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Abstract

The aim of this paper is to analyse the effect of credit guarantees on bank financing. During the COVID-19 (Coronavirus disease) crisis, several new measures have been issued to limit economic losses. One of these measures is credit guarantees which are directed to financial institutions by the government. Accordingly, credit guarantees positively affect the bank's willingness to lend as they are protected by the government and are consequently subject to less risk. However, providing credit guarantees can potentially reduce a bank's monitoring incentives. As a result, credit guarantees may aggregate information frictions in credit markets. In economic downturns, as seen in the COVID-19 pandemic, credit guarantees help to relax financial-economic constraints. Contrarily, in a stable economic state (i.e. when firm default rates are low), credit guarantee intervention can backfire.

1. Introduction

Recent experience has raised questions about the best way governments can intervene in order to stimulate lending during crisis. First, it is essential to underline that in the past recession like the Global Financial Crisis in 2007-2009, the interventions differ from those used during the COVID-19 pandemic.

In this paper, I extend the model of the of Holmstrom – Tirole (1997) ¹ to study the effect of credit guarantees on bank monitoring and lending. Credit guarantees can either worsen or improve credit rationing conditions, and the effect of this depends on the state of the economy (i.e. the default risk of a firm).

As a result of the Global Financial Crisis in 2007-2009, the Basel III ² reforms shortly followed (Gourinchas et al. 2020). Early in the COVID-19 pandemic, countries in Europe had to provide credit support measures such as loan guarantees to mitigate the risk of liquidity shocks from the interventions which had been implemented during the numerous lockdowns ³. This type of credit-support programmes have been announced between March and April 2020 ⁴. The feature of this programme was that most guaranteed loans would be repaid at a subsequent due date. Public financial institutions are the responsible administrators of these national credit-support programs. It is important to note that public guarantees are often seen as a state aid ⁵.

One of the major difficulties that the government faces is the design choice and how to balance objectives against each other. Moreover, the design must counter the rapid capital shortfalls that are caused by the various lockdowns. In addition, the challenge is to design a program that maximises the number of firms with viable business models as quickly as

¹ Holmstrom, B., & Tirole, J. (1997). Financial intermediation, loanable funds, and the real sector.

² <https://www.bis.org/bcbs/basel3.htm>

³ Loan guarantees and other national credit-support programmes in the wake of COVID-19 | Bruegel

⁴ Anderson, J., Papadia, F., & Véron, N. (2021). COVID-19 Credit Support Programs in Europe's Five Largest Economies. Peterson Institute for International Economics Working Paper, (21-6).

⁵ Silva, S. D., & Sum, J. W. (2008). Social funds as an instrument of social protection: an analysis of lending trends-FY2000-2007 (No. 45179). The World Bank., Programs that meet the following four criteria are considered state aid: (i) the intervention is made by the state or involves a transfer of state resources, (ii) the intervention gives the recipient an advantage on a selective basis, (iii) competition has been or may be distorted, and (iv) the intervention is likely to affect trade between member states. See Vademecum (2008) - European Commission, 'Communication: Temporary framework for State aid measures to support access to finance in the current financial and economic crisis' C(2008) 270/02

possible, whilst taxpayer's long-term growth and banks bear the adverse effect. Credit guarantees should be attractive for lenders; this is done by reducing interest rates which then result in cheaper loans. A complex picture is portrayed as these support measures are provided in several different national credit-support programs across Western Europe, with some being managed on a highly decentralised basis.

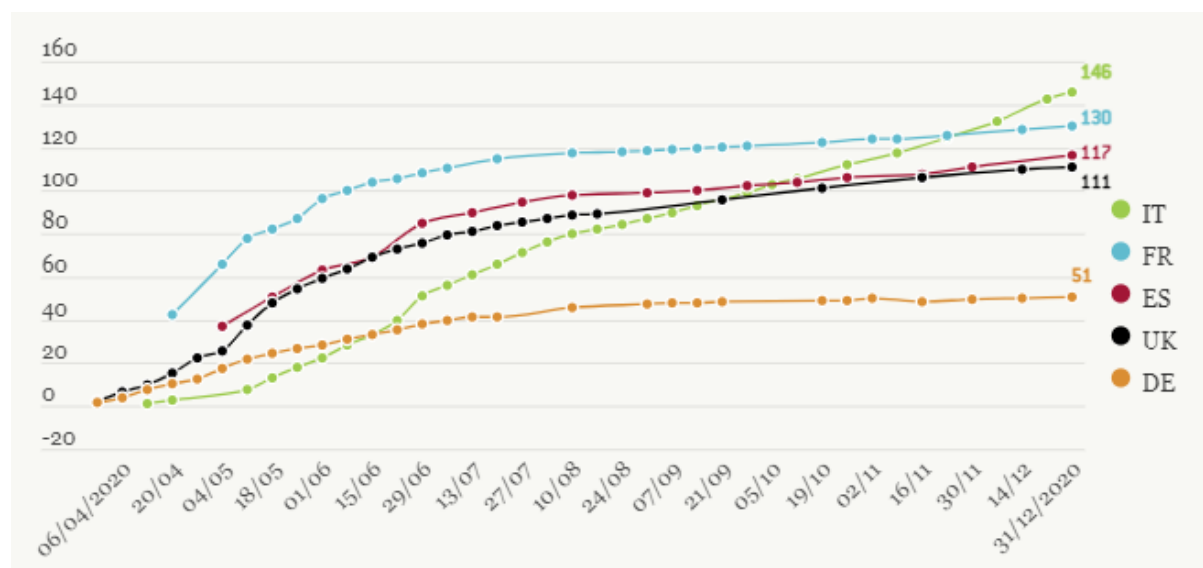


Figure 1: Government-backed credit support to businesses in € billions ⁶

Figure 1 provides an overview of credit support under various programs in European Countries like Italy, France, Spain, the United Kingdom and Germany. We can see that in all five countries, a significant amount of credit guarantees have been issued to interrupt a decline in the economy. Furthermore, Italy was hit the hardest by the pandemic, which can be seen in the amount of issued government support; whereas Germany did not need that much support to recover. In the United Kingdom, almost a quarter of the issued credit support has been corporate debt purchase programs. Although these measures have been very effective in the acute phase it can be argued they have only addressed short-term liquidity shortfalls. This is a direct result of the loans having short grace periods. The additional debt that was offered made the European banking sector more vulnerable to insolvencies. Consequently, in the future this will result in companies first having to pay to deleverage which results in delaying

⁶ Bruegel based on Kreditanstalt für Wiederaufbau (KfW), Bundesministerium für Wirtschaft und Energie (BMWi), Bank of Italy, French Ministry of Economics and Finance, Spanish Instituto de Crédito Oficial (ICO), UK Treasury, Bank of England, Google Finance (for currency exchange rates)

investments ⁷. The primary benefit from credit guarantee programmes for the lender is capital relief. This means that lenders earn interest income on the entire loan while only limited capital is mobilised. The countries worried that unequal/unfair funding support could skew competition in the market which would therefore become obsolete. Results also showed that low-interest rate levels did not increase lending levels. Another interesting finding was that most of the guaranteed funds seem to work as liquidity buffers for the firms ⁸.

The master thesis will be organised in the following way. The first section will give a brief review of existing literature concerning the market and bank financing theory. Examining, how credit guarantees can be used in an economic downturn and what might the implications of this might be.

The second section will aim to give an overview on the effect of credit guarantees and explain the different typologies, as well as identifying the model used in this thesis.

The third section introduces the model of Holmstrom Tirole (1997) which is used to construct the credit guarantees in this thesis. The set-up of -the model, the incentive - and participation constraints of the participants are examined.

To conclude, the final section will be an investigation of the results that relate to possible economic states (i.e. default rate of a firm).

2. Literature review

2.1. Market versus Bank financing

Governments all over the world respond differently to downturns in the economy with different types of market financing or bank financing incentives. Markets offer the possibility to rely on bond issuances or equity issuances and non-intermediate capital to raise financing. A regular loan is not classified as market financing as it cannot be traded on the market ⁹.

⁷ Credit guarantees are relying on a guarantee fee. This fee is generally paid by either lenders or an assigned company, depending on the country. – Guarantees and mutual guarantees European Commission

⁸ Bruegel 2020, EBA (2020) 'First evidence on the use of moratoria and public guarantees in the EU banking sector', EBA Thematic Note 2020/31, European Banking Authority, ECB (2020a) 'Potential impact of government loan guarantee schemes on bank losses', Financial Stability Review May 2020, European Central Bank ECB (2020b) 'Public loan guarantees and bank lending in the COVID-19 period', ECB Economic Bulletin 6/2020, European Central Bank

⁹ Bank-based versus market-based financing: implications for systemic risk, Joost V. Bats, Aerdts, C.F.K. Houben

By contrast, bank financing is the most traditional financing method. The bank steps in as financial intermediation and bears the risk. This is often based on the close relationship some banks have with their clients. In general, lending can cause moral hazard problems as managers can reduce investment profitability and therefore enjoy personal benefits as a result. This can be resolved partially by bank monitoring ¹⁰.

Both financing methods are equally crucial for economic growth. However, some studies were published after the great financial crisis and help to portray which market-based systems are more dominant. This resulted in individuals having preferences as bank-based systems are more severe in a financial crisis compared to market-based structures ¹¹.

In general, it can be concluded that during a banking crisis, bank-dependent firms are exposed to significant valuation losses than firms that have access to public debt markets (Chava and Purnanandam, 2011).

Credit guarantees can be attributed to both bank- and market financing as they are directed to banks from governments. This means that financial institutions play an integral role as the administrators of credit guarantee programs that work on behalf of the government ¹².

2.2. Other possible government interventions

Furthermore, another public incentive to support entrepreneurs could be the use of co-funding. This is a scheme that offers a direct subsidy to firms. In the United States, this type of funding reported great success. Hall (2002) ¹³ concludes that the evidence on the funding gap for R&D and the subsidy programmes provide much more worth due to thorough investigations. Successful companies like FedEx, Intel and Apple Computer all received support at an early stage of their company life cycle from federal programmes. The difference between direct subsidies like co-funding and indirect aid through public financial institutions

¹⁰ Bank-based versus market-based financial systems: A growth-theoretic analysis Shankha Chakrabortya, Tridip Rayb,c

¹¹ Levine and Zervos, 1998, Boyd and Smith, 1998, World Bank, 2001, Beck and Levine, 2004, Gambacorta et al. 2014

¹² In 17 out of 22 programs, financial institutions administered the credit guarantee program. Source: Authors' calculations based on Kreditanstalt für Wiederaufbau (KfW), Bundesministerium für Wirtschaft und Energie (BMWi), Bank of Italy, French Ministry of Economics and Finance, Spanish Instituto de Crédito Oficial (ICO), UK Treasury, Bank of England, Google Finance (for currency exchange rates).

¹³ Hall, B.H., 2002. The financing of research and development. Oxford Review of Economic Policy 18 (1), 35–51.

is that politicians prefer the fact that public banks can monitor firms and prevent them from making inefficient investment choices. Welfare of the firms may increase with the use of subsidies whilst public banks try to economise screening costs ¹⁴. Co-funding schemes do not suggest that entrepreneurs must undermine their effort incentives in order to substitute public for private collateral; an example of this would be the use of credit guarantees. In general, financial intermediaries can help distinguish the difference between entrepreneurs with productive projects and entrepreneurs with an unproductive project. This is achieved through monitoring which is something government credit support agencies cannot do. This would therefore result in some of the co-funding resources ending up with entrepreneurs with an unproductive project which would cause damage, as in this example wealth would be distributed in the wrong way.

Nevertheless, there is still a very high number of entrepreneurs entering credit guarantee programmes, as shown in the paper produced by Arping et al. (2010). As a result, co-funding should only be available in countries that can provide many public funds to help support entrepreneurs and have excellent legally and politically developed institutions. It is recommended that credit guarantees and co-funding should be provided and coordinated together for an optimal distribution of funds. This would help entrepreneurs with productive projects and therefore reduce credit rationing.

3. The effect of credit guarantees

Credit guarantees play a significant role to the extent that they help borrowers or firms that are otherwise credit rationed, to raise external finance. However, it also has an effect on the participation and incentive constraint of the bank. In this paper, I examine the conditions under which credit guarantees increase or decrease credit rationing and the effect on the participation and incentive constraint of the bank.

Credit guarantee schemes increase the access to the credit market for financially constrained firms; this focus, primarily on small and medium-sized enterprises. These schemes have

¹⁴ Hakenes, H., & Hainz, C. (2008). The politician and his banker.

become increasingly popular among developed and developing countries (Beck et al. and Gudger)¹⁵. Financial intermediaries like banks operate this kind of credit guarantee scheme.

The definition of credit guarantees state that in the case of borrower default, a third party (f.e. the government) must pledge to repay a fraction of the initial investment to the lender. This mechanism acts as an insurance for the lender as it reduces his expected credit loss. In the case of these types of schemes borrowers can receive a loan regardless of whether they have enough collateral or not, as the guarantees provide a substitute that lowers the amount of the needed collateral. Riskier borrowers can lower the risk for the lender with credit guarantees and thus receive a loan or obtain extraordinary lending conditions¹⁶.

The three main reasons to create credit guarantee schemes as introduced by Honohan (2008)¹⁷ are as follows. The first reason is to control information to reduce the impact of information asymmetries (i.e. informational advantages over the lender that can help the financial intermediaries). As a result of this, the cost of borrowing would be reduced. Secondly, it is essential to diversify risk across lenders by identifying credit guarantee schemes within different economic sectors and groups. Finally, if the guarantor is not subject to the same requirements as the lender, guarantee schemes can be used to exploit regulatory arbitrage¹⁸.

Credit guarantees are related to government interventions. Governments are primarily involved in setting up credit guarantee schemes and providing the necessary funds. In developing countries, public schemes are often implemented, whereas in developed countries a form of mutual guarantee associations tend to receive financial support from the government, as highlighted by Beck, Klapper and Mendoza (2008)¹⁹. These schemes can be either public or private which means that funding is provided either by the public or the private sector²⁰.

¹⁵ Beck, T., Klapper, L. F., & Mendoza, J. C. (2008). The typology of partial credit guarantee funds around the world. The World Bank, Gudger, M. (1998). Credit guarantees: An assessment of the state of knowledge and new avenues of research (No. 129). Food & Agriculture Org.

¹⁶ Public credit guarantees and access to finance, October 23, 2015, by Juan Carlos Gozzi and Sergio Schmukler) Pombo and Herrero, 2003

¹⁷ Honohan, P. (2008). Cross-country variation in household access to financial services. Journal of Banking & Finance, 32(11), 2493-2500.

¹⁸ Sarigul, H. CREDIT GUARANTEE SCHEMES FOR SMEs IN EUROPE: A CLUSTER ANALYSIS STUDY.

¹⁹ Beck, T., Klapper, L. F., & Mendoza, J. C. (2008). The typology of partial credit guarantee funds around the world. The World Bank.

²⁰ Credit Guarantee Schemes for SME lending in Central, Eastern and South-Eastern Europe (eib.org)

Whether credit guarantees have an effect on welfare is not clearly determined. If credit guarantees are associated with an increase of welfare the following conditions have to be fulfilled. There must be a failure of the private credit market to supply credit to the firms that need it most. This case is worked out in detail by Arping et al. (2010) ²¹ who illustrate how state support can increase welfare by relaxing financial constraints; they also acknowledge that it can also reduce lending requirements.

Collateral is a fundamental requirement in order to receive loans. In theory they tend to reduce information asymmetries like moral hazard and adverse selection. As credit guarantees are not connected with the assets of the borrowers, information asymmetries are increased rather than reduced (Rodrigues-Mesa (2004)). In combination with credit guarantees, the value of the required collateral is reduced for the borrower. This means that by reducing the required collateral for the borrower, information asymmetries in the market increase.

Mutual credit guarantee schemes commonly known as guarantee associations, societies or funds represent another type of credit guarantee scheme. Those guarantees are distributed privately and structured by independent arrangements. In general, they are managed by people who borrow but have been restricted admission to receive bank loans. This association aims to bridge the gap between banks and entrepreneurs, with limited access to credit. Overall, they are funded from subscriptions and the support of the government. This mechanism benefits from the involvement of active members as well as their experience which means that this type of credit guarantee scheme is financially more sustainable as different members are involved. The knowledge and expertise of the members which come from different business sectors underline the main advantages of mutual credit guarantee schemes over any other credit guarantee scheme. This results in a reduction of information about collecting fees and therefore decreases the general transaction costs of mutual credit guarantee schemes. In addition, a study produced by the World Bank in 2008 identified that mutual credit guarantee strategies are primarily operated in profit-making countries. Whereas financially challenged countries have publicly funded credit guarantee schemes ²².

²¹ Arping, S., Lóránth, G., & Morrison, A. D. (2010). Public initiatives to support entrepreneurs: Credit guarantees versus co-funding. *Journal of Financial Stability*

²² Beck, T., Klapper, L. F., & Mendoza, J. C. (2008). The typology of partial credit guarantee funds around the world. The World Bank.

3.1. Typology of credit guarantee schemes

Credit guarantee schemes can differ not only in the objectives they wish to promote, but also their legal structure ²³. The scheme's objective often defines a specific target group of clients, which can be different for each scheme. They can be directed to specific sectors, to products or services in a particular market. The legal structure of the schemes depends on how they are established. Some are established as government associations, whereas others are created as public institutions or private companies. Guarantee institutions with financial organization's support, are part of the public sphere. Private schemes are usually directed by mutual guarantee schemes which is described in Section 3 - The effect of credit guarantees.

The design of the services offered by credit guarantee scheme can vary from case to case. Guarantees can be offered for loan applications on an individual basis but also as a portfolio of eligible loans. An essential attribute is the maximum coverage ratio of the provided guarantees which refers to the guaranteed percentage put at risk ²⁴. Fee structure and the plan of action are metrics that can be very different. Furthermore, depending on the price it might be disbursed by either the saver or the borrower. Risk-sharing agreements are also necessary to adjust incentives as they help to minimise moral hazard from the perspective of the lender.

The distribution of credit guarantees also depends on the scheme's set-up as some assess credit applications as self-governing and completely separate, whereas others rely only on the lenders' credit evaluation. Green (2003) suggests that it is essential to set clear frameworks regarding when and how guarantees are paid-out as well as how long the process will take, as this may lead to disputes between financial intermediaries. Processing applications might be limited to a fixed timeframe for the purpose of keeping everything streamlined. Moreover, taxations and EU state aided regulations might also influence the framework of the credit guarantee schemes.

The evaluation of the introduced scheme happens from the efficient use of the public funds and whether or not they achieve their assigned objectives. In most cases, credit guarantee schemes are either supervised by national authorities or are set up by financial institutions.

²³ Vienna Initiative Working Group. (2014). Credit guarantee schemes for SME lending in Central, Eastern and South-Eastern Europe. A report by the Vienna Initiative Working Group on credit guarantee schemes.

²⁴ Vienna Initiative Working Group. (2014). Credit guarantee schemes for SME lending in Central, Eastern and South-Eastern Europe. A report by the Vienna Initiative Working Group on credit guarantee schemes.

Here it is possible that national authorities supervise them, it might be the central bank, however the finance ministry is always in control of the regulation of credit guarantee schemes ²⁵.

A wide variation of lending criteria in the market is given and several schemes have eligibility rules. For example, there must be a ceiling on borrower size which is often determined by turnover or a ceiling on the guaranteed fund's overall exposure to the borrower. Despite this, the US SBA²⁶ has an additional objective in the selection of a mortgagor. The borrower must attest his demonstrated need for a loan by determining that the desired credit is unavailable to him. Others might define even more complex criteria to monitor the possible borrowers in order to receive such a credit guarantee. A small number of criterions leaves the door open to the misallocation of economic subsidies ²⁷. In conclusion it can be argued that financial intermediaries have an advantage if they can offer a scheme with clear timeframes and criterions for their potential borrowers.

4. Basic Model

The developed model in this section is based on the framework Holmstrom - Tirole (1997). The objective of this is to examine the outcomes that occur from adding credit guarantees to the baseline model. The underlying framework analyses an incentive model of financial intermediation. It shows that firms in some cases are capitally constrained. Wealth across firms and intermediaries, but also interest rates and the magnitude of monitoring has been examined. The results demonstrate that any kind of capital incentives predominantly affect inadequately capitalised firms.

Based on the model of Holmstrom – Tirole (1997), a two-period economy is implemented. In the first period, agreements are signed, and investment choices are made. In the second period, investment returns are registered, and claims are settled. This model includes three types of representatives: firms, intermediaries and investors. This is because all parties are secured by limited liability and cannot, end up with damaging cash positions.

²⁵ Credit Guarantee Schemes for SME lending in Central, Eastern and South-Eastern Europe (eib.org)

²⁶ United States Small Business Administration

²⁷ Partial credit guarantees: Principles and practice, Patrick Honohan, 2008

4.1. The Firm Sector

A number of firms are included in the model as; they all use the exact same investment opportunities and mechanisms. One distinction among them is their amount of cash capital - initial net worth: $A \sim G(A)$. This is an asset that has first-period market value and can be pledged as a collateral. The cumulative distribution function $G(A)$ indicates the proportion of entrepreneurs with assets less than A . As a result, the aggregate capital can be described with the following function

$$K_f = \int A dG(A) .$$

Each firm can identify one economically viable project, which requires a fixed-scale investment of $I > 0$ and returns a random return in $t = 2$. A firm needs external funds to realise a project if $A < I$ in the amount of $I - A$. In case of success, the investment project yields R with probability p_i and probability $1 - p_i$, however the project can be economically unsuccessful (i.e. bad project) - and the return will be zero.

Entrepreneurs are responsible for running their firm successfully but in case of absent incentives or lacking outside monitoring, the probability of success may be reduced to profit from a private benefit.

Each firm can choose the probability of success $p_i \in \{p_H, p_L\}$ itself, but this depends on the effort the firm exerts. The entrepreneur can privately choose the projects he wants work with if given the right amount of effort to accomplish it. As the effort of the entrepreneur is not observable, a moral hazard problem is created. It can be assumed that the probability of success if the firm exerts effort is greater than if the firm does not exert effort, as evidenced below;

$$\Delta p = p_H - p_L > 0.$$

The entrepreneur can choose between good projects (i.e. economically viable projects) with private benefit 0 , bad projects with low private benefit (b) and bad projects with high private benefit (B). Where the probability of success for bad projects (i.e. economically not viable projects) is always low meaning they exert low effort, firms receive a private benefit. In the absence of monitoring, an entrepreneur is always going to choose the bad project with the high private benefit (B). We can see that the order of the private benefit is as follows; $B > b > 0$. This can also be described as the potential opportunity costs that may occur for the entrepreneur if the project is managed correctly.

Project	Good	Bad (low private benefit)	Bad (high private benefit)
Private benefit	0	b	B
Probability of success	p_H	p_L	p_L

Figure 2: Private benefit and probability of success based on project outcome

4.2. The Financial Sector

Many different intermediaries are included in the financial sector and have the function to monitor firms. The monitoring of a firm can be provided in many ways, for example, by looking at the potential cash flow of a firm and how the balance sheet of the firm is composed²⁸. This is a common procedure in bank lending as it can help prevent a firm from choosing the *B*-project with the highest private benefit. In that case, if the firm does not exert effort the private benefit is reduced from *B* to *b*.

As monitoring takes some effort, it is costly for every intermediary to carry it out. A financial intermediary must pay an amount of $c > 0$ to ensure that the firm do not choose the *B*-project. Consequently, a moral hazard problem appears as the intermediary has the possibility to monitor an arbitrary number of firms. As monitoring by the bank is costly and unobservable, there is a moral hazard problem – as a result the firm has to guarantee a sufficiently high payment to the bank in order to incentivise monitoring. Therefore, an intermediary is forced to add a part of their capital into the firm they monitor. Otherwise, they would not have enough capital to perform this step. The following variable represents the aggregate amount of intermediary capital (or informed capital) K_m .

²⁸ In general, monitoring concludes if a firm conforms to the covenants of a financial contract like the minimum cash balance or solvency ratio, where covenants help intermediaries differentiate firms in their opportunity costs of being diligent.

4.3. The Investor Sector

A group of small investors are also added to the model. They are named as uninformed investors as it is important to differentiate between a monitoring intermediary. The rate of return of an uninformed investor is γ . If there is an unlimited provision of outside investment opportunities with a return of γ , then γ is exogenously given. The equilibrium rate of return on intermediary capital invested is β , which is described momentarily.

4.4. Fixed Investment Scale

4.4.1. Direct Finance

Direct finance in the context of this thesis can be defined as, realising projects without the use of finance from an intermediary like financial institutions. A firm only borrows money to realise projects from an uninformed investor. The contract of these two parties is specified on how much they need to invest and how much they should receive as a return from the outcome of the project. This assessment can be concluded with a complete contract and will look like the following: (i) Moreover, the firm is going to invest all its available funds A , in the meantime, the uninformed investor will add the remaining amount of $I - A$, (ii) if the project fails, no party will receive anything from the failed project and, (iii) if the project succeeds, the firm will receive $R_f > 0$, and the uninformed investor will receive $R_u > 0$, where

$$R = R_f + R_u.$$

For a feasible market financing possibility the following incentive constraint has to be satisfied, as it is a crucial factor in order for the firm to stay diligent:

$$p_H R_f \geq p_L R_f + B \Leftrightarrow R_f \geq \frac{B}{\Delta p}.$$

The firm must be paid a specified amount of high private benefit $B / \Delta p$ to realise a project with the use of direct financing. An uninformed investor will receive $R_u = R - B / \Delta p$, which is the highest expected income that can be agreed with investors without damaging the firm's incentives.

The participation constraint for the unsophisticated investor has to be satisfied; the term on the left side must equal the pledge-able (expected) income; and the right side must also show the market value of the funds which the uninformed investors supply:

$$p_H \left(R - \frac{B}{\Delta p} \right) > \gamma(I - A).$$

From this equation it can be concluded that only a firm with sufficiently high initial net worth $A \geq \bar{A}(\gamma)$, can invest in projects with the use of direct finance:

$$\bar{A}(\gamma) = I - p_H / \gamma \left(R - \frac{B}{\Delta p} \right).$$

In addition to exclude the case, of initial net worth using outside investment ($\bar{A}(\gamma)$) would be damaging and as a result the firm would have to invest its own capital. The upcoming equation assumes the external opportunities for an uninformed investor:

$$p_H R - I \gamma < p_H \frac{B}{\Delta p}.$$

This condition states that the total surplus of the project must be smaller than the minimum shares a firm must be paid to act diligent. A firm with low capital levels will not be able to invest in any other project because they do not have the funds to redistribute any surplus.

4.4.2. Indirect Financing

Indirect financing represents an opportunity in terms of, what respect and funds a firm can produce to realise projects from an intermediary. With the monitoring of firms, a financial intermediary can help capital-constrained entrepreneurs to receive funds. This procedure reduces a firm's incentives of not being diligent (choosing a high benefit B -project) and allows more external capital from indirect financing to be raised. The necessary capital to realise the project is raised partly from the intermediary and partly from the uninformed investor.

If the project fails, no party will receive anything like in the example used before. In case of success, the return R is divided into three equal parts:

$$R = R_f + R_u + R_m,$$

where R_m denotes the return of the intermediary, R_f of the firm and R_u of the uninformed investor. As the intermediary will monitor the firm, this process helps to reduce the private benefit and therefore the high benefit project (B -projects) is eliminated. The firm will only have the possibility to choose between the good project and the low benefit project (b -project). Following this, the incentive constraint of the firm looks like the following:

$$R_f \geq \bar{R}f \equiv \frac{b}{\Delta p}.$$

As a condition for banks to monitor the ongoing situation, the incentive compatibility constraint must hold:

$$p_H R_m - c \geq p_L R_m \Leftrightarrow R_m \geq R_m \equiv \frac{c}{\Delta p} .$$

These two incentive constraints show the minimum returns of the project for the firm and the intermediary; just like financial institutions. The highest expected income that may be guaranteed to the investor without information not damaging its incentives is:

$$\begin{aligned} p_H (R - (b + c) / \Delta p) \\ p_H (R + R_f + R_m) . \end{aligned}$$

The incentive constraint of the bank implies that $p_H R_m - c > 0$. This means that the channel which monitors the firms, receives a net return in the second period of the model. If we introduce I_m as the amount of capital provided by an intermediary, we can see that is represented by the supplies of a financial institution to a firm. In this constellation the rate of return for the intermediary is:

$$\beta = p_H R_m / I_m .$$

As previously discussed, monitoring is a costly process ($c > 0$) and the return of bank financing β must exceed the return of the uninformed investor γ . This condition underlines why a firm always prefers capital from an uninformed investor over - informed capital as it is cheaper. As the banks' incentive constraint expects the intermediary to pay at least $R_m \equiv \frac{c}{\Delta p}$, the amount of capital an intermediary invests depends on the intermediary's return. The intermediary will contribute at least the amount of capital to each firm it has the possibility to monitor:

$$I_m (\beta) = p_H c / (\Delta p) \beta .$$

The intermediaries' demand a marginal level of informed capital to the entrepreneur that get monitored. Demanding more capital would be unreasonably costly and demanding less would be conflicting towards the given monitoring incentives. The incentive for the intermediary to invest, is based on the return rate R_m and not on the incentive to monitor. With $I_m (\beta)$, the return for the intermediary is fixed and therefore the market of informed capital clears. Despite this, outside an investor aims to invest the remaining balance of $I_u = I - A - I_m (\beta)$ given the condition that the leftover value is positive. The requirement for a firm to receive financing therefore is given by

$$\gamma(I - A - I_m(\beta)) \leq p_H(R - (b + c) / \Delta p).$$

By rewriting the condition of a financed firm, the following equation can be demonstrated:

$$A \geq \underline{A}(\gamma, \beta) = I - I_m(\beta) - (p_H / \gamma)(R - (b + c) / \Delta p).$$

If a firm has less than the $\underline{A}(\gamma, \beta)$ of initial assets, it cannot be guaranteed that the uninformed investor will invest enough to realise the intended project. This consequence can also be seen in the graph below. The initial net worth $\underline{A}(\gamma, \beta)$ increases both the underlying terms in return on bank capital β and return on market capital γ . In the case that $\underline{A}(\gamma, \beta) > \bar{A}(\gamma)$, the price to monitor would be too high, and no demand would be left for monitoring. This development would result in direct financing which is depicted in Figure 3 below.

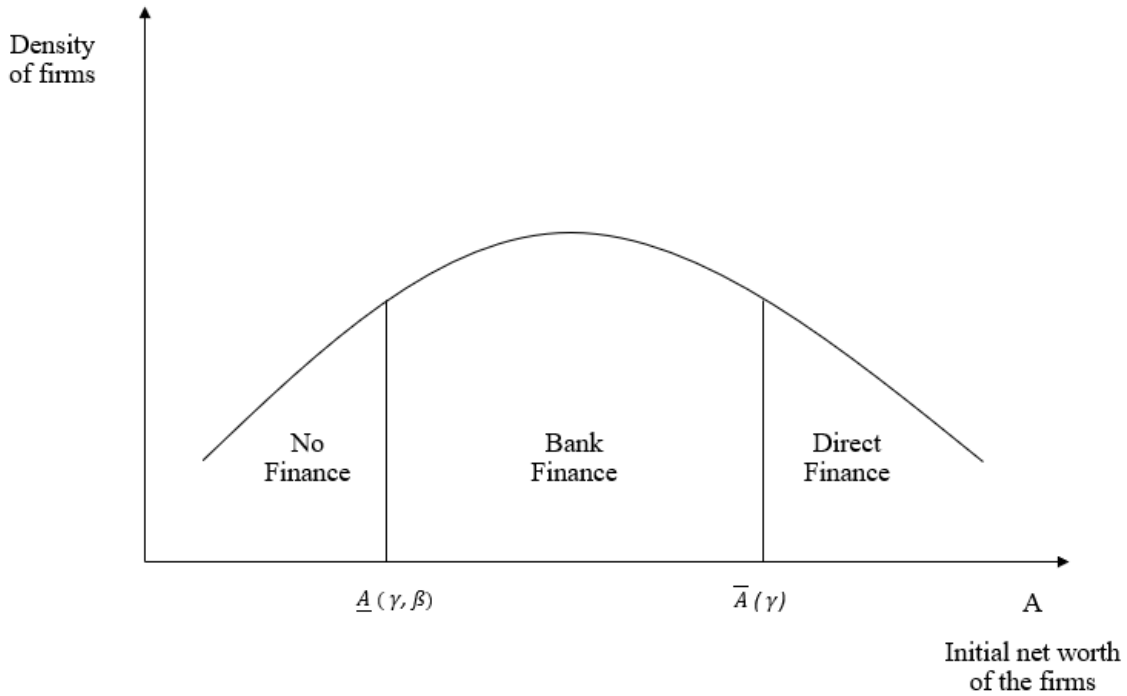


Figure 3: Effect of initial net worth on financing

The return on bank capital β must be low but also high enough to make sense for the intermediary to prefer monitoring. As the other possibility would be, to invest the available capital in the open market, where they could receive the market return γ . If we determine the minimum possible rate of the return on bank capital β we can see that

$$p_H c / \Delta p - c = \gamma I_m (\beta) = \gamma p_H c / (\Delta p \beta),$$

where

$$\beta = p_H \gamma / p_L > \gamma.$$

The minimum rate of return on bank capital β is a fraction of the probability of the good project times that provide the market return γ over the probability of a bad project which must be greater than the market return γ .

4.4.3. Credit Guarantees

As previously mentioned in part 3 - the effect of credit guarantee schemes are seen if borrowers' default. In such circumstance's banks act as a type of insurance by providing solace and repaying a fraction of the initial investment to the lender.

We want to see the effect by adding this policy measure, namely the credit guarantees ϕ , to the above-described model. It will have an effect on the constraint of participation as well as the bondholder and the bank.

The participation constraint of the bank with credit guarantees is shown below:

$$p_H R_m + (1 - p_H) \phi I_m \geq \beta I_m,$$

where the right-hand side is the rate of return of bank capital β times the amount of capital an intermediary is willing to invest in a firm. The left-hand side shows the probability of a successful project times the return of the intermediary, also adding the probability of a bad project times the credit guarantees and the amount of capital an intermediary invests; as a result the left hand side must be greater than the right hand side. Increasing the credit guarantees that ϕ would result in slacking the participation constraint and would therefore make it easier to satisfy.

As we know, I_m denotes the amount of bank lending. In this case, the bank's incentive constraint will look like the following:

$$p_H R_m + (1 - p_H) \phi I_m - c \geq p_L R_m + (1 - p_L) \phi I_m.$$

If we solve the constraint for the rate of return of the bank R_m the following would be our result. Thus, creating a new incentive constraint of the bank:

$$\Delta p R_m \geq c + \Delta p \phi I_m \Leftrightarrow R_m \geq \overline{Rm} = \frac{c}{\Delta p} + \phi I_m.$$

As the credit guarantees that ϕ is increased, the incentive constraint of the bank becomes more challenging to satisfy.

By substituting the binding incentive constraint with the participation constraint, the participation constraint can be written as follows:

$$p_H \frac{c}{\Delta p} + \phi I_m \geq \beta I_m.$$

If we solve the constraint for the minimum amount of bank financing, which is I_m , we produce the following constraint:

$$I_m(\beta) = \frac{p_H c}{\Delta p(\beta - \phi)}.$$

The credit guarantees that ϕ will allow lending to take place at a significantly lower rate of return. This constraint is increasing in the number of credit guarantees ϕ .

We can also conclude that by keeping the incentive constraint satisfied, the participation constraint is relaxed, the amount of bank financing will need to be increased.

Now we must investigate the participation constraints of the bondholder, which is defined as the following

$$p_H(R - R_f - R_m) \geq \gamma(I - A - I_m(\beta)),$$

we can see that the pledge-able income of the bondholder must be smaller or equal compared to the return of a high probability project. The next step is to plug in $p_H(R - ((b + c) / \Delta p) - \phi I_m)$, which represents the condition of a firm being financed. Furthermore, solve for the threshold $A(\phi)$, gives the minimum amount of net worth the firm needs to receive financing which is depicted by:

$$A(\phi) = I - \frac{p_H}{\gamma} \left(R - \frac{b + c}{\Delta p} - \phi I_m(\beta) \right) - I_m(\beta).$$

If the above equation is substituted for bank lending, based on the return of the bank $I_m(\beta)$, we can see how the condition for credit guarantees ϕ changes

$$A(\phi) = I - \frac{p_H}{\gamma} \left(R - \frac{b + c}{\Delta p} \right) - \frac{p_H c}{\Delta p(\beta - \phi)} \frac{p_H \phi}{\gamma}$$

$$A'(\phi) = -\frac{\Delta p p_H c}{\Delta p(\beta - \phi)^2} - \left(1 - \frac{p_H \phi}{\gamma} \right) + \frac{p_H c}{\Delta p(\beta - \phi)} \frac{p_H}{\gamma} \leq 0.$$

The first term of the derivative is negative, and the second term is positive. As a result, this shows that there are two opposite effects that are demonstrated as soon as credit guarantees are added to the model.

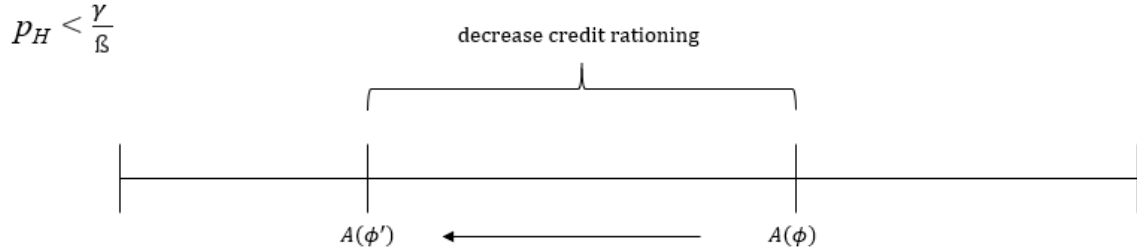


Figure 3: Decrease in credit rationing

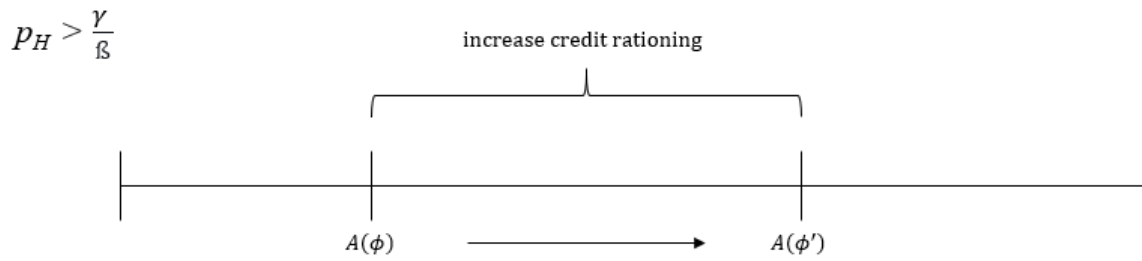


Figure 4: Increase in credit rationing

On this page we can see the illustration of the above-shown effect which, makes the process easier to digest. The negative term in the equation comes from increasing credit guarantees and the participation constraint of the intermediaries' slack. This implies that bank financing gets cheaper without credit guarantees. Furthermore, it allows firms to raise more funds from the bank. The second term is coming from the incentive effect demonstrated above. By increasing the credit guarantees, more income must be pledged into the bank for the incentive to monitor. If we simplify these terms, we get the following:

$$A'(\phi) = -\frac{I_m(\beta)}{(\beta - \phi)} \left(1 - \frac{p^H \phi}{\gamma} \right) + I_m(\beta) \frac{p^H}{\gamma}.$$

Accordingly, is it necessary to ask the resulting question: When is the derivative of the threshold of the minimum amount of net worth $A'(\phi) < 0$? This condition implies that the

effect of the constraints on the participation is dominant. By interpreting the increase of credit guarantees, the bank would end up having to lend more. If this is the case, the following equations will be equivalent to each other:

$$\frac{p_H}{\gamma} < \frac{(1 - \frac{p_H \phi}{\gamma})}{(\beta - \phi)} \Leftrightarrow p_H < \frac{\gamma}{\beta}.$$

4.5. Results

We can see opposing effects of the credit guarantees as a result.

Result 1: Increasing credit guarantees slack in the bank's participation constraint.

The increase has a positive effect on the participation constraint of the bank. In other words, the willingness of banks to lend is increasing. Since the government protects banks, they are less concerned with risk and as a result are more inclined to lend.

Result 2: Increasing government guarantees tightens bank's incentive constraints.

Despite this, there is also a negative effect on the incentives of a bank. This means that providing these guarantees increases the information problems as monitoring incentives are reduced (Vogel and Adams 1997). The value of intermediate capital is reduced, as banks do not intend to monitor as much as previously. This opposite effect allows high-risk investors or investors, that do not have enough collateral, to get loans. Default probabilities of these investors are relatively high in comparison with other market participants, but banks do not have the possibility of noticing this change with less monitoring. Furthermore, it shows that high-risk investors would not have received the loans without the issuance of credit guarantees.

Result 3: Whether credit guarantees increase or decrease credit rationing depends on the state of the economy. The third effect depends on the success probability of the investors, which results from adding credit guarantees to the baseline model of Holmstrom Tirole (1997). This finding also aligns with the recent experience in the market. In connection with a lousy economy, meaning that the default probability is high, the positive participation constraint is dominating. In a situation like this, it would be a possibility to relax financial-economic constraints by using credit guarantees. This only occurs, if the success probability (p_H) is sufficiently low and the default probability ($1 - p_H$) is sufficiently high. However, it

has seen before that if the economy is in a good state (i.e. probability of a firm to default is low), the possibilities that firms default are very low. Whether this is the case, no policies are needed to intervene in the current model.

Now we are prepared to see whether this positive credit guarantee effect dominates the negative incentive effect. Moreover, such a risk is determined by macroeconomic conditions that are outside of a firm's control. For a low probability of success p_H , the default risk is high. Subsequently, credit guarantees would seem to have a desired positive effect on lending (increase lending), as the positive participation effect will dominate. However, if the success probability p_H is high, the default risk is low. As a result, the negative incentive effect on credit guarantees will dominate.

5. Discussion

5.1. Information asymmetry

Information asymmetry is a core effect that makes banks afraid to offer credit guarantee schemes to entrepreneurs. In most cases, banks cannot receive the fundamental knowledge on the creditworthiness of the entrepreneurs. This generates unpredictable outcomes for the upcoming period on the investment's predicted return rates. Monitoring could help resolve this asymmetry, but as we have shown in the above-constructed model, it is costly and not always incentive compatible ²⁹.

5.2. Transfer of risk

The effect of credit guarantee schemes can be described as a mechanism of diversifying and transferring risk. A lender's risk is lowered, as a proportion of the default risk is covered given that there is a secure repayment of at least part of the loan, or in some cases, the full amount of the loan ³⁰. Commonly, an essential part of the borrowers' risk is absorbed by credit

²⁹ Anderson, J., Papadia, F., & Véron, N. (2021). COVID-19 Credit Support Programs in Europe's Five Largest Economies.

³⁰ Green, A. (2003). Credit guarantee schemes for small enterprises: an effective instrument to promote private sector-led growth?. UNIDO, Programme Development and Technical Cooperation Division.

guarantee schemes. Sometimes guarantee schemes are used as compensation for fragile creditor rights or inadequate collateral ³¹.

5.3. Reduction of collateral obligations

The role of collaterals is to reduce the lending risk for the borrower. In general, borrowers are willing to offer high-quality collaterals to secure their repayment of the underlying loan.

However, sometimes an entrepreneur may not have the assets to cover the required collaterals because of unpredictable economic distress, like COVID-19.

With the use of credit guarantee schemes the borrower pool is increased, as companies with inadequate collateral can access the lending market, otherwise these entrepreneurs would be rejected from the credit market. This effect is also shown in our basic model and underlines the two opposing effects of credit guarantees ³².

5.4. Motivation of the government

There might be different welfare objectives for the government to support credit guarantee schemes. One might be shifting the distribution of credits toward SMEs as these entrepreneurs do not fulfil the requirements of the banks. Another objective might be issuing credit guarantees for entrepreneurs excluded from the credit market, which could increase welfare due to the support ³³. Government involvement can also help to resolve frictions. By monitoring the projects and discouraging the borrower excessive risk-taking is reduced. At this point the pricing of guarantees which ensure that expected losses are covered would help the government select market participants ³⁴.

³¹ D'Aguiar, L., & Lima, F. (2010). Credit risk transfer—dealing with the information gap.

³² Schemes, G. (2014). Credit Guarantee Schemes for SME lending in Central, Eastern and South-Eastern Europe.

³³ Honohan, P. (2010). Partial credit guarantees: Principles and practice.

³⁴ Anginer, D., De la Torre, A., & Ize, A. (2014). Risk-bearing by the state: when is it good public policy?

6. Concluding remarks

This master's thesis analyses the effect of credit guarantees in the market for financial intermediaries and bondholders. As recognised from recent economic experiences in times of recession, credit guarantees can help to relax financial-economic constraints. In many Western European countries, credit guarantees during the COVID-19 pandemic were a helpful strategy to limit revenue shortfalls and to maintain liquidity. Despite the fact that in a healthy economy (i.e. firms with a low probability of default) no policies are required to intervene.

An essential finding of the model is the effect on the willingness of the bank to lend more and the incentive to monitor less. The government has a responsible role in issuing credit guarantees so that the financial institutions occur with less risk and thus making this policy attractive. Information asymmetry is the main problem that comes with this policy and allows high-risk investors to enter the market. In this case, the combination with other policies could positively limit the information asymmetry problem.

The final objective of this thesis was to find out which direction, the threshold of the minimum amount of net worth the firm needs to receive financing, is moving. Credit guarantees have an ambiguous effect on the amount of credit rationing ³⁵. This depends on the relationship of the success of probability and the return of the market and bank financing in cooperation with credit guarantees.

To conclude, the issuance of credit guarantees to intervene in economic recessions like the current example of COVID-19 in 2020 had a positive impact on the economy's recovery. However, it is also known that credit guarantees are an important source for SMEs, especially in the foundation phase ³⁶. Therefore, it would be very interesting to conduct further investigations into the effects of credit guarantees for those companies.

³⁵ Green, A. (2003). Credit guarantee schemes for small enterprises: an effective instrument to promote private sector-led growth?. UNIDO, Programme Development and Technical Cooperation Division.

³⁶ Vienna Initiative Working Group. (2014). Credit guarantee schemes for SME lending in Central, Eastern and South-Eastern Europe. A report by the Vienna Initiative Working Group on credit guarantee schemes.

Bibliography

- Anderson, J., Papadia, F., & Véron, N. (2021). COVID-19 Credit Support Programs in Europe's Five Largest Economies. Peterson Institute for International Economics Working Paper, (21-6).
- Abraham, F., & Schmukler, S. L. (2017). Are public credit guarantees worth the hype?. *World Bank Research and Policy Briefs*, (121486).
- Adrian, T., & Ashcraft, A. B. (2012). Shadow banking regulation. *Annu. Rev. Financ. Econ.*, 4(1), 99-140.
- Arnone, M., & Provenzano, V. THE ROLE OF GUARANTEES IN SUPPORT OF ENTREPRENEURIAL MICROCREDIT IN ITALY.
- Arping, S., Lóránth, G., & Morrison, A. D. (2010). Public initiatives to support entrepreneurs: Credit guarantees versus co-funding. *Journal of Financial Stability*, 6(1), 26-35.
- Bats, J. V., & Houben, A. C. (2020). Bank-based versus market-based financing: implications for systemic risk. *Journal of Banking & Finance*, 114, 105776.
- Beck, T., Klapper, L. F., & Mendoza, J. C. (2008). The typology of partial credit guarantee funds around the world. The World Bank.
- Becker, B., & Ivashina, V. (2015). Reaching for yield in the bond market. *The Journal of Finance*, 70(5), 1863-1902.
- Chakraborty, S., & Ray, T. (2006). Bank-based versus market-based financial systems: A growth-theoretic analysis. *Journal of Monetary Economics*, 53(2), 329-350.
- Chaney, P. K., & Thakor, A. V. (1985). Incentive effects of benevolent intervention: The case of government loan guarantees. *Journal of Public Economics*, 26(2), 169-189.

Chava, S., & Purnanandam, A. (2011). The effect of banking crisis on bank-dependent borrowers. *Journal of financial economics*, 99(1), 116-135.

Cowan, K., Drexler, A., and Yañez, A., 2015. The Effect of Credit Guarantees on Credit Availability and Delinquency Rates. *Journal of Banking & Finance* 59, 98-110.

D'Aguiar, L., & Lima, F. (2010). Credit risk transfer—dealing with the information gap. *IPM17: Implementing the 1993 System of National Accounts*, 416.

Fazzari, Steven M, R Glenn Hubbard, Bruce C Petersen, Alan S Blinder, and James M Poterba (1988). “Financing constraints and corporate investment.” *Brookings papers on economic activity*, (1), 141–206.

Gereben, Á., Rop, A., Petriček, M., & Winkler, A. (2019). The impact of international financial institutions on small and medium enterprises: The case of EIB lending in Central and Eastern Europe (No. 2019/09). EIB Working Papers.

Gourinchas, P. O., Kalemli-Özcan, Ş., Penciakova, V., & Sander, N. (2020). Covid-19 and SME failures (No. w27877). National Bureau of Economic Research.

Gozzi, J. C., & Schmukler, S. (2016). Public credit guarantees and access to finance (No. 2068-2018-1284).

Green, A. (2003). Credit guarantee schemes for small enterprises: an effective instrument to promote private sector-led growth?. UNIDO, Programme Development and Technical Cooperation Division.

Gudger, M. (1998). Credit guarantees: An assessment of the state of knowledge and new avenues of research (No. 129). Food & Agriculture Org.

Hall, B. H. (2002). The financing of research and development. *Oxford review of economic policy*, 18(1), 35-51.

Hakenes, H., & Hainz, C. (2008). The politician and his banker.

- Holmstrom, B., & Tirole, J. (1997). Financial intermediation, loanable funds, and the real sector. *the Quarterly Journal of Economics*, 112(3), 663-691.
- Holmstrom, B., & Tirole, J. (1998). Private and public supply of liquidity. *Journal of Political Economy*, 106(1), 1-40.
- Honohan, P. (2008). Cross-country variation in household access to financial services. *Journal of Banking & Finance*, 32(11), 2493-2500.
- Honohan, P. (2010). Partial credit guarantees: Principles and practice. *Journal of Financial Stability*, 6(1), 1-9.
- Levitzky, J., 1997. Best Practice in Credit Guarantee Schemes. *The Financier – Analyses of Capital and Money Market Transaction* 4, 86-94.
- Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of financial economics*, 13(2), 187-221.
- Railiene, G., & Ivaskeviciute, L. (2013). Re-evaluating the Supply Side of Finance Availability for Lithuanian SMEs. *Social Sciences*, 82(4), 70-83.
- Rodríguez-Meza, J. (2004, September). Debtor enhancement policies. In *Inter-American Development Bank Conference on Financial Products and Poverty Reduction in Latin America and the Caribbean*, Washington, DC, September (Vol. 30).
- Sarigul, H. CREDIT GUARANTEE SCHEMES FOR SMEs IN EUROPE: A CLUSTER ANALYSIS STUDY.
- Schemes, G. (2014). Credit Guarantee Schemes for SME lending in Central, Eastern and South-Eastern Europe.
- Silva, S. D., & Sum, J. W. (2008). Social funds as an instrument of social protection: an analysis of lending trends-FY2000-2007 (No. 45179). The World Bank.

Stiglitz, J. E., & Weiss, A. (1981). Credit rationing in markets with imperfect information. *The American economic review*, 71(3), 393-410.

Tan, B., Martinez Peria, M. S., Pierri, N., & Presbitero, A. F. (2020). Government Intervention and Bank Market Power: Lessons from the Global Financial Crisis for the COVID-19 Crisis (No. 2020/275). International Monetary Fund.

Vienna Initiative Working Group. (2014). Credit guarantee schemes for SME lending in Central, Eastern and South-Eastern Europe. A report by the Vienna Initiative Working Group on credit guarantee schemes.

<https://european-economy.eu/leading-articles/public-credit-guarantees-and-access-to-finance/#:~:text=Credit%20Guarantees%20Work%3F-Credit%20guarantee%20schemes%20are%20mechanisms%20in%20which%20a%20third%20party,form%20of%20insurance%20against%20default.>

<https://www.mmccapitalmarkets.com/what-is-capital-market-financing/>

[Basel III: international regulatory framework for banks \(bis.org\)](https://www.bis.org/baselIII/index.htm)

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Zusammenfassung

Diese Masterarbeit analysiert die Konsequenzen des Einsatzes von Kreditgarantien auf die Finanzierung von Banken, da im Laufe der COVID-19 (Coronavirus) Krise einige dieser Maßnahmen zur Eindämmung der wirtschaftlichen Verluste erlassen wurden. Grundsätzlich haben Maßnahmen wie Kreditgarantien, eine positive Wirkung auf die Bereitschaft der Banken, um eine höhere Anzahl an Krediten in einer Rezession herauszugeben. Mit dem Hintergrund, dass Finanzinstitute durch den Staat abgesichert sind und daher weniger Risiken mit sich tragen müssen. Daraufhin wird jedoch auch die Intention der Institute die Kreditnehmer vor einer Kreditvergabe zu überprüfen, reduziert. Die Ergebnisse zeigen, dass Kreditgarantien Informationsasymmetrien in Kreditmärkten synchronisieren. In einer Rezession, wie zum Beispiel der COVID-19 Pandemie, helfen Kreditgarantien wirtschaftliche Finanzierungszwänge zu entlasten. Allerdings, in einer stabilen wirtschaftlichen Lage (d.h. niedrige Kreditausfallraten) können Kreditgarantien fehlschlagen.