Should credit facilitation to SME sectors be targeted at specific wealth groups?

1106213*

University of Warwick

EC331 - Research In Applied Economics

Word Count: 4697 (+166 tables) = 4863

Abstract

In this paper a theoretical investigation of the effect of changing supply-side (credit) factors for small and medium sized enterprises loans and its impact on the SME sector's wealth is made. A Monte-carlo approach simulates two hypothetical economies, one that is sensitive to changes to loans, and another that is very sensitive to changes to loans. The results indicate that targeted credit faciliation to specific wealth levels can work on a case-by-case basis. This implies for policy that in the relevant cases, a targeted faciliation of credit can achieve higher growth than a non-targeted credit faciliation.

*Thank you to my supervisor Jonathan Cave for providing excellent guidance in the making of this project. Thank you to Andrew Carter, a fellow Warwick Student, for programming the Monte-Carlo simulator.

Contents

1 Introduction

This paper presents a theoretical model of lending to small and medium sized enterprises (SMEs). The aim of the paper is to assess whether policies that facilitate credit to a SME sector, such as credit guarantee schemes, should focus facilitation for specific wealth groups of SMEs more than others. The assumptions of the theoretical model has the advantage that it is able to keep demand-side issues constant, and thus investigate more accurately the effect of supply-side constraints on an SME sector. This is achieved by assuming that enterprises will always apply for loans and that their likelihood of improving their wealth will be greater with a loan than otherwise. The paper contributes to the literature by providing a control environment of the demand side, and thus avoids issues of interference between demand-side and supply-side effects that empirical studies of the same nature might have.

A Monte-carlo simulation applied to the model generates proportions of enterprises found in one of two wealth states, high or low, based on the inputs of the variables of the model. The model allows many different economies to be modelled and their wealth distributions found, dependant on parameter values entered. In this paper two hypothetical scenarios of economies are assessed. Both scenarios assume that SMEs are more likely to be remain in higher wealth states with loans and to transition to lower wealth states without loans. Their growths are both positively sensitive to loans, but one scenario is more sensitive. This allows for an assessment of the effects of changing credit facilitation in crisis economies of differing severeness.

The main findings of this paper indicate that targeted finance faciliation to specific wealth groups of SMEs may lead to higher growth than non-targeted faciliation in some cases, but without further research this may only be evaluated on a case-by-case basis. In a less loan-sensitive scenario, targeted credit facilitation increases leads to a greater increase in high wealth proportions than non-targeted faciliation increases. However, in the more loan-sensitive scenario, the targeted credit faciliation leads to a greater increase in wealth compared to the non-targeted faciliation only when high wealth enterprises are favoured, but leads to a lower increase in wealth when low wealth enterprises are favoured. The results of this paper suggest that further research into the underlying interactions of variables, which could then help indicate more clearly what scenarios may lead to improvements through targeted policy, would be needed. Nevertheless the results are encouraging for potential targeted policy scenarios.

2 Literature Review: SME Access to Finance

Beck and De la Torre (2006) present a conceptual framework for investigation of access to financial services, where they argue that access to finance should be broken into supply-side and demand-side frictions to help measure which factors lead to lower access. On the demand-side, access to finance can be voluntary, where a business may have access to the services but does not need them or chooses not to take advantage of them, or involuntary, caused by discrimination and price barriers that may preclude access to finance. For example, wealthy customers may choose not to use financial services, and other moderately wealthy ones may not wish to borrow credit even if it were offered at a favourable rate. Supply side issues also exist, where credit providers may face difficulties in alleviating the problems presented by the principal agent problems and macro-economic risks, and may decide to exclude certain borrowers from credit. The assumptions that enterprises will always apply for loans and that their wealth state is more likely to improve with loans, it avoids issues caused by voluntary exclusion, as well as other issues identified in the literature such as discouraged borrowers (where borrowers do not apply due to fear of rejection) (Holton et. al. 2012, Gerlack-Krisen et. al 2013) and not applying due to perception of credit unavailability (Gerlach-Krisen et. al 2013). Bank credit is not the only form of external finance, however for the model presented in this paper it is assumed that it is; the enterprise either receives a loan as external finance, or no external finance at all.

The assumption of growth for SMEs with loan credit is based on a convincingly established link found in the literature: There is a positive effect between SMEs with increased access to bank finance and their growth. Ayyagari et. al (2006) find, using a major firm level survey conducted by the World Bank in 80 developed and developing countries, that access to finance is one of the few characteristics of the business environment that is robustly linked to firm growth. In a similar study, Beck et. al (2005) find that lack of access to bank finance has an important hamstringing effect for all firms, but the effect that obstacles to finance have for small firms is almost double that for that of large firms. This is partly based on findings that small firms financed investments with bank finance by (only) roughly half of what large firms did. These results lend evidence to the idea that improving access to finance for SMEs will translate into growth for these firms.

Various surveys, many prominently carried out by the World Bank, saliently points out that SMEs themselves consider access to finance one of major obstacles to their functioning and growth (Chavis et. al 2010, Angela 2011). Further evidence by

Banerjee and Duflo (2004) suggests that small firms experienced credit constraints when they did not receive subsidized credit. Their study analysed loan information of over 250 Indian SMEs before and after they were eligible for a subsidized lending program, and found that the additional credit resulted in a proportional increase in sales, rather than a substitution for other non-subsidized credit. Zia (2007) compared small non-listed firms with their large, listed counterparts in Pakistan, and found that small firms, in complete contrast to the large ones, actually reduced their sales after becoming ineligible for subsidized credit. Beck (2007) notes that the results of Zia and Banerjee and Duflo do not necessarily support subsidized credit as a way to ease credit constraints on small firms, but that they show the constraining effect that lack of access to external finance has on small firms.

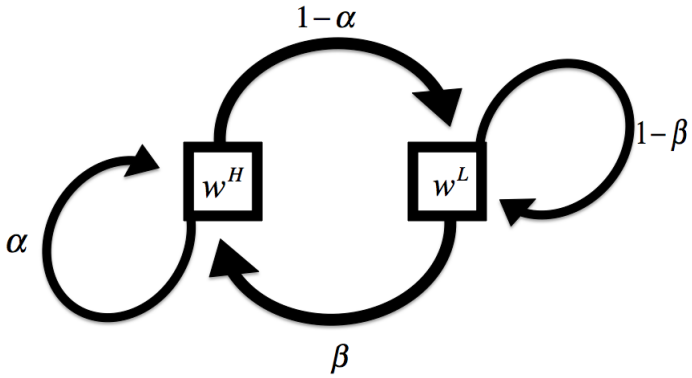

Figure 1: The State Diagram of Wealth Transition

3 The Model: A Stochastic Wealth Transition Process

3.1 Assumptions and the Transition of Wealth

The model in this paper is a stochastic transition process, where enterprises can flow between wealth states based on transition probabilities. Two states of wealth for an enterprise exist, a high wealth (w^H) state and a low wealth (w^L) state.

Time is discrete, where in every time-period t, the enterprise has a given probability ($\alpha, \beta \in [0, 1]$) of transitioning between the two wealth states (see Figure 1):

- α is the probability of remaining w^H in the next period given that the enterprise is w^H in the current period.
- β is the probability of remaining w^L in the next period given that the enterprise is w^L in the current period.

The parameters α and β capture factors in the economy that affect the likelihood of enterprises transitioning between wealth-states. For example, in scenarios where sales are high due to a healthy economy, this would be reflected in higher values of α and β, as higher sales increase likelihoods of reaching a higher wealth state.

Based on the probabilities of transitioning between wealth states, two stochastic matrices for wealth states can be constructed. These matrices show the probability of an enterprise reaching a given wealth state at time $t+1$ given its wealth at time t.

The two matrices differ in that they specify the probabilities of each state contingent on the enterprise being approved for a loan (subscript A) or rejected (subscript R).

H is the transition matrix given that the agent receives a loan. **G** is the transition matrix given that the agent's loan application is rejected.

$$\mathbf{H} = \begin{array}{c} \\ w_t^H \\ w_t^L \end{array} \begin{array}{c} \begin{array}{cc} Pr(w_{t+1}^H) & Pr(w_{t+1}^L) \end{array} \\ \begin{pmatrix} \alpha_A & 1-\alpha_A \\ \beta_A & 1-\beta_A \end{pmatrix} \end{array}$$

$$\mathbf{G} = \begin{array}{c} \\ w_t^H \\ w_t^L \end{array} \begin{array}{c} \begin{array}{cc} Pr(w_{t+1}^H) & Pr(w_{t+1}^L) \end{array} \\ \begin{pmatrix} \alpha_R & 1-\alpha_R \\ \beta_R & 1-\beta_R \end{pmatrix} \end{array}$$

3.2 Modelling the Bank Variables

An entprise is not always successful in securing finance. To capture this, bank variables are added, assigning probabilities of succesful loan applications which will affect the values of parameters α and β available to the enterprises. They do not directly affect the parameter values, but rather show which of the the wealth transition matrices will likely be available to the enterprise.

The bank variables are assigned to enterprises depending on their wealth state, as well as having a previous history of loan approval. Two bank variables exist for each wealth state: γ_H indicates the probability of an enterprise that is in a high-wealth state and which had its loan approved in the previous period being approved for a loan in the next period. θ_H indicates the probability of a high-wealth individual being approved in the next period, given that they were rejected previously. This distinction between functions captures the idea that a high wealth enterprise will have a higher probability of receiving a loan compared to a low wealth enterprise due to their wealth state and that a form of credit history is applied to the model.

The bank variables have a two-fold purpose: Firstly they are a macroeconomic indicators for credit supply, as the probability of achieving loan financing fluctuates with the availability of credit. If more credit is available to the lender, the probability of loans being approved increases. The parameters can therefore be modelled for changes in policies that directly affect the credit availability in the economy. In

situations where assymmetric information is prevalent, the probability of loan approval simply falls, as the bank perceives higher risk and increases the rate at which it is willing to lend. Secondly, the bank variables capture enterprise-specific factors that determine the success rate of their application. For example, financial factors in the application can be captured through changing probabilities depending on the enterprises' previous loan application being approved, as well as its current wealth state playing a role.

The elements of the bank variables can similarly to the transition of wealth states be modelled as a stochastic process. Two 'decision' states exist, where an agent may be in a state of previous approval (γ) or rejection (θ). To model this, two further transition matrices can then be constructed. $\mathbf{K}$ and $\mathbf{L}$ indicate the probabilities of respectively a high or low-wealth enterprise successfully securing a loan, depending on its previous decision state. Similar to the previous stochastic matrices, the entries in the decision matrices give the probability of an agent transitioning or remaining in a state of approval or rejection of their loan in the current period, given their decision state in the previous period.

By modelling the bank variables in such a way, the model incorporate a simple form of credit scoring while maintaining the Markov property (the memoryless property of a stochastic process that makes it dependent only on the previous state), since the probability of an enterprise securing a loan will be contingent on its previous approval state. Furthermore, it allows the model to distinguish between agents in different wealth states by assigning different values to their approval ratings. This is useful, as it can then for example be used to discriminate against low-wealth enterprises, and/or favour high wealth enterprises more, by assigning respectively lower or higher probabilities of approval to them, directly aiding the purpose of this paper's investigation.

$$\mathbf{K} = \begin{array}{c} \\ Approval_{t-1} \\ Rejection_{t-1} \end{array} \begin{array}{c} \begin{array}{cc} Pr(Approval_t) & Pr(Rejection_t) \end{array} \\ \begin{pmatrix} \gamma_{w^H} & 1-\gamma_{w^H} \\ \theta_{w^H} & 1-\theta_{w^H} \end{pmatrix} \end{array}$$

$$\mathbf{L} = \begin{array}{c} \\ Approval_{t-1} \\ Rejection_{t-1} \end{array} \begin{array}{c} \begin{array}{cc} Pr(Approval_t) & Pr(Rejection_t) \end{array} \\ \begin{pmatrix} \gamma_{w^L} & 1-\gamma_{w^L} \\ \theta_{w^L} & 1-\theta_{w^L} \end{pmatrix} \end{array}$$

Where:

- γ is the loan approval probability at time t, given the enterprise was approved at $t-1$.
- θ is the loan approval probability at time t, given that the agent was rejected at $t-1$.

A restriction is applied to the decision parameters in order to incoporate credit score: $\gamma > \theta$. This constraint means that the probability of an enterprise being approved for a loan in the current period is greater if it was approved in the previous period than if it was rejected.

3.2.1 The Limitations of the Bank Variable

The model is not without limitations. The memoryless Markov property simplifies modelling transitions between approval states as it only accounts for the previous period's state. It does then not incorporate a longer history of states, which could be considered an unrealistic depiction of reality. Credit histories are not just based on the last application being previously approved or rejected, but more on a history of approvals and rejections over a longer period of time. If an enterprise has a good track record of approval states, it would make them more likely to receive a loan. Furthermore, a history of approval states would also implicitly indicate some form of wealth record, since the track record of the agent, and their subsequent loan approval, is contingent on having previously shown their ability to continuously repay their debts. The model, however, only accounts for current, not previous, wealth states.

Credit scores should in reality account for wealth growth as well. An enterprise that shows growth between the previous wealth state(s) and the current wealth state should then also have a higher likelyhood of receiving future financing, because it would indicate a higher likelihood of remaining in a higher wealth state, signalling a lower risk debtor. In the model only an enterprise's current wealth state is taken into account in its transition probabilities. The stochastic process for loan approval/rejection as modelled does not account for wealth growth. This allows for an easier depiction of the proportions of the population in a state of approval at any given time by reiteration of the stochastic process, but is limited in the way that it does not account for a longer wealth trajectory.

The issue that would exist with attempting to incorporate more than one previous

state of wealth is that it removes the Markov property from the model, rendering any results it yields inapplicable. This is because the stochastic process defined by the Markov property can only take into account the previous states. To an extent, the issue of wealth history can be conceded - though the model does not account for an enterprise showing wealth growth, it assigns a higher probability of success of loan approval based on its current wealth state, which is implicitly affected by wealth through the loan approval parameters γ and θ.

4 Investigating Changes to the SME Wealth Distribution: Monte-Carlo Simulation

The model presented thus far is a loan model that determines the wealth state of an enterprise applying for a loan. The wealth state of an enterprise can be described as a function of the parameters $w = (\alpha, \beta, \gamma, \theta)$. Any variations in these parameters will affect the likelihood with which an agent lands in a given state of wealth.

The Monte-carlo approach was used to evaluate the behaviour of the model described above. A program [1] (App. 1) was created in the C programming language to simulate the behaviour of 100,000 enterprises that were assigned any combination of two states, loan approval or rejection and high or low wealth. The simulation would then use the current state of each enterprise to select the applicable probabilities from the input parameters, and calculate their next set of states based on the result of a random number generator. The result from the simulation is how many enterprises existed in each state. The nature of the model was that during the first few steps of the simulation the results would rapidly converge upon a steady solution which was independent of the original states of the enterprises. Thus, the simulation was run until this convergence occured, and then the program would average, over a large number of steps, the number of enterprises in each state.

The way the model has been constructed allows an evaluation of supply-side constraints of SME access to finance. This is because the demand side constraints that determine the wealth transition parameters in the model are held constant: It is assumed that the parameters α and β do not change through time once they have been set for a scenario, and that an SME will always be better off with a loan, and

[1] I am greatly indebted to Andrew Carter, a fellow student at the University of Warwick, for programming the simulator. A copy of the program is given with the report.

thus apply. The parameters for wealth transition of receiving a loan are assumed to be greater than not receiving a loan.

4.1 Investigating Parameter Impacts

The parameters α and β define the 'scenario' in which the model results are simulated, and any change to these define a new scenario. Thus, the model cannot directly compare numerical results for different parameter values, but allows for trends to be observed in wealth changes across scenarios.

The scenario of interest in this paper is based on the assumption that SMEs will have a higher likelihood of growth with a loan. This means that the probability of transitioning to or remaining in a high wealth state if they receive a loan must be such that they are expected to on average remain high wealth. This implies the values given to the loan approval parameters must abide to the constraints α_A, $\beta_A > 0.5$. If high wealth enterprises are expected to remain high wealth on average, perhaps due to a healthy economy, it would imply that α_A, $\alpha_R > 0.5$. However, a more interesting example, especially for contemporary SME finance, is to model a crisis-like scenario where firms are expected to remain high wealth on average with a loan, but not without a loan. This would imply that $\alpha_A > 0.5$ and $\alpha_R < 0.5$. This is assumed for low wealth enterprises as well, implying $\beta_A > 0.5$ and $\beta_R < 0.5$. These assumptions make the model positively sensitive to loans: If enterprises recieve loans, they are expected to on average remain high wealth; If enterprises fail to secure loans, they are expected to on average move to a lower wealth state.

With these assumptions, a plausible set of parameter values can be applied to create a scenario (scenario 1):

$\alpha_A = 0.6$	$\beta_A = 0.5$
$\alpha_R = 0.4$	$\beta_R = 0.3$

These values state that high wealth firms will remain high wealth 60% of the time, but only 40% without a loan. A low wealth enterprise will transition to a high wealth state 50% of the time with a loan, but only 30% if it does not recieve a loan.

It is stressed that the parameter values in this scenario are guesses of what a plausible scenario be could like. An area for further research could be to estimate more exact parameter values for a given economy or SME sector, to then be analysed with the model.

Table 1: Changes to Approval Proportions (Enterprises loan sensitive)

Proportions	$w^H \wedge A_{t-1}$	$w^H \wedge R_{t-1}$	$w^L \wedge A_{t-1}$	$w^L \wedge R_{t-1}$	Change w^H
Control Proportions	0.167	0.167	0.333	0.333	-
$\gamma_{w^H} = 0.6$	0.19	0.15	0.33	0.33	0.006
$\theta_{w^H} = 0.6$	0.18	0.16	0.33	0.33	0.006
$\gamma_{w^L} = 0.6$	0.169	0.169	0.363	0.299	0.004
$\theta_{w^L} = 0.6$	0.169	0.169	0.365	0.298	0.004

The assumptions of this simulated experiment ideal for manipulating the credit supply variables (loan approval probability values γ and θ) to investigate how said changes might affect the wealth proportions of SMEs. Changes to the wealth proportions can be found by changing only one value of the γ or θ values to distinguish how any one variable affects the wealth proportions. A trial can run with variables set at 0.5 except for one, which is increased by 10% (0.1 in the absolute value), allows the change in wealth proportions to be quantifiably measured by inspecting approval and rejection rates and comparing them with the control results.

The expected trends emerge from the results (Table 1). Increasing the likelihood of an approval(rejection) variable yields an increase in the approval(rejection) proportions of the wealth state being acted upon, and a decrease in the opposite rejection(approval) proportion. This in turn yields a small increase in the high wealth proportion of firms. The trends show that increasing loan probability for enterprises increases overall wealth. This is explained by the way the model has been constructed and is not a surprising result, since enterprises are made sensitive to loans. Increasing the likelihood of a previously approved high wealth enterprise (γ) being approved for a loan by 10% increases the high wealth proportion by 0.6%, whereas a 10% increased likelihood for low wealth enterprise translates to slightly smaller 0.4% increase in the high wealth proportion. The explanation for this is likely due to this economy scenario having high wealth agents with a higher likelihood of remaining high wealth ($\alpha_A = 0.6$) with a loan than lower wealth agents have of transitioning up with a loan ($\beta_A = 0.5$). This could indicate that in economies where the expected likelihood of enterprises to shift or remain high wealth, a policy targeting the higher likelihood group will lead to a greater increase in overall wealth. This leads to the the hypothesis that in scenarios where one wealth group is more sensitive to loans than the other, targeting that group would lead to a greater increase in wealth proportion than targetting the other would.

A second scenario is created to help investigate this, where the modelled SME sector

is extremely positively sensitive to receiving loans. This would be the case if the following parameter values were entered (scenario 2):

$\alpha_A = 0.9$	$\beta_A = 0.8$
$\alpha_R = 0.3$	$\beta_R = 0.2$

The above parameter values are a more extreme case of the first scenario: if enterprises recieve loans, they will be much more likely to transition to or remain in a high wealth state, but the opposite is true if they fail to acquire credit. Repeating the simulation with all variables being controlled apart from one in the new scenario values yields the following results:

Table 2: Changes to Approval Proportions (Enterprises very loan sensitive)

Proportions	$w^H \wedge A_{t-1}$	$w^H \wedge R_{t-1}$	$w^L \wedge A_{t-1}$	$w^L \wedge R_{t-1}$	Change w^H
Control	0.28	0.28	0.22	0.22	-
$\gamma_{w^H} = 0.6$	0.34	0.24	0.21	0.21	0.02
$\theta_{w^H} = 0.6$	0.295	0.269	0.218	0.218	0.004
$\gamma_{w^L} = 0.6$	0.2802	0.2803	0.2271	0.2123	0.0005
$\theta_{w^L} = 0.6$	0.29	0.29	0.25	0.17	0.02

In the more loan sensitive scenario the results are again as expected (table 2): Increasing the likelihood of a given wealth and rejection state receiving a loan creates a higher proportion of high wealth. However, some interesting results appear. The results of the second simulation do not support the hypothesis created from the first scenario (that targeting more sensitive groups leads to greater overall wealth). In the second simulation, the trend is not always true: Increasing the likelihood of loan approval for a variable by 10% on the high wealth (more sensitive) state leads to a greater increase in wealth than targeting a low wealth state only if they were previously approved for loans. Targeting low wealth individuals who were previously rejected, oddly, leads to higher wealth increases than if targetting low wealth individuals who were approved.

These result indicate that assessing whether a given change to loan probability has a greater impact on the wealth distribution is case specific. In the first scenario where enterprises are sensitive to loans wealth is increased more with targetting, and in the second scenario this trend is not clear. The trend results of each simulation indicate the importance of knowing the underlying functional forms of the variables

of the wealth proportion $w = (\alpha, \beta, \gamma, \theta)$. Without this knowledge of the functional forms and true values of the parameters, the impact of different targeting policies cannot be accurately assessed unless done on a case-by-case basis. This is because the causality of changing multiple variables may not be accurately discerned when multiple variables are changed simultaneously.

The overall trend for both scenarios follow their expected paths: Increasing the probability of a loan being approved for loan-sensitive SMEs will lead to an increase in wealth proportions. The results of the simulations indicate that policy targetting of specific wealth groups may or may not lead to greater improvement to wealth. They indicate that the impact of targetting a specific variable or wealth state of policy can only be considered on a case-specific basis. For the model to be properly applied to assess possible impact of a given specific scenario or economy, more research would required to properly estimate the initial parameter values of a given scenario, and only then could the assessment be made based on the results yielded. For a general analysis, research into solving for functional forms of the variables would be required.

Comparing the results of both cases and the effects that their parameters have on the wealth distribution also indicate that the higher the sensitivity to loan acquisition the SME sector has, the greater the change to wealth is, which could have policy implications. For example, in times where enterprises are very reliant on loans, such as in the crisis scenarios modelled, not reacting with policy changes that improve the likelihood of receiving loans will lead to a larger deterioration of the SME wealth sector. An issue that is not considered here is the impact time that a change to loan probabilities before it reaches a new converged state - the simulation simply solves for final convergence. Further research could look into modelling the movement of wealth over time, and allow for assessments of the impact time of a policy. This could also aid in assessing the severity of a lack of a policy reaction.

4.2 SME Finance Guarantee Schemes

Policies that improve the likelihood of an SME getting a loan have thus far shown to bring an improvement to the wealth of an SME sector. Financing Guarantee Schemes are widely used policies that aim to improve the likelihood of a loan being given to an SME. An example of such a scheme in the UK is the government-guaranteed lending scheme Enterprise Finance Guarantee. Schemes such as the EFG help banks and other lenders offer loans to firms which lack security or do not have proven track

records. The provider of the scheme, in the EFG's case the UK Government, act as a guarantor for the lender in the case the debtor defaults. As accounting opaqueness in smaller firms is often more prevalent (Berger and Udell 2005: 22) and collateral requirements may be difficult for smaller firms to provide (Jimenez and Suarina 2004, Stiglitz and Weiss 1981: 393-410), a guarantee scheme will likely help them recieve a loan. This would be reflected in increased values for all loan approval probabilities (γ and θ).

A finance guarantee scheme could increase the probabilities of loan approval for all wealth states equally, or it could favour some wealth groups over others. Computing results for different types of guarantee schemes could indicate whether a 'blanket coverage' guarantee scheme (increasing loan probabilities for all wealth states) or a targeted guarantee scheme (increasing the loan probability of a specific wealth state more than the other) is more suitable. A situation could be imagined where low-wealth enterprises might have a lot more trouble acquiring loans compared to high wealth enterprises, perhaps due to trouble meeting collater, and a targeted faciliation of low-wealth enterprises might lead to a greater increase in wealth.

Three types of Guarantee Schemes (GS) are simulated. In the first one, blanket coverage is given, where the scheme causes a 10% (0.1) increase in values of γ and θ. In the second, high wealth enterprises are favoured, where γ_{w^H} and θ_{w^H} both increase by 15% whereas their low-wealth counterparts only increase by 5%. The third scheme is the mirrored opposite of the second, except that low-wealth enterprises are favoured.

Table 3: Impact of Loan Guarantee Schemes on Wealth Proportions

Proportions	Scenario 1 w^H	Change w^H	Scenario 2 w^H	Change w^H
Control	0.334	-	0.56	-
Blanket GS	0.46	0.126	0.622	0.062
GS (w^H Favoured)	0.466	0.132	0.63	0.07
GS (w^L Favoured)	0.465	0.131	0.604	0.044

The results of different schemes are displayed in table 3. The expected trends again emerge: increasing loan availability will positively affect wealth. In the first scenario, targeted schemes in both cases translate to greater increases in wealth than a non-targeted scheme, where high wealth targeting leads to a slightly higher increase than a low-wealth targeted scheme. This could indicate that economies where SMEs are loan sensitive, targeting firms that have a higher likelihood of remaining high wealth

will lead to a greater increase in wealth. However, these results contrast with the second scenario. In the very loan sensitive scenario targeting leads to a greater increase in wealth only when high wealth states are favoured, but the non-targeted schemes increase overall wealth more than targeting low wealth individuals. These results back the earlier findings in highlighting the difficulty of drawing causality from the effects of changing multiple variables without knowing exactly which effects are the root of the change.

5 Conclusion

The findings of this paper indicate that targeted credit faciliation to loan sensitive economies can lead to greater wealth increases in some instances, but that this must be evaluated on a case-by-case basis.The situations simulated in this paper do not give a clear view of when targeted policy yields the best results. A possible way to find such thresholds could be done through 'hard solutions' where hundreds of simulations can be computed with slight changes in the parameters and based on these analyze points and find thresholds for where targeted policy may become more effective.

The assumptions in this paper were made to investigate supply-side factors, but ignored the component of enterprises having a choice to apply for finance. A possible extension of the investigation would be to add some form of enterprise application decision factor, where the enterprise decides whether to apply for a loan based on what yields the highest payoff. A cost would be involved in being rejected, and the agent would then face a choice of applying based on expected payoffs of receiving/not receiving loans and being approved/rejected.

6 Appendix

1. A copy of the Monte-carlo simulator program has been handed in with the report. I am greatly indebted to Andrew Carter, a student at the University of Warwick, for programming the simulator.

The model can in theory be solved mathematically. However solving the model mathematically and simulating the results give similar results. The simulation provides the advantage of being able to attach numerical values to the parameters and runn simulations. This allows for a creation of specific scenarios to which can be evaluated numerically.

7 Bibliography and Citations

- Angela, R. (2011) SMEs Sector Access to Finance: An Overview, Article provided by University of Oradea, Faculty of Economics in its journal The Journal of the Faculty of Economics - Economic, Vol. 1, July Issue, pp. 431-437.
- Ayyagari, Meghana, Asli Demirguc-Kunt and Vojislav Maksimovic (2007) How Important Are Financing Constraints? The Role of Finance in the Business Environment. World Bank Policy Research, Working Paper 3820.
- Banerjee, A. and Duflo, E. (2004) Do Firms Want to Borrow More? Testing Credit Constraints Using a Directed Lending Program. CEPR Discussion Paper 4681
- Beck, T. and De la Torre, A. (2006) The Basic Analytics of Access to Financial Services, World Bank Policy Research, Working Paper 4026.
- Beck, T. and Demirguc-Kunt, A. (2006) Small and medium-sized enterprises: Access to finance as a growth constraint, Journal of Banking and Finance Vol. 30, pp. 2931-2943.
- Beck, Thorsten, Asli Demirguc-Kunt and Vojislav Maksimovic (2005) Financial and legal constraints to firm growth: Does firm size matter?, Journal of Finance Vol. 60, pp. 137-177
- Beck, T. (2007) Financing Constraints of SMEs in Developing Countries: Evidence, Determinants and Solutions, Tilburg University Open Access
- Berger, A. and Udell, G. (2005) A More Complete Conceptual Framework for SME Finance, World Bank Policy Research Working Paper 3795.
- Chavis, Larry, Leora Klapper and Inessa Love (2010) Inernational Differences in Entrepreneurial Finance. Enterprise note no. 11, World Bank Group.
- Gerlach-Kristen, Petra, Brian OConnel and Conor OToole (2013) SME Debt and Interest Costs in Ireland, Quarterly Economic Commentary, Autumn, pp. 69-81.
- Holton, Sarah, Martina Lawless and Fergal McCann (2013) SME Financing Conditions in Europe: Credit Crunch or Fundamentals? National Institute Economic Review, No. 255, pp. 52-67.
- Jimnez, G. and Saurina, J. (2004) Collateral, type of lender and relationship

banking as determinants of credit risk Journal of Banking and Finance, Vol. 28, Issue 9, pp. 291-2212.

- Stiglitz, J. and Weiss, A. (1981) Credit Rationing in Markets with Imperfect Information, The American Economic Review Vol. 71, No. 3, pp. 393-410.
- World Bank (2008) Finance for All? Policies and Pitfalls in Expanding Access, The International Bank for Reconstruction and Development / The World Bank.
- Zia, B. (2008) Export Incentives, Financial Constrains, and the (Mis)allocation of Credit: Micro-level Evidence from Subsidized Export Loans. Journal of Financial Economics, Vol. 87, Issue 2, pp. 498-527.