfolio, or with new financial intermediaries, to whom it offers opportunities in the reengineering of the value chain. In a disruptive scenario, the financial system could allow the segregation of funding and risk management, this to be exercised by mutual guarantee operators, freeing financial intermediaries to work out completely alternative business models.

If it is possible to evolve in this direction – which would necessarily require the resolution of complex issues, notably from the regulatory point of view – mutual guarantees could be a structuring – and restructuring – element of the value chain of financing to the economy.

Abbreviations and acronyms

AECM	European Association of Guarantee Institutions
APB	Portuguese Banking Association
BdP	Bank of Portugal
CAE	Portuguese Classification of Economic Activities
CEGEA	Research Centre in Management and Applied Economics, Universidade Católica Portuguesa
Constr.	Construction - Section F of CAE
EAD	Exposure at Default
EBITDA	Earnings Before Interest, Taxes, Depreciation and Amortisation
FCGM	Mutual Counter-guarantee Fund
GDP	Gross Domestic Product
GVA	Gross Value Added
IES	Portuguese Simplified Business Information
INE	Statistics Portugal
LGD	Loss Given Default
Man.	Manufacturing - Section C of CAE
MCGF	Mutual Counterguarantee Fund
MGS	Mutual Guarantee Society
NIPC	National Juridical Person Number
Oth.	Other economic activities - not included in sections C, F and G of CAE
PD	Probability of Default
POC	Portuguese Official Accounting Plan (up to 2009)
QREN	Portuguese National Strategic Reference Framework 2014-2020
RWA	Risk Weighted Assets
SABI	Database of Iberian Business Accounts by Bureau van Dijk
Sig.	Statistical significance
SNC	Portuguese Official Accounting Plan (from 2010)
SME	Small and Medium Enterprises
SPGM	SPGM – Sociedade de Investimento, S. A.
Trade	Wholesale and retail trade; repair of motor vehicles and motor cycles - Section G of CAE
VAT Nr.	Value Added Tax Number

Part I

BACKGROUND

1. Introduction

The Portuguese Mutual Guarantee System is about to celebrate 25 years of activity. Born to improve the financing conditions for small and medium-sized enterprises, the system gained a more prominent status with the 2008 financial crisis, becoming one of the main public policy instruments to support the business network. After an incremental development during the first half of its existence, the crises years witnessed an exponential growth in the activity of the system, reaching record highs in 2009 and 2010. This was followed by a natural slowdown, but the Portuguese system began to regularly issue over 1 billion euros in guarantees every year, becoming one of the most important in Europe.

The increase in the system activity was accompanied by a constant concern with evaluating its impact on the Portuguese economy, a task in which CEGEA collaborating with SPGM. The first evaluation report was produced in 2008/2009 and the following in 2011 and in 2016. The first report assessed the impact of mutual guarantees on the firms using them over the 2003-2006 period. The second comprised a longer period, 2000-2008, and besides the analysis of the impact on users, it also included the macroeconomic impact on GDP and employment. The 2016 report included both these level of analysis but focused on the period immediately following the financial crisis, 2009-2014, having simultaneously introduced relevant methodological changes [1].

This report follows on from this evaluation process, differing from the previous ones in the following points:

• It considers two additional years of the system activity, covering the 2011-2016 period. The intended focus of the analysis is the post-financial crisis period, therefore the years of 2009 and 2010 - years marred by exceptional functioning conditions of the financial system which may have had an impact on users that is not replicable in periods of 'financial normalcy' - have not been included;

• It breaks down the results at a sectoral level, analysing the impact of mutual guarantees not only on the Portuguese firms, as a whole, but also on four sectoral subsamples, corresponding to manufacturing industries, construction, trade and 'other' economic activities[2]; this selection of subsamples privileged sectors with greater weight in the activity of the mutual guarantee system;

• It studies a wide range of dimensions in which the mutual guarantee has impacted on its users. As for the financial impact, in addition to the impact on cost and access to finance reviewed in previous reports, it also studies the impact on debt maturity; as for the impact on the economic performance of users, besides the previously analysed investments and exports, it also goes over employment, profitability and survival rate;

• It presents new metrics of impacts on users, namely in the form of multipliers, i.e. Euros of impact per Euro of guarantee used;

• Besides the previously reported impacts on guarantee users and on the economy, it includes an analysis of the impact on the financial system.

[1] The non-inclusion of the period prior to 2009 in this report results from its analysis in the previous report, but, above all, from methodological issues raised by the change in the Portuguese accounting system. In 2009, Portuguese firms based its accounting on the SNC and abandoned the POC, causing difficulties for carrying out studies based on company accounts covering both the periods before and after that year.

[2] Specificaly, we consider subsamples corresponding to sections C, F and G of the Portuguese Classification of Economic Activities and all other firms are grouped in the subsample designated "other economic ativities".

After this Introduction, the report is organized as follows: the next chapter gives a brief description of the Portuguese Mutual Guarantee System, both in terms of its institutional organisation and of its level of activity. The analysis of the economic impact of the system begins in Chapter 3 which covers the impact of mutual guarantees on the user firms. It also presents the estimates of the benefits obtained in financing – in terms of cost, term structure and amount of debt – and of its economic performance – in terms of investment, exports, employment, profitability and survival. Chapter 4 presents the estimates of the macroeconomic impacts of mutual guarantees in terms of Gross Domestic Product and employment, considering the interactions between the firms using mutual guarantees and the rest of the business network. Finally, Chapter 5 addresses the impact of mutual guarantees on the financial system.

2. Mutual guarantee Portugal

This first chapter briefly describes the Portuguese Mutual Guarantee System, providing some background to the impact analysis presented in the following chapters.

2.1.The Portuguese mutual system

The Portuguese Mutual Guarantee System emerges in 1994, upon the establishment of SPGM – Sociedade de Investimento, S.A. It was a pilot scheme promoted by IAPMEI, designed to test the feasibility of this financial instrument in the Portuguese market. Basing on experiences from other countries, SPGM proposed to facilitate the SMEs access to debt by ensuring, to some extent, the financing operations, thus reducing the risk profile the financier encountered. The mutualist character of the instrument was ensured by the benefiting firms' obligation to take equity participation in the guarantee society.

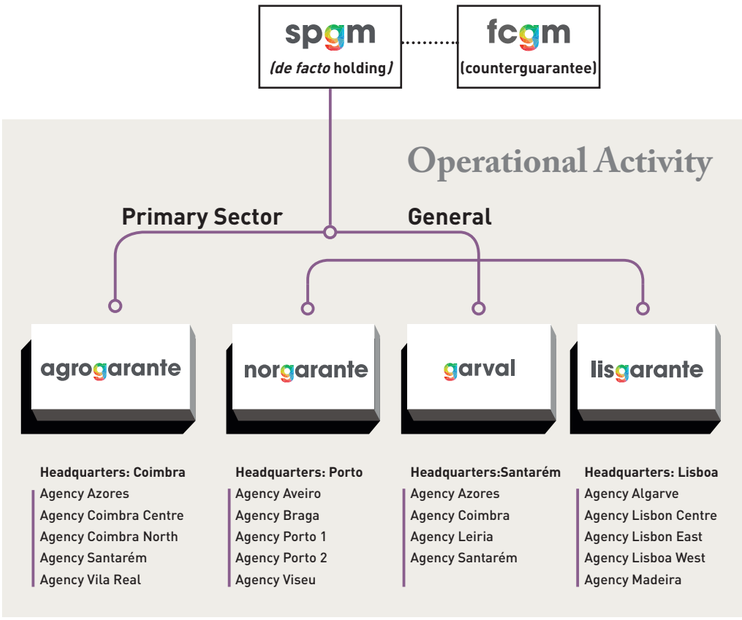
With headquarters and offices in Porto, SPGM began its activity in the following year. The society's capital was shared between various national financial groups and IAPMEI. In the first years of activity, while SPGM was the only entity dedicated to mutual guarantee concession, it focused in disseminating this new financial product, both among prospective user firms and banking institutions, and in preparing the future legal framework to support the development of the Portuguese Mutual Guarantee System and a set of good practices that could be replicated by the future Mutual Guarantee Societies (MGS). The granting of guarantees occurred at a slow but increasing pace, thus explaining the opening of a first delegation in Lisbon at the end of 1997.

In 1998, the specific legal framework for the Mutual Guarantee activity was adopted (Decree-Law 211/98) and has since been amended several times. It defined MGS as financial societies benefiting micro, small and medium-sized enterprises. The Mutual Counter-guarantee Fund (MCGF) was also created, SPGM being responsible for its management (Decree-Law 229/98).

In 2002-2003 the system evolves to its present configuration. In 2002, the activity of SPGM activity was divided into two Mutual Guarantee Societies (MGS), Norgarante and Lisgarante, with headquarters in Porto and Lisbon, respectively. And, at the same time, Garval, a third MGS was created in Santarém. Despite SPGM's participation in the MGS, the majority of their equity capital was held by private organisations, namely national credit institutions and business associations. But the majority of SPGM's capital continued to be publicly owned. As of 2003, the three MGS were in charge of the operational activity of providing guarantees, with SPGM assuming the role of the system's de facto holding and managing the MCGF. As a de facto holding, it was incumbent on them to promote the financial product and the emergence of MGS, ensuring them the provision of a set of shared services. In 2006, there was a new and significant development in the Portuguese Mutual Guarantee System, the formation of Agrogarante. With headquarters in Coimbra, this MGS is exclusively dedicated to supporting the agroforestry sector, having begun its activity in 2007. Like the other MGS, the majority of Agrogarante's capital is private.

The Portuguese Mutual Guarantee System is then currently composed of the six entities shown in Figure 2.1 - Portuguese Mutual Guarantee System's Structure.

Figure 2.1. - **Portuguese Mutual Guarantee System's Structure**



Source: Annual Accounts SPGM, Agrogarante, Garval, Lisgarante and Norgarante.

At the operational level, there are four Mutual Guarantee Societies: Norgarante, Garval, Lisgarante and Agrogarante. The first three provide guarantees to firms in the industrial, energy, construction, tourism, trade, service and transport sectors. Each of these societies has a preferred geographical area of operation, though it may sometimes operate outside it, particularly in the context of syndicated operations.

Supporting the MGS is the Mutual Counterguarantee Fund (MCGF), a public legal entity responsible for 'promoting and carrying out the actions required to ensure the solvency of the Mutual Guarantee Societies.' The Fund counter guarantees operations performed by MGS, having several guarantee lines, resulting from public or international funding. The counterguarantee reduces the risk incurred by the MGS, reducing the required provisions, having a multiplier effect on their ability to provide guarantees without undermining their solvency ratio.

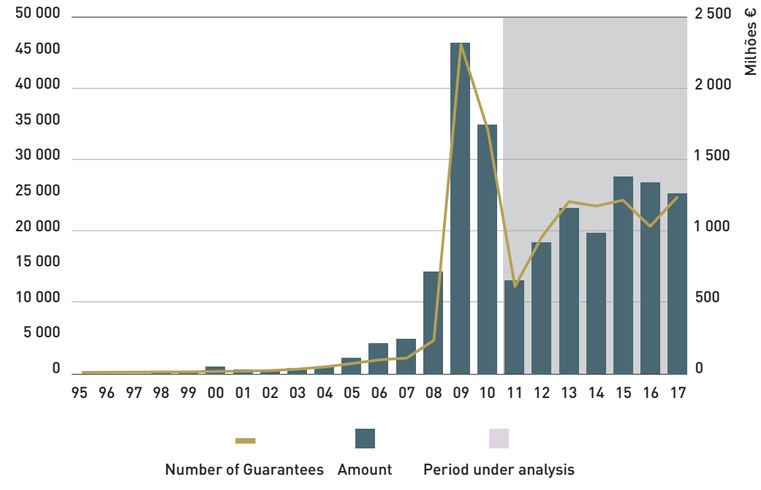
SPGM works as a shared service centre, supporting the four MGS in areas such as treasury, payments, collections, human resources, accounting, taxation, employment, litigation, as well as information systems. It is also responsible for the Mutual Guarantee's strategic and institutional marketing and for the system's institutional and external representation.

2.2. Evolution of the activity

Throughout its over two decades of existence, the Portuguese Mutual Guarantee System has registered a significant evolution of its activity level, as seen in Chart 2.1.

The activity growth was steady but relatively slow until 2007. That year, the system surpassed, for the first time, the threshold of 2,000 guarantees issued per year, representing an amount close to 250 million euros. In the following two years, the activity had exponential growth. The number of guarantees issued doubled in 2008 and increased tenfold in 2009, tripling the amount in each of those years - in 2009 almost 47,000 guarantees were issued, amounting to 2.3 billion euros.

Chart 2.1. Guarantees per issuing year (1995-2017)



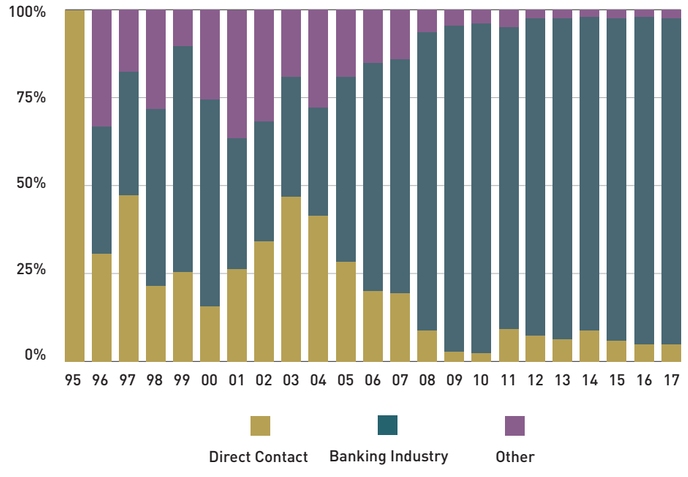
Source: SPGM.
Note: the period under review in this report is highlighted in gray.

This exceptional growth stemmed largely from, as discussed in more detail below, public solutions developed to face the serious economic and financial crisis that marked these years, particularly the onset of subsidised credit lines guaranteed by MGS. In the following years, as the financial situation gradually returned to normal, the guarantee activity slowed down. Still, the mutual guarantee system did not return to pre-financial crisis levels of activity. In 2011, the year with the lowest level of activity in its second decade, the amount of guarantees issued was very similar to that of 2008, around 600 million euros, but the number of guarantees issued was much higher. Activity has since grown again and in the past three years there have been around 1.2 to 1.3 billion euros of guarantees issued annually, with a slight downward trend.

ITS DECISIVE CONTRIBUTION IN THE FIGHT AGAINST THE 2008-2009 FINANCIAL CRISIS MARKED A TIPPING POINT IN THE IMPLEMENTATION OF THE PORTUGUESE MUTUAL GUARANTEE SYSTEM

The financial crisis was a key moment in the implementation of mutual guarantee in Portugal, contributing to its consolidation within the scope of the Portuguese financial system. The activity growth of the mutual guarantee system was accompanied by a significant change in its 'business model'. This change was particularly clear in terms of activity 'origination'. In its first years of activity, SPGM made considerable efforts to promote its financial product - hitherto unknown in Portugal - within the business network, particularly through direct marketing. The aim was to encourage firms to resort to SPGM when looking for guarantees for future operations. In the tradition of other mutualist systems, it was intended that, at a later stage of development, firms themselves or their representatives would promote the creation of mutual guarantee societies. Up to 2004, many of the mutual guarantee operations concluded stemmed from direct contact between SPGM and the firms needing guarantees (Chart 2.2): this corresponded to 42% of the amount of guarantees issued that year.

Chart 2.2 – Amount of guarantees issued by origin of contact with the guaranteed firm (1995-2017)

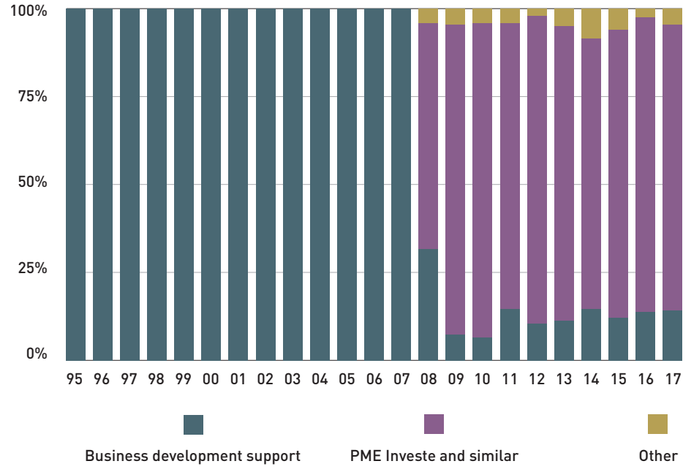


Source: SPGM.
Note: the database only shows thorought records of the contacts' origin from 2006 onwards; the percentages presented ignore the operations of unknown origin.

From then on, the scenario changed considerably, with the banking channel becoming increasingly important. As early as 2005, half of the guaranteed amount originated from contacts promoted by the banking industry and this proportion rose to two-thirds in the following two years. In 2008, the contacts promoted by the banking industry resulted in 85% of the guaranteed amount, and since then, only in 2014 has this percentage fallen below 90%. In the last decade, direct contacts between firms and the MSG never represented over 10% of the volume of guarantees issued annually.

The reaction to the financial crisis largely explains this consolidation of the banking industry as a privileged channel for the mutual guarantee trading. As can be seen in Chart 2.3, until 2007, almost all mutual guarantee operations were carried out within the framework of the MSG's "business development support" guarantee lines[3]. From that year onwards, most of the guarantees and of their amount have been set within the framework of publicly-sponsored credit facilities, created as a reaction to financial constraints arising from the crisis, here referred to as 'PME Investe and similar'.

Chart 2.3 – Amount of guarantees issued by type (1995-2017)



Source: SPGM.

The PME Investe I credit facility was launched on July 2008. Under this line of credit, promoted by the Portuguese Government, most national credit institutions could grant 600 million euros in loans to SMEs, at a subsidised interest rate, for fixed asset investment or for reinforcing working capital associated with the increase of activity. To this end, credit institutions benefited from mutual guarantee on 50% of the amount lent. The MGS, on the other hand, benefited from a counterguarantee of 80% by MCGF whereas, to that end, received a dedicated financial allocation by QREN. In operational terms, credit institutions negotiated with the firms applying for financing, referring to MGS the data required to, within a maximum period of 7 days, decide on the guarantee approval.

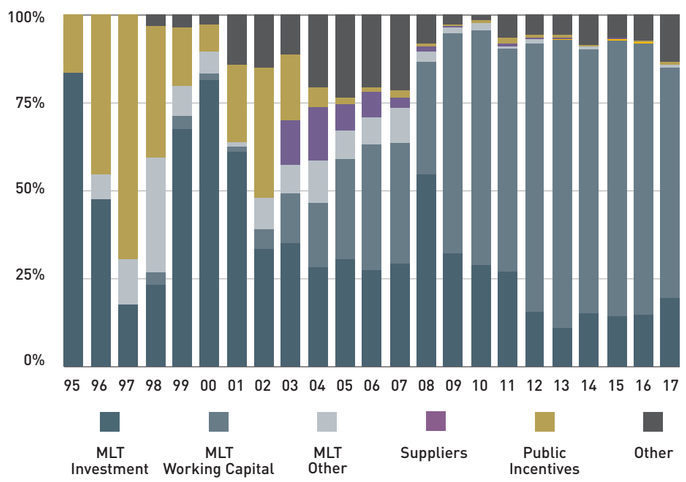
This credit line had a huge demand, running out of the initially allocated 600 million euros in less than a month and being reinforced with 150 million. Given this success, the credit lines PME Investe II and III were launched in the same year. In the following years, the initiative was adjusted and replicated, with new lines PME Investe, PME Crescimento and Capitalizar.

[3] Here we use retroactively the present designation for these lines of activity.

With the increase of these credit facilities, the mutual guarantee system went from a business model where the MGS had an active role in customer acquisition and where, often, they had to promote contact between the firms and the credit institutions, to a business model where, conversely, the credit institutions referred the operations to the MGS, without them having great contact with the firms applying for guarantee. Although the system formally preserves its mutual nature, since the user firms are required to acquire shares of the MGS providing them guarantees this is a form of mitigated mutualism where the customer has little contact with the MGS - usually intermediated by the bank - and considers the share participation as part of the financing cost. And in most cases, the MGS has no privileged knowledge of its guaranteed firms, being no different on that regard from any other financial partner.

The changes in the business model which allowed the exponential growth of the mutual guarantee system from 2008 onwards were also reflected in the typology of the transactions concluded. As seen in Chart 2.4, until 2002, while the system was limited to the action of SPGM, the guarantees issued were designed predominantly to support productive investment, whether via investment credit or via public incentives. Between 2003, when the first MGS appeared, and 2007, this pattern of activity changed: the weight of guarantees for financing medium and long-term investment declined to 30% and guarantees for public incentives gradually became close to residual; conversely, there was a larger expression of guarantees provided to suppliers and, particularly, the support for medium and long-term financing operations reinforcing the working capital represented a third of the amount guaranteed in 2007. Overall, in this period, guarantees for medium and long-term financing operations, whatever their nature, went from 57% to 74% of the total.

Chart 2.4 – Amount of guarantees issued by purpose (1995-2017)

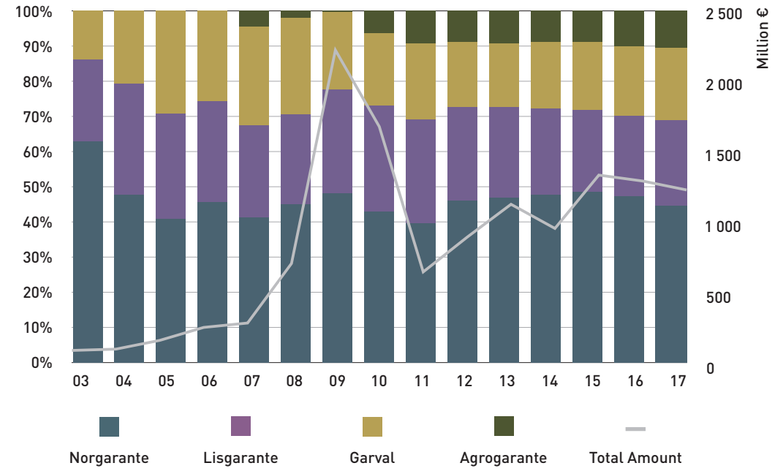


Source: SPGM.

As of 2008, with the onset of publicly-sponsored credit facilities, medium and long-term financing became the destination of around 90% of the guaranteed amount. That year, 54% of the amount of guarantees issued was intended to support investment and 32% to working capital reinforcement. In the following years, as the economic crisis deepened, the relative importance of these two types of operation quickly reversed, investment support having reached a minimum of 11% in 2013, when working capital reinforcement represented 82% of the amount issued. In recent years, there has been a recovery of investment support, but working capital reinforcement is still the dominant purpose of the guarantees issued. As for the other types of guarantees, those intended for short-term financing are the most relevant, representing 4.4% of the issued amount throughout the system's existence. However, in the three-year period 2005-2007, they represented almost 15% of the total and in 2017 over 10%.

In sum, during its first decade of activity, the mutual guarantee system business model focused on direct contact with potential customers, about whom SPGM and MGS tried to have in-depth knowledge, and support them in setting up the financial operations they needed. In sum, during its first decade of activity, the mutual guarantee system business model had SPGM and MGSs having direct contact with customers, trying to garner in-depth knowledge about them, and helping them in setting up the financial operations they needed. Most guarantees were leveraged by SPGM's and MGS's equity and tried to support productive investment, via bank financing or public incentives. In its second decade of activity, the system transitioned to a model where the banking industry became the privileged channel of 'origination' of operations, which now mainly financed the businesses' working capital and were funded by specific publicly-sponsored lines of the MCGF.

Chart 2.5 – Amount of garantees issued by Mutual Garantee Society (2003-2017)

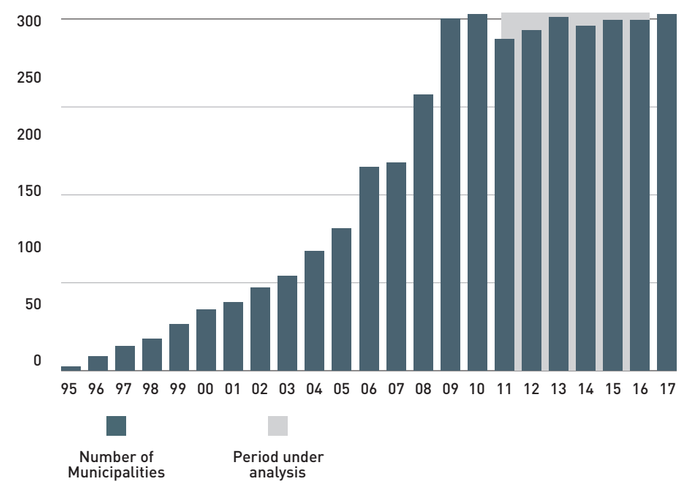


Source: SPGM.

As described in the previous section, after an early stage where SPGM was the only operator, the mutual guarantee system evolved to the formation of several MGS: firstly Norgarante, Lisgarante and Garval and, later, Agrogarante. The relative importance of these MGS in issuing guarantees has displayed great stability as depicted in Chart 2.5. Norgarante, whose activity focuses on Northern Portugal, has consistently been responsible for issuing the lion's share of the total amount of guarantees. Its relative weight reached a minimum of 40% in 2011, averaging between 45% to 48% in recent years. Lisgarante, operating in Southern Portugal and Madeira Islands, often comes in second, averaging between 23% to 25% in recent years. Garval, operating in central Portugal and Azores Islands, has a slightly lower weight, averaging between 18% to 20%. Agrogarante, the youngest of the four MGS, with a sectoral rather than geographical scope, represents between 9% to 11% of the total.

The MGS network, together with the banking industry, enables the system to have deep regional penetration. Over its lifetime, it has already celebrated guarantee operations with firms from all 308 Portuguese municipalities. As seen in Chart 2.6, the geographical range of the system rapidly increased over the first decade of activity and, since 2009, it is nearly universal, annually celebrating guarantees with firms of roughly 300 municipalities.

Chart 2.6 – Number of municipalities where the headquarters of the mutual garantee benefiting firms are located, by issue year (1995-2017)



Source: SPGM.

Still, as one would expect, mutual guarantees have a stronger focus in the municipalities more relevant to the Portuguese economic activity: the top 25 municipalities where firms got the greater amount of guarantees, from 1995 to 2017, represent about half of total guarantees whereas their weight on the national population is 37.5% (Table 2.1). These municipalities, except for Viseu, are located along the Portuguese coastline, between Braga and Lisbon. Lisbon is at the top of this list with 6.44% of the amount of guarantees, followed by Porto, with 3.6%, and Leiria, with 3.2%, corresponding to the activity areas of, respectively, Lisgarante, Norgarante and Garval.

In addition to geographic diversification, the development of mutual guarantee activity was also accompanied by an extension of its sectoral scope. The initial capital of SPGM came, in part, from PEDIP II, an incentive system designed to support the manufacturing industry, which initially restricted the activity of the mutual guarantee system to this economic sector. The arrival of new shareholders into the capital of SPGM from 1999, and the allocation of broader scope funds to MCGF from 2003, allowed to expand the system's action to most economic activities.

Table 2.1 **– Top 25 municipalities with the greater amount of mutual guarantees issued (1995-2017)**

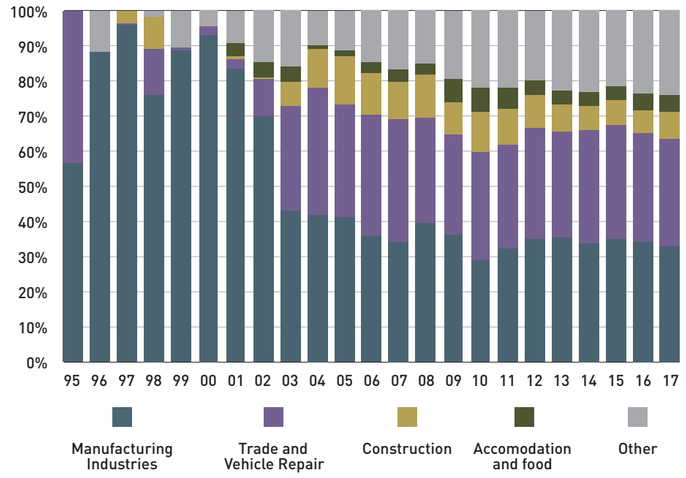
	% Population	Guarantees	% Garantees	Amount	% Amount
Lisboa	4.92%	15 159	6.13%	853	6.44%
Porto	2.09%	8 559	3.46%	479	3.61%
Leiria	1.22%	6 206	2.51%	419	3.17%
Guimarães	1.49%	6 942	2.81%	388	2.93%
V. N. Gaia	2.91%	6 569	2.66%	353	2.66%
Braga	1.76%	6 578	2.66%	348	2.63%
S. M. da Feira	1.35%	5 059	2.05%	324	2.45%
Sintra	3.75%	6 147	2.49%	289	2.18%
V. N. Famalicão	1.28%	4 201	1.70%	281	2.12%
Maia	1.33%	5 249	2.12%	268	2.03%
Barcelos	1.14%	4 213	1.70%	247	1.87%
Matosinhos	1.69%	4 888	1.98%	226	1.70%
Oliv. de Azeméis	0.64%	2 961	1.20%	213	1.61%
Águeda	0.45%	2 915	1.18%	209	1.57%
Loures	2.04%	3 895	1.58%	206	1.56%
Oeiras	1.70%	3 380	1.37%	196	1.48%
Coimbra	1.30%	3 870	1.56%	180	1.36%
Cascais	2.06%	3 662	1.48%	156	1.18%
Aveiro	0.75%	2 610	1.06%	152	1.14%
Felgueiras	0.55%	2 068	0.84%	151	1.14%
Marinha Grande	0.37%	1 753	0.71%	148	1.12%
Alcobaça	0.53%	2 447	0.99%	146	1.10%
Paredes	0.84%	2 569	1.04%	144	1.08%
Viseu	0.95%	2 707	1.09%	142	1.07%
Ourém	0.43%	2 300	0.93%	140	1.06%
Total	**37.53%**	**116 907**	**47.28%**	**6 656**	**50.25%**

Source: INE for population statistics in 2017 and SPGM for all other data.

Chart 2.7 shows that, over the past decade, the sectoral allocation of guarantees issued has been relatively stable. Manufacturing industries (section C of the CAE Rev. 3) absorbs annually about one third of the total amount of guarantees issued, while trade and repair of motor vehicles industries (section G) has a slightly smaller percentage. Within the manufacturing industries, mutual guarantees are widespread, having acted on 329 subclasses of the CAE. Six surpass the threshold of 1% of the total amount of guarantees issued by the system: wine (CAE 11021), outwear (CAE 14131), footwear (CAE 15201), plastic products (CAE 22292), metal products (CAE 25110) and metal moulds (CAE 25734).

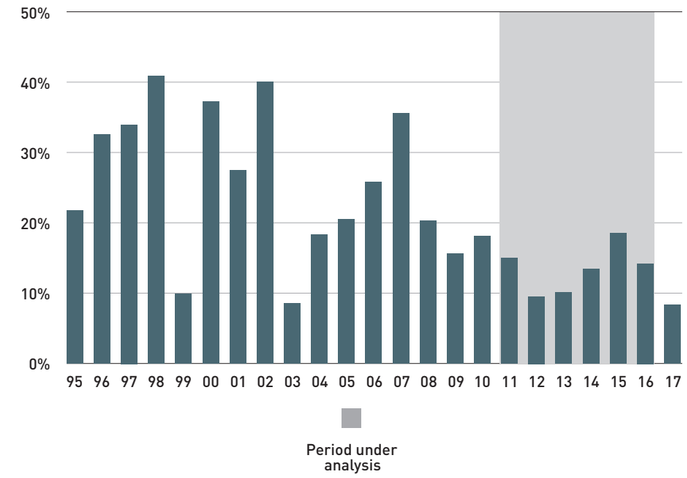
In terms of CAE sections, construction (section F of the CAE Rev. 3) and accommodation and food service activities (section I of the CAE Rev. 3) are next, despite having lower percentages than manufacturing and trade sections: accommodation and food service is usually around 5% of the total amount, while construction has been losing importance, falling from a maximum of 14% in 2005 to about half in the last three years. On the other hand, the amount of guarantees intended for 'other' economic activities has increased, largely as a result of the activity of Agrogarante.

Chart 2.7 – Amount of guaranties issued by economic activity (1995-2017)



Source: SPGM.

Chart 2.8 – Loss ratio by year issued, by amount



Source: SPGM.
Notes: The calculation only considers already extinct or executed guaranties. Loss is considered whenever the guarantee has been partiallly or fully executed by the beneficiary.

Mutual guarantee is an inherently risky activity, and it is expected that part of the guarantees provided will executed by their beneficiaries. Chart 2.8 illustrates the loss ratio, by year of issue: there is great variability, with a minimum of 8.3% in 2017 and a maximum of 40.8% in 1998. Despite this variability, it seems that the loss ratio over the last decade was smaller than that recorded in previous periods. However, we must consider that most guarantees issued in recent years are still 'alive'. The values depicted in the chart for this period are not final and can, therefore, evolve positively or negatively, according to what may happen to these guarantees.

Source: INE para estimativas da população em 2017 e SPGM para os restantes dados.

THE PORTUGUESE MUTUAL GUARANTEE SYSTEM IS THE SIXTH IN EUROPE IN THE AMOUNT OF OUTSTANDING GUARANTEES AND THE FOURTH REGARDING THEIR WEIGHT ON GDP

2.3. Relevance in the international context

Since its expansion over the last decade, the Portuguese Mutual Guarantee System has taken on a significant international relevance.

Table 2.2 – Top 10 European countries in amount of current mutual guarantees (2017)

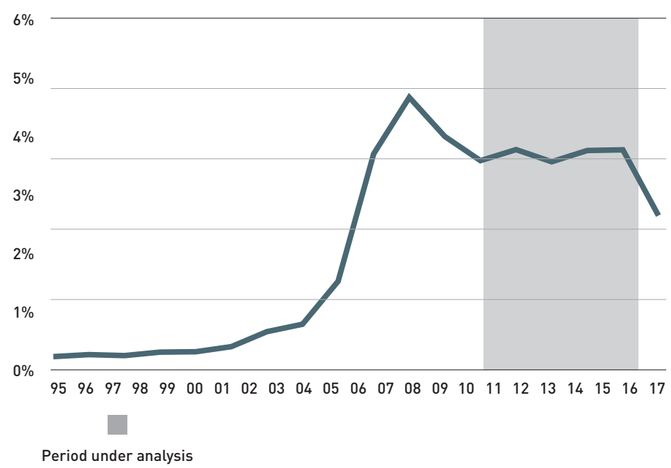
	Amount			Guarantees		Benefiting SMEs	
	Million €	%	% GDP	Thousand	%	Thousand	%
Turkey	44 039	35.1%	5.8%	974	31.9%	645	21.7%
Italy	34 204	27.2%	2.0%	1 055	34.6%	1 332	44.7%
France	21 866	17.4%	1.0%	586	19.2%	578	19.4%
Germany	5 545	4.4%	0.2%	44	1.5%	37	1.2%
Spain	4 032	3.2%	0.3%	72	2.4%	127	4.3%
Portugal	3 483	2.8%	1.8%	93	3.0%	53	1.8%
Poland	2 884	2.3%	0.6%	90	3.0%	90	3.0%
Hungary	2 393	1.9%	1.9%	55	1.8%	45	1.5%
Netherlands	1 824	1.5%	0.2%	18	0.6%	16	0.5%
Austria	911	0.7%	0.2%	6	0.2%	5	0.2%
Other	4 389	3.5%	0.1%	57	1.9%	50	1.7%
Total	**125 570**	**100.0%**		**3 050**	**100.0%**	**2 976**	**100.0%**

Source: AECM, own calculations.

According to AECM (the European Association for the sector) statistics, in 2017, Portugal ranked at sixth among the 25 member countries of the organisation in terms of the amount of current mutual guarantees (Table 2.2), representing 2.8% of the total. Above Portugal are only larger countries in terms of territory, population and economy, such as Germany, France, Italy, Spain and Turkey. However, when considering the amount of guarantees versus the size of the country's economy, as measured by GDP, only in Turkey (5.8%) has mutual guarantee a significantly higher relevance than the one registered in Portugal (1.8%). In Italy and Hungary this relevance is slightly higher than in Portugal, but in all other countries is much lower. Portugal is also among the European countries in which the mutual guarantee system is more relevant when the evaluation criterion is the volume of guarantees or the number of SMEs benefiting.

The relevance of Portugal in the international context grew sharply between 2008 and 2010, when it reached a maximum of 4.9% of the amount of current guarantees, accompanying the evolution of the activity of the Portuguese Mutual Guarantee System (see Chart 2.1). Over the period studied in this report, this weight remained fairly stable, around 4% (Chart 2.9). The fall registered in the year 2017 results, not from a decrease in the importance of guarantees in Portugal, but to an extraordinary increase of issued guarantees in Turkey.

Chart 2.9 – Portugal's weight among 29 European countries as for the amount of current guarantees (2000-2017)



Source: AECM, own calculations.

Part II

IMPACT ASSESSMENT

3. The user firms

This chapter assesses the impact of mutual guarantee on the performance of ts user firms. It presents estimates for three financial performance indicators (cost, amount and maturity of debt) and five economic performance indicators (investment, exports, employment, profitability and survival). Results point to an overall positive contribution of mutual guarantee to business performance.

Although the mutual guarantee system has a broader scope of activity, including the personal credits guarantee for college students, supporting SMEs financing is its crux. As stated in the SPGM website, 'Mutual Guarantee is a pooling system supporting micro, Small and Medium-sized Enterprises (SMEs), in other words, it provides financial guarantees to facilitate credit procurement in conditions suitable to the investment needs and activity cycles of these enterprises.'

The expected impact of mutual guarantees results in, firstly, improving the financing terms of its users. However, this effect is merely instrumental. Better financial terms are expected to allow firms to develop their activity, generating economic gains for themselves (analysed in this chapter) and for the whole Portuguese economy (analysed in the following chapter). The aim of this chapter is to evaluate whether this occurred in the 2011-2016 period.

3.1. Questions, data and methodology

As stated in the Introduction, this report follows on previous assessments of the mutual guarantee impact in Portugal carried out by CEGEA in 2009, 2011 and 2016. As its predecessor, this report continues to answer the following four questions:

- Financing cost – does a mutual guarantee user firm get a lower financing cost than if it had not used this financial instrument?
- Access to financing – does mutual guarantee allow its users to get additional external funding than they would without it?
- Investment – does a mutual guarantee user firm invest more than what it would have invested without mutual guarantees?
- Exports – does a mutual guarantee user firm export more, or not, than what it would have exported without it?

However, to the previous questions, this report adds the following four:

- Term structure of debt – does the use of mutual guarantee allow firms to obtain debt with a longer term structure than without using it?
- Employment – does a mutual guarantee user firm increase its level of employment vis-à-vis their level of employment without this financial instrument?
- Profitability – does the use of guarantee allow its users to reinforce their profitability?
- Survival – to what extent does the use of mutual guarantees change the firm's survival rate?

In short, we now consider three dimensions at the level of the financial impact of the mutual guarantee (access to finance, financing cost and maturity) and five economic dimensions (investment, exports, employment, profitability and survival).

3.1.1. Methodology

This report attempts to quantitatively answer these questions using econometric methods. These methods answer them by comparing the performance of users and non-users of mutual guarantees, considering the possibility that the observed differences could be explained by factors other than the use of mutual guarantee.

Specifically, using a sample as comprehensive as possible of Portuguese firms in the 2011-2016 period, we attempt to identify the determinants of their performance in each of the eight dimensions in analysis and quantify their impact. In particular, we seek to check whether the use of mutual guarantees is one of those determinants. For each one of the dimensions we want to study, we write an equation of the type

$$g=b_0+b_1x_1+b_2x_2+...+b_nx_n+e$$

where g is the variable that we are trying to explain (eg. debt cost rate), $x_1, x_2, \ldots, x_n$ are the observed variables which may explain it and represents the impact of unobserved determinants. The coefficients $b_0, b_1, \ldots, b_n$ measure the impact of each potential explanatory variable in the variable explained.[4]

The utilized methods allow us to find the values of $b_0, b_1, \ldots, b_n$ that 'better' explain the values of g from the values observed of $x_1, x_2, \ldots, x_n$ nin a given sample of firms and, simultaneously, determine the level of statistical confidence of the results.

Whenever it is possible to say, with a certain level of confidence, that a given coefficient b is different from zero, the variable associated to it is posited to influence the variable that we try to explain.

In this study, the observed values stem from a 'panel' of Portuguese firms followed over several years: the figures presented by each firm, in each year, represent an observation of the variables under study; the total number of observations corresponds to the sum of the number of firms with available data in each year.

The results obtained for the coefficients $b_0, b_1, \ldots, b_n$ depend, obviously, on the potential determining variables $x_1, x_2, \ldots, x_n$ that are included in the analysis. The explanatory variables considered here are of four types. First, for each equation, we consider a set of variables suggested by economic theory or by intuition. For instance, economic theory and intuition suggest that the risk the firm represents to its financiers influences the cost of financing. Therefore, in the equation corresponding to the cost of financing, we include variables trying to measure this risk. This type of explanatory variables are specific to each equation and are further described ahead.

4 As we explain below, the procedure for exports and survival analysis is slightly different in view of the specificities of those variables. In terms of exports, the variable explained is null for the majority of firms. As for survival, the variable takes only two values, whether the firm is alive or not. In those cases, the interpretation of coefficients is also different than that explained in the following paragraphs.

The key hypothesis to be tested in this report is that the companies resorting to mutual guarantee get a more favourable performance in each of the areas under review, than they would have obtained if they had not resorted to it. So, in addition to the former, in all the equations we include a set of variables representing the use of mutual guarantee and its characteristics, according to the following specification:

$$\begin{aligned} g &= b_0 + b_1x_1+\cdots \\ &+ (b_{GM} + b_{DEF} \times default + b_{MLP} \times MLP + b_{BAN} \times banking + b_{ADN} \times ADN \\ &+ b_{PMI} \times PMEInveste + b_1 \times age + b_D \times size \\ &+ b_G \times tangible\ assets) \times GM + \cdots + b_nx_n + e \end{aligned}$$

The explanatory variable MG takes the value 1 if the firm, in a given year, used mutual guarantees and 0 if it didn't.[5] When this variable takes the value 1 it has a multiplicative relation with other variables aiming to capture the differential effect of the characteristics of the user firm or of the guarantee itself::

- *default* – this variable takes the value 1 when, in a given year, the firm had an ongoing guarantee operation that, in that same year or later, [6] went into default and 0 in all other cases; it is intended to verify if the mutual guarantee impact is influenced by its success;
- *MLT* – this variable takes the value 1 when the guarantee was provided for a medium or long-term financing operation and 0 in all other cases; it is assumed that the effects of the mutual guarantee may vary according to the maturity of the financing guaranteed;
- *banking* – this variable takes the value 1 if the mutual guarantee operation originated in a financial institution and 0 if it didn't; it is intended to verify that the 'origination' of the operation is relevant to its impact;
- *ADN* – variable that takes the value 1 for guarantees issued within the framework of business development support lines and its predecessors and 0 in all other cases; it is intended to verify that different lines of guarantee had different impacts;
- *PME Investe* – variable that takes the value 1 for guarantees issued within the framework of PME Investe credit lines and similar[7] in all other cases; used with the same purpose as the previous;
- age – it corresponds to the number of years passed since the year the firm was established until the year of observation; the aim is to test the hypothesis that mutual guarantee is the more relevant as younger the firm is;
- size - it is measured by the total assets of the firm, in natural logarithm; the aim is to test the hypothesis that mutual guarantee is the more relevant as smaller the firm is;
- tangible assets - corresponds to the weight of tangible assets in the total assets of the firms; it is based on the hypothesis that a high percentage of tangible asset gives the firm greater ability to provide real guarantees therefore reducing the relevance of the mutual guarantee use.

5 In most equations, this variaable takes the value 1 if the company had, during the year, any active mutual guarantee operaion. In equations relating to investment, however, this equation only takes the value 1 if the firm obtained new mutual guarantees during the year. In the survival analysis both possibilities are, alternatively, considered.

6 The database used endsin 2017, so one can only observe the *defaults* that occurred until that year.

7 According to SPGM's information, in addition to all PME Investe lines, others were considered, particularly the lines PME Crescimento, QREN Investe and Capitalizar, in addition to others with less expression.

The parameter b_{GM} measures the impact that the use of a mutual guarantee would have on a firm that had zero value in the other variables related to the mutual guarantee. But, since those variables, usually, are not nil, the total impact of the mutual guarantee is given by

$$b_{GM} + b_{DEF} \times default + b_{MLP} \times MLP + b_{BAN} \times banking + b_{ADN} \times ADN + b_{PMI} \times PMEInveste + b_1 \times age + b_D \times size + b_G \times tangible\ assets.$$

Therefore, it is not possible to estimate the impact of mutual guarantees without specifying the value of these variables. In this chapter, we present estimates of the impact of mutual guarantees based on the median value of those variables[8], but also provide an assessment of the sensitivity of the estimated impact on the change of characteristics of the user firm, such as its age and size.

In addition to the variables suggested by economic theory and those that reflect the use of mutual guarantee, all equations include variables that take the value 1 for the observations of a given year and 0 on all the others (year 'fixed effects'). These variables aim to capture the impact of phenomena changing over time and that affect firms in general, such as the evolution of the risk-free interest rate, the economic cycle or fiscal policy. Finally, in most of the equations, variables that take the value 1 for each firm and 0 for the all the others (firm 'fixed effects') were also considered. These variables intend to capture idiosyncratic specificities of each of the firms that do not correspond to the general trends that we seek to identify here. The impact of these variables is not individually analysed. In equations regarding the performance of firms in terms of exports and of survival, for reasons of the econometric techniques used and of the size of the sample, it is not possible to consider these 'fixed effects'. Alternatively, in these cases, variables corresponding to the economic sector of the firm are considered. To this end, and considering the sectoral distribution of the mutual guarantee operations presented in Chart 2.7, we divided the sample in four activity sectors:

- Manufacturing, corresponding to section C of the Portuguese Classification of Economic Activities;
- Construction corresponding to section G of the Portuguese Classification of Economic Activities;
- Wholesale and retail trade; repair of motor vehicles and motor cycles corresponding to section G of the Portuguese Classification of Economic Activities;
- Other economic activities corresponding to all activities outside the scope of previous ones.

After estimating the equation corresponding to each one of the questions under analysis, its results are used to estimate the monetary amount of the mutual guarantees' impact in each year of the period studied. For this purpose, for each sector of activity, the impact on the 'median firm' is determined and multiplied by the number of users of mutual guarantees. The monetary amount of the impact on the median firm is also divided by the median amount of granted guarantees by firm to obtain an estimate of the 'multiplier', that is, the monetary effect obtained by the user for every euro of guarantee used. This analysis is carried out by activity sector of the firms.

[8] This is the value that divides the sample in two equal parts.

3.1.2. Data

For this study, accounting data and details were downloaded from the database SABI[8] for all Portuguese entities that fulfilled the following criteria:

- Being a legal entity (this is, their VAT Nr. starts with 5);
- Being a public limited company or limited company;
- Not engaging in the financial activity (this is, their CAE code does not start with 64 or 65).

In addition, SPGM provided a database thoroughly identifying all mutual guarantee operations carried out over the 2011-2016 period, its terms and beneficiary firms.

The two original databases were crossed, creating a new database that, for each company, presents the values of their balance sheet and income statement items for each year and identifies the mutual guarantee operations they benefited from. This database underwent a set of 'cleaning' procedures, namely removing observations presenting no information on key variables under analysis or attributing them impossible or extreme values[10].

Com base nestes métodos e dados, analisou-se então o impacto da garantia mútua em cada uma das oito dimensões de desempenho anteriormente identificadas.

Basing on these methods and data, we examined the impact of mutual guarantee in each of the eight previously identified performance dimensions.

[9] SABI, sold by Bureau Van Dijk, is a database of business information covering Portugal and Spain. It contains information from IES about arounding 220,000 Portuguese firms.

[10] 2,5% of the values at each end of distribuition were excluded.

3.2. Cost of debt

What impact do mutual guarantees have on the cost of debt borne by their users?

The information available for this work, based on annual income statements and balance sheets of the firms, does not allow a direct analysis of the cost rate of the specific financial transactions benefiting from mutual guarantee. What can be observed is the average cost of debt of each firm, defined as the ratio between interest and similar expenses incurred in a given year and the average of the firm's debt that year and the year before[11]:

$$cost\ of\ debt = \frac{interest\ and\ similar\ expenses\ incurred_{year}}{\frac{debt_{previous\ year} + debt_{year}}{2}}$$

In the near to 400,000 observations on which this analysis focuses, this rate has an average of 4.98% for firms not using mutual guarantees and of 4.77% for those benefiting from them. Therefore, there is a difference, in favour of the user firms, of 0.21 percentage points, roughly 4% of the rate supported by non-users. Finding that mutual guarantee users support an average cost of debt lower than other companies does not, however, prove that this is due to the use of mutual guarantees, as it is not certain that the two groups consist of comparable firms. It could be that, for instance, the users' group was made up of firms that, regardless of the use of this instrument, displayed lower levels of risk than non-users, that being the explanation for their lower financing cost.

To answer the question raised, a model that explains the debt cost rate borne by firms and that isolates the effect of the use of mutual guarantee from that of other relevant variables is necessary. In line with matters discussed in section 3.1, the models described in Table 3.1 consider four groups of explanatory variables of the cost of debt: idiosyncratic features of the firm (these variables are not presented in the table for space-saving reasons), the year in which the cost of debt is measured, a set of variables related to the use of mutual guarantees and, finally, variables that theory suggests will influence the cost of debt. As for this latter group, we consider specifically the following:

- *size* – the size of the firm is defined as the natural logarithm of the total assets of the firm in the year preceding the observation under analysis; the hypothesis justifying the inclusion of this variable is that larger firms are able to get lower debt rates (Carey et al., 1993);[12]

$$size = \ln(total\ assets_{previous\ year})$$

11 The use of similar variables is frequent in the literature on cost of financinging. See, e.g., Pittman & Fortin (2004).

12 There are several reasons for being so. First, there are scale economies in credit-granting: the cost of the analysis of a credit operation does not grow in proportion to its amount. Then, also for informational reasons: prospective creditors are often better informed about larger firms, often having a relationship record, than about smaller firms.

- *liabilities* – this is the ratio between total liabilities and assets in the previous year; it is assumed that a capital structure with a greater weight of debt implies higher risk for lenders and therefore leads to higher debt cost rates (Sengupta, 1998);

$$liabilities = \frac{liabilities_{previous\ year}}{total\ assets_{previous\ year}}$$

- *non-financial liabilities* – it is the ratio between non-financial liabilities and total assets in the previous year; the hypothesis here is the same as in the previous variable, but, with the use of this variable, it is intended to verify that the nature of the liabilities has repercussions on the cost of debt;

$$non\ financial\ liabilities = \frac{non\ financial\ liabilities_{previous\ year}}{total\ assets_{previous\ year}}$$

- *financial liabilities* – in the same way, it is intended to verify that the nature of the liabilities has repercussions on the cost of debt;

$$financial\ liabilities = \frac{financial\ libailities_{previous\ yera}}{total\ assets_{previous\ year}}$$

- $ebitda_{t-1}$ – firm's profitability is measured as the ratio between earnings before interest, taxes, depreciation and amortisation (EBITDA) and the total assets of the previous year; it is assumed that the most profitable firms have greater capacity to bear the burden of debt, this way representing less risk to the financier, and consequently obtaining a lower debt cost rate (Pittman & Fortin, 2004);

$$ebitda_{t-1} = \frac{EBITDA_{previous\ year}}{total\ assets_{previous\ year}}$$

- *tangible assets* – this is the ratio between fixed tangible assets and the total assets in the previous year; it is assumed that a higher proportion of tangible assets in the balance sheet strengthens the capability to provide real guarantees, thus reducing the debt cost (Pittman & Fortin, 2004);

$$tangible\ assets = \frac{fixed\ tangible\ assets_{previous\ year}}{total\ assets_{previous\ year}}$$

The three models presented in Table 3.1 are differ only in the treatment given to the liabilities of the firm.[13]

13 We also tested an alternative specification, in which, for each firm, the six previous variables were measured in terms of deviation from the sectoral average. The results were substancially identical to those presented, which is why they were omitted.

MUTUAL GUARANTEES LOWER THE AVERAGE INTEREST RATE PAID BY THEIR USERS BY 0.57 PERCENTAGE POINTS

In model A, this is considered in aggregate terms, while models B and C treat financial and non-financial liabilities separately. In addition, model C considers the possibility that the effect of financial liabilities can be nonlinear. Model A was estimated using nearly 400,000 observations. Models differentiating financial and non-financial liabilities use a smaller sample of 343,000 observations, since the data needed was not always available.

Table 3.1 - Determinants of debt cost rate

	Model A		Model B		Model C	
Variável	Coefficient	Sig.	Coefficient	Sig.	Coefficient	Sig.
dimension	-0,0038664	***	-0,0090087	***	-0,0082436	***
liabilities	-0,0104406	***				
non-financial liabilities			0,0418683	***	0,0410552	***
financial liabilities			-0,0392496	***	-0,0857678	***
financial liabilities^2					0,0657799	***
$ebitda_{t-1}$	-0,0015448		0,0032443	**	0,0025101	
tangible assets	-0,0029364	**	0,0028972	**	0,004717	***
mutual guarantee	-0,0217362	***	-0,0183975	***	-0,0176738	***
GM x default	0,0047382	***	0,0072427	***	0,0072391	***
GM x MLT	-0,0013172		0,0000698		-0,0000548	
GM x banking	-0,0004958		0,0004706		0,0004743	
GM x ADN	0,0010385		0,0037877	***	0,0034924	***
GM x PME Investe	0,0022607	*	0,0035624	***	0,0038125	***
GM x age	0,0000967	***	0,0000262		0,0000291	
GM x size	0,0021217	***	0,0017379	***	0,0017171	***
GM x tangible assets	0,0057841	***	0,0058441	***	0,0048913	***
2012	0,0010929	***	0,0014342	***	0,0011767	***
2013	-0,0023725	***	-0,0015859	***	-0,0019516	***
2014	-0,0031046	***	-0,0021342	***	-0,0026035	***
2015	-0,0080938	***	-0,0060668	***	-0,0066138	***
2016	-0,0129996	***	-0,0102846	***	-0,0109346	***
constant	0,0863038	***	0,1028677	***	0,1031177	***
GM's marginal effect	-0,0056887	***	-0,002114	***	-0,0014261	***
Total observations	398 034		343 014		343 014	
F	212,35	***	307,43	***	299,83	***
R^2	0,6774		0,6925		0,6943	

Notes: ***, ** and * mark coefficients statistically different from zero with significance levels of 1%, 5% and 10%, respetively. Firm fixed effects variables are omitted for space reasons.

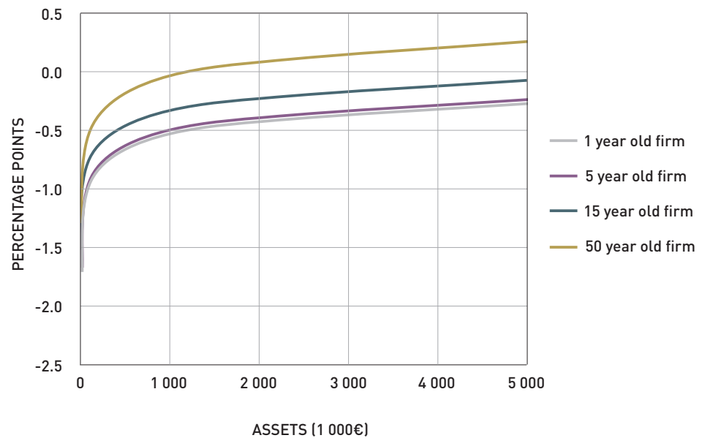
Model A assigns a marginal effect of -0.0056887 to the use of mutual guarantee. This indicates that, once the impact of other determinants is controlled for, the use of mutual guarantees reduces the debt cost rate by 0.57 percentage points, which corresponds to 11.65% of the mean rate of 4.89% observed in the sample as a whole.[14] As the debt benefiting from mutual guarantees is, in most cases, only part of the total debt of the firm, this reduction in the total debt cost implies a proportionately greater impact on the effectively guaranteed debt.

[14] Although the models used are not exactly equal, affecting the comparison made, the effect now decteted is higher than that found in the study carried out for the 2009-2014 period, which was in order of 0,42 percentage points.

According to the analysis, the impact of mutual guarantees on the cost of debt is influenced by characteristics of the benefited user, such as its age, size and asset composition. The positive coefficient found for the variable MG x age (0.0000967) shows that the debt cost rate borne by the users is smaller as smaller their age is: specifically, for each decade less, the user company reduces the cost of deb by circa 0.1 percentage points. On the other hand, the positive coefficient of MG x size (0.0021217) reveals that the impact of mutual guarantees is more intense in smaller users: for a firm that has half of the assets of another, the use of mutual guarantee grants it, on average, a reduction of the cost of debt by 0.15 percentage points. Finally, the use of guarantees is also more relevant for firms that have a lower proportion of tangible assets in their total assets: a reduction of ten percentage points in the weight of total tangible assets would lead to a reduction in 0.058 percentage points of the debt cost rate obtained with the use of mutual guarantee. Mutual guarantees are therefore more relevant to younger, and smaller firms and to those with less ability to provide real guarantees.

Chart 3.1 depicts the sensitivity of the impact of mutual guarantee on the debt cost rate to variations in size and age of a firm that, for the rest, has the median characteristics of the sample. For smaller firms, mutual guarantee use significantly reduces the cost of debt, whatever their age. The same goes for young firms, whatever their size. According to our estimates, it would only be for firms with an age of several decades and with over a million euros in assets that the use of mutual guarantee would not reduce the cost of debt.

Chart 3.1 - Estimate of the mutual guarantee impact on the debt cost rate as a function of the size and age of the user firm (model A)



Note: the chart assumes a firm and guarantee operation with medium characteristics, e.g., a guarantee from the banking industry for medium or long-term financing and with the framework of PME Investe or similar lines, granted to a firm with 19,6% of s tangible assets that did not go into default.

As for the other variables related to the use of mutual guarantee, only MG x default presents a result with levels of statistical significance assuring that it is effectively different from zero. According to the results, on average, for firms that subsequently go into default, the use of mutual guarantee increases the debt cost rate by 0.47 percentage points when compared to other users of this financial instrument: therefore, for these firms, the benefit arising from the use of mutual guarantee is very small. As for the guarantee line used, there is some evidence, though statistically fragile, that the PME Investe and similar lines reduced the cost of debt less than the others. The 'origination' of the deal and the term of the guaranteed financing do not seem to impact on the debt cost rate of the users.

As for the variables unrelated to the mutual guarantee, the year of the observation presents results consistent with intuition, suggesting an increase in the cost of finance in 2011 and 2012, and consecutive cuts since then.

As expected, the debt cost rate decreases with the size of the firm. This variable's coefficient (-0.0038664) entails that a duplication of the firm's assets is associated with a reduction in 0.27 percentage points of its debt cost. This is, it has an impact on the debt cost of about half of that resulting from the use of mutual guarantee.[15] In return, for each additional 10 percentage points in the weight of the tangible assets in the total assets, there is a reduction in 0.029 percentage points of the cost of debt, consistent to what was expected. However, somewhat surprisingly, the profitability of the firms, measured by its EBITDA, does not reveal a significant statistical effect on its cost of debt.

However, the most surprising result is the liabilities effect on the cost of debt. Contrary to what one would expect, the results suggest that higher levels of liabilities result in a lower cost of debt: for every 10 percentage points added to the weight of liabilities in assets, the debt cost is reduced in 0.1 percentage points. The study regarding the 2009-2014 period found a similar result and intensity. It should be noted that this is not a result specifically concerning to the mutual guarantee user firms: it is a regularity which is observed within the whole sample, consisting of nearly 400,000 observations of user and non-user firms. The attempt to fix or explain this result has prompted that we would alternatively estimate models B and C.

In model B, the variable liabilities is decomposed into the variables non-financial liabilities and financial liabilities. Since this data is not available on all firms, the sample is reduced to 343,000 observations. The variable non-financial liabilities now has the expected result: companies with greater weight of non-financial liabilities in the assets support higher debt cost rates. However, even in this specification, financial liabilities continue to reduce the cost of debt, this effect being even stronger than in model A for all liabilities. Furthermore, in this model there are two other counter-intuitive results: both profitability (ebitda) and capability to provide real guarantees (tangible assets) are now associated with higher debt cost rates.

In model C we use the same variables, but add the square of the financial liabilities, in order to test the hypothesis that the effect of this variable is non-linear. The results concur, suggesting that, for very high levels, an increase in financial liabilities has the expected effect of increasing the cost of debt: specifically, the cost of debt is decreasing with the non-financial liabilities up to a level close to 65%, but grows from then on. In this model, the counter-intuitive result regarding the ability to provide real guarantees remains, while again profitability does not have a statistically significant impact on the cost of debt, as in model A.

[15] In the study regarding the 2009-2014 period, the two effects were of similar magnitude: we now find an enhanced impact of mutual guarantee and a reduction in the impact of size. .

MUTUAL GUARANTEES SAVED THEIR USERS 186 MILLION EUROS IN FINANCIAL COSTS BETWEEN 2011 AND 2016

Models B and C validate, in qualitative terms, most of the results regarding the impact of mutual guarantee on the cost of debt, finding cost savings that are particularly important for smaller firms and firs with less ability to provide real guarantees. However, unlike model A, no significant relationship between the age of the firm and the impact of mutual guarantee is detected. It also confirms that there is less impact on the firms that then go into default and supports the evidence that the guarantees included in PME and similar lines, as well as in the lines of business development support, had less impact on the cost of debt than the others. Despite validating that the mutual guarantee reduces the cost of debt, these models suggest that this effect is smaller than revealed by model A, pointing to respectively 0.14 and 0.21 percentage points.

The marginal impact of mutual guarantee found in model A allows us to estimate the monetary amount of the cost savings bestowed on its the users. As seen in Table 3.2, this model shows that the decreased cost of debt stemming from mutual guarantee provided its users accumulated savings, over the 2011-2016 period, of close to 186 million euros in financing costs. In absolute terms, the most significant impact was in trade firms, which absorbed 39% of total savings, followed by 'other activities' (27%) and manufacturing industries (24%). In absolute value, the impact was slightly more prominent in 2011 and 2012 than in the following years, but the differences are not significant. However, the table also reveals that the impact multiplier, i.e. the impact obtained by every thousand euros of guarantee, presented a descending trend over the studied period, common to all sectors. In the last year analysed, 2016, this multiplier ranged between a minimum of 11 euros for manufacturing industries and a maximum of almost 18 euros for trade.

Table 3.2 - Estimates of the mutual guarantee impact on the cost of debt (model A)

	Multiplier (by 1 000€)				Impact (1 000€)				
	Man.	Constr.	Trade	Other	Man.	Constr.	Trade	Other	Total
2011	-15,87	-19,94	-18,87	-15,18	-7 842	-4 829	-12 962	-8 333	-33 966
2012	-12,09	-18,23	-17,94	-13,85	-7 744	-4 400	-12 909	-8 401	-33 454
2013	-12,54	-17,85	-18,55	-14,84	-7 113	-3 237	-11 661	-8 078	-30 089
2014	-13,59	-15,74	-17,08	-14,55	-6 459	-2 385	-10 836	-8 040	-27 720
2015	-11,45	-15,17	-18,32	-13,16	-7 094	-2 438	-11 904	-8 490	-29 926
2016	-11,00	-15,12	-17,92	-13,31	-7 415	-2 511	-12 019	-9 059	-31 004
Total					**-43 667**	**-19 800**	**-72 291**	**-50 401**	**-186 159**

3.3. Access to financial debt

The second question this report tries to answer concerns the impact of mutual guarantee use in its users' access to financial debt. To answer this question, we attempt to identify the determinants of the proportion of financial debt on total assets financed (Scherr et al., 1993), measured as follows:

$$financial\ debt = \frac{financial\ liabilities_{year}}{total\ assets_{year}}$$

For the sample available under analysis, composed of 207,000 observations, financial debt corresponds to 27.9% of assets for non-users of mutual guarantee and 30.7% for user firms. Although this difference suggests that mutual guarantees allow access to additional debt, it does not prove that it is so because differences between the firms composing the two groups are not considered. To do this, we use a model of the financial debt ratio which includes the following explanatory variables:

- *cost of debt* - this is the financial debt cost rate, i.e. the same variable that we sought to explain in the previous section; the underlying hypothesis is that the more expensive external financing is, the less firms will use it;

$$cost\ of\ debt = \frac{interest\ and\ similar\ expenses\ incurred_{year}}{\frac{debt_{previous\ year} + debt_{year}}{2}}$$

- *growth* – the company's operating revenue growth in the year observed; it is assumed that contemporary growth will tend to be accompanied by greater use of debt (Titman Wessels, 1988); this variable is defined as:

$$growth = \frac{operating\ revenue_{year} - operating\ revenue_{previous\ year}}{total\ assets_{previous\ year}}$$

- $ebitda_{t-1}$ -the firm's profitability defined the same way as in the previous section; it is assumed that more profitable firms have less need to resort to external financing (Titman & Wessels, 1988):

$$ebitda_{t-1} = \frac{ebitda_{previous\ year}}{total\ assets_{previous\ year}}$$

In addition to these, as in the previous section, variables corresponding to the use of mutual guarantee and year and firm fixed effects are included in the analysis.

MUTUAL GUARANTEES EASE THE ACCESS TO BANK FINANCING, INCREASING ITS WEIGHT ON USERS' CAPITAL STRUCTURE BY 5 PERCENTAGE POINTS

The results (see Table 3.3) show that these variables have the expected impact: the use of financial debt is decreasing in its cost and in the profitability of the firm and increasing in the growth rate of the firm. There is also a decreasing trend in the use of financial debt over the period studied, reflected in the variables corresponding to the year of observation.

Table 3.3 - Determinants of the financial debt ratio

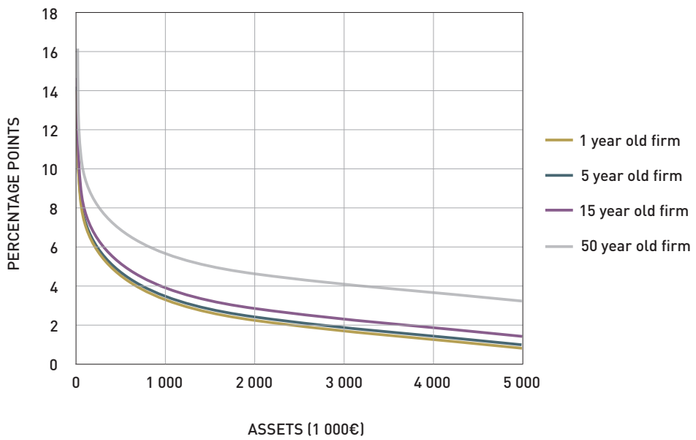
	Coefficient	Sig.
cost of debt	-0,70903	***
growth	0,02425	***
$ebitda_{t-1}$	-0,08761	***
mutual guarantee	0,07881	***
MG x default	0,04659	***
MG x MLT	0,01142	
MG x banking	-0,00003	
MG x ADN	0,04059	***
MG x PME Investe	0,03810	***
MG x age	0,00049	**
MG x size	-0,01543	***
MG x tangible assets	0,04875	***
2012	-0,02337	***
2013	-0,03170	***
2014	-0,03335	***
2015	-0,04142	***
2016	-0,05693	***
constante	0,33722	***
MG's Marginal effect	0,05039	***
Total observations	207 269	
F	148,14	***
R^2	0,8516	

Notes: ***, ** and * mark coefficients statistically different from zero with significance levels of 1%, 5% and 10%, respetively. Firm fixed variables are omitted for space reasons.

The results unequivocally point to a link between mutual guarantee use and higher levels of financial debt in the capital structure of the firm. It is estimated that the use of mutual guarantees results in a rise of 5 percentage points on the debt ratio, representing about one-sixth of the average value of this variable in the sample. This effect is strongest in smaller firms but also in those of greater age and higher availability of tangible assets: a firm with half of the assets of another has one additional percentage point of impact of mutual guarantee in the financial debt ratio; this impact increases by 0.49 percentage points for each additional decade of age of the firm and also by 0.49 percentage points for every 10 percentage points in additional weight of tangible assets in the total assets.

The two types of guarantee lines object of analysis, PME Investe and similar and the business development support line, reveal a substantial positive effect on the impact of mutual guarantee on access to financial debt, in both cases in the order of four percentage points, corresponding to their additional impact vis-à-vis other guarantee lines. Interestingly, the same is true for operations that ended in default. As for the cost of debt, no evidence was found that the term of the guaranteed financing or the origin of the operation affect the impact of mutual guarantees on the financial debt ratio. Chart 3.2 shows that the impact of the mutual guarantee on access to debt is significantly bigger in the smaller firms, though it remains positive for large ones.

Chart 3.2 - Estimate of the mutual guarantee impact on the weight of financial debt on assets as a function of the size and age of the user firm



Note: the chart assumes a firm and guarantee operation with medium characteristics, e.g., a guarrantee originated from the banking industry for medium or long-term financing and within the framework of PME Investe or similar lines, granted to a firm with 21.7% of tangible assets that did not go into default.

Table 3.4 - Estimates of the mutual guarantee impact on the use of financial debt

	Multiplier (by 1 000€)				Impact (1 000€)				
	Man.	Constr.	Trade	Other	Man.	Constr.	Trade	Other	Total
2011	628	623	695	672	426 673	150 787	477 747	383 986	1 439 193
2012	545	581	652	657	418 991	140 350	468 891	398 610	1 426 842
2013	592	632	705	691	389 320	114 606	443 326	375 968	1 323 220
2014	587	553	621	568	331 874	91 342	393 807	326 905	1 143 928
2015	537	564	651	573	364 209	90 693	423 114	369 276	1 247 292
2016	520	526	572	554	375 654	87 335	434 734	377 076	1 274 799
Total					**2 306 721**	**675 113**	**2 641 619**	**2 231 821**	**7 855 274**

MUTUAL GUARANTEES ALLOWED THEIR USERS ACCESS TO 7.8 BILLION EUROS OF ADDITIONAL BANK FINANCING (2011-2016)

The results imply that, over the studied period, mutual guarantee allowed user firms to get additional 7.9 billion euros of financial debt than they would have obtained in its absence, as depicted in Table 3.4. In absolute terms, this impact exceeded 2 billion euros in three of the analysed sectors (manufacturing industries, trade and 'other' activities) and was close to 675 million in the construction sector.

Comparing the debt obtained with the underlying guarantees, we find that every thousand euros of guarantee granted access to an additional amount of debt, which depending on the year and the activity sector of the firm, varied between 500 and 700 euros. We stress that these values represent the debt that would not have been obtained without the guarantee, not the total debt guaranteed, which was larger. In general, this 'multiplier' is slightly lower in the manufacturing industries than in other sectors of activity.

3.4. Term structure of debt

In addition to its amount and cost, it is possible that the use of mutual guarantees could also be reflected in other debt features. This section presents results relating to its impact on the term structure of debt. Specifically, it examines the determinants of the following variable:

$$maturity = \frac{medium\ and\ long\text{-}term\ debt_{year}}{total\ debt_{year}}$$

In the sample available for analysis of this question, composed of 271,000 observations, maturity has an average value of 70.1%, but rises to 71.5% among non-users of mutual guarantee and drops to 68.5% for those that use it, which seems to suggest that the use of mutual guarantees reduces the maturity of the debt. However, the analysis presented below shows that, conversely, the use of mutual guarantee lengthens the maturity of debt, the negative difference between the two groups of firms being explained by other factors. The explanatory model of maturity used is based on Ozkan (2000) and considers, in addition to the variables associated with mutual guarantees, and year and firm fixed effects, the following explanatory variables:

- $maturity_{t-1}$ - it is widely recognised that the term structure of debt has great stability, the term structure on any given year being an important explanatory factor of the term structure in the following year;

$$maturity_{t-1} = \frac{medium\ and\ long\text{-}term\ debt_{t-1}}{total\ debt_{t-1}}$$

- *size* – the size of the firm is defined as the natural logarithm of the total assets of the firm in the previous year; it is assumed that larger firms tend to use longer term debt, in particular because they have greater capacity to withstand the associated placement costs;

$$size = Ln(total\ assets_{previous\ year})$$

- *growth potential* – this is measured here by the effective growth rate of ebitda between the observed year and the following year[16]; the underlying hypothesis is that, in the context of a market with information asymmetries, the firms with the highest growth potential choose shorter term financing as a way of signalling its quality;

$$quality = \frac{ebitda_{following\ year} - ebitda_{year}}{ebitda_{year}}$$

16 Including a variable whose calculation requires data from the year following that of the observation implies that, in this case, it is only possible to present results for the 2011-2015 period, as it would only be possible to determine the 2016 values if we knew the 2017 values, which are not included the database used.

- *assets maturity* – it is the ratio between tangible assets and depreciation, determined by the difference between *ebitda* and *ebit*; it is assumed that firms seek to align the liability and asset maturity; a positive relationship between the two variables is thus expected;

$$assets\ maturity = \frac{tangible\ assets_{year}}{ebitda_{year} - ebit_{year}}$$

- *effective tax rate* – corresponding to the ratio between tax and profit before tax; a negative relationship with the debt maturity is expected;

$$tax\ rate = \frac{taxes_{year}}{results\ before\ taxes_{year}}$$

THE USE OF MUTUAL GUARANTEES EXTENDS THE MATURITY OF DEBT BY 2 PERCENTAGE POINTS

Table 3.5 - Determinants of financial debt maturity

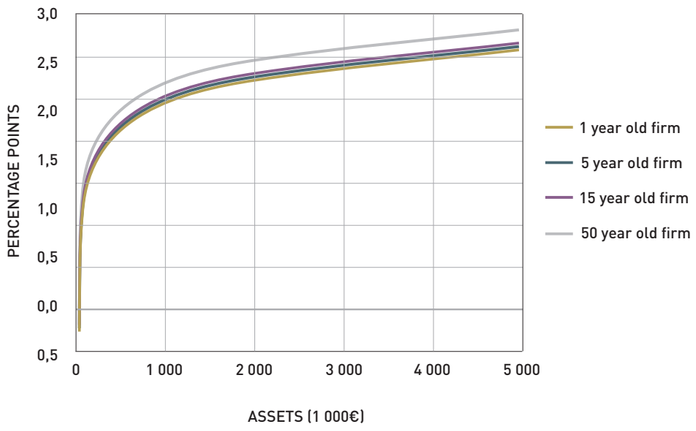
	Coefficient	Sig.
previous year maturity	0,09129	***
size	-0,01021	**
growth potential	-0,00045	
asset maturity	0,00115	***
tax rate	0,00421	
mutual guarantee	-0,01547	
MG x default	-0,01376	
MG x MLT	0,02193	
MG x banking	-0,00120	
MG x ADN	0,00435	
MG x PME Investe	-0,00587	
MG x age	0,00004	
MG x size	0,00332	
MG x tangible assets	-0,00451	
2012	-0,00996	***
2013	-0,00390	**
2014	-0,02059	***
2015	-0,01346	***
constant	0,68842	***
MG's marginal effect	0,01984	***
Total observations	270 959	
F	29,12	
R^2	0,7913	

Notes: ***,** and * mark coefficients statistically different from zero with significance levels of 1%, 5% and 10%, respetively. Firm fixed effects variables are omitted for space reasons.

The results in Table 3.5 show that the use of mutual guarantee lengthens debt maturity by almost 2 percentage points, contrary to what was apparent from the comparison between users and non-users. However, none of the variables associated with the use of mutual guarantee is, individually, statistically significant: in particular, neither the user characteristics, nor the guarantee lines used explain the impact of mutual guarantee.

Although not statistically significant, the estimated coefficients imply that the impact of mutual guarantee would increase with the size of the company but would almost be unaffected by its age, as portrayed in Chart 3.3.

Chart 3.3 - Estimate of the mutual guarantee impact on the financial debt maturity as a function of the size and age of the user firm



Note: the chart assumes a firm and guarantee operation with medium characteristics, e.g., a guarantee from the banking industry for medium or long-term financing and within the framework of a PME Investe or similar lines, granted to a firm with 21% of tangible assets that did not go into *default*.

The results point to lower debt maturity from 2012 onwards, vis-à-vis what occurred in 2011. As expected, debt maturity in a given year is positively related to its value in the previous year and to the asset maturity of the firm. Contrary to expectations, larger companies tend to use a smaller proportion of non-current debt. The growth potential and tax rate variables do not reveal a statistically relevant impact on debt maturity.

In monetary terms, the impact of the use of mutual guarantees translates into an increase of non-current debt of about 677 million euros in the 2011-2015 period, particularly concentrated in the industrial and trade sectors (Table 3.6). This effect was stronger in the first two years analysed than in the following periods. All sectors registered a decrease of the 'multiplier', over the studied period: while, in 2011, every thousand euros of mutual guarantee enabled between 50 and 81 euros of additional non-current debt, depending on the sector, in 2015, this interval showed values between 44 and 67 euros.

Table 3.6 - Estimates of the mutual guarantee impact on the use of non-current financial debt

	Multiplier (by 1 000€)				Impact (1 000€)				
	Man.	Constr.	Trade	Other	Man.	Constr.	Trade	Other	Total
2011	80,5	71,2	81,0	49,7	49 693	17 232	55 655	28 427	151 007
2012	64,2	63,3	77,7	41,9	49 383	15 274	55 915	30 492	151 064
2013	74,0	59,9	82,0	53,6	46 151	10 868	51 540	29 160	137 719
2014	66,4	50,5	62,9	44,7	31 292	8 627	41 308	25 719	106 946
2015	64,7	52,7	67,4	43,9	43 870	8 765	49 032	29 146	130 813
2016	-	-	-	-	-	-	-	-	-
Total					**220 389**	**60 766**	**253 450**	**142 944**	**677 549**

Note: no estimates are presented for 2016 due to lack of adequate data.

3.5. Investment

Previous results have shown that mutual guarantees produce financial benefits for their users in the form of access to more debt, with longer maturities and lower cost rate. In this section and in the following, we will try to determine the extent to which these financial benefits have impacted on the economic performance of the user firms. We start by investigating the impact of the use of the mutual guarantees on corporate investment.

The accounting data available for analysis has, for this purpose, some limitations as a direct measure of investment is not available. What can be observed are variations in balance sheet items between subsequent years that we use as a proxy for investment. Two alternative definitions of investment are considered:

- *total investment* – measures investment in a broad sense, and it is defined as the ratio between the variation of total assets and the total assets of the previous year;

$$total\ investment = \frac{total\ assets_{year} - total\ assest_{previous\ year}}{total\ assets_{previous\ year}}$$

- *tangible investment* - it is the investment rate in a stricter sense, and it is defined as the ration between the variation of fixed tangible assets and the fixed tangible assets of the previous year:

$$tangible\ investment = \frac{fixed\ tangible\ assets_{year} - fixed\ tangible\ assets_{previous\ year}}{fixed\ tangible\ assets_{previous\ year}}$$

In the sample of 187,000 observations used, total investment has an average of 8.1%, but is only 6.6% among firms that do not use mutual guarantees and amounts to 16.2% among the user firms. As for tangible investment, with a sample consisting of 165,000 observations, its average is 55.1%, with 53.7% among non-users of guarantee and 61.4% among its users. These figures suggest that mutual guarantees allow sharp increases in investment, both in terms of total and tangible assets, but, as usual, a stronger conclusion must await for a model that considers the effect of other variables that may explain the difference between the two groups of firms.

The explanatory variables considered in this case are:

- *cost of debt* – the same variable previously used; the underlying hypothesis is that more expensive the financing will reduce investment; (Jorgenson, 1971; Fazzari et al., 1988);

$$cost\ of\ debt = \frac{interest\ and\ similar\ expenses\ incurred_{year}}{\frac{debt_{previous\ year} + debt_{year}}{2}}$$

- *size* – a variable already used for explaining the cost and maturity of debt; it is expected that the investment rate decreases with the size of the firm (Jorgenson, 1971);

$$size = \mathrm{Ln}(total\ assets_{\text{previous year}})$$

- *tangible assets* – a variable also previously used for explaining the cost of debt; it is assumed that a higher proportion of tangible assets strengthens the ability to provide real guarantees and, consequently, facilitates the access to financing and, therefore, investment;

$$tangible\ assets = \frac{fixed\ tangible\ assets_{previous\ year}}{total\ assets_{previous\ year}}$$

- *growth* – a variable previously used for explaining access to finance; it is assumed that greater growth requires greater use of debt (Kaplan & Zingales, 1997);

$$growth = \frac{operational\ revenue_{year} - operational\ revenue_{previous\ year}}{total\ assets_{previous\ year}}$$

- $ebitda_{t-1}$ - a previously used variable, corresponding to the firm profitability in the year previous to the observation; it is assumed that higher profitability in the past generates liquidity, inducing further investment (Fazzari et al., 1988);

$$ebitda_{t-1} = \frac{ebitda_{previous\ year}}{total\ assets_{previous\ year}}$$

- *ebitda* - a similar variable, but corresponding to the observation year; it is assumed that higher contemporary profitability may induce further investment (Fazzari *et al.*, 1988);

$$ebitda = \frac{ebitda_{year}}{total\ assets_{year}}$$

- *produtivity* – total factor produtivity calculated econometrically from data relating to sales and services provided, purchases of goods for resale, consumed goods and fixed tanglible assets, using the methodology of Levinsohn & Petrin (2003).

In addition to these, similarly to the previous sections, variables corresponding to the use of mutual guarantees, and year and firm fixed effects are considered. However, it must be pointed out that here the use of mutual guarantees is measured differently from the previous sections: to explain investment, we consider that the firm benefits from mutual guarantees if it obtained at least one new mutual guarantee in the year observed; when explaining the other variables, we consider that the firm is benefiting of a mutual guarantee if there is at least one ongoing guarantee operation in the year observed.

3.5.1. Total investment

Two explanatory models of the total investment rate were estimated, without and with the variable productivity, corresponding to models A and B in Table 3.7. The results do not differ greatly.

Table 3.7 - Determinants of total investment

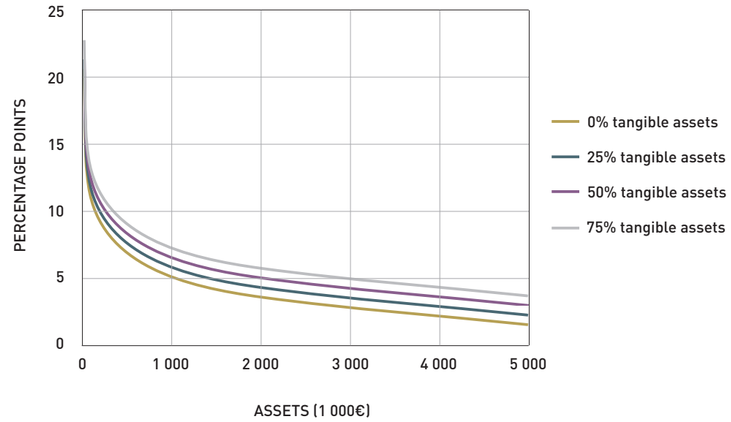
	Model A		Model B	
Variable	Coefficient	Sig.	Coefficient	Sig.
cost of debt	-0,30505	***	-0,32345	***
size	-0,30612	***	-0,28921	***
tangible assets	-0,08528	***	-0,04558	**
gorwth	0,15298	***	0,16096	***
ebitdat_1	0,19751	***	0,23047	***
ebitda	0,66701	***	0,66498	***
produtivity			-0,00195	***
mutual guarantee	0,15712	***	0,12390	***
MG x default	0,01075		0,02333	
MG x MLT	0,03778	*	0,03059	
MG x banking	0,02706	*	0,04329	***
MG x ADN	0,05902	***	0,05513	***
MG x PME Investe	-0,01257		-0,01424	
MG x age	-0,00002		-0,00004	
MG x size	-0,02230	***	-0,01902	***
MG x tangible assets	0,02854	**	0,02906	**
2012	-0,00979	***	-0,00823	**
2013	0,00260		0,00897	***
2014	0,01372	***	0,02219	***
2015	0,02882	***	0,03604	***
2016	0,04834	***	0,06169	***
constant	0,04834	***	0,06169	***
MG's marginal effect	0,07471	***	0,06646	***
Total observations	187 462		119 973	
F	409,80	***	264,51	***
R^2	0,7050		0,7028	

Notes: ***, ** and * mark coefficients statistically different from zero with significance levels of 1%, 5% and 10%, respetively. Firm fixed effects variables are omitted for space reasons.

Mutual guarantee generates a substantial increase in the total investment of its users which is estimated at 7.5 percentage points in model A and 6.6 percentage points in model B. As expected, this mutual guarantee impact is greater for smaller firms: specifically, a firm with half of the assets of another has 1.5 percentage points of additional impact of the use of mutual guarantee in total investment. One might think that the firms with a higher proportion of tangible assets would have a greater ability to provide real guarantees and, therefore, obtain less benefit from the use of mutual guarantees. However, results show the reverse: an increase of 10 percentage points on the weight of tangible assets in total assets increases the impact of mutual guarantee in total investment by 0.28 percentage points.

Chart 3.4 depicts the effect of these two variables on the impact of the mutual guarantee. Unlike the previously studied variables, the age of the user firms is not relevant to this impact.

Chart 3.4 - Estimate of the impact of mutual guarantees in total investment, as function of the size and percentage of tangible assets of the user firm (model A)



Note: the chart assumes a firm and guarantee operation with medium charateristics, e.g., a guarantee from the banking industry for medium and long-term financing and within the framework of PME Investe or similar lines, granted to a 15 year old firm that did not go into *default*.

The guarantees granted within the framework of business development support lines had a greater impact on investment than other lines of guarantees, the same happening with the ones originated from the banking industry.

After a fall in 2012, investment shows a growing trend over the period studied. Overall the remaining variables have the expected impact on investment: investment rate is decreasing with the cost of debt and with the size of the firms and increasing with their profitability and growth. However, unlike the hypothesis suggested, the investment rate is decreasing with the weight of the tangible assets in total assets. When considered, in model B, productivity shows a negative impact on investment.

According to the estimates resulting from these models, over the 2011-2016 period, the use of mutual guarantees led the benefiting firms to increase investment, in the broad sense of total asset variation, by some 3.8 billion euros comparing to what they would have invested without guarantees (Table 3.8). This effect was more significant in trade (36%) and in manufacturing industries (31%) than in construction (8%). The total impact has grown sharply between 2011 and 2013, when it hit a maximum of 769 million euros, but in the last three years fluctuated between 600 and 700 million.

When comparing the investment with the amount of guarantees that originated it, we see a downward trend of its multiplier effect. While in 2011 a thousand euros of guarantees generated between 1,617 and 3,574 euros of additional investment, depending on the sector, in 2016 this interval turned to between 886 and 1,243 euros.

Table 3.8 - Estimates of the mutual guarantee impact on total investment

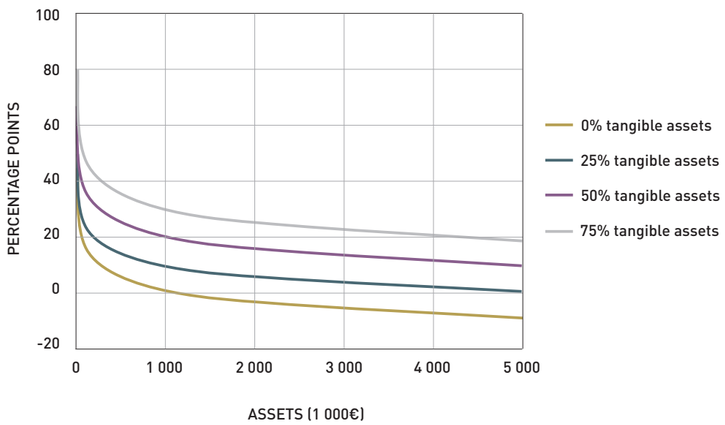
	Multiplier (by 1 000€)				Impact (1 000€)				
	Man.	Constr.	Trade	Other	Man.	Constr.	Trade	Other	Total
2011	1 617	2 074	3 574	2 908	145 940	48 936	148 228	116 013	459 117
2012	1 733	1 612	2 238	1 766	205 402	50 491	235 624	149 639	641 156
2013	1 640	1 542	2 311	1 750	229 823	58 066	284 250	197 335	769 474
2014	1 503	1 537	1 976	1 510	192 514	42 078	221 118	157 909	613 619
2015	1 182	1 462	1 599	1 616	207 218	58 033	253 968	177 465	696 684
2016	886	1 173	1 183	1 243	195 456	43 707	216 939	162 687	618 789
Total					**1 176 353**	**301 311**	**1 360 127**	**961 048**	**3 798 839**

3.5.2. Investment in tangible assets

We used the same two models to estimate the determinants of investment in tangible assets. Table 3.9 presents the results obtained.

In both models, the use of mutual guarantees results in an increase of the investment rate in tangible assets in the order of 15 to 16 percentage points. However, individually none of the variables characterising the circumstances in which the guarantee is used reveals statistically significant explanatory power.

Chart 3.5 - Estimate of the impact of the mutual guarantee on the investment in tangible assets, as function of the size and percentage of tangible assets of the user firm (model A)



Note: the chart assumes a firm and guarantee operation with medium charateristics, e.g., a guarantee from the banking industry for medium and long-term financing and within the framework of PME Investe or similar lines, granted to a 15 year old firm that did not go into *default*.

Still, the model suggests that the impact of the mutual guarantee on the investment rate in tangible assets would be higher for smaller sized firms and firms where tangible assets represent a greater slice of the total assets (Chart 3.5).

Table 3.9 - Determinants of the investment in tangible assets

	Model A		Model B	
Variable	Coefficient	Sig.	Coefficient	Sig.
cost of debt	-2,08930	**	-1,67350	**
size	-1,44955	***	-1,01251	***
tangible assets	-12,37608	***	-8,78480	***
growth	0,33271	*	0,31548	**
ebitdat_1	-0,57878		-0,57543	
ebitda	1,96088	**	2,09525	***
produtivity			-0,01672	*
mutual guarantee	0,53213		0,72808	*
MG x default	0,15406		0,15607	
MG x MLT	0,02764		0,09456	
MG x banking	0,25619	*	0,22550	
MG x ADN	-0,06219		-0,15481	
MG x PME Investe	-0,40010		-0,49637	
MG x age	0,00771		0,00238	
MG x size	-0,07423		-0,05748	
MG x tangible assets	0,38053		-0,24955	
2012	-0,21519	*	-0,12238	**
2013	-0,24365	**	-0,11547	**
2014	-0,24220	**	-0,06788	
2015	-0,11616		-0,01166	
2016	-0,05186		0,01141	
constant	12,96774	***	9,23760	***
MG's marginal effect	0,14779	**	0,16273	***
Total observations	165 487		119 526	
F	10,52	***	15,68	***
R^2	0,7315		0,7916	

Notes: ***, ** and * mark coefficients statistically different from zero with significance levels of 1%, 5% and 10%, respetively. Firm fixed effects variables are omitted for space reasons.

MUTUAL GUARANTEES ALLOWED 1.7 BILLION EUROS OF ADDITIONAL INVESTMENT IN TANGIBLE ASSETS (2011-2016)

As for the variables unrelated with mutual guarantees, the cost of debt, the size of the firm and the weight of the tangible assets in total assets have a significant negative impact on the investment rate in tangible assets, while operating revenue growth and current profitability, but not past profitability, have a positive impact. When considered, in model B, productivity has a negative impact on investment in tangible assets, as was also the case for total investment, although, in this case, statistically weaker.

These results imply the monetary impact estimates presented in Table 3.10: overall, over the 2011-2016 period, access to mutual guarantees generated tangible investment that would have not occurred otherwise in the order of 1.7 billion euros, mainly registered in manufacturing industries (41%) and in 'other' activities (37%). Despite reaching its maximum in 2013, this impact shows a growing trend.

Table 3.10 - Estimates of the mutual guarantee impact on tangible asset investment (model A)

	Multiplier (by 1 000€)				Impact (1 000€)				
	Man.	Constr.	Trade	Other	Man.	Constr.	Trade	Other	Total
2011	1 013	343	819	2 075	91 463	8 104	33 951	82 809	216 327
2012	1 189	262	513	1 023	140 907	8 634	54 061	86 670	290 272
2013	968	280	557	1 048	135 648	10 811	68 496	118 191	333 146
2014	753	372	410	1 047	96 396	10 189	49 138	109 531	265 254
2015	647	303	366	1 080	115 658	12 252	58 057	118 690	304 657
2016	559	238	291	890	123 353	11 085	53 270	118 921	306 629
Total					**703 425**	**61 075**	**316 973**	**634 812**	**1 716 285**

3.6. Exports

To analyse the impact of mutual guarantees on exports, we considered their weight in the firms' operating revenues:

$$exports = \frac{exports\ of\ goods\ and\ services_{year}}{operacional\ revenue_{previous\ year}}$$

In the whole sample, consisting of 477,000 observations, this variable has an average value of 5.2%, being 4.1% among the non-user firms and reaching 6.6% among users of mutual guarantee. As in previous cases, to ascertain whether the use of mutual guarantee explains this difference, we considered an explanatory model of the determinants of exports, including the following variables:

- *size* – a previously used variable; it is assumed that it is easier for larger firms to enter external markets, namely, due to a greater availability of the required resources (Katsikeas et al., 1996);

$$size = Ln(Total\ assets_{previous\ year})$$

- *age* – it corresponds to the number of years passed since the year the firm was established until the year under analysis; it is expected that age allows firms to accumulate experience, making it easier to enter external markets;
- $exporter_{t-1}$ - this variable takes the value 1 if the firm had exports in the year preceding the observation and 0 otherwise; it is assumed that past export experience facilitates exports (Sousa et al., 2008);
- $exporter_{t-2}$ - a similar variable but corresponding to the scenario two years before the year observed (Sousa et al., 2008).

In addition, we use explanatory variables concerning the use of mutual guarantees and the year observed. Contrary to what happens in previous sections, we do not consider variables corresponding to firm fixed effects, since the number of data years available for each firm is limited. This implies that the results obtained are not purged of idiosyncratic factors of each of the firms. On the other hand, variables corresponding to the activity sector of the firms are used, distinguishing those in manufacturing, construction and trade from the other. The estimation of this model uses a different methodology (TOBIT) from that of the previous ones to deal with a very high number of observations in which the variable export has null value.

These methodological differences imply that the results presented in this section are not strictly comparable with those of the previous.

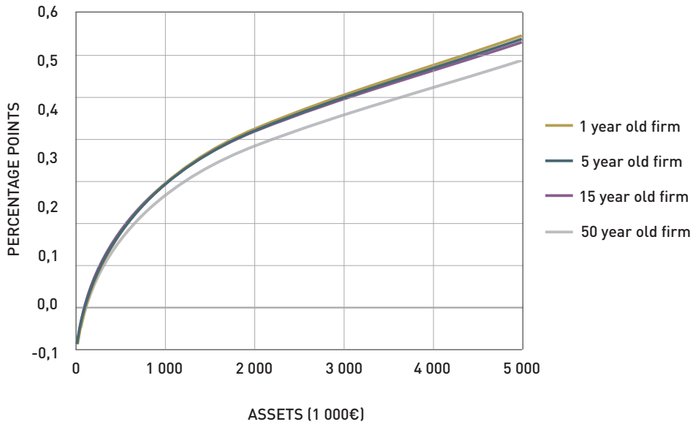
Table 3.11 - Determinants of exports

	Coefficient	Sig.
size	0,0208584	***
$exporter_{t-1}$	0,4442512	***
$exporter_{t-2}$	0,1650367	***
age	-0,0017586	***
mutual guarantee	-0,053617	***
MG x default	0,0122619	***
MG x MLT	-0,0338992	***
MG x banking	-0,0057915	
MG x ADN	0,0281921	***
MG x PME Investe	0,0588671	***
MG x age	0,0002973	***
MG x size	0,0107631	***
MG x tangible assets	-0,0759355	***
2012	0,0771391	***
2013	0,085685	***
2014	0,0725286	***
2015	0,076072	***
2016	0,067562	***
construction	-0,112527	***
trade	-0,1137428	***
other activities	-0,1024603	***
constant	-0,5411813	***
MG's marginal effect	0,00141	***
Total observations	476 605	
LR chi2(21)	238 276,61	***
Pseudo R^2	0,5615	

Notes: ***, ** and * mark coefficients statistically different from zero with significance levels of 1%, 5% and 10%, respetively.

The estimates obtained indicate that the use of mutual guarantees increases the export rate, for the median firm, in 0.14 percentage points. This effect is more intense for older and larger firms, as seen in Chart 3.6, but decreasing with the weight of the tangible assets in total assets.

Chart 3.6 - Estimate of the mutual guarantee impact on exports, as function of the size and age of the user firm



Note: the chart assumes a firm and guarantee operation with medium charateristics, e.g., a guarantee from the banking industry for medium and long-term financing and within the framework of PME Investe or similar lines, granted to a firm with 19,8% of tangible assets that did not go into *default*.

The guarantees included in PME Investe and similar lines had a particularly strong impact on exports, although the business development support lines also stand out positively from the rest. Guarantees associated with medium and long-term financing had a lesser impact on exports than others. Of all the variables analysed for the user firms of mutual guarantee, only the origin, from banking or not, of the operations had an impact, positive or negative, on exports.

The size of firms and their background in exports over the previous two years have a significant positive impact on exports. But, contrary to what was expected, the age of the firms is negatively linked to their export activity, possibly because older firms developed in the context of a relatively closed market, while younger firms' ambition from day one is to enter the international market.

Table 3.12 shows that, in the 2011-2016 period, mutual guarantees will have caused a stimulus in exports exceeding 800 million euros. This impact is mainly focused (83%) in manufacturing industries, reaching 665 million euros, while being minute in construction and in the 'other' activities. In manufacturing, the multiplier effect of mutual guarantees is significant, with every thousand euros in guarantees resulting in some 200 euros of additional exports, but in other sectors is quite reduced. Apart from 2014, when it was a bit lower, as a result of the slowdown in the mutual guarantee activity, the estimated annual impact of mutual guarantees on exports amounted to 140 million euros.

ADDITIONAL EXPORTS INDUCED BY THE USE OF MUTUAL GUARANTEES REACHED 800 MILLION EUROS

Table 3.12 - Estimates of the mutual guarantee impact on exports

	Multiplier (by 1 000€)				Impact (1 000€)				
	Man.	Constr.	Trade	Other	Man.	Constr.	Trade	Other	Total
2011	206,3	30,0	43,0	6,9	101 921	7 263	29 512	3 300	141 996
2012	201,8	14,1	22,2	3,3	116 359	3 408	16 002	1 972	137 741
2013	280,2	17,2	26,4	4,5	127 199	3 126	16 565	2 366	149 256
2014	228,8	15,0	21,5	3,6	80 873	2 214	11 763	1 647	96 497
2015	211,3	16,5	25,6	4,3	118 616	2 568	16 071	2 487	139 742
2016	199,0	14,6	22,7	3,6	119 775	2 340	15 254	2 433	139 802
Total					**664 743**	**20 919**	**105 167**	**14 205**	**805 034**

3.7. Employment

A novelty in this report, compared to previous studies on the impact of mutual guarantees in Portugal, is an analysis of their impact on job creation by its users. We analyse, particularly, the evolution of the following variable:

- *c_job* – job creation, defined as the rate of change in number of employees between two subsequent years.

$$c\_job = \frac{employment_{year} - employment_{previous\ year}}{employment_{previous\ year}}$$

This variable presents an average of 3.6% in a sample of 340,000 observations, rising to 3.9% for the firms not using mutual guarantees and falling to 3.3% for their users. However, as in seen before, this difference cannot be directly attributed to the use of mutual guarantees without controlling for the impact of other factors that differentiate the two groups of firms. For this purpose, we use a model based on Oberhofer & Vincelette (2013), which includes the following explanatory variables:

- *employment* – the employment level of the firm in the year preceding the observation; it is expected that larger firms tend to have less job creation;
- *age* – the number of years passed between the year the firm was established and the year under analysis; younger firms are expected to create more jobs; for technical reasons, this variable is multiplied by employment;
- *productivity* —total factorial productivity econometrically calculated from data relating to sales and services provided, purchases of goods for resale, consumed goods and fixed tangible assets, according to the methodology of Levinsohn & Petrin (2003); it is assumed that the most productive firms will tend to grow more and therefore to present higher levels of job creation.

According to the results presented in Table 3.13, after controlling for the influence of other explanatory variables, the use of mutual guarantees has a positive impact on job creation, increasing its annual rate of change in 0.6 points percentages. This impact is stronger for both younger and larger firms: for every additional ten years, the firm reduces the employment variation in 0.58 percentage points, while doubling firms' assets increases employment variation in 2.5 percentage points. Guarantees granted to firms that later went into default had less impact on employment than the other.

Table 3.13 - Determinants of employment growth

	Coefficient	Sig.
employment	-0,02889	***
employment x age	0,00039	***
produtcivity	-0,00598	***
mutual guarantee	-0,22480	***
MG x default	-0,01996	**
MG x MLT	0,01599	
MG x banking	-0,01761	
MG x ADN	0,01203	*
MG x PME Investe	0,01471	*
MG x age	-0,00058	***
MG x size	0,03641	***
MG x tangible assets	0,00124	
2012	-0,04315	***
2013	-0,03912	***
2014	-0,01379	***
2015	-0,00340	*
2016	-0,01086	***
constant	0,37240	***
MG's marginal effect	0,00638	
Total observations	339 756	
F	307,79	***
R^2	0,4522	

Notes: ***, ** and * mark coefficients statistically different from zero with significance levels of 1%, 5% and 10%, respetively. Firm fixed effects variables are omitted for space reasons.

MUTUAL GUARANTEES LED TO 0.6% ADDITIONAL GROWTH OF EMPLOYMENT AT THEIR USERS, CORRESPONDING TO 14 THOUSAND JOBS

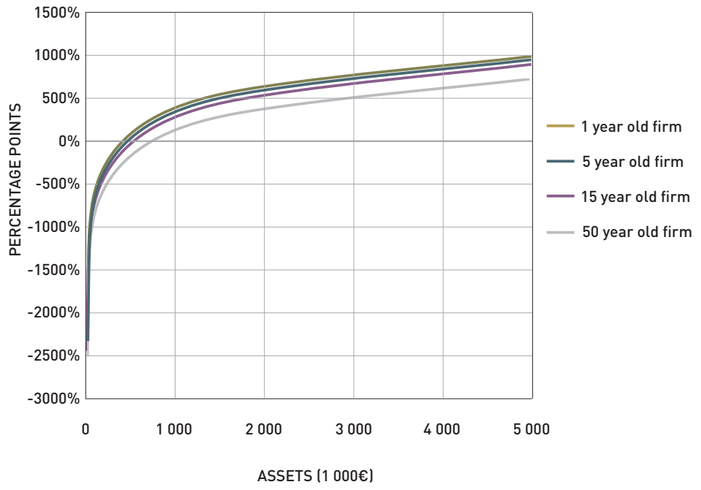
Chart 3.7 depicts the combined effect of age and size of the firm over the impact of mutual guarantees on employment. For young firms, this impact is positive for asset values starting at 300,000 euros, although for firms with several decades of existence this threshold exceeds 700,000 euros.

As for the explanatory variables unrelated to the use of mutual guarantee, predictably, employment grows less in the firms in which it already is high, but, contrary to expectations, for a certain level of employment, it grows more in older firms. Also, unlike what was expected, employment grows less in companies with greater productivity.

Table 3.14 shows that, between 2011 and 2016, due to mutual guarantee, its users have increased employment by 14,000 new job posts. However, this impact presents a strong sectoral heterogeneity, with significant growth in manufacturing and trade but a considerable decrease in 'other' activities, possibly due to productivity gains resulting from projects supported by mutual guarantee.

Results also show that the employment multiplier was in the order of 4 to 5 jobs per million euros of guarantees in the manufacturing industries but close to 1 job in trade activities. For construction, the multiplier went from a positive value, and higher than one, in the 2011-2013 period, to a negative value in recent years, as it also occurred in all the years analysed for 'other' activities.

Chart 3.7 - Estimate of the mutual guarantee impact on employment, as a function of the size and age of the user firm



Note: the chart assumes a firm and guarantee operation with medium charateristics, e.g., a guarantee from the banking industry for medium and long-term financing and within the framework of PME Investe or similar lines, granted to a firm with 19.6% of tangible assets that did not go into *default*.

Table 3.14 - Estimates of the mutual guarantee impact on employment

	Multiplier (by 1 000€)				Impact (1 000€)				
	Man.	Constr.	Trade	Other	Man.	Constr.	Trade	Other	Total
2011	5,2	1,5	1,7	-1,8	2 590	363	1 139	-1 047	3 045
2012	4,3	0,9	1,4	-1,3	2 633	216	1 017	-926	2 940
2013	5,9	1,5	1,6	-1,1	2 992	271	993	-591	3 665
2014	2,9	-0,7	0,3	-2,2	1 185	-110	203	-1 208	70
2015	4,2	-0,2	1,0	-1,2	2 459	-32	653	-781	2 299
2016	3,8	-0,8	1,0	-1,1	2 446	-126	648	-740	2 228
Total					**14 305**	**582**	**4 652**	**-5 293**	**14 246**

Note: in the interest of readability, the multiplier is here defined per million euros of mutual guarantee, unlike the thousand's unit used in other tables.

3.8. Profitability

Although relevant, particularly from the point of view of the economic impact of mutual guarantee, for the user firms the performance dimensions analysed in previous sections are instrumental. Ultimately, it is to be expected that their options aim at profitability and survival goals. In this section we investigate the impact of mutual guarantees on their user's profitability, leaving the analysis of survival effects for the following section.

Profitability is here evaluated at the level of EBITDA:

- $ebitda_t$ - the firm's profitability is defined as the ratio between earnings before interest, taxes, depreciation and amortisation (EBITDA) of a given year and the total assets of the previous year;

$$ebitda_t = \frac{ebitda_{year}}{total\ assets_{previous\ year}}$$

In the sample, consisting of 324,000 observations, this variable has an average value of 8.8%, being of 8.4% for non-user firms and reaching 9.2% for users of mutual guarantees. The model used to explain the firm's profitability, based in Goddard et al. (2005), includes, in addition to mutual guarantee related variables, and year and firm fixed effects, the following explanatory variables:

- $ebitda_{t-1}$ - the variable we are trying to explain but observed in the previous year; the inclusion of this lagged variable is justified by the hypothesis that profitability tends to persist over time;

$$ebitda_{t-1} = \frac{ebitda_{previous\ year}}{total\ assets_{previous\ year}}$$

- $ebitda_{t-2}$ - the same variable but observed in the two previous years, for similar reasons;

$$ebitda_{t-2} = \frac{ebitda_{2\ years\ earlier}}{total\ assets_{previous\ year}}$$

- *leverage* - the ratio between debt capital and own funds in the firm's financing; it is assumed that a higher proportion of debt limits the discretion of management, and may contribute to increased profitability of the firm;

$$leverage = \frac{medium\ and\ long\text{-}term\ liabilities + dívida\ corrente}{own\ funds}$$

- $leverage_{t+1}$ - same variable, but measured in the year following the one when the firm benefited from mutual guarantee;

$$leverage_{t+1} = \frac{medium\ and\ long\text{-}term\ liabilities_{following\ year} + current\ ebt_{following\ year}}{ownfunds_{following\ year}}$$

- *size* – the size of the firm is defined as the natural logarithm of its total assets; it is assumed that larger firms benefit from various types of advantages, including scale economies, that strengthen their profitability;

$$size = \text{Ln}\ (Total\ assets_{year})$$

- $size_{t+1}$ – same variable, but measured in the year following the one when the firm benefited from mutual guarantee;

$$size_{t+1} = \text{Ln}\ (Total\ assets_{following\ year})$$

- *liquidity*– degree of the firm's liquidity, measured as the ratio between current assets and liabilities; a high level of liquidity reduces the financial risk of the firm but tends to hamper the profitability of its assets;

$$liquidity = \frac{current\ assets}{current\ liabilities}$$

- $liquidity_{t+1}$ – same variable, but measured in the year following the one when the firm benefited from mutual guarantee;

$$liquidity_{t+1} = \frac{current\ assets_{following\ year}}{current\ liabilities_{following\ year}}$$

- *share* – the firm's market share in its industry defined at five digits level of the Portuguese classification of economic activities; it is assumed that firms with higher share may have more market power and, consequently, greater profitability;

$$share = \frac{operational\ revenue_{firm}}{operational\ revenue_{industry}}$$

- $share_{t+1}$ – same variable but measured in the year following the one when the firm benefited from mutual guarantee;

$$share = \frac{operational\ revenue\ of\ firm_{following\ year}}{operational\ revenue\ of\ industry_{following\ year}}$$

- *produtivity* – total factorial productivity defined in the same way as in previous sections; it is assumed that productivity favours profitability.

For a firm with the median features of the sample, the impact of mutual guarantee on profitability is negative in 1.2 percentage points (Table 3.15). However, as seen in Chart 3.8, this impact is negatively influenced by the firm's size: for a firm with the median age of the sample (16 years), mutual guarantee would have a positive impact on profitability if its assets were lower than 228,000 euros. On the other hand, the firm's age reinforces the impact of mutual guarantees: for a 50-year-old firm, the size threshold above which this impact is positive approaches 900,000 euros. Also, the weight of tangible assets in total assets enhances the impact of the guarantees: for each 10 percentage points of additional tangible assets there is an increase of 0.2 percentage points in the impact of guarantees.

No well-defined trend of evolution of profitability between 2011 and 2016 is apparent. As for the remaining explanatory factors, the results only partially confirm the hypotheses proposed. As expected, the size and the market share of the firm have a significant positive impact on its profitability, as does its profitability in the previous year. However, profitability in a certain period is negatively linked to the profitability two periods before, suggesting that companies do not maintain their levels of profitability for a long time. Contrary to expectations, financial leverage has negative impact on profitability, even when this is measured before financial costs. The other variables show no statistically significant effect on profitability.

IN THE SHORT RUN, MUTUAL GUARANTEES DO NOT SEEM TO INCREASE THEIR USERS' PROFITABILITY

Table 3.15 - Determinants of profitability

	Model A		Model B		Model C	
Variable	Coefficient	Sig.	Coefficient	Sig.	Coefficient	Sig.
ebitda			0,03543	***	0,02934	***
$ebitda_{t-1}$	0,02047	***	-0,08888	***	-0,09709	***
$ebitda_{t-2}$	-0,06554	***				
$leverage_{t+1}$			-0,01151	***	-0,01328	***
leverage	-0,00928	***				
$size_{t+1}$			0,08272	***	0,08239	***
size	0,04623	***				
$liquidity_{t+1}$			0,00018	*	0,00176	***
liquidity	-0,00003					
$share_{t+1}$			1,68481	***	0,97563	***
share	2,01260	***				
produtivity					-0,00020	**
mutual guarantee	0,09813	***	0,04154	***	0,03829	***
MG x default	-0,01153	***	-0,01497	***	-0,01449	***
MG x MLT	-0,00592		-0,00176		-0,00527	
MG x banking	-0,00376		-0,00205		0,00138	
MG x ADN	-0,00130		-0,00725	**	-0,00802	**
MG x PME Investe	-0,00639	**	-0,00608		-0,00301	
MG x age	0,00073	***	0,00058	***	0,00050	***
MG x size	-0,01806	***	-0,00849	***	-0,00805	***
MG x tangible assets	0,02309	***	0,01278	***	0,01274	***
2012			0,00202	***	0,00210	***
2013	0,00317	***	0,00300	***	0,00322	***
2014	0,00214	***	0,00431	***	0,00451	***
2015	0,00541	***				
2016	0,00063					
constant	-0,18132	***	-0,40764	***	-0,41485	***
MG's marginal effect	-0,01254	***	-0,00987	***	-0,00959	***
Total observations	324 016		197 643		128 165	
F	300,7	***	190,65	***	130,43	***
R^2	0.7393		0.7911		0.7923	

Note: ***, ** and * mark coefficients statistically different from zero with significance levels of 1%, 5% and 10%, respetively. In addition to the ones presented, we also considered explanatory variables corresponding to the fix effects of the firm that were ommited for space saving. In model A, the variable explained is profitability in that year while in models B and C is profitability in the following year.

The negative impact found for mutual guarantees is unexpected, since its use is voluntary, and it is not expected that the firms would use instruments that harm them. It is possible that the use of mutual guarantees induces changes in firms that take time to reveal their full effects, this negative impact being merely temporary.

To test this hypothesis, models B and C analyse the impact of mutual guarantee, not on the profitability of the year in which they were used, but in the next year. The impact is still negative, but less than in model A, which might be consistent with this hypothesis. However, its demonstration would require the analysis of a longer series of data than the one available for this report, since the use of variables lagged by more than one period seriously reduces the size of the sample.

The effects of other variables are almost always consistent for the three models. The only exception is the variable liquidity in model C, which, unlike in model A, has positive and statistically significant impact. Model C also includes the variable productivity, not included in models A and B, showing negative impact on profitability, although of reduced absolute value.

Chart 3.8 - Estimate of the mutual guarantee impact on the debt cost rate, as a function of the firm's size and age (model A)

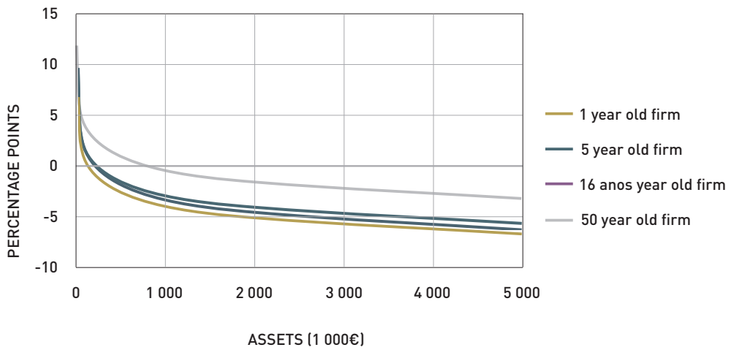


Table 3.16 - Estimates of the mutual guarantee impact on EBITDA (model A)

	Multiplier (by 1 000€)				Impact (1 000€)				
	Man.	Constr.	Trade	Other	Man.	Constr.	Trade	Other	Total
2011	-	-	-	-	-	-	-	-	-
2012	-243	-261	-254	-63	-140 002	-62 918	-182 581	-38 189	-423 690
2013	-271	-231	-257	-66	-138 402	-41 793	-161 530	-35 725	-377 450
2014	-196	-166	-172	-31	-71 042	-24 721	-109 130	-16 382	-221 275
2015	-209	-149	-219	-42	-122 146	-23 956	-142 516	-27 377	-315 995
2016	-182	-115	-204	-33	-118 192	-19 149	-136 677	-22 587	-296 605
Total					**-589 784**	**-172 537**	**-732 434**	**-140 260**	**-1 635 015**

These results suggest that, for the median firm, every thousand euros of guarantee are associated with a decrease of around 150 euros in EBITDA or, in aggregate terms, a decrease of this indicator by some 300 million euros per year (Table 3.16).

3.9. Survival

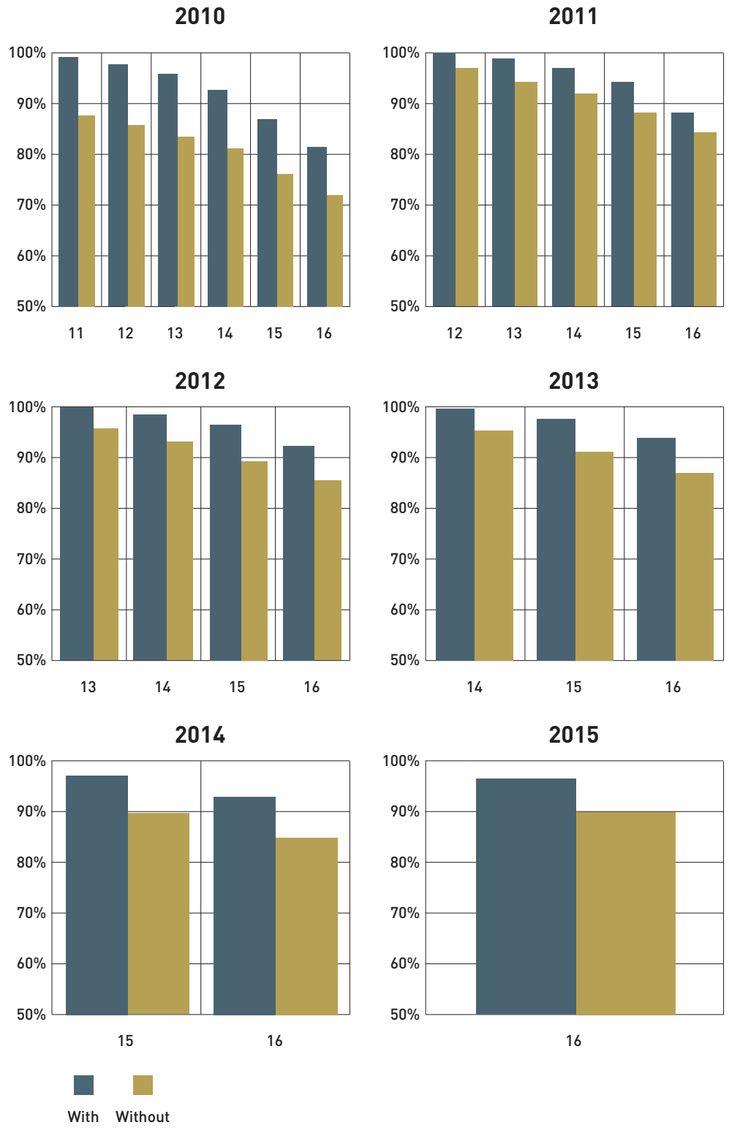
Another key dimension to evaluate the relevance of using any financial instrument is its impact on firm survival. In this case, to what extent does mutual guarantee contribute to the user firm's survival?

The answer to this question is hindered by the difficulty in identifying the 'death' of a firm. Although, sometimes, firms disappear after formal processes of bankruptcy that are duly registered in the database used in this report, other times they just cease activity without any timely registration. For a first approach to this subject, which was not treated in previous studies of CEGEA, we adopted a pragmatic perspective: we assume that a firm 'died' when it does not appear in the database used in a given year or any subsequent year. The variables we are trying to explain in this section are of the following type:

- *s20xx_yy* - it takes the value 1 when a firm appearing in the database in the year 20xx, still appears in the year 20yy or any subsequent year, and 0 when it does not.

This criterion provides only an approximate measure of the firms which effectively disappeared, since the firm can still be operating, even though it is not included in the database. We note that the database used in this report is on the IES forms that Portuguese firms must deliver yearly: but while the form delivery is mandatory, there are always firms infringing this legal obligation despite still operating. This analysis assumes that these cases are exceptions. Another concern is that the disappearance of a firm from the official records may be caused by different phenomena: although in most cases it corresponds to the failure of a business project, sometimes it will the results of transformation processes, such as mergers by incorporation, which may even create improved conditions for the project's success. Thus, a degree of caution is necessary in reading the results presented in this section of the report. Chart 3.9 presents the survival rate, over the following years, of the firms that are in the database in a given year, differentiating those using a mutual guarantee in that year from those that do not. In all cases, the survival rate of the mutual guarantee users is greater than that of the non-users. For instance, for firms in the database in 2010, the survival rate of the mutual guarantee users exceeds the non-users' by around 11 percentage points between 2011 and 2015, and by some 9 percentage points in 2016. In the sample analysed, the smaller difference in terms of survival rate occurs in 2012 for firms in the database in 2011, reaching 3 percentage points.

Chart 3.9 - Survival rate of the firms in the database in a given year



Notes: With – firms that have obtained a new mutual guarantee in the year referred to in the chart; Without – firms that have not obtained a mutual guarantee in the year analysed; it is considered that a firm 'survived' when its accounts are listed in the database on the year that the calculation is performed or in the following years.

Of course, these descriptive statistics are not enough to categorically state that mutual guarantee explains the difference in survival rates, since, unlike what was done in all previous sections, we are not controlling for the differences between the firms composing the two groups regarding other characteristics that may be relevant to explain survival.

To do so, we proceed with an econometric analysis of the survival rate using a method (Probit) suited to determine the determinants of the probability of a given event, in this case, the survival of the firm. This method was used to estimate the impact of the use of mutual guarantees in 2010 on the survival probability for each of the years of the period under study (2011-2016). In addition to the use of mutual guarantees, we considered the following possible determinants of survival, all evaluated in 2010:

- *age* – number of years passed since the firm was established until 2010; it is well known that young firms have a very high "mortality rate";
- *age^2* – the square of the previous variable, used since we admit here that the impact of age on survival is not linear, being stronger for young firms;
- *share* – the firm's market share in its industry determined at the five digits level of the Portuguese classification of economic activities; it is assumed that firms with higher quota may have more market power and, consequently, greater survival probability;

$$share = \frac{operational\ revenue_{firm}}{operational\ revenue_{industry}}$$

- *ebitda* – the firm's profitability is defined as the ratio between earnings before interest, taxes, depreciation and amortisation (EBITDA) and the total assets; it is assumed that the most profitable companies have a higher survival probability;

$$ebitda = \frac{ebitda}{total\ assets}$$

- *produtivity* – the total factorial productivity calculated as previously; it is assumed that firms with higher productivity have a higher probability of survival.

In addition to these, we also use variables to identify the sector of activity of the firm, granted that inter sectoral differences may exist in terms of survival:

- *construction* – this variable that takes the value 1 if the activity of the company falls into section F of the Portuguese classification of economic activities, and 0 in all other cases;
- *trade* – takes the value 1 if the activity of the company falls into section G of the Portuguese classification of economic activities, and 0 in all other cases;
- *other ativities* – takes the value 1 if the activity of the company does not fall into section C, F or G of the Portuguese classification of economic activities, and 0 in all other cases.

Manufacturing firms are identified by assigning the value 0 to these three varables.

Concerning the use of mutual guarantees, we consider two alternative specifications:

- MG1 – the variable that takes the value 1 if the firm had, at least, one mutual guarantee operation ongoing in 2010 and 0 in all other cases;
- MG2 – the variable that takes the value 1 if the firm had, at least, one new mutual guarantee operation in 2010 and 0 in all other cases.

Table 3.17 presents the results obtained regarding the determinants of survival until 2013 of the firms that were in the database in 2010. The results for the survival of these firms to the remaining years of the 2011-2016 period are qualitatively similar.

The two models presented represent the two ways of measuring the use of mutual guarantee described above: in model A, a distinction is made between firms that had a mutual guarantee in 2010 or not; while in model B a distinction is made between those that have obtained a mutual guarantee that year, or not. Again, qualitatively the results are quite similar.

Table 3.17 - Determinants of survival rate until 2013 of the firms in the database in 2010

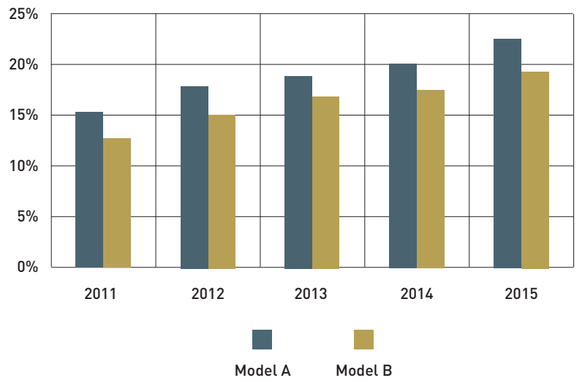
	Model A		Model B	
Variable	Coefficient	Sig.	Coefficient	Sig.
age	0,00282	***	0,00631	***
age^2	-0,00007	***	-0,00012	***
share	0,98089		2,17414	***
ebitda	1,13275	***	1,10896	***
produtivity	0,00059	***	0,00063	***
MG1	0,62963	***		
MG2			0,59415	***
construction	-0,28791	***	-0,29766	***
trade	-0,18277	***	-0,19999	***
other ativities	-0,28979	***	-0,32741	***
constant	-0,10499	***	-0,04431	***
MG's marginal effect	0,19129	***	0,17002	***
Total observations	119 039		119 039	
LR chi2(8)	10338,85	***	8021,85	***
Pseudo R^2	0,0632		0,0489	

Notes: ***, ** and * mark coefficients statistically different from zero with significance levels of 1%, 5% and 10%, respectively.

The results validate that the probability of a firm's survival, between 2010 and 2013, relates in a non-linear form with its age: while firms are young (up to an age of 20 years in model A and 26 in model B), the survival probability increases with age; but, beyond a certain age, it decreases. The initial increase of the survival probability is consistent with numerous findings of previous studies that show that the mortality rate of young firms is extremely high. Profitability, productivity and market share show the expected positive impact on survival, but market share is statistically significant only in model B.

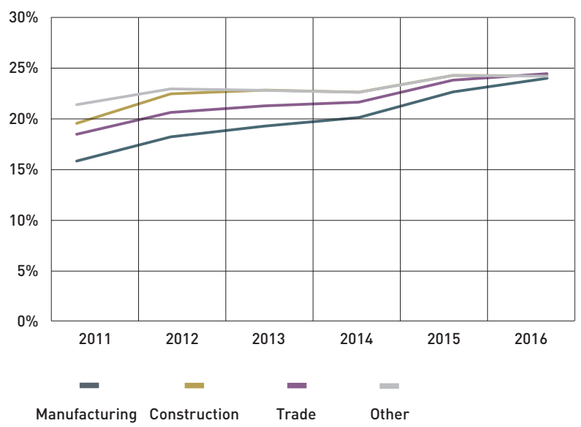
In sectoral terms, the variables corresponding to the construction firms, trade and 'other' activities have negative coefficients, which implies that all these sectors present a lower survival rate than the control group, which in this case is the manufacturing industries firms.

Chart 3.10 - Marginal impact of mutual guarantee on the survival probability from 2010 until a given year



Note: model A distinguishes the firms that had, at least, one mutual guarantee ongoing in 2010 from other firms; model B separates the companies obtaining, at least, one new mutual guarantee in 2010 from the remaining firms.

Chart 3.11 - Marginal impact of mutual guarantee on the survival probability from 2010, by sector (model A)



MUTUAL GUARANTEES NOTICEABLY INCREASED THE SURVIVAL RATE OF THEIR USERS

As for the central subject of this analysis, the variables representing the use of mutual guarantee have, in both cases, a positive coefficient, which implies that the use of mutual guarantee in 2010 – whether a new guarantee, or a guarantee obtained in the previous years – increased the survival probability of these firms until 2013. After controlling for the effect of the other variables considered in the model, the use of mutual guarantee increases the survival probability of survival in 19.1 percentage points, according to model A, or 17 percentage points, according to model B.

Chart 3.10 shows how this impact changes if, instead of 2013, we consider survival until another year in the 2011-2016 period. Chart 3.11 presents the same information divided by activity sector of the user of mutual guarantee. The short-term impact is always significant, but higher in the 'other' activities than in manufacturing industries. However, these intersectoral differences mitigate over the years.

These results show that, during the period under review, the use of mutual guarantees substantially increased the survival probability of their users, even more than suggested by the comparison between users and non-users presented in Chart 3.9.

4. The Portuguese economy

In this chapter, we use input-output analysis methods to estimate the impact of the mutual guarantee system on the Portuguese economy, considering the interaction between users – studied in the previous chapter – and other Portuguese firms. According to the results presented here, in recent years, mutual guarantees contributed with 0.5 to 0.75% of total production and employment in Portugal.

The additional activity that the Portuguese Mutual Guarantee System induces in user firms has repercussions both on the beneficiaries of the income they generate (namely, workers and shareholders) and on their suppliers. Therefore, the economic impact of the system is not limited to the direct effects on its users, analysed in chapter 3. This chapter seeks to quantify the aggregate impact of mutual guarantees on the Portuguese economy.

4.1. Methodology

The method used to determine the aggregate impact resulting from the activity of the mutual guarantee system is based on the input-output tables of the Portuguese economy.

This method is commonly used to estimate the economic impact of certain events or activities. It is often used, e.g., to estimate the impact of major sporting events or public works programs. In both cases, the difficulty lies in the fact that the impact of the event or activity is not exhausted in its direct effects: for instance, a public work has a direct impact on construction firms; but these, on their turn, will resort to other firms to get supplies, resulting in indirect impacts; but these direct and indirect impacts affect disposable income, e.g. through the payment of salaries, leading to potential increases in consumption and, consequently, further increases in production - these are induced impacts. If direct effects where our only concern, a survey of users might provide the necessary information. But it's not feasible to do the same to quantify indirect and induced effects, given the large number of and the difficulty in identifying affected entities.

4.1.1. Input-output analysis

Input-output analysis seeks to solve these issues. To implement it, the economy is segmented in several activity sectors. Each sector's production has two possible types of destination: either it is reabsorbed in the productive process of the same or other sector, in which case it is named intermediate consumption, or it will feed final demand in one of its forms (consumption, public spending, investment and exports). Using index *i* to identify the sector originating the production and index *j* for the destination sector, we can call X_{ij} to the production of sector *i* which is absorbed by sector *j*. On the other hand, let g_i denote the part of's sector *i* production that goes to final demand, instead of being reabsorbed in production. So, for a given sector *i*, the sum of every X_{ij} (intermediate consumption) with g_i (procura final) (final demand) is equal to the total of its production, which we name X_i. Therefore:

$$\sum_j X_{ij} + g_i = X_i$$

This identity (i) synthesises the productive relationships between sector *i*, other sectors and final demand.

The basis of input-output analysis is the table describing this set of relations. Each table row corresponds to one sector of origin of production. The number of the row matches index *i* in the previous identity: the first row register what happens to the production of the first sector, the second row what happens to the production of the second sector, and so on. The table columns match the production destinations, that is, index *j*: in the first column, we register the production absorbed by the first sector, in the second column, the production absorbed by the second sector and so on. Since not all production turns into intermediate consumption, some being destined to final demand, in addition to the columns of the destination sectors, the table includes one additional column to record the values of g_i. In summary, the rows of this input-output table match the sectors of origin of production and the columns the destination sectors and final demand.

The input-output matrix is a descriptive tool: for a given period, it represents the relationship between the various industries and final demand. But input-output analysis goes beyond description, studying the economic impact of changes, real or hypothetical, on final demand. For this purpose, it is assumed that the structure of those relationships is stable: i.e., input-output analysis assumes that, although the amounts involved may vary, the fraction of the output of each sector being absorbed as input by each of the other sectors or going to final demand is stable over the period under review.

In practical terms, let $a_{ij} = X_{ij} / X_i$, be the fraction of the production of sector *i* incorporated by sector *j*. These fractions are known as technical coefficients. Using this notation, it is possible to rewrite identity (i) as

$$\sum_j a_{ij} X_i + g_i = X_i \qquad \text{(ii)}$$

In this form, the identity refers to a single sector of origin *i*. The set of similar identities for all sectors of origin can be written using matrix notation as:

$$AX + Y = X \qquad \text{(iii)}$$

In this equation, A is the matrix of technical coefficients and X and Y are column vectors corresponding respectively to the total production of each sector and to its part destined to final demand. Equation (iii) can be manipulated, using matrix algebra, to obtain the column vector of production, X, as a result of A and Y, resulting in:

$$[I - A]^{-1} Y = X \qquad \text{(iv)}$$

In this new equation, the matrix $[I - A]^{-1}$ called the Leontief inverse matrix, links final demand for the production of each sector (Y) with its total production (X). Assuming the stability of this matrix, this equation can be used to determine the impact on national production that would result from a given variation in final demand ΔY. Let $[I - A]^{-1} = B$, to simplify the notation. The variation in national production that results from a given variation in demand is then given by:

$$B \, \Delta A = \Delta X \qquad \text{(v)}$$

Or, more elaborately:

$$\begin{bmatrix} b_{11} & \cdots & b_{1n} \\ \vdots & \ddots & \vdots \\ b_{n1} & \cdots & b_{nn} \end{bmatrix} \times \begin{bmatrix} \Delta y_1 \\ \vdots \\ \Delta y_n \end{bmatrix} = \begin{bmatrix} \Delta x_1 \\ \vdots \\ \Delta x_n \end{bmatrix}$$

The coefficients B_{ij} should be interpreted as the variation of the production of sector *i* needed to satisfy a unit variation on the final demand for sector *j*. In the main diagonal of matrix B we find the direct effect of a variation in demand addressed to a given sector over its own production and outside this diagonal the indirect effects, i.e. the increase in the production of a sector to provide inputs to other sectors. Using matrix B, ou inversa de Leontief, or Leontief inverse matrix, we can calculate the direct and indirect economic impact on the production of the various activity sectors that results from a change in final demand.

4.1.2. Induced impact of a variation in final demand

The total economic impact of a variation in final demand is not limited, however, to the direct and indirect impacts. The variation in the total production of each sector that results from to the variation in final demandl ΔY, lleads to an increase in gross value added (GVA) that is distributed as remuneration of labour and capital factors. This implies an increase in the disposable income of households which, in turn, leads to an increase of consumption.

To calculate this induced impact, for a given variation in final demand , we calculate its impact on the intermediate production and on the GVA of each sector. Then, we assume families benefit from part of that GVA only, namely the part corresponding to the remuneration of labour and capital factors (salaries and net operating surplus). Further, we assume that only part of the increase in income leads to new consumption: we use the average propensity to consume to calculate the increase in consumption to be expected as a result of the variation in final demand ΔY.

Finally, we assume that this increase of consumption constitutes a new variation of the final demand addressed to various sectors of activity ($\Delta Y'$). The $\Delta Y'$ vector is used to calculate the additional direct and indirect impact on the production of the various sectors of activity that would be required to meet this increase in final demand - the induced impact of the variation of the initial final demand ΔY. This induced effect need not be limited to a single iteration: this first round of induced effects generates more income that leads to more consumption and induces further production which itself generates more income, and so on. However, these impacts mitigate over successive rounds. It is usual to limit the analysis to the first round of induced effects which are the most significant and this is also the procedure followed herein.

In summary, the total impact on the production of the various sectors of activity following a variation in final demand ΔY results from the sum of the three above mentioned effects: direct, indirect and induced.

The effects on investment and exports of mutual guarantee users estimated in chapter 3 are the variation in final demand that, using this method, we use to determine the impact of this financial instrument on the Portuguese gross value added.

4.1.3. Impact on employment of a variation in final demand

In addition to gross value added, we also present estimates of the macroeconomic impact of the mutual guarantee system on employment. This estimation is done by assuming the existence of a stable relation, at the sectoral level, between GVA and labour, this is, assuming the stability of labour productivity in each sector.

Knowing the vector of employment by activity sector,

$$E' = [\, E_1 \ldots E_n \,] \qquad \text{(vi)}$$

we calculate a vector of coefficients of employment:

$$a_i = \begin{bmatrix} a_1 \\ \vdots \\ a_n \end{bmatrix} = \begin{bmatrix} E_1/X_1 \\ \vdots \\ E/X_n \end{bmatrix} \qquad \text{(vii)}$$

in which X_1 still represents the production of each sector. These coefficients correspond to the amount of labour required, on average, to produce one unit of output in each sector. being the matrix of these coefficients,

$$A = \begin{bmatrix} a_1 & 0 & \cdots & 0 \\ 0 & a_2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & a_n \end{bmatrix} \qquad \text{(viii)}$$

and assuming that productivity is constant, we estimate that an increase in final demand ΔY, leads to the following change in employment:

$$\begin{aligned} AE &= A \times \Delta X \\ &= A \times B \times \Delta Y \end{aligned} \qquad \text{(ix)}$$

Or, more elaborately:

$$\begin{bmatrix} a_1 b_{11} & \cdots & a_1 b_{1n} \\ \vdots & \ddots & \vdots \\ a_n b_{n1} & \cdots & a_n b_{nn} \end{bmatrix} \times \begin{bmatrix} \Delta y_1 \\ \vdots \\ \Delta y_n \end{bmatrix} = \begin{bmatrix} \Delta l_1 \\ \vdots \\ \Delta l_n \end{bmatrix} \qquad \text{(x)}$$

This way, we calculate the expected variation in employment that results from the change in final demand ΔY, both in total terms and for each sector of activity. As for GVA, this variation in employment can be subdivided in the parts that result from direct, indirect and induced impacts of the variation in final demand.

4.1.4. The data

The input-output analysis of the macroeconomic impact of the mutual guarantee system in Portugal presented here uses two main types of data. First, input-output tables representing the structure of the Portuguese economy. In Portugal, the National Institute of Statistics (INE) oversees the development of input-output matrices. The most recent tables available refer to the year 2013. In this report, we use these 2013 technical coefficients tables to carry out the calculations for the 6 years under review (2011 to 2016).

Secondly, we use data on variations in final demand arising from the activity of mutual guarantee societies. To this end, we consider the variations in total investment and exports estimated in chapter 3. Specifically, we consider the estimates of total investment impact corresponding to model A in section 3.5.1 and estimates of the impact on the exports of section 3.6, all of which, for this purpose, were segmented by sector of activity.

Additionally, for the calculation of induced effects, we use the final consumption data as a percentage of disposable income, according to the national accounts (2011), from INE. Lastly, to estimate the impact of mutual guarantees on employment, we use employment and GVA data by activity sector, from the same source.

BETWEEN 2011 AND 2016, MUTUAL GUARANTEES INCREASED THE PORTUGUESE GVA BY 5.1 BILLION EUROS

4.2. Impact on gross value added

The application of the methodology explained above to the additional investment of the mutual guarantee users estimated in chapter 3 results in the estimation of an impact on Portuguese GVA of around 4.4 billion euros, over the 2011-2016 period, following the timeline presented in Table 4.1.

Table 4.1 – Impact on the Portuguese gross value added of the additional investment resulting from the use of mutual guarantees (million euros)

Year	Direct impact	Indiret Impact	Induced impact	Total impact
2011	238	111	173	522
2012	337	153	245	736
2013	411	182	298	891
2014	326	145	236	707
2015	370	165	268	804
2016	327	147	236	710
Total	**2 009**	**903**	**1 457**	**4 369**

Source: own calculations.

The annual impact on the GVA ranged from a minimum of 522 million euros, in 2011, to a maximum of 891 million, in 2013. Despite some year-to-year variation, direct effects were, on average, responsible for 46% of the total impact, with 21% coming from indirect effects and 33% from induced effects.

The impact of the mutual guarantee users' additional exports is described in Table 4.2, rising to a total of 765 million euros. The evolution over time of this effect is somewhat different from that of investment, with the highest value, 141 million, happening as early as 2011. Except for 2014, the yearly impact of exports was relatively stable, never falling below the 130 million euros mark.

Table 4.2 – Impact of additional exports resulting from the use of mutual guarantees on the Portuguese gross value added (million euros)

Year	Direct impact	Indiret Impact	Induced impact	Total impact
2011	63	34	44	141
2012	57	33	40	130
2013	61	36	43	140
2014	40	23	28	91
2015	58	33	41	132
2016	58	33	40	131
Total	**336**	**193**	**236**	**765**

Source: own calculations.

Putting the two effects together, the global impact of mutual guarantees on the Portuguese GVA, between 2011 and 2016, was of some 5.1 billion euros, as can be seen in Table 4.3. The impact surpassed one billion euros in 2013, the year when the system activity also peaked, for the period under review, having its lowest point in 2011.

Table 4.3 – Aggregate impact of additional investment and exports resulting from the use of mutual guarantees on the Portuguese gross value added (million euros)

Year	Direct impact	Indiret Impact	Induced impact	Total impact
2011	301	145	218	663
2012	394	186	285	865
2013	472	218	341	1 031
2014	366	169	264	798
2015	428	199	309	935
2016	385	180	277	842
Total	**2 346**	**1 096**	**1 693**	**5 135**

Source: own calculations.

Table 4.4 – Relevance of the impact of the mutual guarantee system on the GVA of the Portuguese economy

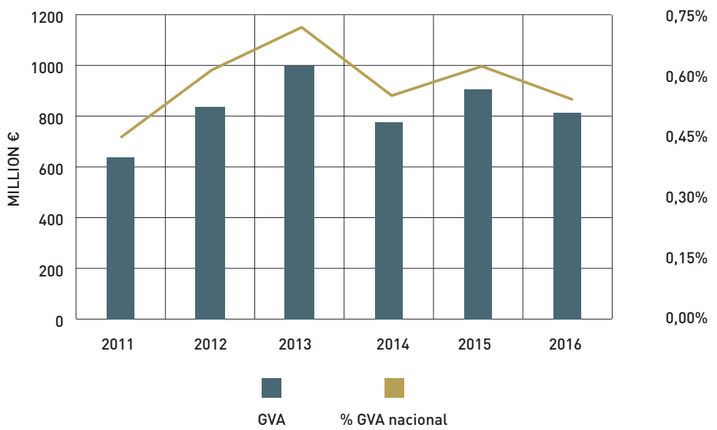
Year	% of GVA induced by MG in total GVA	Variation of the total GVA of the Portuguese economy
2011	0,43%	-1,10%
2012	0,59%	-3,20%
2013	0,69%	-0,80%
2014	0,53%	0,40%
2015	0,60%	1,60%
2016	0,52%	1,60%

Source: own calculations. INE.

Table 4.4 shows that the production induced by the mutual guarantee system represented, annually, between 0.43 and 0.69% of total Portuguese GVA. For reference, this impact is slightly larger than the contribution to GDP of the entire Portuguese furniture and mattresses industry and only slightly lower than the contribution of the machinery and equipment industry. The table also presents, by way of comparison, the annual variation rate of Portuguese GVA. As can be seen, in the years in which the performance of the Portuguese economy was more favourable, mutual guarantees' contribution accounted for about a third of the total growth of the Portuguese economy.

Chart 4.1 shows the evolution of the impact of the mutual guarantee system along the period studied which, of course, follows closely the evolution of the activity guarantee scheme itself.

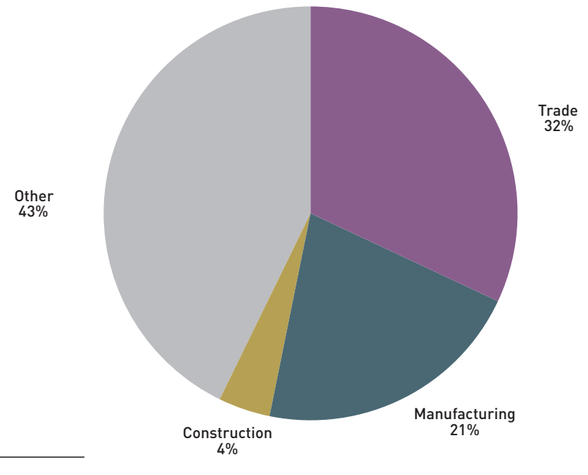
Chart 4.1 – Evolution of the impact of the mutual guarantee on Portuguese GVA



As can be seen in Chart 4.2, commercial activities account for nearly a third of the value added generated following the intervention of the mutual guarantee system, a very similar weight to that they represent in the amount of guarantees issued (see Chart 2.7). On the other hand, guarantees granted to manufacturing industries have a significant impact on other sectors of the economy, either by way of acquisitions that manufacturing firms themselves make from service firms, or via the expenses induced by the salaries they pay that, to a large extent, end benefiting commercial and service firms. For this reason, manufacturing industries weight on the impact of mutual guarantees on GVA is lower than what they have in terms of the guarantees granted. The same is true, for similar reasons, for the construction activities. To the contrary, the weight of 'other' activities – predominantly services – in the impact on GVA (43%) more than doubles its weight in the guarantees issued.

Table 4.5 further breaks down the same data and presents the ten branches of activity in which the impact generated by the mutual guarantee system was more expressive. Wholesale and retail trade activities lead this table, ensuring more than a quarter of the total impact on Portuguese GVA. In third position, with a significantly lower percentage, is the first manufacturing branch, metal products, that benefits greatly from investments of other sectors of the economy. The remaining industries listed in the table are services to companies or private individuals (real estate, financial, transport, legal, administrative, catering), as well as trade in vehicles.

Chart 4.2 – Sectoral distribution of gross value added induced by mutual guarantees (2011-2016)



Source: own calculations.

Table 4.5 – The 10 industry branches in which the mutual guarantee generated a greater impact on Gross Value Added (2011-2016)

#	Branch	% GDP
1	Wholesale trade; except repair of motor vehicles and motorcycles	16,3%
2	Retail trade; except repair of motor vehicles and motorcycles	12,9%
3	Manufacture of fabricated metal products, except machinery and equipment	4,4%
4	Real estate activities	4,1%
5	Financial service activities, except insurance and pension funding	3,3%
6	Legal and accounting activities	3,0%
7	Land transport and transport via pipelines	2,9%
8	Wholesale & retail trade and repair of motor vehicles and motorcycles	2,8%
9	Serviços administrativos e de apoio prestados às empresas	2,4%
10	Administrative service and business support activities	2,1%

Source: own calculations.

4.3. Impact on employment

The additional production due to the support of the mutual guarantee system described in the previous section implied increased demand for labour the estimates of which are presented in Table 4.6. According to our results, this demand varied between 21,000 employees in 2011, and 30,000 in 2013, in a total of 129,000. This represents between 0.50 and 0.78% of the total employment of the Portuguese economy, depending on the year considered. To put these numbers in perspective, these percentages are similar to those of the whole Portuguese industry of manufacture of motor vehicles and accessories or to the industry of furniture and mattresses.

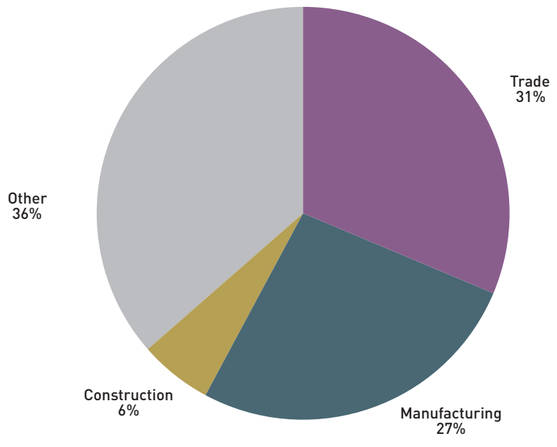
EMPLOYMENT IN PORTUGAL INCREASED BY 0.5% TO 0.78% ANNUALLY, DUE TO THE AVAILABILITY OF MUTUAL GUARANTEES

Table 4.6 – Impact on employment of additional investment and exports resulting from the use of mutual guarantee

Year	Via investment	Via exports	Total impacto	% employment in the whole economy
2011	16 014	4 582	20 596	0,50%
2012	21 874	4 192	26 066	0,66%
2013	25 762	4 342	30 104	0,78%
2014	20 920	2 822	23 742	0,60%
2015	23 660	4 080	27 740	0,69%
2016	20 838	4 006	24 844	0,60%

Source: own calculations.

Chart 4.3 – Sectorial distribution of employment induced by mutual guarantees (2011-2016)



Source: own calculations.

Table 4.7 – The 10 industry branches in which the mutual guarantees generated greater impact on employment (2011-2016)

Branch	% Employment
Retail trade; except repair of motor vehicles and motorcycles	18,0%
Wholesale trade; except repair of motor vehicles and motorcycles	9,5%
Manufacture of fabricated metal products, except machinery and equipment	5,7%
Wearing apparel	4,0%
Wholesale & retail trade and repair of motor vehicles and motorcycles	3,8%
Land transport and transport via pipelines	3,2%
Construction of buildings	3,0%
Legal and accounting activities	2,8%
Employment activities	2,7%
Services to buildings and landscape activities	2,7%

Source: own calculations.

By comparison to GVA, the sectoral impact on employment shows a relatively greater significance of manufacturing industries and construction, that get close to their weight on guarantees granted, against a lower weight of 'other activities' (Chart 4.3). The weight of trade remains relatively the same. This pattern is explained by the labour-intensive nature of manufacturing and construction, when compared with many service activities.

For this reason, wearing apparel and construction join metal products in the list of the ten branches of activity in which the impact of the mutual guarantee on employment was more significant (Table 4.7), by comparison with what happens in terms of GVA. Trade and service activities, however, continue to be the majority in this listing.

Part III

MUTUAL GUARANTEE AND THE FINANCIAL SYSTEM

5. Mutual guarantee and the financial system: preliminary results and strategic perspectives

This final chapter addresses the positioning of mutual guarantees in the value clain of the financial system, to identify the services it provides to banks and potential new financial intermediaries. It also presents empirical evidence - now from the accounts of financial institutions - which corroborates the results presented in Chapter 3 - from user accounts - on the benefits of mutual guarantee in reducing costs and widening access to credit.

5.1. Financial intermediation and innovation

Traditionally, the channelling of savings into productive investment is characterised as assuming one of two alternatives: on the one hand, a pure financial intermediation system, traditionally made up of banks that collect deposits from retail clients and grant credit to underfunded agents, mainly businesses; and, on the other hand, a system of financial di-sintermediation, in which capital markets - historically, stock exchanges - are responsible for a mechanism that allows the continuous adjustment between supply and demand.

In Anglo-Saxon terminology, the two forms correspond to bank-based or market-based financial systems, respectively. Of course, neither of these exist in their purest form. In the past, financial systems were distinguished by the preponderance, or proximity, of one or the other of the solutions, depending on political options and economic and social reasons. More recently, we have witnessed the emergence of a multiplicity of institutional solutions and arrangements between these extremes, giving way to a spectrum that is progressively filled by financial innovation.

The distinction between financial intermediation and disintermediation - or bank-based and market-based solutions - is now of little use, since systems are characterised by the functions assumed by financial institutions and the structure of markets that support the transactions. For example, in a pure banking system, there are credit and deposit markets, in which contracts for attracting savings and financing investment are transacted according to specific rules. The financial intermediary who organises and transacts such financial assets obtains remuneration in return for the costs and risks incurred, i.e., for the transformation functions it performs.

Under this functional perspective of the financial system, the institutional solutions that are observed at each moment are the result of a process of financial innovation that responds to the opportunities that are created, either by the varying legal and regulatory frameworks, the advancement of technology, or institutional frameworks governing the economy, including agent preferences. In recent years we have seen profound changes in the profile of the financial system, a true laboratory of experiences for new forms of financial intermediation, in the broad sense - i.e., alternative solutions for channelling of savings into investment.

Understanding the vast set of innovations and the advances that are registered in the financial system requires the knowledge of value chains, identifying the critical elements that compose them and that, following Coase (1937), can be outsourced, leaving the internal hierarchy of institutions and being transferred to markets that determine their price. From the economic perspective, this is a question of evaluating the most efficient solution from the point of view of welfare, that is, the solution that provides the lower cost for the several components that make up the price of the final service.

Focusing on banking and lending, where guarantees play a dominant role, the debate focuses on which institutions are better able to perform these functions and how they share the value created between them. Traditionally, all the activities involved in credit granting were controlled and executed by the banks, responsible for raising funds and structuring the financing agreement itself, taking responsibility for risk analysis and management, in addition to the commercial function of identifying investment opportunities.

From a functional perspective, it can be argued that banks have internalised potential markets, such as those relating to the quantification of credit risk, for example, to illustrate with a service that is now also provided through the market by specialised entities, such as rating agencies In some cases, banks retain comparative advantages in the analysis and, as such, reserve for themselves the production and control of information, particularly in the case of small firms, which do not see any obvious advantages in the existence of a market in which information about their credit risk profile is autonomously transacted.

The reference to credit risk serves as a motivation for the analysis of the relevance of 'mutual guarantees' for the development of the financial system and for the efficient allocation of resources in the economy. There is a growing range of banking activities that occur in, more or less, transparent markets, which have in common the fact they make explicit - through the price charged - their individual contribution to the overall cost of the financing operation. In this sense, if the information on the 'credit quality of the debtor' can be acquired in the market under more favourable conditions, banks will consider expurgating it from their internal activities, trusting that it will be accessible when necessary.

Obviously, the decision is not simply a matter of cost comparison, because the use of publicly-available information reduces competitiveness to productive efficiency and eliminates the potential for gains from the exploitation of information asymmetries. Issues related to the viability of these markets must also be considered, namely the need to align incentives between those who produce the information and those who need it to make decisions. The financial crisis, of which the subprime is the best example, well illustrates the risks of moral hazard and adverse selection that are associated with the independent production of information and the misalignment of interests.

If we temporarily put aside these asymmetries and their implications for the financial system, institutions, and ultimately the economy, then the pooling of expected losses may, in the abstract, result in a more efficient price for risk if it is possible to achieve better risk diversification. If this is the case, effective management of this centralisation will ensure access to finance for several firms which, a priori, do not qualify for existing financing institutions.

The mutual guarantee system can be seen in this perspective: an expected loss sharing mechanism, which suppresses informational weaknesses and provides banking intermediaries - but not only them - with elements of the credit agreement central to fixing its price, without which the financing would have a higher cost, or would not exist.

Ideally, the existence of an independent, indisputable external guarantee allows the banking sector to design contracts where the only determinant element is the cost of funding - in the abstract, the risk-free interest rate. In parallel, it makes room for new entrants - with no history of information or ability to assess credit risks - to focus on the operational side of the business and exploit scale and scope economies, reengineering the value chain.

By making credit risk assessment autonomous, the mutual guarantee system may facilitate the exploitation of technological advances and changes in the regulatory framework that favour the opening of the credit activity value chain to third parties, such as FinTechs, for whom information asymmetries and the difficulty of building a knowledge base on customers is the main barrier to entry or induces businesses based on a misallocated distribution of risks between economic agents.

5.2. Stylised credit value chain

In a value chain perspective, the financing of investment, or credit granting operations, can be described – starting from the origin of funds and in the direction of their application - based on the following sequence of events, or activities, with no pretension to be exhaustive, but only for illustrative purposes:

1. Mapping funding sources
2. Design of fund-raising contracts (risk-return profile)
3. Placement of fund-raising contracts
4. Aggregation of savings funds
5. Mapping investment projects
6. Search for credit placement opportunities
7. Profile and risk assessment of credit customers
8. Risk mitigation instruments (guarantees and collateral)
9. Design and calibration of credit contracts (risk-return profile)
10. Placement of credit contracts (investment financing)
11. Operational contract management (debt service and reimbursement)
12. Default risk management (recovery and insolvency)

This sequence is a stylised representation of the tasks involved in a credit process. Traditionally, in a banking institution, all of these were internalised and managed within a hierarchy which would define objectives and establish priorities - distributing the work by the various departments of the bank, from the retail network, in charge of attracting savings, to corporate banking, responsible for placing credit, through the units and directions of analysis of credit risk or operations management. A sequence that articulates what is produced internally, with what - i.e., services - can be bought and sold in the market: fundamentally, deposits and credit themselves.

Figure 5.1 - Traditional value chain of financial intermediation

Note: Traditionally, in a banking instituition, all layers are internalised and managed within a single hierarchy.

5.2.1. Fragmentation of the value chain

Focusing on the main functions, we may distinguish: [1] 'origination', which corresponds mostly to the commercial function of identifying opportunities for granting credit and negotiating the terms of the contract, after identifying the risk profile of the client; [2] 'financing', which comprises obtaining and mobilising the liquidity necessary to finance the operation, establishing - or not - a link between this contract and the characteristics of the debtor; [3] 'risk management', which includes the use of risk mitigation instruments and risk pricing itself; and [4] 'operation management', involving the procedures for the execution of the credit agreement, from mandatory records up to the financial settlement flows.

Originally, banks integrated all these functions, managing the four major phases of the value chain in a coordinated way. Progressively, the development of financial markets favoured their autonomous development with the links between them being articulated through the market. Historically, one of the earliest examples was the 'securitisation' of banking assets. Banks could multiply their credit granting capacity by resorting to wholesale markets for the 'financing' function. In practice, third parties were contracted to seek funds available from retail. Reasons of a regulatory nature were also behind this trend.

More recently, it was 'origination' that followed the same path. However, the segregation of origination along with an aggressive management of guarantees took the financial system to the verge of collapse, highlighting the flaws in the markets where risks are transacted. Numerous institutions showed signs of financial fragility and some went bankrupt. The authorities - notably the central banks - have witnessed systemic risk of unprecedented magnitude, shaking businesses and compromising employment, and stressing the need for regulation.

However, to understand the origin of potential market failures, it is important to separate the functions of 'origination' and 'risk management'. The former can be thought of as a retail business - where a distributor 'sells' credit contracts with certain characteristics to final clients - individuals and businesses. 'Risk management', in brief, consists in verifying that the proceeds of the sale are received as expected, to ensure the continuity of the business.

It is in this 'risk management' heading that the discussion of the mutual guarantee role makes sense. Particularly, to which degree does it help reduce the price of the credit operation and, in extreme cases, avoid that firms are excluded from access to investment funding, by rationing via quantity and price. In a partial equilibrium setting, to the extent that the mutual guarantee system is more competitive in determining the price of risk - i.e., provides a lower value - investment is benefited through a reduction in the cost of financing.

But mutual guarantees can also be analysed in what concerns the incentives created for the parties involved in the transaction. From an integrated perspective, for sustainability, all elements that make up the credit value chain must be in tune. If this responsibility resides in a single financial intermediary, the result is endogenously reached, since any imbalance – e.g., an excessively low-risk premium – threatens the sustainability of the business. However, when the management of the value chain is shared, there is room for opportunistic behaviour, as a result of the data asymmetries between economic agents in different 'mid-markets'.

5.2.2. Risk management

But how to describe the risk management? In a credit relation, information and knowledge about the debtor are fundamental for the choice of the terms of the contract, especially those concerning remuneration and risk-sharing. Specifically, in business credit operations, the most significant risk that is assumed by the creditor is the potential default of the debtor. As a rule, the contractually promised remuneration is an interest rate, which does not vary with the actual performance or profitability of the financed business. It is only if this business is not capable of releasing sufficient funds that the creditor earns a different value - less, in fact – from the one agreed.

The creditor - financial institutions, in general, and banks, in particular - is therefore exposed to a credit risk. This is a potential loss, which translates into an effective loss when and if the business proves unable to generate sufficient funds to service the debt and the value of the assets given as collateral - explicit or implicit - is less than such debt. As a rule, volatility is taken as a synonym for risk, and both practice and theoretical models use standard deviation as its effective measure. Measurement difficulties aside, credit risk will be greater the greater the business volatility and the lower the value of the assets given as collateral.

On average, for a financial intermediary, the expected return on a credit transaction comprises the contracted interest rate, less the default losses incurred and moderated by the collateral amount given or required as guarantee. Of course, if the value of the collateral is more than enough to compensate for adverse scenarios, the expected return of the operation is equal to the contracted rate because there will be no losses to be recorded as a result of the default. Things will be different, however, if the value of collateral is lower.

In determining the risk premium, two elements must be considered: the probability that the debtor defaults and the loss in case of default, which is moderated by the assets given as collateral. The risk premium is chosen so that, for the credit portfolio as a whole, the expected return is sufficient to pay the cost of the 'financing' under the terms and conditions of risk agreed with the savers. It should be noted, however, that the absence of expected losses does not imply a risk-free interest rate for the credit, since it is necessary to consider unexpected losses and the availability to bear them.

i. Risk premium and credit rating classes

In models of banking financial intermediation, credit risk contains two parts: the expected loss and the unexpected loss. Only the expected losses should be included in the pricing models - i.e., the interest rate choice, through an appropriate risk premium, such that the profitability of the business satisfies the cost of capital, which depends on the exposure to unexpected losses. Moreover, in banking regulation models, each credit operation requires the company to have own funds equivalent to the unexpected loss, which is synonymous with the capacity to resist adverse global scenarios.[17]

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17 In these cases, the regulator establishes the amount of own funds that financial institutions should set up to support the unexpected losses and thus protect the creditors - i.e., the depositors in the case of banks. In effect, there are differences between the regulatory minimum amount of own funds required and the ideal amount regarding the risks to which the institution is exposed to – i.e., the economic capital. This difference stems from the approach of the regulatory authorities to the Basel accords (in its successive revisions and models), which sets the responsibilities of banks in terms of risk management, regarding the stability of the financial system as a whole. Since funds are expensive, it is natural that financial intermediaries seek to minimise its use, using low cost risk mitigation strategies, whenever possible.

In a stylised way, the rate of a credit transaction corresponds to the risk-free interest rate plus a premium - or spread - to cover the portfolio expected losses. Understandably, the interest rates of the operations depend on the segmentation strategies chosen by the banks, and their effectiveness. There is, so to speak, a central decision variable in which, rather than the measure of credit risk, it is important to choose the degree of dilution or distribution of risk - in other words, the number and width of the risk classes chosen.

In the way that credit risk is analysed and assessed in the banking system, it is necessary that there is a sufficient number of good debtors - i.e. who honour their credit obligations timely - to compensate for what is lost with those who do not fully or partially comply.[18] Presumably, the greater the number of risk classes, the lower the possibility of diluting risk between good and bad debtors, insofar as the separation between 'good' and 'bad' - borrowing from credit scoring terminology - becomes clearer.

Thus, in a stylised way, the choice of the interest rate to be charged (R) – for each euro lent – can be represented by the following expression, where PD representa a probabilidade de incumprimento (*probability of default*); EAD érepresents the probability of default; LGD is the value of the exposure at default; and corresponds to the percentage of loss given default:

$$R^e=(1-PD)\times(1+R)+PD\times(1+R)\times EAD\times(1-LGD)-1$$

Of course, the expected return associated with the credit operation (R^e) must be enough for the bank to cover the cost of its own financing, plus all other expenses it must incur by offering the financial intermediation service in a sustainable manner. Or, in a mathematical formalisation:

$$R^e \geq R^f + k^g$$

where R^f represents the cost of funds - i.e., the weighted average of the remuneration payable to depositors, creditors and shareholders, for their willingness to lend the resources – and k^g is a stylised representation of the structural costs for each euro of loans granted.

Overall, in choosing the interest rate on operations, the bank must comply with this restriction for the credit portfolio - i.e., the expected weighted average interest rate of the credit portfolio must exceed the weighted average funding cost and the structure costs. In practice, depending on its strategic options, it stratifies customers by classes of credit risk and seeks to verify the minimum profitability condition for each of them. In this way, lower-risk clients can access more favourable financing conditions compatible with their soundness.

[18] This corresponds to the theoretical formulation where banks can be considered economic agents maintaining a risk-neutral attitude, expecting only that the credit income may equal the cost of funds – deposits, debt and own funds - plus the general expenses.

The ideal number of credit risk classes - which make up the ratings of financial intermediaries - is not the subject of this paper. In any case, its definition is one of the most important strategic choices. This results in market segmentation, with different interest rates for clients, depending on the losses expected in their respective classes.

In principle, for each rating notation, the risk premium is enough for the expected return to pay the cost of the respective financing. In any case, we should not exclude the possibility of cross-subsidisation between the various classes of credit risk, such that, globally, the remuneration expected to be obtained from the credit granted suffices to cover the income due to the lenders. In a perfect market, such an imbalance would not occur, but given that there is friction in the financial markets - for reasons of information asymmetry, among others - this is a highly plausible result.

In fact, it is common to note that market risk premiums between credit risk classes are not linear. As a rule, in higher risk operations - i.e., with less favourable credit ratings - it is common to require high premia. This, also, because these are markets where there is less supply and the great volatility tends to drive investors away. Reasons of a regulatory nature - such as the increased capital requirements for these operations, help to explain what happens. In practice, these are cases in which credit is rationed via price and quantity.

The negative effects on welfare stem from imperfections and the way banks develop their business models. Among them, information asymmetries and risk aversion[19] (even when it can be mitigated through diversification or socialisation) exclude investment projects with a positive economic and social value.[20] We are faced with a market failure because institutional arrangements are unable to offer a satisfactory solution to the problem.

ii. Own funds requirements and unexpected losses

Banks are not completely free in choosing sources of funding to raise the resources - i.e., the funding - they need for credit granting. In particular, they face restrictions on the minimum amount of own funds, which must be adjusted to the level of risk of their operation, among which the risks of the credit portfolio stand out, namely the possibility of total or partial default by debtors.[21]

Bank regulators understand banks' own funds as a cushion to withstand losses that are not considered, or covered, by the price of the operation. In the Basel Accords, these are designed to deal with unexpected losses, i.e. whether the probability of default and the loss in case of default are beyond the initial estimates. Ideally, the lower the likelihood of estimated expected losses, the greater the capital requirement. [22] And each bank must raise sufficient capital to cover losses in the generality of adverse events, except in catastrophic situations where the magnitude of the loss requires another type of intervention. [23]

[19] Infringing the assumption, underlying the analysis, that financial intermediaries are risk-neutral economic agents.

[20] In practice, penalising clients with greater probability of default, even when the interest rate charged is more than enough to offset the expected loss and still ensure an expected return equal to the cost of funds. The origin of risk aversion comes from unexpected losses and the largest capital consumption – e.g., the low reliability of estimates relating to default..

[21] The capital requirements impending on the banks are regulated by the Basel accords (object of successive revisions and adaptations since its introduction in the 80s - Basel I, II and III).

[22] We recall here the random and complex nature underlying the estimate of expected losses (EL - expected loss), which depends on the already mentioned PD (probability of default), EAD (exposure at default) and LGD (loss given default), working as follows::

[23] In order to counter all possible losses, each bank would have to accumulate own funds in an amount equal to the loans. However, this option would be economically inefficient, besides having implications on the architecture and organisation of the present payment system. Thus, acknowledging that there is an optimal value for the damages that each institution can accommodate, the regulator established mechanisms and forms of socialisation for losses exceeding this limit.

Understandably, own funds must respond to a multiplicity of contingencies, of which credit risk is only one.[24] Simultaneously, there are different classes of own funds, depending on their stability. Nowadays, own funds are also used as an instrument of monetary policy, stabilising the financial system. It should be noted that the regulator can even act surgically, differentiating between financial institutions.[25]

Given the nature of this work, we focus attention on the calculation of own funds required to specifically address credit risks. Methodologically, they are determined as a percentage of the value of the credits adjusted by the respective risk factors. In banking terminology, banks must meet a solvency ratio of over 8%, which corresponds to the division of their own funds by risk-weighted assets (RWA) - as explained below:

$$\frac{\text{Own Funds}}{RWA} \geq 8\%$$

Regarding the choice of risk-weighted measure, the regulator allows one of two alternative approaches: the 'standardised approach' and the 'internal rating-based approach'. For reasons we will not discuss here, most Portuguese banks use the 'standardised approach', which establishes that the capital requirements - for companies that do not have coverage and rating by external agencies – are a percentage of the exposure value (between 75% and 85%).[26]

[24] Originally focused on credit risk, the Basel accords have undergone a major evolution. The current version – Basel III – introduces greater demands regarding credit itself and more stringently includes other risk factors inherent in banking activity, such as operational risk and liquidity, and a major concern with the stability of the banking sector and systemic risk.

[25] See Basel accords and successive revisions and adaptations.

[26] Typically, loans covered by mutual guarantees are included in the bank retail portfolios, due to the small size of the debtors and the loans, not requiring individual risk treatment. In the retail portfolio, the capital is determined bearing in mind the set of debtors, not their individual situation, which are grouped into homogeneous risk classes. In the standard model, the risk weights, for determining capital requirements, are fixed equally for all retail clients (75%), with slight variations for the real estate sector credits (60% to 85%).

iii. Credit risk mitigation and mutual guarantee

It is natural for banks and credit clients to use guarantees to mitigate the negative impact of default. The former to minimise losses, expected and unexpected, and the latter to reduce the cost of financing. The guarantees effectiveness is measured by the reduction of the credit risk spread charged to the client and by the reduction of the consumption of own funds at the level of the banking institution, at the same time it ensures sufficient solidity to honour the commitments to depositors, among others.

Different instruments can be used to mitigate credit risk, going from the assignment of real assets as collateral – such as mortgages and pledges – to the provision of guarantees by third parties – particularly sureties, insurance of credit risk and mutual guarantee. These have different impacts on the price of the operation as they differently influence the expected and unexpected loss. At the same time, the different regulatory treatment of each has a non-negligible effect on the capital requirements and, the bank's funding structure.

Often, loans are accompanied by mortgages and guarantees to minimise losses in default incidents. Thus, LGD (loss given default) is reduced and, as a direct consequence, the bank can charge lower interest rates on credit operations. At the limit, if the collateral is more than enough to cover the entire exposure in case of default, the bank does not incur in expected losses and the interest rate can be set as if the possibility of default does not exist.[27]

Using other guarantees - such as the mutual guarantee provided by the MGS - must be considered among alternative and, in certain cases, complementary, possibilities. In what concerns the risk of the credit operation, mutual guarantees are a very competitive alternative as they may allow the total elimination of LGD: i.e., the bank may incur in no loss in case of default. This competitiveness is reinforced because mutual guarantees present low contractual requirements and are easy and fast to execute.

In theory, the financial intermediary should be indifferent between collateral that implies zero LGD and a mutual guarantee that ensures the same result. However, there are two reasons why this should not happen. First, the flexibility of using mutual guarantees and their prompt realisation in case of a credit event have a time value that should not be overlooked. Second, the fact that the mutual guarantee enjoys a counterguarantee from the Portuguese State reduces the capital requirements by reducing the weight of the credit risk.

Under the standardised approach,[28] guarantees on loans - embedded in risk mitigation strategies - can be used to moderate capital requirements. For the part of the loan that is guaranteed, the bank may apply the risk weight of the entity that assumes responsibility for the proper execution of the contract. Only the balance is weighted according to the risk class of the debtor. As a result, mutual guarantees have regulatory value, insofar as they reduce exposure to credit risk, in whole or in part.

[27] SIt should be noted that the possibility of unexpected losses and the eventual risk aversion of some financial intermediaries should result in interest rates above the risk-free interest rate.

[28] And, also, in models based on internal rating systems.

In the Portuguese Mutual Guarantee System, the existence of a state counterguarantee allows the risk-weighted credit risk for the part of the operation that is guaranteed to be 'zero', which is to say that, in addition to assuming the absence of default losses, there are no capital requirements, simply because there will be no loss - expected or unexpected.[29] In case of default, the mutual guarantee shall replace the debtor and fully compensate the creditor bank.

The pricing of a guaranteed operation follows the following expression, in which w_g represents the fraction of the credit that is guaranteed; and LGD_g the 'loss given default' of the party that is guaranteed. The remaining variables have the previous meaning.

$$R^e=(1-PD\times(1+R) \\ +PD\times(1+R)\times EAD\times[w_g\times(1-LGD_g)+(1-w_g)\times(1-LGD)]-1$$

Rearranging, you get:

$$R^e \approx -(1+R)\times[PD\times EAD\times LGD-PD\times EAD\times w_g\times(LGD-LGD_g)]$$

Approximately, the expression can be written equivalently, to represent the (minimum) interest rate to charge in the credit granted:[30]

$$R=R^e+[PD\times EAD^*\times LGD-PD\times EAD^*\times w_g\times(LGD-LGD_g)]$$

The interest rate applied in the operations is composed of two parts: the cost of funding – $R^e=R^f+k^g$ –plus the risk premium that compensates for the expected losses on the loan. In its turn, the risk premium has two determinants, the counterparty risk – measured by expected loss in case of absence of guarantees – deducted from 'benefit' - i.e., the insurance value - provided by the guarantee. Naturally, the insurance will have more value the higher the client's LGD and the greater the coverage provided. In the case of mutual guarantee, where the creditor does not incur in loss on the credit's part that is guaranteed, the cost of the operation is equal to:

$$R=R^e+[PD\times EAD^*\times LGD-PD\times EAD^*\times w_g\times LGD$$

If the guarantee offers full coverage of the operation - i.e.,wg=100% – the interest rate to be charged on the credit should coincide with the funding cost plus the expenses with the structure. Since mutual guarantees rarely fully cover the value of the operation, risk mitigation is not total and therefore the relative gains for the financial institution depend on the probability of default and the LGD of the debtor. In practice, risk dilution is greater for clients with less capability to access credit.

[29] In this regard, see the regulatory framework established by the Basel accords and its transposition into EU and Portugal, in terms of the credit risk treatment of the bank loan portfolio.

[30] Where , meaning that risk exposure may be greater than the value of the loan, not only due to eventual moratorium and late payments, but also due to the interest owed. In fact, under regular circumstances, on the default date, the company owes – at least – the loan capital, plus interest for the period.

In the Portuguese case, mutual guarantee produces additional positive effects on banks' capital requirements. The existence of a state counterguarantee allows part of the credit insured by this instrument to have a zero weight. For a maximum guarantee of 50%, the RWA can be reduced in the same proportion. For example, a credit of 100 thousand euros in the retail business portfolio, weighted - without guarantees - at 85%, uses an average weight of 42.5%. That is, the equivalent RWA goes from 85 to 42.5 thousand euros.

This reduction in capital requirements allows banks, on the one hand, to use less expensive sources of financing, reducing the average cost of funding and, on the other hand, to free up capital for new credit operations, increasing the financial leverage of the balance sheet. These two effects are particularly important in cases where financial institutions face capitalisation difficulties and firms need access to finance. In practical terms, mutual guarantee operates as a kind of credit multiplier.

5.3. Mutual guarantee, financial innovation and welfare

The importance of mutual guarantee for the financial system can be gauged by the way financial intermediaries use it, as regards the conditions of access to finance offered to companies that use this redistribution and risk-sharing mechanism. As results from the previous discussion, the mutual guarantee system has the merit of allowing banks to expand the client base and expand credit granted to the economy, considering the appetite for risk inherent in the business model and the limitations in the fundraising structure - fundamentally, deposits, own funds and conditions of access to the bond issue market.

In a perfectly competitive market and taking as a basis the behavioural model for the banking sector presented in the previous section, the use of mutual guarantees should translate into a decrease in the cost of financing for firms. The magnitude of the decrease in the interest rate - or the reduction of the credit risk spread - will vary according to the sectors considered, depending on probabilities of default (PD) and losses given default (LGD). Naturally, the potential gains will be greater, the greater the risk of the debtor. Or, perhaps more assertively, the more the financial intermediary considers the sector in question to be risky. [31]

The most immediate effect associated with financial innovation is the autonomous treatment of the credit risk premium. By sharing, albeit partially, potential losses with banking institutions, mutual guarantee provides a barometer for the price of risk. It should be noted that the purpose of mutual guarantee is to cover the risks of default by its participants. By making this part of the cost of credit for firms more autonomous, the value of the 'risk management' carried out by the banking sector and, in particular, its competitiveness vis-à-vis non-traditional alternative financing vehicles, becomes more explicit.

Conceptually, mutual guarantees provide transparency to the financial markets and, given the appropriate incentives, allow a better management and pricing of risks. In particular, by comparing similar transactions with and without mutual guarantee, the credit risk premium implicit in the banks' proposals can be determined. In addition, given its regulatory treatment, one can gain awareness of the origin of costs and benefits. It was this simulation exercise of the mutual guarantee effect on the price of credit operations that we have tried to perform, with the results presented below.

31 An illustration of the above is the high risk that banks associated with real estate during the crisis. The segmentation of the credit supply by sector of activity, as is normal practice, hindered the access to credit, penalising companies in credit risk premia, for the high rates of default and loss observed. In many cases, there was even rationing by quantity, to avoid additional exposure to a sector already considered problematic.

5.3.1. Credit price decomposition

We simulate the effect of mutual guarantees on the cost of access to credit for firms under the current regulatory framework. The baseline scenario is parametrised based on recent studies on the performance of the Portuguese banking system during recent years, after the financial crisis of 2011. To determine the 'ideal' credit price, we use the model described in the previous section in which the interest rate for each class of credit is based on the respective expected losses, the funding cost and the structure costs. The implications of credit concession for the capital structure of banks, in particular their minimum capital requirements, are also considered.

The 'ideal' credit price - or the ideal spread of credit risk - corresponds to that which allows the financial intermediary to cover the overall cost of the resources needed to finance the operation and recover its structural costs. We ignore additional complexities, such as strategic targets for the credit portfolio risk profile, the use and assignment of distinct funding sources for different operations (e.g., by sector of activity), or the effects of revenues from other credit-related services which, from the bank's perspective, should be considered in the evaluation of the 'profitability' provided by the client.[32]

However, simplification does not inhibit conclusions. The model and simulations are intended to evaluate the impact of mutual guarantee use on the price of the credit operation, keeping all the rest constant. If the price function is fundamentally linear, the effects of these additional complexities translate into 'parallel' movements of the credit cost curve. The aim of this analysis is to find the maximum amount of credit risk spread reduction that banks can consent to upon the acceptance of the mutual guarantee in a credit operation, given the alternative in which it is absent.[33]

The following parameters are used for the baseline scenario: own funds cost (15%); cost of external funds, to include deposits and other debt securities (2%); capital requirements for credit risk as a percentage of risk-weighted assets (10%); probability of default, in line with the average of recent years (PD = 5%); loss given default, within the intervals estimated by empirical studies (LGD = 45%); percentage (maximum permissible) of credit coverage by mutual guarantee (50%); the credit risk weight to determine RWA, in line with the requirements set by the regulator (75%); and, finally, structure costs as a percentage of the credit portfolio (1.5%).

Under these basic assumptions, the interest rate to be charged on a bank loan backed by mutual guarantee should be 5.2%, to provide an expected return of 4.0%, sufficient to remunerate funding (2.49%), and structure costs (1.5%). Compared to an equivalent non-guaranteed operation, the interest rate charged is 1.7% lower and the funding cost is reduced by 0.5%. The results are compiled in the following table:

32 Among others, card fees, current account services, direct payroll, etc.

33 Yet we do not consider an additional effect resulting from the likely reduction of the value of unexpected losses and the associated economic capital. This effect should be small, insofar as, in the event of default, according to law and regulations, the mutual guarantee society has access to all the collaterals offered to the financial intermediary through pari passu.

Table 5.1 – Credit interest rate components, with and without mutual guarantee

Operation...	Counterpart Risk [1]	Mutual Guarantee [2]	Credit Costs [3]=[1]–[2]	Funding Costs [4]	Strutural Costs [5]	Loan Pricing [6]=[3]+[4]+[5]
... *WITHOUT garantee*	2,406%	0,000%	2,406%	2,975%	1,500%	6,880%
... *WITH garantee*	2,366%	1,183%	1,183%	2,488%	1,500%	5,171%

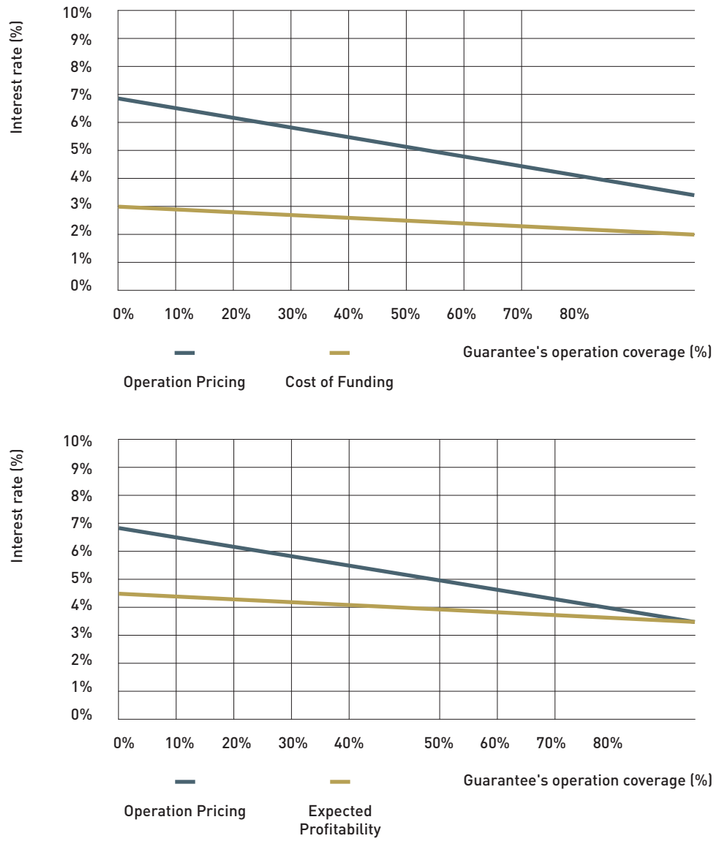
Notes: calculations made using the pricing model described in 'Section 2 - Stylised credit value chain'. The guaranteed operation is assumed to have a coverage of 50% of the credit value and the risk-weighting factor in respect of that part of the credit is zero. To meet the regulatory capital requirements (RWA), the standardised approach is used, where the retail portfolio has a risk weight of 75%.

In this baseline scenario, the difference in interest rate between transactions, with and without guarantee, for similar companies is approximately equal to 1,7 percentage points. To understand the sensitivity of interest rates to the various parameters of the model, simulations can be made for changes in: (1) percentage of the credit covered by the mutual guarantee; (2) probability of default (PD); (3) losses in case of default (LGD); and (4) cost of debt (weighted average cost of deposits and other bank debt instruments). Overall, the findings that collateral has a significant effect on reducing the cost of credit are unchanged.

i. Percentage of credit covered by mutual guarantee

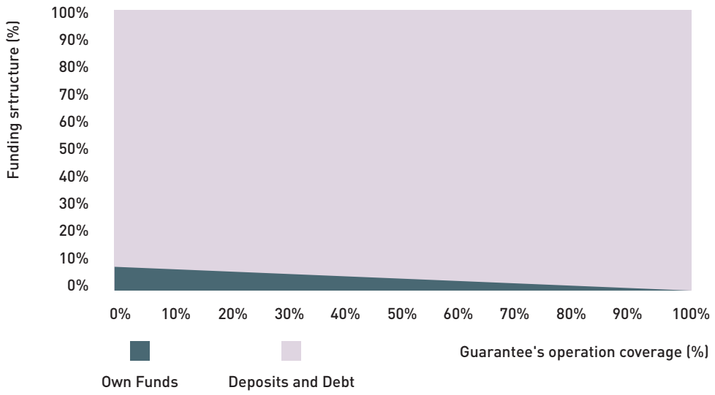
Because the two effects complement each other, as the use of mutual guarantees increases, the reduction in the price of credit - which is the same as that of the risk premium - occurs at a faster rate than the dilution of expected losses. In a mathematical language, mutual guarantee allows banks a multiplier effect of credit to companies. By reducing the regulatory capital requirements, it frees up the ability to expand the credit portfolio without additional restrictions, except for the possible widening of the deposit base and the contraction of debt in institutional and interbank markets. For guarantees of 50%, banks' credit capacity doubles, *ceteris paribus*.

Chart 5.1 – Effects of mutual guarantee on the cost and funding of the credit



Notes: simulations based on the pricing model described in 'Section 2 - Stylised credit value chain'. The impact of changes in the degree of coverage by mutual guarantee in the interval [0-100%] was simulated, everything else constant. Mutual guarantee coverage does not generally exceed a maximum of 50%. However, the results allow us to assess the potential of the instrument for the release of own funds into banking financial intermediaries.

Chart 5.2 – Effects of mutual guarantee on own funds and credit multiplier



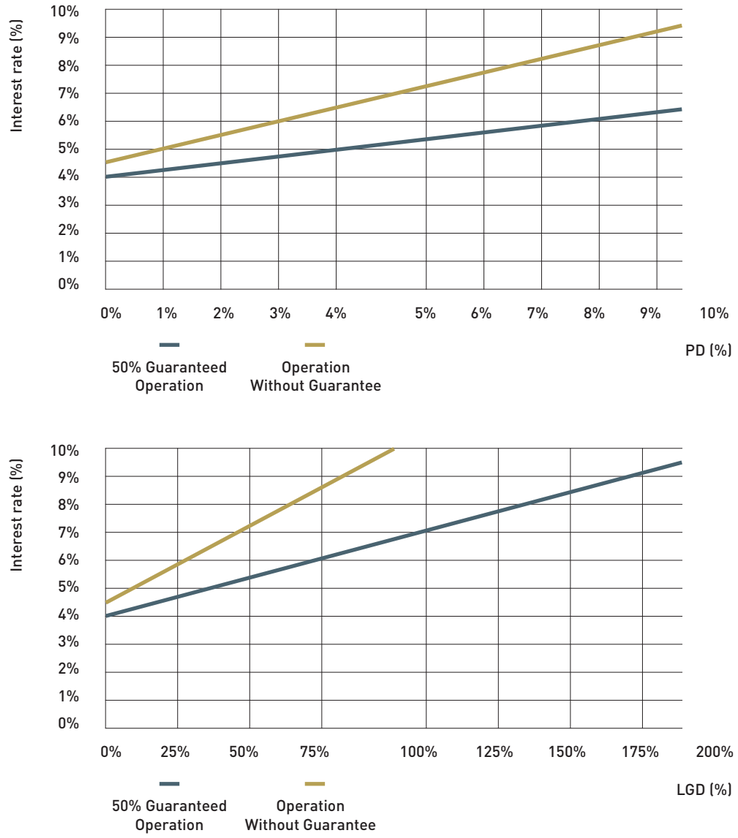
Notes: simulations based on the pricing model described in "Section 2 – Stylised credit value chain". The impact of changes in the degree of coverage by mutual guarantee in the interval [0-100%] was simulated, everything else constant. Mutual guarantee coverage does not generally exceed a maximum of 50%. However, the results allow us to evaluate the potential of the instrument to reduce the costs of corporate financing.

The reduction of the cost of credit reaches its maximum when the guarantee fully covers the exposure. In this hypothetical case, by comparison with the absence of mutual guarantee, the interest rate falls by 3.38 percentage points (from a maximum of 6.88%). In this scenario, the operation presents no credit risk, and the remuneration corresponds to the cost at which banks can issue debt and deposits (2%), plus structural costs (1.5%). Although this is not a plausible situation, the results matter to perceive the limits of possibilities offered by the mutual guarantee and to test how much the banks transfer the benefits realised for their clients. However, it should be considered that this reduction in the banking cost - i.e. the interest rate paid on credit – implies the additional costs that result from participation in the mutual guarantee scheme, which should not be ignored.

ii. Probability of default (PD) and loss given default (LGD)

We also simulate changes in probabilities of default and in losses in case of default, to better understand the implications of mutual guarantee for the different classes of credit risk - e.g., for sectors of activity with different risk profiles. The results are as follows.

Chart 5.3 – Effects of PD and LGD on credits with and without mutual guarantee



Notes: simulations based on the pricing model described in 'Section 2 - Stylised credit value chain'. The impact of a PD variation in the [0-10%] range and the LGD in the [0-200%] range was simulated for two comparable credits, distinguished only regarding mutual guarantee coverage: coverage of 50% of the value of operation, on the one hand, and absence of guarantees, on the other. The results allow us to test the potential of the instrument for the reduction of interest rates because of dilution and risk sharing for a banking financial intermediary.

The interest savings that can be achieved in situations where the probability of default (PD) and associated loss (LGD) are high. The effect is particularly evident for sectors or classes of risk where losses are of great magnitude. For example, an LGD change from 40% to 60% increases the interest rate on non-guaranteed operations from 6.6% to 8.8%, while comparable operations backed by mutual guarantee increase from 5.0 to 6, 1%. In another perspective, the 'risk premium' differential grows from 1.6% to 2.7%.

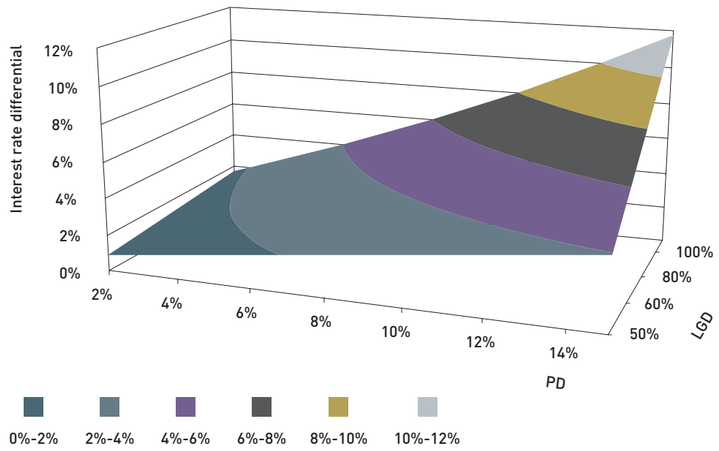
The combined effect of LGD and PD - which are generally positively correlated - makes the potential positive effects of mutual guarantee clearer by opening the bank credit market to firms that would otherwise be excluded, given their high risk exposure.[34] As the system does not allow banks to pass the full risk to MGSs, it preserves - at least in part - the incentives necessary for the creditor to continue to monitor the credit quality of their clients.

In this sense, it is possible that mutual guarantees solve a problem of market failure by bringing firms subject to credit rationing into the perimeter of accessibility to bank credit.[35] NFor financial intermediaries, sharing the risk with an external entity brings the combined risk[36] of the operation in line with standards compatible with the solidity of the business model required by the regulator. Not only does this allow savings of, more expensive, own funds as it also dilutes risk, putting the risk and the profitability of the operation within levels compatible with the chosen appetite for risk.

Chart 5.4 allows for some important practical observations regarding the role of guarantees in the normalisation of bank credit portfolios, avoiding the contamination of recent historical experiences on future operations. It should be remembered that, in all models of risk analysis, past evidence plays a preponderant role in the calibration of the models. Thus, sectors of economic activity hampered by high PD and LGD in the recent past are particularly penalised in the credit risk assessment, all the rest being constant.

Illustratively, the shift from a [PD, LGD] of [2%, 40%] to [10%, 80%] increases the differential between interest rates on guaranteed and non-guaranteed operations by 4.3 percentage points [from 0.9% to 5.2%]. When the economic environment becomes more adverse, the cost of financing increases in a burdensome way for those sectors where (due to recent experience) more difficulties are anticipated. And this, assuming that the capital cost differentials remain constant in the two default scenarios analysed, which is not necessarily the case. On the contrary, it is normal for banks to seek higher expected return rates on portfolios with higher credit risk. [37]

Chart 5.4 – Effects of PD and LGD on credit risk premiums



Notes: simulations based on the pricing model described in "Section 2 – Stylised credit value chain". The impact of a PD variation in the [0-14%] range and the LGD in the [0-100%] range was simulated for two comparable credits, distinguished only by mutual guarantee coverage: coverage of 50% of the value of operation, on the one hand, and absence of guarantees, on the other. The results allow us to test the potential of the instrument for the reduction of interest rates because of dilution and risk sharing for a banking financial intermediary.

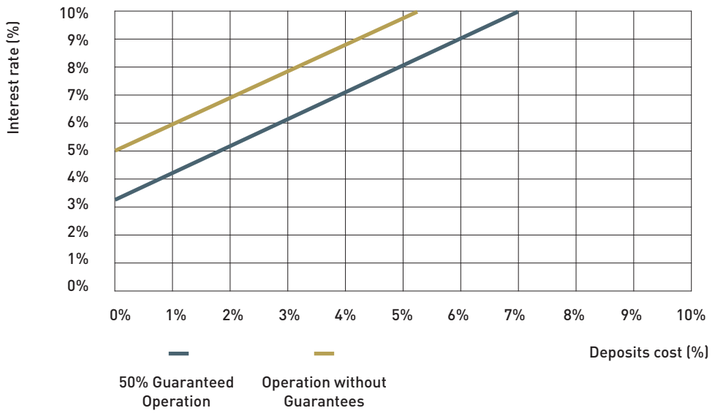
34 In this regard, we recall the penalty that high-risk firms suffer today in banking systems, as a result of strict regulatory constraints. As a result of the non-linear relationship between the counterparty risk and capital requirements, the banks focus its loans on the best credit risk classes, with lower PD and LGD.

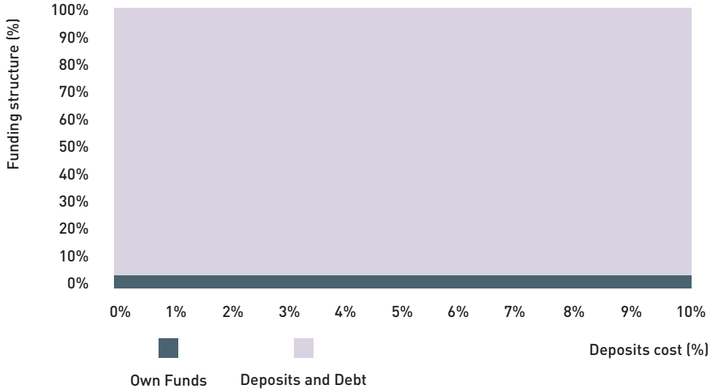
35 Rationing stems from, for instance, a more than commensurate penalty in regulatory capital requirements. As an example, in the current regulatory framework, loans (retail) to construction and real estate sector (whose revenues rely on the performance of the respective market) have a weight of 85%, using the standardised approach, while the rest of the portfolio has a weight of 75%. Despite not being the subject of analysis, the models based on internal rating systems will likely produce stronger effects for higher-risk classes, since they allow more lenient capital requirement for lower-risk classes. In any case, this apparent greater adversity lacks rigorous and comprehensive mathematical study.

36 Combined risk should be regarded as the counterparty risk mitigation due to the use of guarantees. As previously explained, this is the reduction of the risk of exposure being provided by mutual guarantees.

37 Such can stem from both the higher economic capital requirements associated with these operations and the risk aversion of managers, who prefer lower volatility in the results. In the calculations presented, we assume that economic capital corresponds to the regulatory capital – according to the standardised approach - and that banks maintain a risk-neutral attitude. It is recalled that, in the standardised approach, the regulatory capital of retail is constant and independent of the probability distributions of LGD and PD.

Chart 5.5 – Effects of PD and LGD on credits with and without guarantee





Notes: simulations based on the pricing model described in 'Section 2 - Stylised credit value chain'. The impact of the variation of the funding cost in the range of [0, 10%] was simulated, everything else constant. Two comparable credits were considered, regarding the mutual guarantee coverage: coverage of 50% of the value of the operation, on the one hand, and absence of guarantees, on the other. The results allow us to test the potential of the instrument to free up own funds and enhance banks' profitability through greater use of debt, i.e. greater financial leverage.

i. Bank funding costs

Finally, we tested the impact of changes in the cost of bank funding for credit operations with and without mutual guarantee, to conclude that the reduction of the cost of bank financing is passed on to clients in a constant way, making the system particularly valuable in periods of low interest rates, where the greatest relative saving in interest rates for firms is recorded (Chart 5.5).

5.3.2. Potential for innovation and social welfare

From an economic perspective of welfare, the benefits of mutual guarantees for the banking sector and for firms cannot but be contrasted with the respective 'cost of production'. It should be noted that in order to use mutual guarantees as 'insurance' with banks, companies incur in a cost. It is only if this cost is lower than the benefit of its use – i.e., reduction of risk-spread paid on credit or increased the access to finance – that we can conclude that mutual guarantees have a positive effect on the economy as a whole, and, simultaneously, may enhance financial innovation.

The benefits of mutual guarantees are diverse. Firstly, on the assumption that the mutual guarantee system offers a risk management service equivalent to that of any bank, the reduction of the credit risk premium may result from better diversification of the portfolio or from limiting the effects of risk aversion by the banking sector. If it results in lower default and effective losses rates, the system generates ideal conditions to resolve market failures, which are reflected in inadequate credit risk pricing, either because of the inefficient segmentation that banks make of debtors or because of information asymmetry problems.

In general, given the way the mutual guarantee system is structured in Portugal, part of the cost to the participants - i.e. the firms that use this financial service - arises from the obligation to buy shares of the MGS. There is, therefore, an immobilisation of financial resources, whose opportunity cost varies from firm to firm, according to the cost of its own capital. This is the first component that each mutual guarantee beneficiary has to pay to use the system and improve the conditions of cost of access to credit, particularly bank loans. The other is, of course, made up of the commissions charged to it by the MGS[38]

Because of the pooling of losses, the mechanics of mutual guarantee operations allow participants to enter and exit the system through the purchase and sale of participation units. The possible devaluation of these units is the other cost element for the borrower since losses are diluted by the various participants.[39] These losses are mitigated - at least partially - by the fact that there is a penalty for defaulting participants, resulting in the loss of their participation and the possibility of executing any existing real and collateral guarantees.

If it is competitive in the pricing of credit risk, mutual guarantee provides firms with the possibility to improve conditions for accessing bank financing, among others. That is, the reduction of the interest rate - i.e., the credit risk spread - to a magnitude that is higher than the implicit and explicit cost that the borrower underwrites with the policy subscription, as described in the preceding paragraphs - i.e., the opportunity cost of the resources that are immobilised[40], plus the variation in the valuation of the participation and the commissions charged by the service.

38 In some cases, as in the funding lines for government programmes exclusively dedicated to investment support, the firms benefiting from guarantees may be exempt from paying fees, strengthening their competitiveness when compared to different architectures of credit access.

39 In the current mutual guarantee system, buying and selling shares is made at face value, eluding any appreciation or depreciation of the participation.

40 In fact, invested in the acquisition of a share in the mutual guarantee fund.

Ex-ante, the guarantee allows to reduce the cost of financing the firm and, thus, to finance investment opportunities and projects that would otherwise be rejected.[41] For the financial system – considering mutual guarantee and the financial intermediary - there is a gain if risk premia are reduced as a result of diversification and distribution of risks with lower transaction costs, and fewer distortions arising from asymmetries of information - moral hazard and adverse selection. It is possible, however, that mutual guarantees only lead to a redistribution of risk premia among participants - for example, firms have a lower risk premium, but lower than the benefit provided by the guarantee.[42]

It should not be ruled out a priori that the advantage of the mutual guarantee is only apparent, residing in deficiencies in the methodologies of the measurement of credit risk, leading to its understatement. However, since consistency can only be measured retrospectively - as is common in financial systems, where time-delayed payment promises are transacted - the parameters of the model should be carefully compared ex-ante and ex-post, for validation of the consistency and sustainability of the business model. That is, in order to unambiguously conclude that the mutual guarantee system is central to resolving a market failure.[43]

In another dimension, the benefits of the system also come from the counterguarantees granted by the Mutual Counterguarantee Fund, which have two effects. One is to reduce the capital requirements of banks and the other to ensure that the LGD in the mutual guaranteed share is null, or almost null. Broadly, there is a prior commitment to socialisation of losses beyond the credit concession perimeter, which comes from the possibility of resorting to public revenues to finance any shortfalls in the guarantee fund's capacity to cover losses. Hence, the economic value of the mutual guarantee must also be analysed in face of the positive externalities it can generate - for example, the reduction of systemic risk.

The system could contain a perverse incentive, especially for loans with higher risks. The subsidization of loans through a fixed reduction of the spread - or the interest rate - means that financial intermediaries reap more benefits in operations where they have the highest PD and LGDs. When the value of the guarantee exceeds that of the interest rate subsidy (i.e., spread reduction), banks can increase expected profitability by placing operations under mutual guarantee. Incentives, however, appear to be controlled by the existence of a deadlock mechanism, which results from the fact that the risk premium charged by the financial intermediary cannot exceed a limit which excludes from the mutual guarantee radar firms with very high risk.[44]

41 In a macroeconomic perspective, it is possible to speak of a multiplier effect, resulting from increased investment potential, induced by lowering the required return rate on the projects.

42 The existing interest subsidy mechanism suggests that firms do not take the full benefits provided by the use of mutual guarantees. In this sense, despite being lower, the credit risk spread remains at high levels, allowing the banks to increase the expected profitability of these operations. This theme, however, calls for further research, given the complexity of the relations and interaction, and the existing system of incentives.

43 This market failure results in negative discrimination of firms with high credit risks due to the risk aversion of the financial intermediaries and information asymmetries. The mutual guarantee can solve these issues by replicating the risk-neutral decision model and minimising adverse selection and moral hazard behaviours.

44 This may, at the same time, represent a limitation of the mutual guarantee's efficiency in expanding the basis of firms capable of obtaining a bank credit. The highest risks and, presumably, the most in need of guarantee are precisely those excluded by this procedure. This means that firms with high PD and LGD, paying high interest rates – even after the guarantee's effect – are flatly rejected for this mutual funding.

Under no circumstances does the mutual guarantee scheme allow beneficiaries to fully cover the credit risk. It thus keeps incentives for financial intermediaries to continue to invest resources to gather information on the borrower's solidity and profitability, besides the commitment to monitor his behaviour afterwards. Failure to do so may result in losses that, whilst shared, cannot be completely nullified. Surely so for the lower credit risk classes, where mutual guarantee does not have a sufficiently competitive value to encourage banks to use it.[45]

The partial coverage provided by mutual guarantee – between 50% to 70% of the transaction value, as it seems to be the norm – does not fully enable the separation of 'time value of money' (i.e., the liquidity advance provided by financial intermediaries) and 'credit risk' (i.e., the dilution of expected losses) components. Thus, the impact on the emergence of new entrants in financial intermediation, "completing" the markets, is still somewhat mitigated.[46] The role of the banks in the risk management is therefore not completely discarded. Conversely, banks are still in charge of the risk classification of the operation, notwithstanding the mutual guarantee disposal of internal rating systems.

In a more disruptive business model, mutual guarantee could offer full 'collateralisation' of the credits - i.e., the total reduction of credit risk. Hypothetically, by segregating functions, room would be opened for a reconfiguration of the value chain of SME financing, similarly to the role that securitisation of banking assets played in the past. The responsibilities for screening and monitoring debtors would have to be accounted for, to avoid perverse behaviours, such as those verified in the past with subprime. MGSs would require a more robust architecture in this respect, bringing them functionally closer to the role of credit risk insurance firms, offering services to a range of companies that today do not find enough supply of private instruments of this nature.

As a final note, despite the above limitations, the role of the mutual guarantee system in solving market failures can be reinforced, through counterguarantees that, a priori, create favourable conditions to solve problems of information asymmetry and risk aversion of investors which result in excessive risk premiums. In these cases, a balanced pooling - i.e., the contributions paid by participants compensate for the expected losses - allows the cost of access to credit to be reduced, without the need for State guarantees to be used (in principle), even if they are essential for disciplining the behaviour of financiers.[47] This is a topic worthy of further analysis and reflection, considering the opportunities for the future development of the Portuguese Mutual Guarantee System.

45 The simulations carried out, for operations with low LGD and PD, show that the benefit provided by mutual guarantee is minimal, which is usually reflected in the spread reduction.

46 Related to this is the previously mentioned situation where really high-risk clients are side-lined, due to the limitations of mutual guarantee in terms of the maximum risk value available in the portfolio, risking replicating the banks' strategy and thereby reducing its value as a vehicle for promoting the development of the financial market.

47 The counterguarantee allows financial investors to ignore (at least partially) risk aversion, since they are assured that losses will be supported by an independent entity. The interest rate required converges to the risk-free interest rate, as a result of the outsourcing of the losses.

5.4. Performance of the mutual guarantee in the Portuguese financial sector

As discussed in the previous section, mutual guarantees can mitigate market failures and extend the banks' credit base through an inclusion effect of clients who would otherwise be subject to rationing, or even rejected. For banks, the mutual guarantee system provides a mechanism by which the loss in the event of default is covered - in whole or in part - by the entity that pools losses. If collateral can offset losses in the event of default (LGD), it reduces the expected loss (EL) and allows lower interest rates, ceteris paribus. In addition, by acting as an instrument to improve the quality of credit - credit enhancement – mutual guarantees reduce the capital needed to meet regulatory requirements and increase the credit multiplier.[48]

With or without credit rationing, operations with higher credit risk should see their relative importance raised. In fact, from the perspective of the incentives created, the 'insurance' offered by mutual guarantee is particularly useful for companies classified in less favourable classes of credit risk, for two reasons: first, because the risk pricing system is not, as a rule, linear; and the second because risk sharing is an indispensable procedure to include its operations in the credit-eligible portfolio. Reducing risk to affordable levels enables banks - with business models that focus on soundness - to extend the credit base, facilitating investment financing.

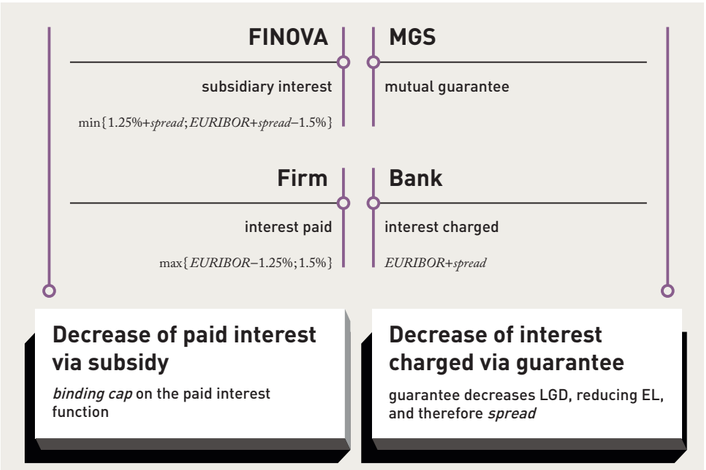
It is important to remember that mutual guarantee in Portugal is also associated with public policies for business and industrial development, in particular as regards to investment, export and innovation promotion. Community programs and financial lines of support to firms rely on mutual guarantee as a mechanism to mitigate uncertainties and enable access to credit. This fact justifies the preponderance of some sectors and business segments that can be observed in the weight of the guaranteed operations on the total of the bank credits. However, it should be noted that the system is non-discriminatory, and, in principle, any firm can unilaterally obtain a mutual guarantee, regardless of whether it is covered by specific community or government programs, for which its use is a mandatory requirement.

In terms of overall operating mechanics, mutual guarantees allows banks to reduce the spread charged on operations agreed with their business clients. In effect, depending on the percentage of loan guaranteed, LGD decreases - assuming that, if executed, the mutual guarantee society will replace the debtor and assume full payment of the secured part, without any loss to the creditor - and, along with it, the expected loss is also reduced. In the end, ceteris paribus, this combination of effects results in the financial intermediary requiring a lower interest rate to carry out the transaction, but still obtaining an expected return consistent with the respective risk class.

[48] Credit multiplier should be regarded, in this case, as the amount of credit possible for every euro of own funds, or similar. Reducing the credit risk of the operation, via mutual guarantee, allows the banks to work with lower capital and reserves than those that would be required for a similar loan totally exposed to counterparty risk.

The existence in Portugal of subsidised credit lines for loans with mutual guarantee justifies a note on the difference between interest borne and interest charged. In this respect, we have a twofold cost of capital: on the one hand; the interest borne by the debtor is impacted by the subsidy; and, on the other, the interest charged by the bank is impacted by the mutual guarantee, through the reduction of LGD, i.e. through transferring risk out of the financial intermediary.

Figure 5.2 – PME Investe, illustration of mutual guarantee use



Notes: The decrease of the interest charged through mutual guarantee (reduction of the spread) will reduce the subsidised interest, in case there is a subsidy. In the absence of the subsidy, the decrease of the interest charged through mutual guarantee (reduction of the spread) will decrease the interest borne. It is not implicit in the illustration any doubling of benefits to the firm. Benefits distinction only.

In a stylised way, the decrease of the interest through mutual guarantee influences: [1] the interest borne by the firm if there is no subsidy; or [2] the subsidised interest if there is a subsidy. Figure 5.2 illustrates the combination of mutual guarantee with protocol lines in which the subsidy is designed so that the 'interest borne' by the firm is insensitive to the spread charged by the bank. Thus, the mutual guarantee effect is, in this case, only capturable on the 'interest charged' side, via spread. Methodologically, the analysis of the impact of mutual guarantee on the pricing of operations (via spread), carried out in this section, focuses on 'interest charged'.

MUTUAL GUARANTEES SOFTENED THE IMPACT OF THE RISK OF CREDIT IN THE PRICE OF OPERATIONS, PARTICULARLY DURING THE FINANCIAL CRISIS

'Interest rates' and 'turnover' behaviour

Summing up, for the financial system, whether in the activities underlying direct financing or in the activities underlying indirect financing, the issuance of financial asset (for example, a bank credit) corresponds to a transfer of risk from the issuer to the investor. In fact, there is a transfer of several risk components - namely, credit risk, liquidity risk, market risk, early repayment risk, among others.

Economic rationality dictates that investors require higher rates of return for higher overall risk levels. Or, in other words, investors request a risk-free interest rate plus a spread that incorporates the required compensation for each of the various risk components associated with the transaction. Although empirically it is complex to disaggregate the different sources of risk, conceptually there is a risk premium for each factor, which are additively incorporated in the rate of return demanded by investors, that is, the interest rate of the operation.[49] And so it is, also, for credit risk. If everything else is constant, the greater the probability of default, the greater the 'credit risk spread'.

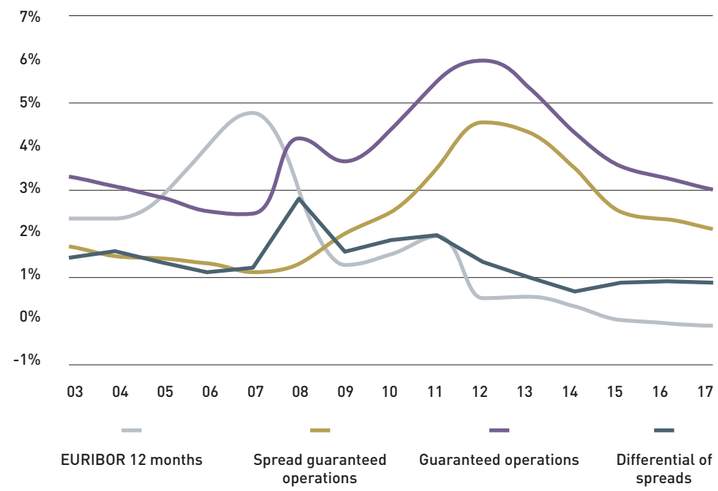
The mutual guarantee scheme enables beneficiaries - and in particular banks - to cope with credit risk. Notwithstanding that the spread effectively charged on bank credits responds to other factors - among them, liquidity, market or early repayment risk, among others - we admit, in the empirical exercise we carry out below, that the credit risk is preponderant and, therefore, we take the 'interest rate spread' practised on the operations as a good proxy for the measurement of the credit risk. Methodologically, for two similar credits, risk spreads will be different, depending on the degree of mutual guarantee coverage. This assumption leads to the expectation that the spread of the guaranteed operations will be lower than the spread of total credit operations.

The evidence for the period from 2003 to 2017 is broadly consistent with this hypothesis, with the differential of spread between total operations and guaranteed operations being systematically positive (see Chart 5.6). The difference is larger during the 'financial crisis' (between 2007 and 2011) when mutual guarantees seem to have been especially relevant to allow beneficiary firms more attractive financing conditions. This may have been because of a revision of the credit risk models to incorporate higher PD and LGD estimates.

[49] In the financial markets praxis, the interest rate of the operation is usually referenced to a risk-free interest rate, so that the operation price is also identified as the 'risk spread', this is, the part needed be added to the risk-free interest rate as a compensation for all the uncertainties that the operation brings to the financial intermediary. In this spread the credit risk has a special bearing, mainly when we are talking about loans denominated in local currency and in jurisdictions where legal risks are negligible.

[50] Note that, based on data from the BdP, we do not have any autonomous data available on credit without mutual guarantee. As such, the comparator used – all the credit portfolio, which includes operations with and without mutual guarantee – is influenced in the relative weight of the guaranteed operations over the set.

Chart 5.6 - Evolution of risk spreads in credit operations, between 2003 and 2017



Source: BdP and SPGM, own calculations.

Notes: the "guaranteed operations spread", calculated on Euribor, correponds to the average risk spread weighted by the amount, for credits with a mutual guarantee (SPGM data). 'Operations spread' corresponds to the difference between the interest rate on new credit operations of up to 1 million euros - granted by monetary financial institutions to non-financial corporations' resident in the euro area - and 12-month Euribor (BdP data). It should be noted that only 1% of the guaranteed operations have an amount greater than 1 million euros. We excluded the years before 2003 because there is a relatively high number of guaranteed transactions for which no spreads are reported, resulting in missing values and inconsistent results.

However, between 2011 and 2014, the differential between the spreads of the (new) guaranteed operations and the overall credit portfolio of the banking sector has reduced significantly, following the downward trend of Euribor, with, at least, two possible explanations: a downward revision of the PD and LGD - leading, from the point of view of the financial intermediaries, to the lesser relevance of the loss-sharing aim - and the increased weight of the guaranteed operations in the total bank credit portfolio - which causes the average spread of all operations to fall faster than that of the mutual guarantee subset.[50] The second explanation seems more likely.

As suggested by the previous results, it is possible to distinguish two effects of mutual guarantees on the volume of banking business: one corresponding to the change in the credit portfolio's structure, given the attractiveness of mutual guarantees regarding the reduction of the exposure to the credit risk of the firms; and the other resulting from the reduction in the average yield required, which should allow to expand bank credit, namely by including investment projects that would otherwise be excluded from access to financing.

Regarding the latter, it is expected that, by reducing the spread, mutual guarantees will reduce any restrictions related to credit rationing, allowing banks to do a set of operations they would otherwise not do, and firms to get financing they would not otherwise get (with some exceptions, for example, via subsidised credit lines).

On the former, with or without restrictions related to credit rationing, it is reasonable to assume that banks will transfer to the mutual guarantee framework the operations they place in higher risk classes, because these are the ones that can benefit more from the guarantees - given their high rates of PD and LGD, plus the possibility of not fully passing on the benefit over the risk spread of the operation.[51]

Keeping the bank's decision neutral, firms will be interested in the mutual guarantee operation if the benefits associated with it are greater than the costs. The benefits grow by risk class because they are mainly reflected in the spread reduction. Costs consist essentially of issuing / assembling costs and guarantee fees. The assembly costs are mainly related to the difficulties inherent in the existence of an additional agent in the business (related, for example, to the speed of assembly of the operation) and therefore also to a large extent invariable with credit risk. The guarantee fees are defined according to the amount and risk of the operation. We proceed with the assumption of relative insensitivity of the cost of mutual guarantee to credit risk[52], leading, therefore, to the hypothesis that the net benefit to the firms is increasing with the level of credit risk.

[51] On the assumption that the mutual guarantee is an agreement sufficiently competitive for firms - sometimes, at a cost close to zero, as occurs with the fee exemptions on EU investment support programmes – the banks have a strategic incentive to 'share' the benefit of the firm, reducing the spread in a value lower than that provided by the guarantee 'insurance'. This effect is, however, generally mitigated in programmes that set as a qualifying condition the non-existence of spreads over a fixed maximum limit. However, there are still incentives for strategic behaviour within the allowed interval.

[52] Some evidence pointing to this is presented in the subsection "sectoral analysis".

5.4.1. Determinants of interest and portfolio composition

To test the previous claims, we combined SPGM data on all guarantees issued with APB data containing financial statements of the banks' that have been beneficiaries of mutual guarantee operations. In particular, we wanted to compare the interest rate on guaranteed transactions with the interest rate on non-guaranteed transactions - with and without mutual guarantee, respectively - by controlling the weight of the mutual guarantee on the banks' total credit portfolio.[53].

Our sample covers the 2005-2017 period and comprises 14 banks.[54], cKey descriptive statistics are presented in Table 5.2. It is interesting to note that: [1] the guaranteed operations rate of interest is on average 2 percentage points lower than the interest rate on non-guaranteed operations - captured by the variable 'with and without guarantee differential'; [2] the interest rate on guaranteed operations shows lower dispersion than that of non-guaranteed operations; [3] the weight of mutual guaranteed operations in the total banks credit portfolio does not exceed 22% in any single bank-period observation for the whole period considered [55], suggesting that there is potential to increase the diffusion of this instrument in financial intermediation markets.

Table 5.2 – Descriptive statistics of key variables between 2003 and 2017

	Interest rate...	# obs.	Average	Standard Deviation	Minimum	Maximum
[1]	*... implicit in credit operations*	140	6,30%	2,52%	1,07%	14,46%
[2]	*... implicit in guaranteed operations*	132	4,08%	1,25%	2,40%	7,73%
[3]	*... implicit in non guaranteed operations*	140	6,38%	2,69%	1,07%	17,23%
[4]=[3]-[2]	*With and without guarantee differential*	132	2,21%	2,40%	–1,51%	12,83%
[5]	*Weight of guaranteed operations*	140	2,02%	2,75%	0,00%	21,63%

Source: APB and SPGM, own calculations.

[53] For more information on the definition of variables and data generation process, see methodological note at the end of the chapter.

[54] The 14 banks are: Banco BIC, Banco BPI, BANIF, Bankinter, Barclays, BBVA, BES / NB, CCCAM, CGD, Deutsche Bank, Millennium BCP, Montepio, Popular and Santander Totta. These are responsible for the vast majority of bank activities in Portugal and also of the mutual guarantee backed loans, accounting for 99.8% of the total cumulative amount of mutual guarantee (guarantee value) with a bank beneficiary and 93.4% of the total cumulative amount of all mutual guarantees.

[55] 98,6 % out of 140 observations has a weight of guaranteed opearations bettween 0%-10%.

As in the analysis of the mutual guarantee impact on its users, we use econometric techniques to test to what extent this differential between the rate of operations with and without mutual guarantee is due to mutual guarantees. In this sense, we estimate equations explaining each of the following: [1] the average interest rate charged by each bank, [2] the rate charged on operations benefiting from mutual guarantees, [3] the rate charged on operations without mutual guarantee, and [4] the spread between guaranteed and non-guaranteed rates. The explanatory variable of interest, in each equation, is the weight of guaranteed operations in the portfolio (% operations with MG), including its square to test the hypothesis of non-linear effects. Bank fixed effects (one dummy variable for each bank) and year fixed effects (one dummy variable for each year) are also used to control for temporarily fixed characteristics of banks and for temporal factors that impact all banks in a similar way. The results are presented in Table 5.3.

It is verified (equation [4]) that the rate differential between transactions with and without mutual guarantee is in fact non-linearly affected by the weight of the guaranteed transactions in the banks' portfolio. The marginal effect of the weight of guaranteed transactions on that spread is negative when that weight is less than 12%, although it reaches its minimum at a weight of about 6%.[56] The results of the other equations suggest that this is because of a lower interest rate implicit in the non-guaranteed operations, and not because of a higher interest rate implicit in guaranteed operations. That is, according to these results, the interest rate that banks charge on operations that do not benefit from mutual guarantee decreases as the bank performs more mutually guaranteed operations.

Overall, these results are consistent with previously presented argument regarding the asymmetric expansion of the banking business.[57] Banks being able to strategically determine the usage of mutual guarantees, the results suggest they use it first for operations with high credit risk and only afterwards for operations with better rating. For the credit portfolio as a whole, there is an overflow effect between these two large classes of credit. In addition, there seems to be a booster effect provided by mutual guarantee on the expansion of bank credit, through dilution and risk sharing with the mutual guarantee.

[56] It should be noted that, as previously stated, 98.6% out of the 140 observations have a weight of guaranteed operations between 0%-10%.

[57] It should be noted that this evidence is also consistent with alternative explanations. Particularly, it is possible to conceive the existence of factor(s) – for instance, bank characteristics that vary over time - simultaneously explain both the dependent and independent variable.

Table 5.3 – Econometric tests on the importance of mutual guarantee on interest rates

	[1] Total portfolio		[2] Operations WITH guarantee		[3] Operations WITHOUT guarantee		[4] WITH and WITHOUT guarante differential	
Variable	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.
% operations with MG	–0,3666	*	+0,0107		–0,4054	**	–0,5454	***
% operations with MG ^2	+2,7810	***	–0,0458		+3,8110	***	+4,3827	***
No of observations	140		132		140		132	
F	30,73	***	193,54	***	30,47	***	23,96	
R^2	0,8380		0,9716		0,8533		0,8272	

Notes: ***, ** and * mark coefficients statistically different from zero with significance levels of 1%, 5% and 10%, respectively. In all specifications, the independent variable of interest is the weight of the mutual guarantee operations. It also includes its square to consider its possible non-linearity. In addition to the ones presented, we also considered variables corresponding to bank and time fixed effects that were omitted for space saving.

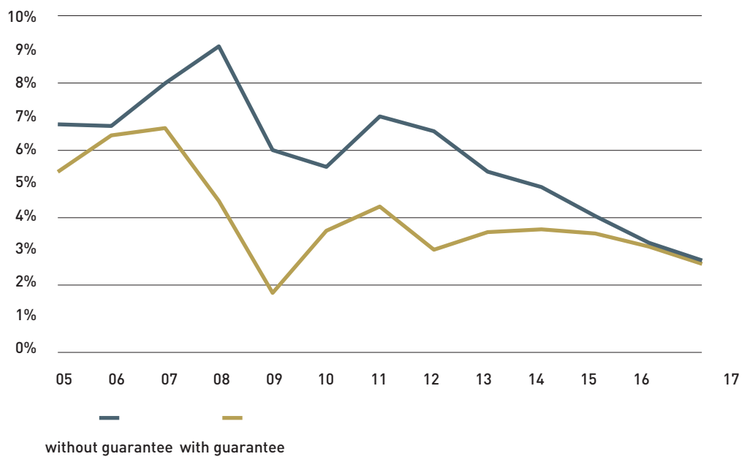
The specification of temporal dummy variables, not shown in the table, allows us to test the impact of each year and to isolate the trend effect observed in interest rates (Chart 5.7).[58] As expected, the temporal circumstances that affect all banks systematically - for example, the 2007-2009 financial crisis and the 2011-2012 sovereign debt crisis - are associated with larger differences between interest rates for both guaranteed and non-guaranteed transactions.[59] It is interesting to note that interest rates on non-guaranteed transactions are falling at a faster rate, meaning that during and over the period immediately following the crisis, mutual guarantee operations were more important in maintaining non-financial firms' cost of capital at lower levels, the situation appearing relatively normalised in recent years.[60]

[58] The variable interest rate is not stationary. For most of the period under review there was a decreasing trend of interest rates. The inclusion of dummy variables for each of the years allows to accumulate in this variable the effects of annual variation, making the series stationary.

[59] These peaks correspond to peaks observed in the spread differential in Chart 5.6, although here the comparison is different – in Table 5.3 and in Chart 5.7, the interest rate of the guaranteed operations is compared to the interest rate of bank loans, granted to businesses or individuals, while in Chart 5.6 we compare bank loans with guarantee in favour of non-financial companies to those without.

[60] Methodologically, the relevance of the operations with guarantee can be measured by the span between the two curves. When they coincide, the pricing of transactions with and without guarantee suffers similar oscillations. When different, the comparison between the two curves shows the different sensitivity of each segment to interest rate variations. For example, in 2007, the interest rates of the operations with guarantee rose less than those of the non-guaranteed operations. This can be explained by the revisions of PD and LGD that banks have carried out, leading to strong increases in interest rates of the non-guaranteed operations. The effects were mitigated by using mutual guarantees, whose operations showed a more moderate growth of interest rates. The following year, rates evolved conversely.

Chart 5.7 - Trend of interest rates with and without mutual guarantee between 2005 and 2017



Source: BdP and SPGM, own calculations.

Notes: the graph shows trends based on the specifications for each dependent variable ("guaranteed" and "non guaranteed"). For each specification: (1) the value of the dependent variable of the omitted year corresponds to the average of the dependent variable observed in that year; (2) the value of the dependent variable of each of the remaining years corresponds to (1) + the coefficient associated with the dummy of that year.

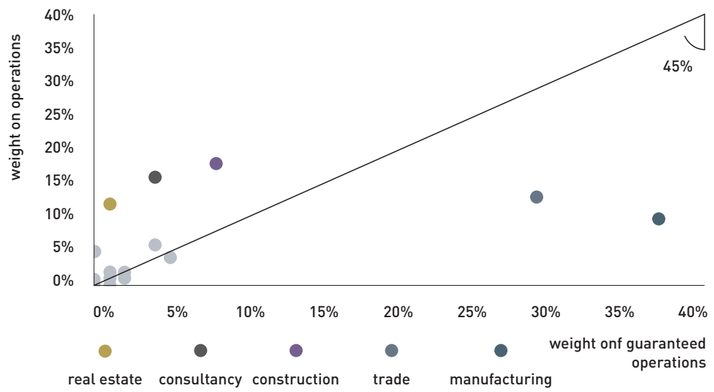
5.4.2. Impact of the mutual guarantee by sector of activity

Theoretically, mutual guarantee motivates an increase in the banks business and a change in the structure of their portfolio of credit to non-financial firms, with an increase in the relative importance of companies with a higher probability of default. A related question is whether these changes affect the various sectors of activity in a homogeneous way. Hypothetically, the sectors with the greatest increases in credit risk should benefit more from mutual guarantees.

Chart 5.8 compares the weight of loans by sector in the bank's total portfolio, with the same indicator for the portfolio of operations that enjoy mutual guarantee. In a scenario where mutual guarantee was used in a random, cross-sectional and non-discriminatory way, the two indicators should coincide. Deviations from that pattern are suggestive of the option to deliberately use mutual guarantees relatively more, or less, in some sectors. The data suggest that the sectoral composition of the guaranteed portfolio is not random, with a strong representation of sectors such as trade and manufacturing and under-representation of real estate, consulting and construction.[61]

The bias is likely explained by economic policies and community investment support programs anchored in the mutual guarantees, of which construction and real estate are often excluded. For example, protocol lines anchored in the mutual guarantee system and directed to SMEs favour greater representativeness of sectors with a higher incidence of SMEs.

Chart 5.8 - Relative importance of mutual guarantee in the portfolio of bank loans, by sectors of activity, from 2002 to 2017



Source: BdP and SPGM, own calculations.

Notes: The "weight on operations" corresponds to the average weight of total credits granted by the financial sector to non-financial firms (accumulated from 31 Dec 2002 to 31 Dec 2017). The 'weight on guaranteed operations' corresponds to the average weight in total banking transactions with mutual guarantees (total accumulated).

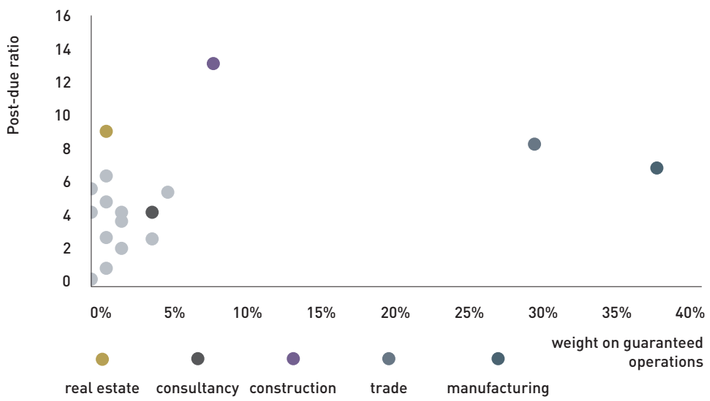
[61] The absence of bias would result in the positioning of all the dots roughly over the 45° diagonal dividing this quadrant.

On the other hand, the differentials of sectorial representation may result from the fact that the benefits associated with the mutual guarantee are systematically different among sectors of activity. At least two factors contribute to this: first, the size and type (e.g. level of tangibility) of the guarantees that firms can provide in the absence of mutual guarantees differs between sectors; second, credit risk also varies systematically across sectors of activity.

The latter explanation stems from the previously explored argument of asymmetric banking business expansion, whereby the net benefit of mutual guarantee for firms is increasing with the level of credit risk. It is reasonable to assume that in the short term there may be a significant positive correlation between the credit risk of firms within each sector of activity (namely because they share the same business cycle) and therefore that sectors will differ in their average risk. Thus, sectoral differences in credit risk (translated into higher PD and LGD) may explain the greater presence of firms from the sectors with higher credit risk in the guaranteed operations portfolio.

The evidence points, in fact, to some association between the sectoral credit risk and the sectorial representativeness in the total banking business with mutual guarantee, as seen in Chart 5.9. In this chart, we use the past due loan ratio as a proxy for credit risk measurement. Except for construction and real estate, which are under-represented in the mutual guarantee loan portfolio, trade and manufacturing seem to confirm the hypothesis that mutual guarantees were preferentially used for sectors with greater exposure to risk.

Chart 5.9 - Mutual guarantee use and levels of risk by sectors of activity, from 2002 to 2017.



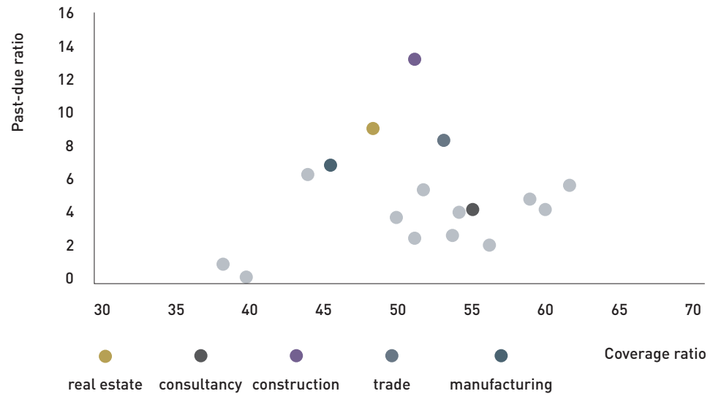
Source: BdP and SPGM, own calculations.

Notes: The "past-due ratio" was obtained through a simples average of the quartely observations between 31 Dec 2002 and 31 Dec 2017 (similar results for the time window 2008-2017). The 'weight on guaranteed operations' corresponds to the average weight in total banking transactions with mutual guarantees (total accumulated).

As previously stated, the hypothesis that the net benefit of mutual guarantee for firms is increasing with the level of credit risk is valid on the assumption of relative insensitivity of the cost of mutual guarantee to credit risk. To ascertain the reasonableness of this hypothesis, it should be recalled that mutual guarantee involves two types of costs: issue / setup costs and guarantee fees.

Setup costs are mainly related to the difficulties inherent in the existence of an additional agent in the business (related, for example, to the speed of setting up the operation) and therefore also to a large extent invariable with credit risk. The guarantee fees are defined according to the amount and risk of the operation and may be positively correlated with the level of credit risk.

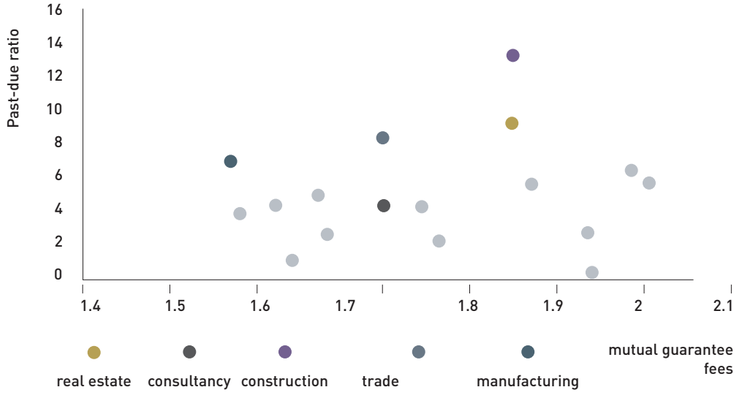
Chart 5.10 - Coverage (by mutual guarantee) of credits and levels of risk by sectors of activity, from 2002 to 2017



Source: BdP and SPGM, own calculations.

Notes: The "past-due ratio" was obtained through a simple average of the quartely observations between 31 Dec 2002 and 31 Dec 2017 (similar results for the time window 2008-2017). The 'coverage ratio' corresponds to the average ratio 'mutual guarantee amount-to-operation amount', weighted by the operation amount.

Chart 5.11 - Commissions charged by mutual guarantee and credit risk by sector of activity,



Source: BdP and SPGM, own calculations.

Notes: The "past-due ratio" was obtained through a simple average of the quartely observations between 31 Dec 2002 and 31 Dec 2017 (similar results for the time window 2008-2017). The 'coverage ratio' corresponds to the average ratio 'mutual guarantee amount-to-operation amount', weighted by the operation amount.

The assumption of relative insensitivity of the cost of mutual guarantee to credit risk is the more plausible the lower the correlation between 3 variables: credit risk level; coverage and mutual guarantee fees. On this subject, the evidence is of very insignificant correlations, judging by the sectorial average data, represented in charts 5.10 and 5.11.

5.5. Conclusions

Mutual guarantee plays a vital role in reducing the risk of the bank credit portfolio because of the loss-sharing mechanism it establishes. In this sense, this instrument is particularly relevant for clients that are classified - from the point of view of credit risk analysis - into rating classes with high default rates (PD and LGD). The dilution of losses, through sharing with the mutual guarantee society, and reinforced by existing counterguarantees, allows banks to extend their business to clients who would otherwise be excluded or penalised in accessing the financing. As a corollary, the increase in the number of operations eligible for credit granting encourages investment beyond what would have be possible if the system did not exist.

The empirical analysis of mutual guarantee performance in Portugal over the last 15 years suggests that it supported the expansion of the banking business and was particularly important during the period in which the effects of the financial crisis were felt. As expected, there were some asymmetric effects, especially the preponderance of coupling mutual guarantees to firms with higher credit risk. This is consistent with the hypotheses formulated in financial theory. The incentive system associated with mutual guarantees - as they are implemented - recognises that banks obtain greater benefits when they select the highest risks for this purpose.

The data also show that mutual guarantee is still closely associated with government and European community programs to support investment and business development. An analysis of the sectoral distribution of operations shows that the potential benefits offered by this system of guarantees are not yet fully explored. Sectors of activity that would easily qualify for this purpose - such as construction and real estate - are under-represented in the credit portfolio with mutual guarantee vis-à-vis sectors such as manufacturing and trade. There is still a way to go, so that adherence to the system is more voluntary and less a formal requirement of protocol lines to support the economy.

The results presented and the subsequent conclusions that can be drawn from their critical reading suggest a number of additional research clues. First, it would be important to enrich our database with a panel of comparable non-guaranteed loans collected from financial intermediaries. This would allow us to better understand the elements of risk and price determination and to understand how banks choose credit risk mitigators at each moment. Further, it would also be important to isolate the effects of the different protocol lines on the interest rates of the operations, to avoid some results of more difficult reading and explanation and to understand more rigorously the cost of the 'guarantee' in relation to the saving of interests by the debtors. Additional work is therefore needed to further advance in the analysis of the strategic importance of mutual guarantee for financial innovation and to overcome any perversions that may result to the incentive system.

5.6. Methodological note

The process of data generation for the empirical analysis was based on data provided by the SPGM and the APB and was carried out in the following terms:

5.6.1. SPGM

The information on the 'contracted interest rate' and 'spread rate' (SPGM data) is used to estimate the 'guaranteed operations rate of interest'. For each year and each operation, the 'guaranteed operations rate of interest' equals the sum of the 'spread rate' and the 12-month average EURIBOR observed in that year. SPGM data report a positive 'spread rate' 204,133 operations, out of a total of 227 thousand. In all other cases, they either do not report it, or report zero. These cases represent 10% of the observations (20% of the value of operations). For these cases and for the 4 cases with a 'spread rate' of over 15%, we assumed 2.7% (average value).

There is heterogeneity in the fundamental contractual elements of operations (maturity, periodicity, holiday periods, etc.). For each year and for each bank, we have measured the value of 'guaranteed operations interest rates' and 'principal amount of guaranteed operations' by constructing the debt service map for each operation under the following conditions: (1) maturity (difference between the year of issue and estimated year of end) and interest rate ('guaranteed operations interest rate'), as reported by SPGM; (2) assuming annual periodicity, constant capital amortisations and end of period repayment; (3) assuming absence of holiday periods, other charges and default; (4) assuming issue at the beginning of the issuance year.

6% of the 227,000 operations do not reach theoretical maturity. We assumed these correspond to default cases, in the remaining years, for the principal still in debt.

The 'implicit interest rate on the guaranteed operations' of the year t and bank i is given by the ratio 'interest guaranteed operations' t / 'principal amount guaranteed operations' t-1.

5.6.2. APB

Based on the information on 'clients credit' and 'interest and similar incomes' (APB data) we estimate the 'implicit interest rate of operations', 'implicit interest rate of non-guaranteed operations', 'non-guaranteed guaranteed differential of implicit interest rates' and 'guaranteed operations clients credit ratio '.

The 'implicit interest rate of operations' of year t is given by the ratio 'interest and similar incomes' t / 'customer credit' t-1.

The 'implicit interest rate on the non-guaranteed operations' of the year t is given by the ratio 'interest non-guaranteed operations' t / 'principal amount non-guaranteed operations' t-1. In which: (1) 'interest on non-guaranteed operations' is given by the difference 'interest and similar income' - 'interest guaranteed operations'; and, (2) 'principal amount non-guaranteed operations' is given by the difference 'clients credit' - 'principal amount guaranteed operations.

The 'non-guaranteed differential of implicit interest rates' of year t is given by the difference 'implicit interest rate non-guaranteed operations' t - 'implicit interest rate guaranteed operations' t.

The 'weight of guaranteed operations' of the year t is given by the ratio 'principal amount guaranteed operations' t / 'credit to clients' t.

We favoured individual data, but for 2005-2009 it was necessary to use consolidated data for most banks. For BPI, we used consolidated data for lack of unconsolidated data for 'interest and similar incomes'.

References

Carey, M., Prowse, S., Rea, J., & Udell, G., 1993. The economics of private placements: a new look. *Financial Markets Institutions and Instruments* 2, 1–66.

Coase, R., 1937. The Nature of the Firm. *Economica* 4, 386-405.

Fazzari, S., Hubbard, R., Petersen, B., Blinder, A., & Poterba, J., 1988. Financing constraints and corporate investment. *Brookings Papers on Economic Activity* 1988(1), 141-206.

Goddard, J., Tavakoli, M., & Wilson, J., 2005. Determinants of profitability in European manufacturing and services: evidence from a dynamic panel model. *Applied Financial Economics* 15:18, 1269-1282.

Jorgenson, D., 1971. Econometric studies of investment behavior: a survey, *Journal of Economic Literature* 9(4), 1111-1147.

Katsikeas, C., Piercy, N., & Ioannidis, C., 1996. Determinants of export performance in a European context. *European Journal of Marketing* 30(6), 6-35.

Levinsohn, J., & Petrin, A., 2003. Estimating production functions using inputs to control for unobservables. *The Review of Economic Studies* 70(2), 317-341.

Kaplan, S., & Zingales, L., 1997. Do investment-cash flow sensitivities provide useful measures of financing constraints?, *The Quarterly Journal of Economics* 112 (1), 169–215.

Oberhofer, H. & Vincelette, G., 2013. Determinants of job creation in eleven new EU member states: evidence from firm level data. Policy Research Working Paper; No. 6533. World Bank, Washington, DC.

Ozkan, A., 2000. An empirical analysis of corporate debt maturity structure. *European Financial Management* 6, 197-212.

Pittman, J. & Fortin, S., 2004. Auditor choice and the cost of debt capital for newly public firms. *Journal of Accounting and Economics* 37, 113–136.

Scherr, F., Sugrue, T., & Ward, J., 1993. Financing the small firm start-up: determinants of debt use, *Journal of Small Business Finance* 3 (1), 17-36.

Sengupta, P., 1998. Corporate disclosure quality and the cost of debt. *The Accounting Review* 73(4), 459-474.

Sousa, C., Martínez-López, F., & Coelho, F., 2008. The determinants of export performance: A review of the research in the literature between 1998 and 2005. *International Journal of Management Reviews* 10, 343-374.

Titman, S. & Wessels, R., 1988. The determinants of capital structure choice. *The Journal of Finance* 43, 1-19.

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