Short-term Finance, Long-term Effects: Theory and Evidence from Morocco *

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Abstract

We study the effect of working capital loan guarantee programs on firm growth and their aggregate implications. Using a Moroccan firm-level dataset, we show that firms with guaranteed short-term loans (i) decrease their cash ratio, (ii) expand their production scale homogeneously and persistently, and that (iii) participation in the guarantee program is humped-shaped in firm size. We rationalize these findings in a heterogeneous-firm model with collateral and working capital constraints. First, we show that while relaxing collateral constraints on short-term loans always has a positive short-term effect on firm growth as firms reallocate cash to capital, persistent effects on firm scale depend on the existence and size of intertemporal distortions. Second, the combination of a flat fixed participation cost and size-dependent collateral constraints explain the non-monotonous participation rate. The interaction of the collateral constraint with these two frictions is crucial to determine the aggregate effect of a loan guarantee program. We parameterize the model to our Moroccan firm-level data. We show that the growth and welfare gains of expanding credit guarantee programs through a higher guaranteed amount or a lower participation cost are substantial, with the former generating relatively more growth while also increasing participation.

Keywords: collateral constraints; financial frictions; firm dynamics; SME financing;
JEL Classification: E22, E27, E44, G28, G38

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1 Introduction

Financial frictions hinder the ability of firms to use inputs efficiently, affect firm growth, and, therefore, lower economic development, especially in emerging economies. An extensive literature addresses how the scarcity of long-term external finance leads to under-leveraged small and medium enterprises and hinders economic development.[1] However, little attention is paid to the scarcity of short-term external finance in underdeveloped countries. Relative to this literature, our objective in this paper is to understand better the effect of alleviating frictions in short-term external finance on firm growth and the aggregate economy in emerging economies.

The role of short-term external finance is quite different from long-term external finance. Long-term external finance promotes firm growth since it directly enlarges entrepreneurs' total asset scale, given their net worth. Short-term external finance, however, promotes firm growth by enabling a more efficient allocation of the entrepreneurs' existing net worth. With working capital constraints, entrepreneurs in emerging economies tend to hoard a substantial amount of cash to meet their working capital needs. Therefore, short-term external finance promotes firm growth by allowing entrepreneurs to allocate their net worth more efficiently away from unproductive cash and towards to productive capital.

In this paper, we study the effect of a loan guarantee program designed to relax short-term external finance constraints. Using a unique Moroccan firm-level dataset, we first show that firms with guaranteed short-term loans (i) decrease their cash ratio, (ii) expand their production scale homogeneously and persistently, and (iii) participation in the guarantee program is humped-shaped in firm size. In a heterogeneous firm general equilibrium model, we then analytically and quantitatively rationalize the above empirical findings, analyze the mechanism, and finally evaluate the growth and welfare gains of expanding credit guarantee programs. We especially examine the role of intertemporal distortions, participation costs, and size-dependent collateral constraints in determining the aggregate impact of the guarantee.

First, we study the effects of relaxing short-term finance in the data. Our empirical analysis is based on the combination of Moroccan firm-level data from Orbis with the national-level loan guarantee data from Tamwilcom.[2] We first focus on how guaranteed firms choose their capital, cash holdings, and production scale as well as their growth path relative to their un-guaranteed matched peers. First, our difference-in-difference (DID) estimates show that guaranteed firms expand their production scale homogeneously by increasing sales, capital input, and labor input

[1] Cooley and Quadrini (2001), Albuquerque and Hopenhayn (2004), Clementi and Hopenhayn (2006), DeMarzo and Fishman (2007), Buera, Kaboski, and Shin (2011), and Arellano, Bai, and Zhang (2012), among others.

[2] Tamwilcom is a public financial institution under the supervision of the Central Bank of Morocco, Bank Al-Maghrib. Therefore, the national-level loan guarantee data covers every firm that was ever guaranteed in Morocco.

relative to their matched peers. Second, they decrease their cash-to-asset ratio. Importantly, these effects are persistent. And finally, we show that the participation rate is humped-shaped in firm size, as intermediate-sized firms have a higher probability of entering the program.

Then, motivated by our empirical findings, we build a heterogeneous firm general equilibrium model in which firms face collateral and working capital constraints, intertemporal distortions in the form of an exit probability and a tax on net worth, a loan guarantee program (henceforth LGP), and a uniformly distributed LGP participation cost. We use the model in a simple, special case to rationalize our empirical findings and illustrate the main mechanisms. In the model, constrained firms preserve unproductive cash instead of productive capital to finance short-run working capital. First, a loan guarantee program mitigates credit constraints and induces firms to reduce their cash holdings and expand their production scale. Second, when intertemporal distortions are present, relaxing credit constraints not only speeds the convergence of firms to their long-run scale by efficiently reallocating resources from cash to capital but also increases said long-run scale. Finally, the participation cost prevents small firms from entering the program as only firms with a high enough growth potential self-select into the program, while the large firms do not self-select into the program since they do not need the guarantee.

Next, we take our quantitative model with more general functional forms and institutional details back to the Moroccan firm-level data. The model matches Moroccan firm-level moments well and replicates the patterns in our empirical findings. More specifically, our empirical estimation of the persistent impact of the guarantee is used to identify the intertemporal distortions in the model. The quantitative model rationalizes our empirical findings as well: Accessing loan guarantee programs lowers the firm's unproductive cash holdings, improves its productive capital stock, and increases its long-term growth. Median-size-constrained firms are more likely to participate in the loan guarantee program.

Finally, we conduct counterfactual analyses by enlarging the loan guarantee programs. As shown in the model, there are two frictions that limit the firms' loan guarantees: a low guarantee ratio and a high participation cost. We show that the gains from enlarging the loan guarantee programs via reducing both frictions are substantial. Increasing the guaranteed ratio from 60% to 80%, as in Indonesia, could more than double the participation rate, decrease the cash ratio by 0.5 percentage points, and achieve an output growth of 0.4% and a welfare gain of 0.2%. Decreasing participation costs achieves less extra growth and welfare but selectively targets small and medium firms, achieving more inclusion and less inequality between firms without substantially increasing the guaranteed portfolio.

Literature Review This paper contributes to several strands of literature. First, this paper is related to the large literature on financial frictions and their implications for firm growth and economic development. There is a large literature that studies long-term external finance and firm growth, such as Cooley and Quadrini (2001), Albuquerque and Hopenhayn (2004), Quadrini (2004), Clementi and Hopenhayn (2006), DeMarzo and Fishman (2007), Huynh and Petrunia (2010), Arellano, Bai, and Zhang (2012), Moll (2014), Midrigan and Xu (2014), and others. Long-term external finance promotes firm growth in the literature because it helps entrepreneurs expand their scale of production and improves capital allocation efficiency between firms. We contribute by showing that short-term finance also matters for firm growth. We show that short-term external finance promotes firm growth. It allows entrepreneurs to allocate their net worth more efficiently towards productive capital stock from unproductive cash holdings conditional on their existing net worth.

Second, this paper is related to the financial friction and capital misallocation literature. Since the seminal work by Restuccia and Rogerson (2008) and Hsieh and Klenow (2009), capital misallocation in emerging economies has been taken seriously by researchers. The role of collateral constraints on capital misallocation is then studied by Moll (2014), Midrigan and Xu (2014), Gopinath et al. (2017), Jo and Senga (2019), among others. This literature is concerned with the aggregate effect of external finance and has shown that these gains are elusive. In particular, when productivity shocks are persistent, then firms typically grow out of their collateral constraints through savings and self-financing (Moll, 2014; Buera, Kaboski, and Shin, 2021). In this paper, we show that intertemporal distortions are an overlooked and crucial factor determining the aggregate effect of external finance, i.e., distortions in the consumption/saving choices of entrepreneurs, and we estimate their magnitude using the data. This intertemporal friction interacts with the external finance frictions to determine the impact on the long-run scale of firms, thus generating potentially larger effects of alleviating external finance frictions.[3]

Third, this paper contributes to the emerging literature on credit guarantee schemes. A credit guarantee scheme is one of the most common policy tools to facilitate SMEs' access to finance. Gudger (1998) and Green (2003) provide an overview of credit guarantee programs' typology, design, implementation, and general evaluation around the world. Beck, Klapper, and Mendoza (2010) surveys 76 partial credit guarantee schemes across 46 developed and developing countries. Saadani, Arvai, and Rocha (2011) focuses on the Middle East and North Africa (MENA) and reviews credit guarantee programs in 10 countries in the MENA region. Some empirical contributions study the impact of guarantee programs using microdata, including Oh et al. (2009), Lelarge, Sraer, and Thesmar (2010), Bah, Brada, and Yigit (2011), Banerjee and Duflo (2014), Mullins and Toro (2018), and Barrot et al. (2019). Our paper contributes to the literature by presenting new

[3]Intertemporal distortions are often in the background of theoretical papers studying firms' financial frictions in the form of an exit probability or a tax, but their role is not made explicit. See for instance Arellano, Bai, and Zhang (2012), Jo and Senga (2019), Cooley and Quadrini (2001).

empirical findings on the use of cash on the profile of growth post-guarantee and draws novel macroeconomic implications using a theoretical model.

Fourth, this paper contributes to the literature on the existence of credit constraints faced by SMEs.[4] As documented by Berger and Udell (2006), SMEs are more likely to be credit-rationed due to the incomplete information they can provide to banks. The most studied countries are advanced economies due to their data availability.[5] Few studies have been done to examine emerging economies. One notable paper is written by Banerjee and Duflo (2014) on India. They exploit the 1998 policy reform of India's priority sector lending program and confirm that firms in the program are severely credit-constrained. Our paper contributes to the literature by presenting new empirical findings and a novel theoretical model on the existence of credit constraints faced by SMEs in emerging economies.

Layout The rest of the paper is organized as follows. Section 2 presents the institutional background, the data, and the empirical findings. Section 3 lays down the full model. Section 4 presents the mechanism and implications of short-term financial constraints in a special case. Finally, Section 5 parameterize the full model using the data and perform policy experiments.

2 Empirical Analysis

In this section, we estimate the impact of a loan guarantee program on firm growth, production inputs, and cash holdings using Moroccan firm data and show evidence on the participation rate.

2.1 Institutional Background

Collateral Requirements and Loan Guarantee in Morocco Collateral requirements for loans are exceptionally high in Morocco. Approximately 84% of the loans in Morocco require collateral, as reported by World Bank (2013). In order to reduce potential inefficiency caused by such high collateral requirements, Tamwilcom, as a public financial institution under the supervision of the Central Bank of Morocco, *Bank Al-Maghrib*, cooperates with four leading banks which jointly cover an extensive credit network to provide loan guarantee programs to SMEs.[6]

[4]The most notable theories on this subject are developed before 2000 including Stiglitz and Weiss (1981), Cho (1986), Myers and Majluf (1984), Greenwald, Stiglitz, and Weiss (1984), de Meza and Webb (1987), and Hellmann and Stiglitz (2000).

[5]A large literature including Hadlock and Pierce (2010), Krishnan, Nandy, and Puri (2014), Hoberg and Maksimovic (2014), and Levenson and Willard (2000) studied the US, and McCarthy, Oliver, and Verreynne (2017), Farinha and Félix (2015), and Steijvers (2013) studied other advanced economies.

[6]Tamwilcom (formerly *Caisse Centrale de Garanties*) has a long history as a credit institution dating back to 1949. Since its reform in 2012, Tamwilcom has started to focus on SME-related loan guarantees (Tamwilcom, 2013-2018).

The procedure for applying for a loan guarantee is as follows. Firms that apply for bank loans at these four leading banks and that are deemed "risky" due to insufficient collateral but are still eligible for guarantees are transferred to Tamwilcom for further assessment. Once approved, the bank grants credit to qualified borrowers, and Tamwilcom underwrites a share of the loan.

Details of the Loan Guarantee Programs Among a range of products offered by Tamwilcom, we focus on two main products catering to the firm's working capital needs, Damane Exploitation which is renamed as Damane Atassyir after 2019, and Damane Express.

Damane Exploitation targets medium-sized firms with sales below 175 million dirhams (approximately 18 million US dollars) requesting a short-term loan of up to 18 months. For most firms approved for Damane Exploitation, the threshold has not been binding; approximately 92% of firms in the program have a sales number below 100 million dirhams. The loan size varies substantially, ranging from 180 million to as small as 1 million. Tamwilcom guarantees 60% of the loan and requires a commission fee of 0.5% of the loan amount. The guarantee request can be approved within ten days. Damage Exploitation is a product that explicitly targets working capital loans or credit lines.

Damage Express is a newer product designed explicitly for small firms with a much-simplified process and a fast approval period of 48 hours. It deals with loans below 1 million dirhams and provides a guarantee coverage of up to 70%. The commission fee is 0.5% for maturity loans up to 12 months and 1.5% for those beyond 12 months. We focus on a subset of Damane Express guarantees covering working capital loans. Since both programs are designed to alleviate credit constraints of firms ranging from small to medium and jointly cover all SMEs, we will evaluate both programs together as one treatment. As we can see in Figure 4, the distribution of sales for firms guaranteed under both products is smooth. It implies that firms self-select into different programs based on the number of their liquidity needs. There is no obvious cutoff in requirements for the two products.

2.2 Databases, Sample Construction, and Statistics

Our analysis merges the loan-level data from Tamwilcom with Orbis firm-level data.

Loan-level Data The first database used in this paper is a confidential loan-level database from Tamwilcom. The database includes firm identifiers (name, national ID, address, creation date) and loan characteristics (loan approval date, maturity, loan amount, guarantee amount, commission, and maturity). It provides information on 43,195 loans associated with 23,017 firms guaranteed by Tamwilcom from 2009 to 2019. The total number of guaranteed loans amounts to 87 billion

Our study focuses on the post-reform period from 2012 to 2018.

dirhams, which constitutes about 3.2% of the total short-term loans extended to SMEs in Morocco.[7]

Firm-level Data The second database used in this paper is the Orbis firm-level database, a commercial database by Bureau van Dijk (henceforth BvD). BvD collects firm-level balance sheet data from a country's business register, the Office of Industrial and Commercial Property (OMPIC) for Morocco, and then standardizes to its global format. Despite the suitability of the database, Orbis has several issues related to data coverage.[8] The most important one is the reporting bias, as several firms, especially small firms, do not report their balance sheet to OMPIC, or only partially. We discuss later how we take this bias into account in our methodology.

Sample Construction We first clean the Orbis firm-level data following Kalemli-Ozcan et al. (2015): (i) we deflate data series by the Moroccan national GDP deflator from the World Bank (2007 base); (ii) the entire series of company data is dropped if total assets, sales, tangible fixed asset are negative in any year; (iii) values of zero are dropped for all financial variables; (iv) the series are winsorized by year at 1% (Amamou, Gereben, and Wolski, 2020); (v) as a final step, we exclude firms that are in the finance and insurance, public administration and utilities sectors, as firms in these sectors are not eligible for Tamwilcom guarantees. We then pair the guaranteed firms in the Tamwilcom database with their balance sheet data in the Orbis firm-level database. See Appendix A for details.

Sample Statistics After linking the Tamwilcom database to Orbis, we can identify 11,344 out of 23,017 guaranteed firms in the Orbis database, implying a rate of the successful pairing of 49.3%. Further participation of identified and unidentified guaranteed firms in Orbis shows that the two groups have similar characteristics. As Table 9 in the Appendix shows, loan amount, guaranteed amount, and sales reported by Tamwilcom are comparable for the two groups. One notable difference is that firm size is slightly higher for the subset of guaranteed firms that have been merged with Orbis data. This is expected since small firms usually report less complete information, making it less likely to be identified in Orbis. We provide an extensive discussion on the merged sample in Appendix A.

It should be pointed out that a substantial portion of the successfully paired firms does not have data coverage for financial variables. Only 7505 firms have sales data for the year where it is granted the guarantee. The number drops even further when a panel of at least three consecutive years is required for the matching process later. In fact, only 2.2% of the Tamwilcom-guaranteed firms are in the final matched sample. The rate is admittedly low but consistent with other studies

[7] It should be noted that canceled guarantees are excluded, and we only consider the first guarantee in case of renewal in our empirical analysis.

[8] Please refer to Kalemli-Ozcan et al. (2015) for careful discussions.

that use Orbis as a source of firm-level data.[9] Our main concern is the attrition of small firms in the final sample. To correct for this bias, we follow Amamou, Gereben, and Wolski (2020) and use the technique of inverse probability weight (henceforth IPW) to recover the shares of firms of different sizes in the original treated population as a robustness check.

2.3 Empirical Strategy

We do not observe the counterfactual outcome of a guaranteed firm in the absence of the treatment, which poses a challenge to establishing a clear causal link between the treatment and firm-level outcomes. This amounts to the standard selection bias problem in impact evaluation studies.[10] Our empirical strategy to account for this selection problem is to combine pre-treatment matching with the difference-in-difference (DID) method, based on a large body of literature originating from Heckman, Ichimura, and Todd (1997).

The matching, implemented under the assumption of "selection on observables," consists of finding statistical twins (control firms) for a guaranteed firm based on a series of time-varying and observable variables relevant to selection into the program. The DID method controls for unobservable group-specific time effects, where the "group" refers to the treated firm and her control firms. Following the two steps, differences in outcome variables between treated and control firms can be effectively attributed to the guarantees.

Matching We use the Mahalanobis distance matching (MDM) method to construct a control sample, in which a treated firm is matched with five nearest "neighbors." The Mahalanobis distance is a matrix that measures the multivariate proximity between two observations based on selected variables. Following Caliendo and Kopeinig (2008) recommendation, we choose the matching variables based on the existing literature and on the institutional setting. As a result, total assets, sales, current liabilities, and cash and cash equivalents, together with firm age, are used to measure the statistical distance between observations.

Total assets and sales are selected as matching criteria since they are essential to balance sheet items, which reflect the firm's size and overall performance. Current liabilities, namely short-term debt, shed light on the firm's ability to rely on bank credit and the amount of existing

[9]In Amamou, Gereben, and Wolski (2020), only 13.25% of the original guaranteed observations are included; Asdrubali and Signore (2015) record a rate of 18.3% and Gereben et al. (2019) report a rate of only 3.6%. In Brown and Earle (2017), 14% of the initial loan sample ends up in the final one. These studies focus on the EU and the US, which have better data coverage. The low pairing rate for a developing country such as Morocco is expected.

[10]The selection bias refers to the fact that firms that are selected into the guarantee program are likely those who have high-performing balance sheets and therefore have a higher probability of achieving higher sales even without guarantees. Consequently, if a direct comparison is conducted between guaranteed and non-guaranteed firms, the estimates are expected to be biased upwards.

indebtedness and risks associated with external credit. Cash and cash equivalents contain short-term investments and funds that can be used for paying current invoices, representing the firm's liquidity situation. The selected financial variables are log-transformed.

The matching is based on the firm's three-year history before receiving the credit guarantee. Firms with insufficient data coverage are inevitably excluded from the matching procedure. We apply exact matching on the sector, year, and firm size classification. We further divide the firms into 20 quantiles based on their sales and impose exact matching on their quantile bin. The purpose is to maximize the similarities between firms that are matched while maintaining a decent sample size. In robustness tests, we extend the three-year pre-treatment period to four and five. Our results are robust for both tests.

It is worth noting that we conduct a new round of matching for each outcome variable in Section 2.4. In each round, we impose two requirements to ensure sample quality. First, we restrict the sample used for matching only to firms with data points for that outcome variable in that year. If a firm's data is missing for this variable in that period, this observation is dropped automatically. This is to make sure that we match firms that actually have data for the specified outcome variable to be tested in the regression. Second, we drop out outliers for that outcome variable before conducting matching.[11]

A guaranteed firm is matched with a maximum of five closest control firms based on their Mahalanobis distances. Matched observations of treated firms are assigned a weight of one, whereas those of control firms are allocated a weight based on their distance from the corresponding treated firm. Section B in the Appendix provides more details about the matching procedure (choice of the caliper, weighting of observations).

Matching Outcomes All matched samples are similar in characteristics. For ease of discussion on matching outcomes, we hereby use as a representative sample the one where the outcome of interest is sales growth between year $t + 1$ and year $t - 1$. We obtain a final matched sample of 506 guaranteed firms and 1937 control firms, among which 60% have been matched only once, and 26% are used twice. The maximum number of times that a control firm has been matched is eight. There are only eight firms in this situation. Since the majority of the untreated firms are matched only once, we expect the estimation results to be similar to that of a matching procedure done without replacement. This is confirmed later by a robustness check.

We check the balancedness of the matched sample. Figure 1 illustrates the weighted average of the log value of the four variables used in matching. It confirms the parallel pre-treatment trend between the treated and control firms and provides preliminary evidence on the dynamic

[11] We have 18 outcome variables, all of which are log-changes of certain financial variables. An observation is considered an outlier if that log change exceeds 10.

Figure 1: Trend Inspection of Four Financial Variables Used in Matching

Notes: This figure depicts the weighted average of the log values of sales, total assets, current liabilities, and cash in years $t-3$ to $t+3$ of treated and control firms in the final matched sample. Confidence intervals are at the 95% level.

impact of working capital loan guarantees on a firm's growth. As shown in Figure 1, guaranteed firms experience growth in sales, total assets, current liabilities, and a decline in cash. This will be confirmed later in the regressions. Overall, standard balancedness tests indicate a good balance in the sample (see Appendix B for details).

As for the level of financial variables before treatment, it is similar, except for cash. Guaranteed firms have a lower level of cash holding on average compared to their matched control firms. This is likely linked to the firm's short-term credit demand. Firms that apply for a guarantee have insufficient cash to cover their liquidity needs. In order to address this issue, we conduct two robustness tests of a matching procedure focused only on cash-related variables. We show that the results are consistent. It is discussed in detail in Section C in the Appendix.

Difference-in-difference Regression Our difference-in-difference regression follows the setup of Brown and Earle (2017):

$$\Delta Y_{igt} = \delta D_{it} + \lambda_{gt} + \epsilon_{igt}, \tag{1}$$

where i indexes the firm, g is the group (the guaranteed firm and its matched control firms), and

t is the year. The dependent variable ΔY_{igt} is the change in the selected outcome variable in the post-treatment period compared to the year prior to obtaining the guarantee. It has the form $\Delta Y_{igt} = Y_{igs} - Y_{igt-1}$, where year $t-1$ is considered as the base year and $s = t+1, t+2, t+3$ refer to three post-treatment years. Since all variables are in logs, the dependent variable can be read as a growth rate. D_{it} is a dummy variable indicating if firm i has been granted a guarantee in year t. λ_{gt} are the group-year fixed effects, which control for the group-specific trend. We also include city-year fixed effects to control local demand and financial conditions. Other fixed effects (sector, year, and size) are not incorporated since a group of guaranteed, and control firms share the same characteristics in these dimensions. Firm-level fixed effects are not included since our dependent variable has differenced out any individual fixed effects relevant to the outcome. Standard errors are clustered at the group-year level.

2.4 Estimation Results

Fact 1: Firms with guaranteed short-term loans expand their production scale homogeneously and persistently. We explore the impact of loosening credit constraints on SMEs' production scale, measured in sales growth, total assets growth, costs of employees growth, and fixed assets growth. Columns (1) to (3) of Table 1 report the estimation results for sales growth. The firms' sales growth under a Tamwilcom guarantee increases by 14%, compared to the pre-treatment period, relative to non-guaranteed firms. The impact is close to 13% in the third year after obtaining the guaranteed loan. This large and significant effect on sales indicates that the relaxation of credit constraints leads to a firm's expansion in production. As shown in Figure 6, the pre-treatment trend (year $t-3$ and $t-2$) of this coefficient on sales growth is not significant. This corroborates the fact that the positive growth impact comes from the guaranteed loan. Columns (4) to (6) of the Table report the significant and positive effect of the guarantee on total assets. This shows that the firm simultaneously increases its net worth. All in all, access to the loan guarantee generates a persistent increase in firm scale.

Table 2 provides an estimate of the impact of the guarantee on the firm's production inputs. We use the variable "costs of employees" to detect changes in a firm's hiring since we do not have good coverage of the number of employees in the Orbis database. As Table 2 shows, labor costs increase by 11.5% in the year following the grant of a guarantee relative to non-guaranteed firms and remain 10.6% and 10.5% higher in the two following years. Along with the increase in the wage bill, guaranteed firms also experience a 20.3% increase in fixed tangible assets in the second year after the treatment, according to Table 2, and a 22.4% increase in the third year after the treatment. This variable is a good proxy for investment in productive assets (Amamou,

Table 1: Estimation Results of Firm's Sales and Total Assets

	(1)	(2)	(3)	(4)	(5)	(6)
	Sales Growth			Total assets Growth		
	t+1	t+2	t+3	t+1	t+2	t+3
Guaranteed	0.140***	0.053	0.128*	0.088***	0.079+	0.149**
	(0.024)	(0.038)	(0.055)	(0.023)	(0.044)	(0.050)
N	18836	10770	5670	19150	11133	6015
adj. R^2	0.209	0.197	0.264	0.191	0.215	0.214
Group × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
City × Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table reports the coefficients of treatment ("Guaranteed") from the DID regression (1). Each outcome variable in each year is based on a different matched sample where we drop firms without data for that outcome variable in that year before matching and excluding outliers. The dependent variable "Sales Growth" is the log difference between sales in year $t+1$, $t+2$ or $t+3$, and sales in year $t-1$. The dependent variable "Total Assets Growth" is the log difference between total assets in year $t+1$, $t+2$ or $t+3$, and total assets in year $t-1$. "Guaranteed" indicates that a firm receives a Tamwilcom guarantee in year t. Group-year and city-year fixed effects are included. Standard errors are clustered at the group-year level. Significance level: $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 2: Estimation Results of Tamwilcom Guarantee on Firm's Labor Costs

	(1)	(2)	(3)	(4)	(5)	(6)
	Costs of Employees Growth			Fixed Assets Growth		
	t+1	t+2	t+3	t+1	t+2	t+3
Guaranteed	0.115***	0.106**	0.105*	0.094	0.203*	0.224+
	(0.021)	(0.036)	(0.052)	(0.058)	(0.080)	(0.128)
N	17854	10424	5418	18744	10853	5891
adj. R^2	0.252	0.227	0.240	0.192	0.194	0.183
Group × Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table reports the coefficients of treatment ("Guaranteed") from the DID regression (1). Each outcome variable in each year is based on a different matched sample where we drop firms without data for that outcome variable in that year before matching and excluding outliers. The dependent variable "Costs of Employees Growth" is the log difference between labor costs in year $t + 1$, $t + 2$ or $t + 3$, and labor costs in year $t - 1$. The dependent variable "Fixed Assets Growth" is the log difference between fixed tangible assets in year $t + 1$, $t + 2$ or $t + 3$, and fixed tangible assets in year $t - 1$. "Guaranteed" indicates that a firm receives a Tamwilcom guarantee in year t. Group-year and city-year fixed effects are included. Standard errors are clustered at the group-year level. Significance level: $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Gereben, and Wolski, 2020). It shows that guaranteed firms allocate more resources to long-term productive assets, which is consistent with an expansion in productive capacities.

Fact 2: Firms with guaranteed short-term loans do not increase their cash holdings and increase their current liabilities. We explore firms' changing position in current liabilities and cash, which is summarized in Table 3. There is a growth of 13.8% in short-term leverage associated with treated firms. This arises naturally from the buildup of current liabilities resulting from newly granted working capital loans. On the opposite, we observe stagnation and even a weak decline in cash for guaranteed firms. The effect is significantly negative at about 21% in the second year after the treatment and is insignificant after three years. This result, combined with Fact 1, implies that cash decreases in proportion to the production scale. This highlights the precautionary motive for holding cash for financially constrained firms, which have to self-insure against liquidity risk (Abel and Panageas, 2020; Han and Qiu, 2007). When a guarantee reduces the liquidity risk for short-term loans, the firm reduces the accumulation of precautionary liquid assets and redirects them to production-related activities. This is an important growth channel for financially constrained firms.

Table 3: Estimation Results of Tamwilcom Guarantee on Firm's Current Liabilities

	(1)	(2)	(3)	(4)	(5)	(6)
	Current Liabilities Growth			Cash Growth		
	t+1	t+2	t+3	t+1	t+2	t+3
Guaranteed	0.138***	0.119**	0.194***	-0.061	-0.210^{+}	0.089
	(0.027)	(0.039)	(0.049)	(0.091)	(0.121)	(0.152)
N	19448	11262	6012	18766	10690	5816
adj. R^2	0.204	0.203	0.163	0.322	0.303	0.289
Group × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
City × Year FE	Yes	Yes	Yes	Yes	Yes	Yes

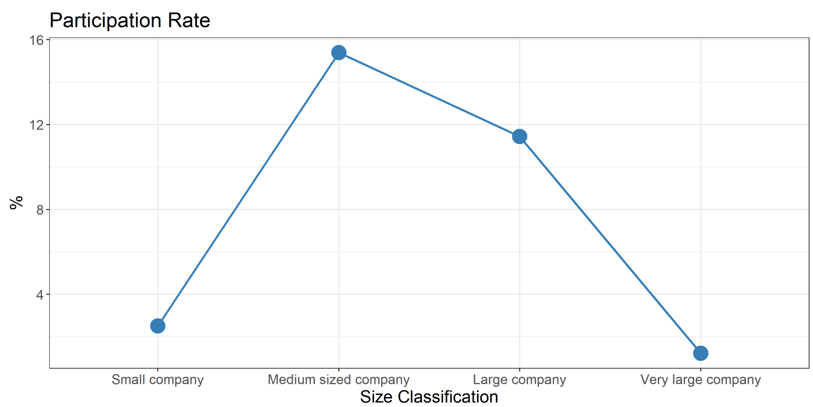
Note: This table reports the coefficients of treatment ("Guaranteed") from the DID regression (1). Each outcome variable in each year is based on a different matched sample where we drop firms without data for that outcome variable in that year before matching and excluding outliers. The dependent variable "Current Liabilities Growth" is the log difference between current liabilities in year $t + 1$, $t + 2$ or $t + 3$, and current liabilities in year $t - 1$. The dependent variable, "Cash Growth" is the log difference between cash and cash equivalents in years $t + 1$, $t + 2$ or $t + 3$, and cash and cash equivalents in years $t - 1$. "Guaranteed" indicates that a firm receives a Tamwilcom guarantee in year t. Group-year and city-year fixed effects are included. Standard errors are clustered at the group-year level. Significance level: $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Robustness Checks We perform the following robustness checks. (1) we match firms based on more pre-treatment years, (2) we deal with data attrition by using an inverse probability weighing, (3) we match only on cash-related variables, and (4) we vary the matching method. All the results are reported in Appendix C. Our results remain mostly unchanged.

2.5 Participation in the Loan Guarantee Program

Fact 3: Participation in the guarantee program is humped-shaped in firm size. We finally examine the participation rate in the loan guarantee program of all firms in our Orbis sample. Figure 2 represents the percentage of Orbis firms that have been identified as benefiting from a guarantee, which is an estimate of the participation rate. The participation rate is humped-shaped, as both small and very large companies have a small rate compared to medium and large firms. This humped-shaped distribution is maintained if we check the participation rate by quantile bins of total assets. Figure 7 in the Appendix provides more details on this. It is important to note that these results are biased by the size-dependent probability of Tamwilcom firms being paired with Orbis firms, as this probability is increasing in firm size. In particular, the probability of a small firm being paired may be underestimated. However, the probability of a small firm being paired is 1.7 times lower than that of a medium firm (30% versus 52%). This cannot explain the strong difference in the estimated participation rate.

Figure 2: Participation Rate by Size



Notes: This figure shows the participation rate by size of our Orbis firm sample in Morocco. The size classification defines very large companies as those with operating revenue larger than 100 million euros, total assets larger than 200 million euros, and more than 1000 employees. Large companies are referred to as those with operating revenue larger than 10 million, total assets larger than 20 million euros, and more than 150 employees. Medium-sized companies are those with operating revenue larger than 1 million euros, total assets larger than 2 million euros, and more than 15 employees. All the remaining companies are defined as small. The participation rate is calculated as the ratio of the number of guaranteed firms to the total number of firms existing in Orbis.

3 The Model

We consider an economy with heterogeneous entrepreneurs facing collateral constraints and working capital constraints. Time is discrete. There is a unit mass of entrepreneurs. Each entrepreneur who owns a firm $i \in [0,1]$ is subject to idiosyncratic productivity shock. Firms decide how much investment to undertake, how much labor to hire, how much debt to issue, how much cash to hold, and how much dividends to pay. Firms face three frictions that will help match the three facts documented in Section 2: 1) external financial friction in the form of a collateral constraint and a working capital constraint, 2) intertemporal distortions in the form of an exogenous exit risk and an erosion on net worth and 3) imperfect selection into the guarantee program in the form of a stochastic entry cost.

3.1 Production Firm's Problem

Technology Each firm i produces with idiosyncratic stochastic productivity $z_{i,t}$, capital $k_{i,t}$, and labor $l_{i,t}$ using the production function $y_{i,t} = z_{i,t}F(k_{i,t}, l_{i,t})$, where $z_{i,t}$ is the stochastic idiosyncratic following an exogenous Markov process $\log(z_{i,t}) = \rho_z \log(z_{it-1}) + \sigma_z \varepsilon_{i,t}$. And $\varepsilon_{i,t}$ follows a standard normal random process. The input combination $F(k_{i,t}, l_{i,t})$ features decreasing returns to scale.

Working Capital Constraint At the beginning of each period, before the realization of their productivity shocks, firms pay in advance for their working capital: they are required to pay upfront their current period wage bill $w_t l_{i,t}$ before production. They can finance this working capital through both internal and external funds: they can use their cash holdings $c_{i,t}$ or a short-term credit line $b_{i,t} \leq \bar{b}_{i,t}$. Therefore, the working capital constraint is $w_t l_{i,t} \leq c_{i,t} + \bar{b}_{i,t}$.

Collateral Constraint The short-term credit line $b_{i,t} \leq \bar{b}_{i,t}$ of firm i is constrained by its collateral. Since firms can easily transfer their liquid asset (cash holdings), banks only consider their illiquid asset (fixed capital) as collateral. Besides, the resale of firms' fixed capital would incur higher average costs, i.e., organizing a firm restructuring incurs some fixed costs, which will be higher when divided by the capital of a smaller firm. The collateral constraint is therefore nonlinear and is of the general form $\bar{b}_{i,t} \equiv \Theta(k_{i,t})$, where $\Theta(k_{i,t})$ will be specified later.

3.2 Loan Guarantee Program for Firms

To model the loan guarantee program in Morocco realistically, we adapt our setup to match the institutional status of Moroccan firms. First, a large fraction of credit in Morocco is in the form of informal third-party credit, which could hardly be guaranteed by the government. Therefore, we assume two sources of credit: a proportion s comes from formal bank loans, and a proportion $(1-s)$ is from informal third-party credit. Firm i can apply for a loan guarantee program (henceforth LGP) only for their bank loans.

Second, the LGP does not restrict large firms from applying; the hump-shaped participation rate over size shown in section 2.5 mainly reflects self-selection. So we do not constrain firm size to participate in the LGP in the model. Besides, a firm's selection into LGP is not perfectly reflecting its profitability. Therefore, we assume that firms participating in the LGP incur a uniformly distributed random fixed participation cost $\xi \in [0, \bar{\xi}]$.[12]

Finally, upon successfully getting the guaranteed loan, the firm pays a commission fee of μ for the guaranteed part $(\chi - 1)sb_{i,t}$ to the government.

Let $F = \{A, N\}$ indicate whether an SME firm decides to pay the fixed participation cost. When $F = A$, the firm pays the participation cost and relaxes its borrowing constraint, and when $F = N$, the firm does not pay the participation cost and can only borrow up to its original collateral constraint. Therefore, the effective constraint that firm face depend on F:

$$b_{i,t} \leq \begin{cases} (1 + (\chi - 1)s)\Theta(k_{i,t}) & if\, F = A \\ \Theta(k_{i,t}) & if\, F = N \end{cases}$$

where χ is a multiplier larger than 1, which reflects the ratio of the loan guaranteed by the government, i.e., if the government guarantees 60% of the bank loan, then $\chi = \frac{100\%}{100\% - 60\%} = 2.5$. The firm can now borrow up to χ times its formal bank loans as part of the collateral constraint.

3.3 Recursive Problem for Firms

The individual state variables of a firm are its idiosyncratic productivity $z_{i,t}$ and its starting net worth $n_{i,t-1}$ of the firm entering period t. Firms' decisions are divided into two sub-periods. In the first sub-period, firms make production and working capital decisions. In the second sub-period, they make consumption and saving decisions.

Production Decisions In the first sub-period, firms maximize their total net revenue given their productivity and starting net worth. The firm decides how much capital $q_t k_{i,t}$ to invest, how much cash $c_{i,t}$ to hold, and whether to actively engage in the loan guarantee program $F_{i,t}$. Given

[12] This random fixed cost setup is widely used in the lumpy investment literature, i.e., Khan and Thomas (2008), Fang (2020), and Fang (2022). It is also introduced in Chen, Deng, and Fang (2022) for patent collateral participation. It helps to match the fact that firms' decisions to get into loan guarantee programs are not perfectly sorted from their states of productivity and net worth, which helps to match the data better.

the presence of the working capital constraint and the collateral constraint, the firm maximizes its end-of-period total net worth

$$\pi^*(z_{i,t}, n_{i,t-1}, F_{i,t}) = \max_{k,c,l} \left\{ z_{i,t}F(k_{i,t}, l_{i,t}) - w_t l_{i,t} + (1-\delta)q_t k_{i,t} + (1+r_t)c_{i,t} - r_t b_{i,t} - F_{i,t} \cdot \mu \tilde{b}_{i,t} \right\} \tag{2}$$

subject to the constraints

$$n_{i,t-1} = q_t k_{i,t} + c_{i,t} \tag{3}$$

$$w_t l_{i,t} \leq c_{i,t} + F_{i,t} \cdot (1 + (\chi - 1)s)\Theta(k_{i,t}) + (1 - F_{i,t}) \cdot \Theta(k_{i,t}) \tag{4}$$

$$\tilde{b}_{i,t} = (\chi - 1)s(w_t l_{i,t} - c_{i,t}) \tag{5}$$

$$b_{i,t} = w_t l_{i,t} - c_{i,t} \tag{6}$$

where $F_{i,t} = 1$ (or A) denotes that the firm participates in the loan guarantee program and $F_{i,t} = 0$ (or N) denotes that the firm is not participating in the loan guarantee program.

Consumption/saving Decisions and Intertemporal Distortions In the second sub-period, entrepreneurs make saving and consumption decisions. Entrepreneurs face two intertemporal distortions that are relevant to their consumption/saving choices. The first is due to the high exit risk that firms face in emerging countries. We assume an exogenous survival rate $\epsilon < 1$. Exiting firms are replaced with the same measure of entrants with an initial low net worth $\underline{n}_0$. The second is the "erosion" of the firm's net worth, which we represent through a tax on net worth $\tau \geq 0$. Such erosion could come from red tape, corruption, and expropriation risk, and captures the entrepreneur's potential losses on their net worth in developing countries. Both the exit risk and net worth erosion work as intertemporal distortions. We will use our Moroccan firm-level data to discipline both distortions and quantify their effects on the economy.

The firms maximize their value function $v(z_{i,t}, n_{i,t-1}, F_{i,t})$ given their end of period total net revenue $\pi^*(z_{i,t}, n_{i,t-1}, F_{i,t})$. We write the entrepreneur's optimization recursively. The value function of the firm maximizing the present value of current and future dividends must satisfy:

$$v(z_{i,t}, n_{i,t-1}, F_{i,t}) = (1-\epsilon)\frac{n_{i,t-1}^{1-\eta}}{1-\eta} + \epsilon \max_{d_{i,t}} \left\{ \frac{d_{i,t}(z_{i,t}, n_{i,t-1}, F_{i,t})^{1-\eta}}{1-\eta} + \beta E_z[\tilde{v}(z_{i,t+1}, n_{i,t})] \right\} \tag{7}$$

where the entrepreneur's periodic utility of consumption (using dividends) is identical to other households. The net worth follows the accumulation rule:

$$n_{i,t}(z_{i,t}, n_{i,t-1}, F_{i,t}) = (1-\tau) \left\{ \pi^*(z_{i,t}, n_{i,t-1}, F_{i,t}) - d_{i,t}(z_{i,t}, n_{i,t-1}, F_{i,t}) - \xi_{i,t} \right\} \tag{8}$$

Finally, we denote $\tilde{v}(z_{i,t+1}, n_{i,t})$ as the value of the firm before drawing the new participation cost, which is $\tilde{v}(z_{i,t11}, n_{i,t}) = \frac{\xi^*(z_{i,t+1},n_{i,t})}{\bar{\xi}} v(z_{i,t+1}, n_{i,t}, A) + (1 - \frac{\xi^*(z_{i,t+1},n_{i,t})}{\bar{\xi}}) v(z_{i,t+1}, n_{i,t}, N)$, where $\xi^*(z_{i,t+1}, n_{i,t})$ corresponds to a threshold participation cost:

$$\xi^*(z_{i,t}, n_{i,t-1}) = \frac{\pi^*(z_{i,t}, n_{i,t-1}, A) - \pi^*(z_{i,t}, n_{i,t-1}, N)}{w_t} \tag{9}$$

Firms with state $(z_{i,t+1}, n_{i,t})$ who draw the fixed cost higher than $\xi^*(z_{i,t+1}, n_{i,t})$ will not participate in the loan guarantee program, otherwise, they pay the drawn fixed cost and join the program. $\xi^*(z_{i,t+1}, n_{i,t})$ is bounded between 0 and $\bar{\xi}$.

3.4 Other Households and Capital Good Producer

The general equilibrium model is completed by introducing a unit mass of identical households and the capital good producer.

Households There is a unit measure continuum of identical households with preferences over consumption C_t and labor supply L_t whose expected utility is as follows:

$$E_0 \sum_{t=0}^{\infty} \beta^t \left(\frac{C_t^{1-\eta}}{1-\eta} - \theta \frac{L_t^{1+\omega}}{1+\omega} \right)$$

subject to the budget constraint $C_t + \frac{1}{1+r_t} B_t \leq B_{t-1} + W_t L_t$, where β is the discount factor of households, θ is the disutility of working, r_t is the interest rate, B_t is a one period bonds, and W_t is the wage. Households choose consumption, labor, and bonds, which supply two Euler equations that determine both the wage and the interest rate:

$$w_t = -\frac{U_l(C_t, L_t)}{U_c(C_t, L_t)} = \theta L_t^{\omega} C_t^{\eta} \tag{10}$$

$$\frac{1}{1+r_t} = \beta \frac{U_c(C_{t+1}, L_{t+1})}{U_c(C_t, L_t)} = \beta \Big(\frac{C_t}{C_{t+1}} \Big)^{\eta} \tag{11}$$

Capital Good Producer There is a representative capital good producer who produces new aggregate capital using the technology $\Phi(I_t/K_t)K_t$, where I_t are units of the final good used to produce capital, $K_t = \int k_{jt} dj$ is the aggregate capital stock at the beginning of the period, $\Phi(I_t/K_t) = \frac{\delta/\phi}{1-1/\phi} \left(\frac{I_t}{K_t} \right)^{1-1/\phi} - \frac{\delta}{\phi - 1}$, and δ is the steady-state investment rate. Profit maximization pins down the relative price of capital as $q_t = \frac{1}{\Phi'(I_t/K_t)} = \frac{I_t/K_t}{\delta}^{1/\phi}$.

3.5 Equilibrium Definition

We now characterize and define the equilibrium of the model. We first define the stationary equilibrium without considering any aggregate shocks, including swifts in the government loan guarantee policies. The economy is at its steady-state given current government policies.

Definition 1 (Stationary Equilibrium) *A Stationary Equilibrium for this economy is defined by a set of value and policy functions* $\{v(z,n,F),\ \xi^*(z,n),\ k(z,n,A),\ k(z,n,N),\ c(z,n,A),\ c(z,n,N),\ l(z,n,A),\ l(z,n,N),\ \pi(z,n,A),\ \pi(z,n,N),\ d(z,n)\}$*, a set of quantity functions* $\{C,\ L,\ Y,\ K\}$*, a set of price functions* $\{w,\ r,\ q\}$*, and a distribution* $\mu'(z,n)$ *that solves the firm's problem, capital good producer's problem, household's problem, and market clearing of labor and final goods such that:*

1. *[Firm Optimization] Taking the aggregate prices* $\{w,r,q\}$ *as given,* $\{V(z,n), \xi^*(z,n), k(z,n,N), c(z,n,A), c(z,n,N), \pi(z,n,A), \pi(z,n,N), d(z,n)\}$ *solve the firms' static choices of production and financing and the dynamic choice of net worth and dividend.*

2. *[Household and Capital Good Producer Optimization] Taking the aggregate prices* $\{w,\ r,\ q\}$ *as given,* C *and* L *solve the household's utility maximization problem and* $I = \delta K$ *solves the capital producer's maximization problem.*

3. *[Market Clearing] Given the aggregate prices* $\{w,\ r,\ q\}$ *as given, the labor market clears* $L = \int l_j d\mu'(z,n)$*, and the final goods market clears* $Y = C + I$*.*

4 The Mechanisms in a Special Case

Before we turn to the quantitative analysis of the full model, we consider a simple, special case of the model in partial equilibrium to illustrate the main mechanisms that could explain our empirical findings and discuss their aggregate implications. Specifically, we show how, in the joint presence of collateral constraints and working capital constraints, getting access to the loan guarantee program alleviates cash liquidity needs, and more resources are allocated to productive capital (Fact 2).

We also discuss two key mechanisms that help explain the facts further. First, while the loan guarantee always benefits firms in the short run, the guarantee has an effect on the firm's long-run scale (Fact 1) only in the presence of intertemporal distortions. We show that these intertemporal distortions reinforce the long-term impact of the guarantees. Second, a fixed participation cost prevents small and productive firms from entering the guarantee program, while a size-dependent collateral constraint lowers the incentives of large firms to enter the program (Fact 3).

4.1 Specifications of the Special Case

We consider here a special case of SME firms defined as follows:

Definition 2 (A Special Case) *In the special case, we make the following assumptions:*

1. *The technology is Leontief, and productivity is constant:*

$$y_t = Z[min(k_t, a^{-1}l_t)]^{\alpha} \tag{12}$$

where Z is the firm's constant total productivity, which also stands for the permanent differences between firms for size, a^{-1} measures the relative labor productivity of the firm, and α is the curvature of the production function.

2. *The collateral constraint is linear: $\Theta(k_t) = \theta k$. Note that in a conventional calibration, labor share relative to capital share is ($a = 2$), and $\theta \leq 1$, so we assume $a >> \theta$ always holds.*

3. *The loan guarantee does not incur any fee: $\mu = 0$ and the participation cost is zero: $\xi = 0$.*

4. *The wage, the price of capital, and the interest rate are constant (partial equilibrium): $w_t = q_t = 1$ and $1 + r_t = 1/\beta$.*

In what follows, we discuss the effects of short-term finance in the form of loan guarantee programs on the SME's optimal choices of capital and cash as well as the growth of the SME. The loan guarantee programs provided by a government agency help to scale up the SME's pledgeable share of its capital (θ) from a θ_{low} ($F = N$) to a θ_{high} ($F = A$) where the additional share ($\theta_{high} - \theta_{low}$) is guaranteed by the government. We compare the trajectories of an SME in two worlds, one in which it obtains access to the guarantee and one in which it does not.

With the Leontieff assumption, $l_t = ak_t$ always holds. Define ψ_t as the equilibrium profits. Assuming that the SME behaves competitively so that the cost of labor is equal to its marginal return, then $\psi_t = \psi(k_t) = Z\alpha k_t^{\alpha} - ak_t$. We consolidate the SME's problem, represented by (2) and (7). The SME's choice can be summarized by the following maximization:

$$v(n_{t-1}) = \max_{k_t, c_t, d_t, n_t} \left\{ \frac{d_t^{1-\eta}}{1-\eta} + \beta \epsilon v(n_t) \right\} \tag{13}$$

subject to the constraints

$$(1 - \tau)[\psi(k_t) + (1 - \delta)k_t + (1 + r_t)c_t] - d_t - n_t \geq 0 \tag{14}$$

$$n_{t-1} \geq k_t + c_t \tag{15}$$

$$c_t + \theta k_t \geq a k_t \tag{16}$$

$$c_t \geq 0 \tag{17}$$

4.2 Reallocation of Resources from Cash to Capital

In the first step, we analyze how scaling up the SME's pledgeable share from a θ_{low} to a θ_{high} affects the static choice of SME's production and financing decisions given its net worth n_t.

Denote by η_t the shadow price of the budget constraint (14), and $\gamma_t\eta_t(1-\tau)$, $\lambda_t\eta_t(1-\tau)$ and $\zeta_t\eta_t(1-\tau)$ the shadow prices of, respectively, the net worth allocation constraint (15), the working capital constraint (16) and the non-negative cash constraint (17). The shadow prices are normalized by $[\eta_t(1-\tau)]^{-1}$ for convenience. From the first-order conditions of objective (13) with respect to capital and cash holdings, we can derive the following relationship between the marginal benefit of capital (MBK) and marginal benefit of cash holding (MBC) through the three shadow prices.[13]

$$\gamma_t = MBK_t = MBC_t + \zeta_t \tag{18}$$

where the marginal benefit of capital (MBK) and marginal benefit of cash holding (MBC) are

$$\begin{aligned} MBK_t &= \underbrace{(\psi'(k_t) + 1 - \delta)}_{\text{Physical Return}} + \underbrace{\lambda_t(\theta - a)}_{\text{Shadow Return of Finance}} \\ MBC_t &= \underbrace{1 + r_t}_{\text{Physical Return}} + \underbrace{\lambda_t}_{\text{Shadow Return of Finance}} \end{aligned}$$

with $\psi'(k_t) = Z\alpha k_t^{\alpha-1} - a$. Both capital and cash holding have a physical return and a shadow return of finance. These physical and shadow returns may differ. First, capital has a large physical return $(\psi'(k_t) + 1 - \delta)$ for a sufficiently small SME, while cash has a low physical return. Second, capital has a negative shadow return of finance $(\lambda_t(\theta - a))$.[14] Increasing the capital stock increases the demand for labor and hence the need for working capital, thus increasing the tightness of the collateral constraint. However, cash provides a positive marginal shadow return of finance ($\lambda_t > 0$) because increasing cash reduces the need for external working capital funds, thus relaxing the tightness of collateral constraint.

The optimal choice of a constrained SME whose demand for cash is positive ($\zeta_t = 0$), that

[13]The derivation process is at the appendix E.1

[14]Since a measures the input share of labor relative to capital which is usually assumed to be around 2, without loss of generality, $a >> \theta$ always holds. As a result, $(\lambda_t(\theta - a)) < 0$ always holds.

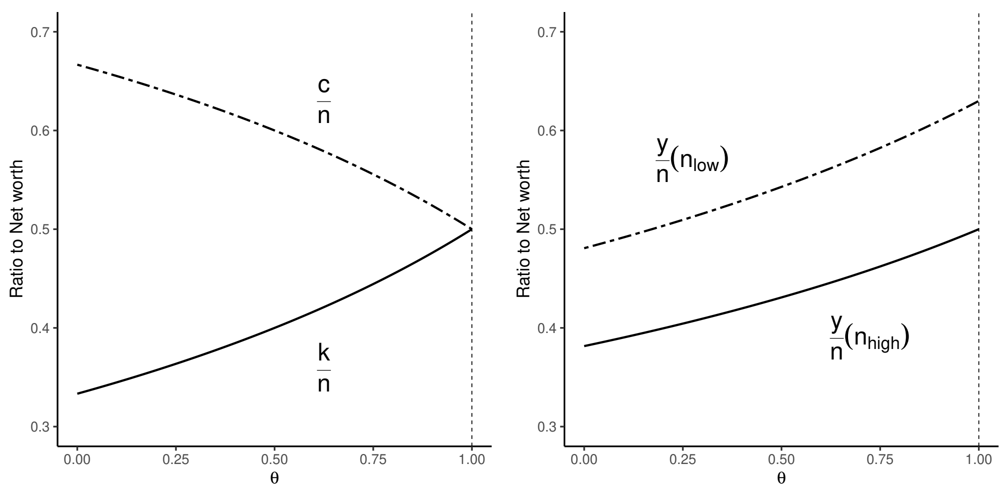
is, a sufficiently small SME, would be to build cash holdings up to achieve a shadow benefit of relaxing the collateral constraint such that $\lambda_t^* = \frac{\psi'(k_t)-\delta-r_t}{1+a-\theta} \geq 0$. We can take the partial derivative of this shadow price with respect to θ:

$$\frac{\partial \lambda^*(k_t, \theta)}{\partial \theta} = \frac{\psi'(k_t) - \delta - r_t}{(1 + a - \theta)^2} \geq 0$$

SMEs will face an increment in the shadow benefit of relaxing the collateral constraint for a given capital stock. This increment is proportional to the net return of capital $\psi'(k_t) - \delta$, which is higher for smaller firms, as $\psi(\cdot)$ decreases in k, and k is constrained by n. Combining the binding collateral and working capital constraints ($ak_t = c_t + \theta k_t$) and the budget constraint ($c_t + k_t = n_t$), the constrained SME's choices of capital and cash are proportional to net worth:

$$k_t = k(\theta, n_t) = \frac{1}{1 + a - \theta} n_t, \quad c_t = c(\theta, n_t) = \frac{a - \theta}{1 + a - \theta} n_t. \tag{19}$$

Figure 3: Relationship between Optimal Choices and θ



(a) Capital and Cash (b) Production (or Sales)

Note: This plot shows the entrepreneur's optimal capital, cash, and production choices as a function of θ. The numerical calibration of the parameters is conventional to an annual model: $\delta = 0.1$ stands for annual depreciation in the capital, $\alpha = 2/3$ stands for decreasing return to scale, $a = 2$ stands for labor share in production, $n_{low} = 1$ and $n_{high} = 2$ stand for smaller and larger entrepreneurs.

Using the production equation (12) along with the optimal capital and cash equations (19), we can determine how the capital, cash, and output choices are affected by θ, which is summarized in the Proposition 1 below. Figure 3 illustrates these four properties in Proposition 1 visually.

Proposition 1 *Given that $a >> \theta$, loan guarantee programs that increase the SME's collateral ability θ would increase the shadow benefit of relaxing the collateral constraint, and therefore,*

(i). increases the SME's optimal choice of capital $\left(\frac{\partial k}{\partial \theta} > 0\right)$.

(ii). decreases the SME's optimal choice of cash holdings $\left(\frac{\partial c}{\partial \theta} < 0\right)$.

(iii). increases the SME's optimal sales $\left(\frac{\partial y}{\partial \theta} > 0\right)$.

Proof. *(i), (ii), and (iii) are derived directly from Equation (19).*

4.3 Firm's Long-term Scale with Intertemporal Distortions

In the second step, we analyze how scaling up the SME's collateral ability from θ_{low} to θ_{high} affects the long-run scale of the SME. We, therefore, consider now the SME's intertemporal choices.

The first-order conditions of the SME's objective (13) with respect to dividends, future net worth, and cash yield the following Euler equation for the entrepreneur that owns the SME:[15]

$$1 = \beta\epsilon(1-\tau)\left(\frac{d_{t+1}}{d_t}\right)^{-\eta}((1+r_{t+1}) + \lambda_{t+1}) \tag{20}$$

where $\epsilon(1-\tau) < 1$ is the total intertemporal distortion, which results from both the exit risk and the net worth erosion, and which distorts the entrepreneur's net worth accumulation. If the firm survives long enough, the shadow price of the constraint admits a long-term value that we denote by λ^{LT}. It is defined by the Euler equation (20) where $d_t = d_{t+1}$:

$$\lambda^{LT} = \frac{1}{\beta\epsilon(1-\tau)} - (1+r_{t+1}) \tag{21}$$

where $\beta(1+r_{t+1}) = 1$ if the economy is in a steady state. Then the long-term shadow price of cash survives ($\lambda^{LT} > 0$) in the long run only if $\epsilon(1-\tau) < 1$, that is if entrepreneurs face intertemporal distortions. Therefore, a key implication is that the firms' long-run scale is affected by financial constraints only in the presence of intertemporal distortions. Otherwise, the financial constraints are irrelevant ($\lambda^{LT} = 0$) in the long run, so financial constraints only affect the speed at which firms converge to that long-term scale. The following proposition summarizes how the financial constraints affect the firm's long-run scale.

Proposition 2 *Suppose that the economy is described by the special case defined in Definition 2 and that household consumption is stationary ($C_t = C_{t+1}$).*

[15] The derivation process is at the appendix E.1.

(i) The financial constraints remains relevant in the long run (i.e., $\lambda^{LT} > 0$) if and only if the intertemporal distortions are non-negligible: $\epsilon(1-\tau) < 1$. In that case

$$\lambda^{LT} = \frac{1}{\beta}\left(\frac{1}{\epsilon(1-\tau)} - 1\right) \tag{22}$$

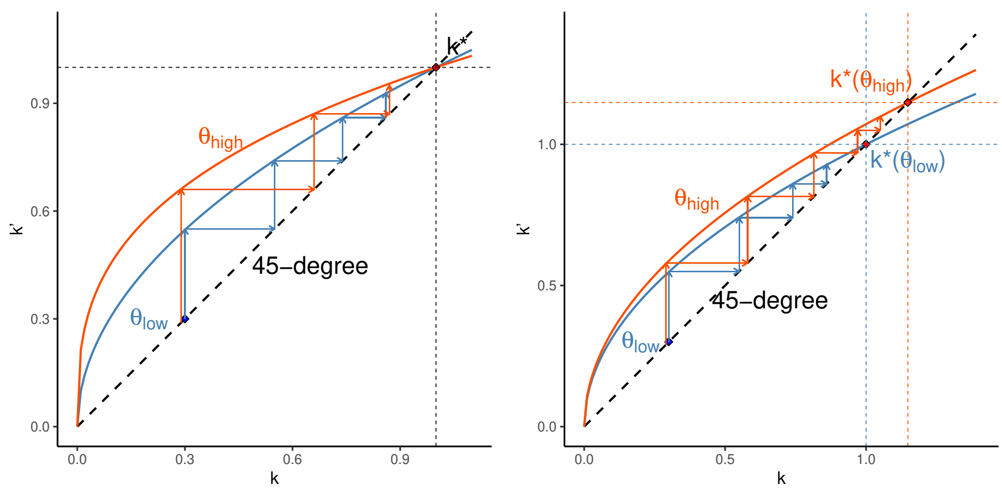
(ii) In the long run, the gap between long-term capital k^{LT} and the undistorted capital stock k^{opt} is affected by the long-term shadow value of the financial constraint λ^{LT} following

$$\psi'(k^{LT}) - \psi'(k^{opt}) = (1 + a - \theta)\lambda^{LT} \tag{23}$$

where λ^{LT} is defined in equation (22), and $\psi'(k^{opt}) = 1/\beta - (1-\delta)$.

Proof. *See the appendix E.2.*

Figure 4:
Dynamics of Firms' Long-run Growth



(a) Without Intertemporal Distortions $\epsilon(1-\tau) = 1$ (b) With Intertemporal Distortions $\epsilon(1-\tau) < 1$

Note: This plot shows the entrepreneur's growth dynamics given the erosion conditions. The numerical calibration of the parameters is conventional to an annual model: $\delta = 0.1$ stands for annual depreciation in the capital, $\alpha = 2/3$ stands for decreasing return to scale, $a = 2$ stands for labor share in production, $n_{low} = 1$ and $n_{high} = 2$ stand for smaller and larger entrepreneurs.

The first point of proposition 2 simply restates the above discussion. The second point describes in more detail how the distortion in long-term capital accumulation depends on the interaction between the intertemporal distortions (through λ^{LT}) and the collateral constraint (through

θ). The expression (23) shows clearly that the saving wedge and the collateral constraint reinforce their respective impact on capital accumulation in the long run. We illustrate this proposition in Figure 4. An increase in θ increases the stock of capital of firms that are below their long-run scale as compared to a firm that does not benefit from an increased θ. In the absence of intertemporal distortions, this increase is temporary as the long-run scale is unchanged. In the presence of intertemporal distortions, a firm that benefits from an increased θ converges to a larger scale.

4.4 The Participation In the Guarantee Program

In the final step, we analyze how scaling up the SME's collateral ability from θ_{low} to θ_{high} and the participation cost affects the participation of SMEs in the guarantee program.

We consider the same special case as above, except that the participation cost is now strictly positive $\xi > 0$. We examine which type of firm self-selects into the loan guarantee program in this case. A firm decides to ask for the guarantee if $\psi(k(\theta_H, n_t)) - \psi(k(\theta_L, n_t)) > \xi$, which we can approximate further as follows:

$$\psi'(k(\theta_L, n_t)) \cdot n_t > \frac{\xi}{\Delta\theta} \tag{24}$$

where we used $k(\theta_L, n_t) - k(\theta_L, n_t) \simeq n_t \Delta\theta$ with $\Delta\theta = \theta_{high} - \theta_{low}$. Importantly, from the firms perspective, considering the participation cost ξ and the guarantee increment $\Delta\theta$, essentially two factors decide whether they would join the guarantee program: productivity $\psi'(\cdot)$ and net worth n_t.

First, given the same net worth n_t, more productive firms (with high marginal productivity $\psi'(\cdot)$) would be more likely to self-select into the program. This selection is beneficial in the aggregate as resources are allocated to firms with higher growth potential. Second, given the same marginal productivity $\psi'(\cdot)$, larger firms (with a high net worth n_t) would more likely self-select into the program. This selection is beneficial in the aggregate as more resources are allocated to firms with a higher total output. Third, neither very large firms ($\psi'(\cdot) \to 0$) nor very small firms ($n \to 0$) will ask for the guarantee, which explains the hump-shaped participation ratio by size in our empirical findings in the section 2.5.

However, there is a group of SMEs that are inefficiently constrained. These are the high-potential firms with high $\psi'(\cdot)$ but a low net worth n_t, who may have low incentives to ask for a guarantee. In that case, the firm is limited in its capacity to increase its scale, which limits the incentives to pay the participation cost ξ. As a result, some small but productive firms may still not ask for a guarantee if the participation cost is high. Either lower participation costs ξ or an increase in the guaranteed ratio $\Delta\theta$ could potentially motive these firms to participate.

4.5 Remarks of the Special Case

This simple case provides us guidelines for how loan guarantee programs should affect SMEs' static production and financing choices, as well as their growth in the short run and long run. SMEs with loan guarantee programs would lower their unproductive cash holdings, increase their productive capital stock, and achieve higher short-run growth and a larger long-run scale if they face non-negligible intertemporal distortions. These predictions are consistent with the regression evidence shown in the empirical section 2. We have also shown that small firms and firms with lower marginal productivity (large firms with decreasing return to scale) self-select out of the loan guarantee program, which is consistent with the hump-shaped sized-dependent participation rate shown in the empirical section 2. And finally, this special case suggests that either lower participation costs or increasing the guaranteed ratio could potentially motivate productive but small SME firms to participate in the loan guarantee program.

5 Quantitative Analysis

We now assess quantitatively how the availability of short-term finance shapes firms' financing and growth. We parameterize the model to Moroccan firm-level data. The key parameters that capture financial frictions are parameterized to capture some cross-sectional and dynamic patterns observed in the data. We then find that the lack of short-term finance can quantitatively account for the observed firm size, finance, and growth in the data. Improving financial conditions in the model reduces the difference in both growth rates and cash ratios of small versus large firms. We finally consider several experiments in which we expand the loan guarantee programs, resulting in the substantial long-term growth of Moroccan firms and the economy.

5.1 Specifications

We specify more general functional forms in the quantitative analysis. First, we assume that the production function is the conventional Cobb-Douglas form:

$$F(k,l) = k^{\alpha} l^{\nu}, \quad \alpha + \nu < 1$$

Second, we take a reduced-form approach as in Gopinath et al. (2017) to model the size-dependent collateral constraint as follows:

$$b_{i,t} \leq \bar{b}_{i,t} \equiv \theta_0 k_{i,t} + \theta_1 \Psi(k_{i,t}) = \left[\theta_0 + \theta_1 \frac{\Psi(k_{i,t})}{k_{i,t}}\right] k_{i,t} \tag{25}$$

where $\Psi(k) = exp(\gamma k) - 1$ is an increasing and convex function of capital and θ_0 and θ_1 are parameters characterizing the borrowing constraint. In this micro-foundation, the $\Psi(\cdot)$ function denotes an increasing and convex cost that firms incur from the disruption of their productive capacity. Different to Gopinath et al. (2017), we introduce the elasticity γ to change the convexity of the size-dependent component of the collateral constraint to provide additional freedom to better match the moments in the Moroccan firm-level data.

5.2 Parameterization

We group parameters into two categories. The first category includes preference and technology parameters that are difficult to identify using our data. We fix these parameters using values that are common in existing work. The second category includes parameters that determine the process for productivity, financial frictions, and loan guarantee programs. We pin down these parameters by requiring that the model fits the salient features of the Moroccan data.

Table 4: Fixed Parameters

Parameter	Description	Value
Firms		
α	Capital coefficient	0.21
ν	Labor coefficient	0.64
δ	Capital depreciation	0.10
ϕ	Capital adjustment cost	4.0
Households		
β	Discount factor	0.96
η	Elasticity of intertemporal substitution	1
θ	Leisure preference	2
ω	Inverse Frisch	0.5

Fixed Parameters Table 4 lists the parameters that are calibrated from the literature. The frequency of the model is a year, so we set the discount factor $\beta = 0.96$ to match an annual interest rate of 4%. We assume log utility, which implies a unit elasticity of intertemporal substitution ($\eta = 1$). We set the Frisch elasticity of labor supply to 2, within the range of macro elasticities identified by Chetty et al. (2011), which implies an inverse Frisch $\omega = 0.5$. We then set leisure preference $\theta = 2$ to match that households spend a third of their time working. On the firm side, we set the capital coefficient $\alpha = 0.21$ and the labor coefficient $\nu = 0.64$ to match a labor share of two-thirds and implied decreasing returns to a scale of 85%. Capital depreciates at a rate of $\delta = 0.10$ annually, and the capital adjustment cost is set to $\phi = 4.0$, which generates an average aggregate nonresidential fixed investment rate as in Bachmann, Caballero, and Engel (2013).

Fitted Parameters The second category of parameters, listed in Table 5, are jointly pinned

Table 5: Fitted Parameters

Parameter	Description	Value
Output Dynamics		
ρ_z	Persistence of TFP shock	0.90
σ_z	Volatility of TFP shock	0.06
$\underline{n}_0$	Net worth of entrants	0.07
ϵ	Survival rate	0.91
τ	Net worth erosion	0.02
Financial Frictions		
s	Share of formal bank loans	0.20
θ_0	Collateral constraint (size-irrelevant)	0.01
θ_1	Collateral constraint (size-dependent)	0.26
γ	Collateral constraint (size-dependent)	1.35
Loan guarantee program		
μ	Guaranteed loan commission fee	0.5%
χ	Multiplier of LGP on loans	2.5
$\bar{\xi}$	Upper bound of LGP fixed cost	0.26

Table 6: Target Moments

Moments	Data	Model
Output Dynamics		
1-year autocorrelation of output	0.89	0.89
3-year autocorrelation of output	0.69	0.71
5-year autocorrelation of output	0.53	0.56
Size ratio of entrant relative to average	17%	17%
Annual exit rate of firms	9.0%	9.0%
Financial Frictions		
Mean cash/asset ratio (non-guaranteed)	22%	22%
Mean cash/asset ratio (guaranteed)	9%	7%
Mean debt/asset ratio (non-guaranteed)	51%	38%
Mean debt/asset ratio (guaranteed)	64%	62%
Guaranteed loan/current liability ratio	22%	22%
Loan guarantee program		
Guaranteed loan commission fee	0.5%	0.5%
Percentage of loan guaranteed	60%	60%
Percentage of firms participating LGP	3.4%	3.8%

Note: This table reports the moments from the Orbis firm-level database of Morocco and the Tamwilcom loan-level database of Morocco. Moments of *productivity* and *entry/exit* are from all the Morocco firms in the Orbis firm-level database. The output level of a firm is measured by its sales. The size ratio of the entrant relative to the average is calculated using the total assets. The exit rate is calculated for Moroccan firms from 2006 to 2017. Moments of *financial frictions* are calculated from both the sample of the Orbis firm-level database and the sample of the Tamwilcom loan-level database. The debt/asset ratio only includes current liability because, for SMEs in Morocco, the long-term debt is almost all zeros.

down by the requirement that the model accounts for the firm-level facts in Morocco in order to match the moments in Table 6, except the net worth erosion τ. First, the four parameters related to output dynamics: persistence of TFP shock ρ_z, volatility of TFP shock σ_z, the net worth of entrants $\underline{n}_0$, and survival rate ϵ jointly match the three moments of productivity persistence, the relative size ratio of entrants to an average firm, and the annual exit rate of firms in the data. Second, the loan guarantee parameters: commission fee μ, multiplier of LGP on loans χ, and share of guaranteed loans s explicitly match the three corresponding moments of the commission fee, percentage of loan guaranteed, and guaranteed loan to current liability ratio in the data.

Then, we parameterize the other three financial friction parameters: upper bound of LGP fixed cost $\bar{\xi}$, size-irrelevant collateral constraint θ_0, and size-dependent collateral constraint θ_1 to jointly match the five moments of LGP participating rate, cash asset ratios, and debt asset ratios. The upper bound of LGP fixed cost $\bar{\xi}$ mostly uniquely pins down the percentage of firms participating in LGP of 3.8%. The collateral constraint parameters then jointly pin down the cash asset ratios and debt asset ratios of both the guaranteed and non-guaranteed firms. These four moments reflect that guaranteed firms have, on average, a 13 percentage point lower cash ratio and a 13 percentage point higher debt ratio.

Table 7: Estimation Results of τ using guarantee program

	(1)	(2)	(3)	(4)	(5)	(6)
	Sales Growth (Data)			Sales Growth (Model)		
	t+1	t+2	t+3	t+1	t+2	t+3
Guaranteed	0.140***	0.053	0.128*	0.196***	0.177***	0.129***
	(0.024)	(0.038)	(0.055)	(0.005)	(0.008)	(0.009)
N	18836	10770	5641	480000	470000	460000
Adjusted R^2	0.209	0.197	0.263	0.551	0.488	0.461
Matched Group	Yes	Yes	Yes	No	No	No
Group × Year FE	Yes	Yes	Yes	No	No	No
Firm Controls	No	No	No	Yes	Yes	Yes
Firm FE & Year FE	No	No	No	Yes	Yes	Yes

Note: This table reports the coefficients of treatment ("Guaranteed") from the DID regression (1) and from the model regression (26). The dependent variable "Sales Growth" is the log difference between sales in year $t+1$, $t+2$ or $t+3$, and sales in year $t-1$. The dependent variable "Total Assets Growth" is the log difference between total assets in year $t+1$, $t+2$ or $t+3$, and total assets in year $t-1$. "Guaranteed" indicates that a firm receives a Tamwilcom guarantee in year t. Significance level: $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Robust standard errors are in parentheses.

Identification of the Net Worth Erosion Finally, we need to identify the net worth erosion parameter τ, which cannot simply be targeted with the cross-sectional moments in Table 6 since τ is tied to the dynamic path of the firms' net worth accumulation process. Therefore, we decided to use the loan guarantee program regression (1) on the sales growth in Table 1 to estimate the net worth erosion parameter τ. To do so, we simulate a panel of firms and run a regression as close as the regression (1). Since we can directly control for the firm characteristics before they joined the loan guarantee programs, we run the following regressions instead:

$$\Delta Y_{it} = \delta D_{it} + \gamma_z' Z_{jt-1} + \gamma_j + \gamma_t + \epsilon_{it}, \tag{26}$$

where i is the firm and t is the year. The dependent variable ΔY_{it} is the sales growth in the post-treatment period compared to the year prior to obtaining the guarantee. It has the form $\Delta Y_{it} = Y_{is} - Y_{it-1}$, where year $t-1$ is considered as the base year and $s = t+1, t+2, t+3$ refer to three post-treatment years. Since all variables are in logs, the dependent variable can be read as a growth rate. D_{it} is a dummy variable indicating if firm i has been granted a guarantee in year t. $gamma_j$ and γ_t are the firm and year fixed effects, respectively. Z_{jt-1} is the group of control variables that are used in the matching process for the regression (1). Since the estimation is over-identified for a single parameter τ, we target mainly the coefficients in the longer run $(t+3)$. The results in Table 7 gives us an estimate of the net worth erosion parameter τ equals 0.02.

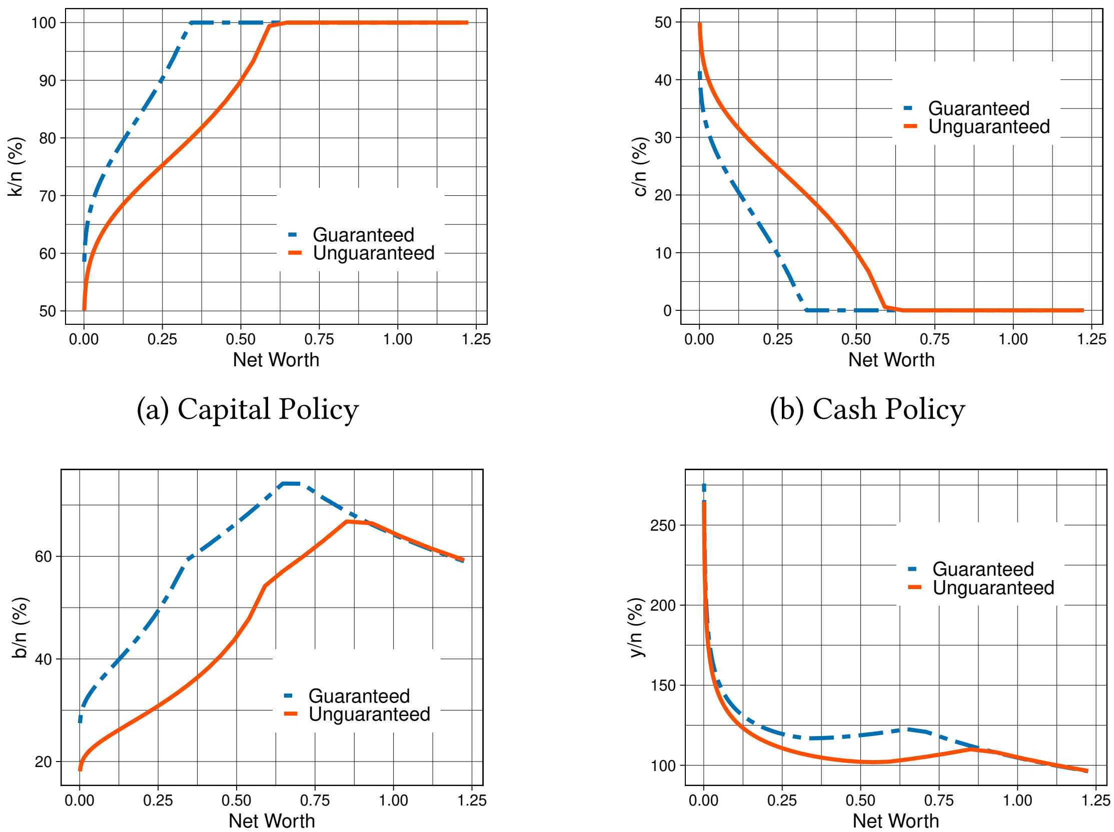
5.3 The Effects of Short-term Finance

With the calibrated model, we show how the loan guarantee program affects firms' static choice between capital and cash, the participation rate in the loan guarantee program, and the firms' long-term scale. We find that the quantitative model perfectly rationalizes the empirical findings of Moroccan firms in section 2 and the mechanisms from the special case in section 4.

Reallocation of Resources from Cash to Capital We first show the effects of short-term finance on the reallocation of resources from cash to capital. Figure 5 plots the optimal capital, cash, and debt policies and the realized output of both guaranteed firms and unguaranteed firms. First, we compare the optimal policies among the dimension of net worth, focusing on unguaranteed firms. Due to their limited access to short-term external finance, smaller firms borrow less, hoard more cash, and accumulate less capital. When the firms grow larger, their short-term financial constraints are relaxed, so they start borrowing more and lower their cash holdings. Finally, if the firms grow further, they become unconstrained.

Second, also in Figure 5, we compare the policies and realized output of the guaranteed firms versus the unguaranteed firms. In general, guaranteed firms who have access to the guarantee accumulate more productive capital, lower their unproductive cash holdings, borrow more external debt, and produce more output per net worth. The changes are most significant for the median-sized firms. The policies converge when the firms get large and unconstrained. These effects on the reallocation of resources from cash to capital and its consequences are consistent with our empirical findings in section 2.4 and our analytical findings in section 4.2.

Figure 5:
Reallocation of Resources from Cash to Capital



(a) Capital Policy

(b) Cash Policy

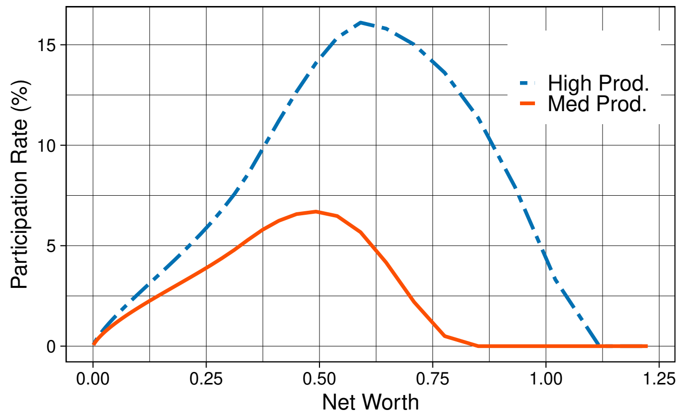
(c) Debt Policy

(d) Realized Output

Notes: This figure shows the policies in the capital, cash, and debt, and the realized output of firms with the median productivity over the dimension of net worth. The blue line stands for the guaranteed firms, and the red line stands for unguaranteed firms. Net worth is truncated at 1.25 because the measure of firms larger than 1.25 is tiny, and the decision rules are monotone from net worth at about 1.25.

Participation In the Guarantee Program Figure 6 shows the participation probability for firms with two different productivity levels as a function of net worth. First, the participation rate is hump-shaped over the net worth dimension. The smallest firms hardly participate in the LGP programs since they can hardly support the fixed cost of participation, while the largest firms also hardly participate because they are much less financially constrained. As a result, the median-sized firms are most engaged in the LGP. Second, high-productivity firms have a higher participation rate than low-productivity peers with the same net worth since these firms would gain more from participating in the LGP and are more able to pay with their higher profits for the participation costs. These effects on the participation rate in the LGP are consistent with our

Figure 6:
The Participation In the Guarantee Program



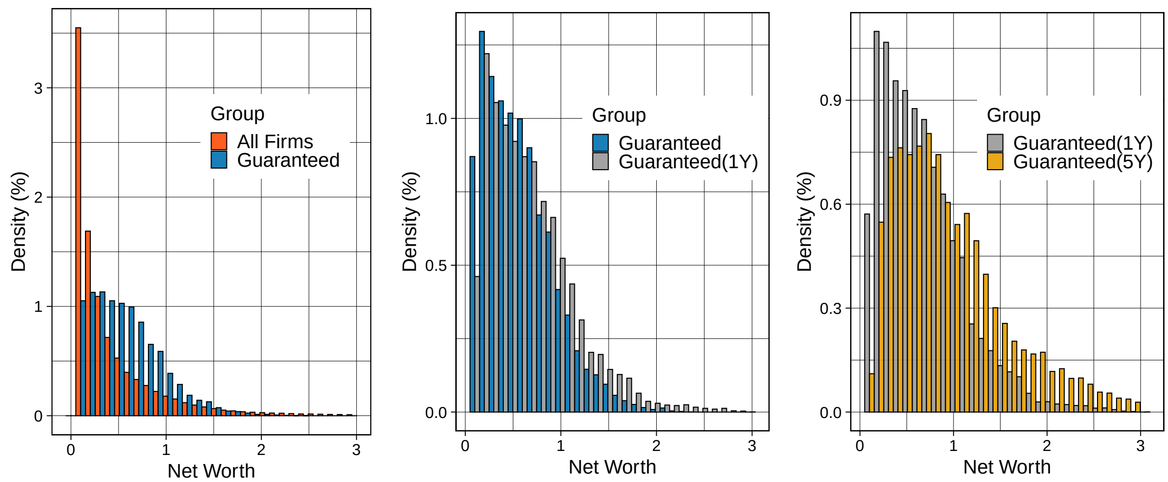
Notes: This figure shows the optimal decision rules in participating in the loan guarantee programs with two different productivities over the dimension of net worth. The blue line stands for the higher-productivity firms, and the red line stands for the lower-productivity firms (in this plot, the median productivity). Net worth is truncated at 1.25 because the measure of firms later than 1.25 is tiny, and the decision rules are monotone, starting from the net worth at about 1.25.

empirical findings in section 2.5 and our analytical findings in section 4.4.

The Growth in Firm's Long-term Scale We then show the effects of short-term finance on the long-term scale of firms. Figure 7 plots the distribution of all firms and that of guaranteed firms alone. More specifically, the distribution of guaranteed firms is shown in three stages. The first stage is the distribution of firms that self-select into the loan guarantee program before accessing the additional credit line. Given the random fixed participation cost, larger firms are more likely to be able to pay the fixed cost and enter the program, which is consistent with our data in section 2.4. The difference between the distributions of *Guaranteed* and *All Firms* shows the selection effect of the loan guarantee program.

The second stage is the distribution of these guaranteed firms in the first stage after one-year growth without exiting. The additional credit line from the loan guarantee program helps them accumulate more net worth, so the distribution shifts to the right. Finally, we show the third stage, the distribution of the guaranteed firms after five years of guarantee without exiting. These firms grow significantly larger with a distribution shifting to the right. These effects on the long-term scale of firms are consistent with our empirical findings in section 2.4 and our analytical findings in section 4.3.

Figure 7:
Distribution of Firm's Long-term Scale



(a) LGP Self-Selection (b) One Year Growth (c) Five Year Growth

Notes: This figure shows the net worth distributions of all firms, guaranteed firms upon their self-selection into the loan guarantee program, guaranteed firms after one-year growth without exiting, and guaranteed firms after five-year growth being continuously guaranteed without exiting. It helps to distinguish the selection effect and growth effect. The mean net worth of the distributions are 0.51, 0.72, 0.85, and 1.27, respectively.

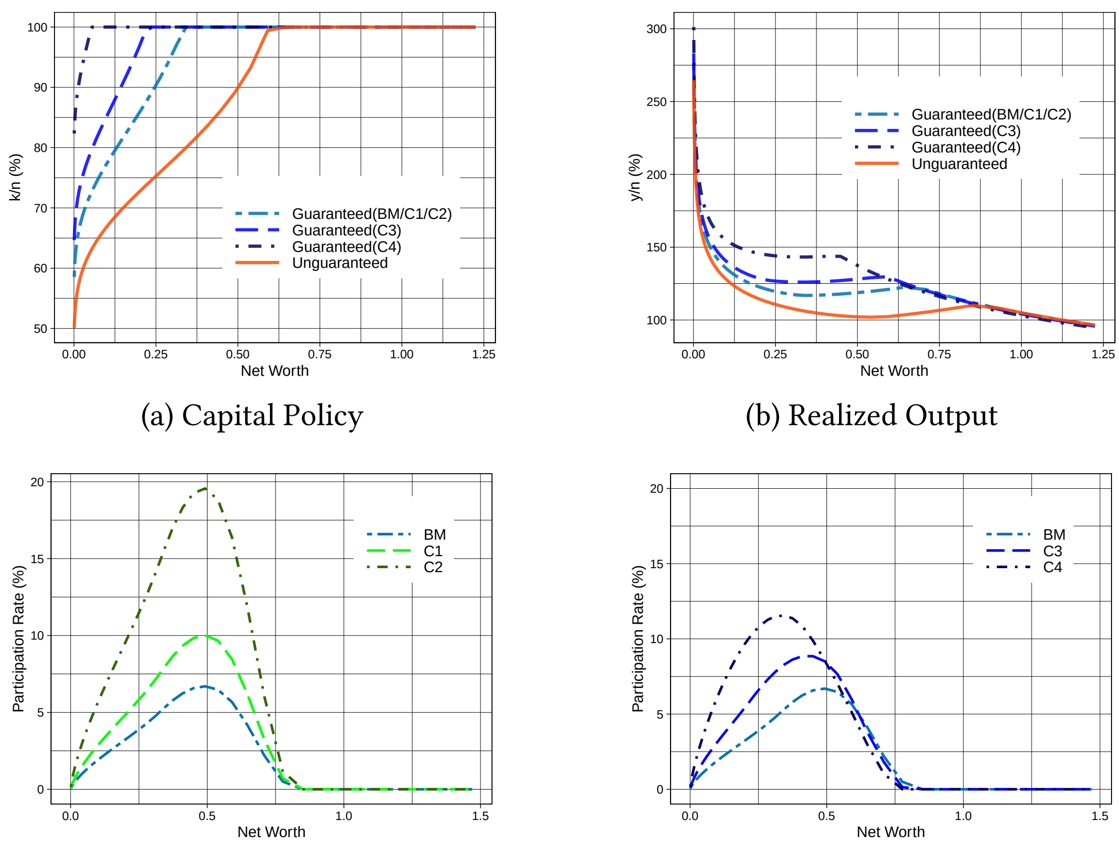
5.4 Counterfactual Analysis

We now conduct several counterfactuals to demonstrate how expanding the loan guarantee program could further promote firm growth in Morocco. There are mainly two restrictions in the loan guarantee programs, as our analytical analysis suggested in section 4.4: the fixed participation cost and the guaranteed ratio. We show below in this section how much firm growth we can achieve by further relaxing these restrictions and expanding the inclusiveness and coverage of the loan guarantee program in four counterfactuals.

LGP Expansions: Participation Cost Reduction/Guaranteed Ratio Increment In the original benchmark, the upper bound of the fixed participation cost ($\bar{\xi}_{bm} = 0.26$) gives us a loan guarantee program participating ratio of 3.8%. More importantly, the fixed cost is an overhead cost that is relatively expensive for smaller entrepreneurs, as our analytical analysis suggested in section 4.4. We explore below two counterfactuals where we cut the upper bound of the fixed participation cost to two-thirds ($\bar{\xi}_{c1} = 0.173$) and to one-third ($\bar{\xi}_{c2} = 0.087$). These could be understood in the real world as the government guarantee agents requiring fewer financial documents, simplifying the evaluation procedures, or subsidizing the application fees on LGP.

Also, in the benchmark, the guaranteed ratio is 60%, which gives formal loans multiplier of $\chi_{bm} = \frac{100\%}{100\%-60\%} = 2.5$. This is lower than guaranteed ratios in some other countries: in Kazakhstan, it is up to 70%, in India 75%, and in Indonesia and Japan 80% according to Yoshino and Taghizadeh-Hesary (2019). We explore below two counterfactuals where the guaranteed ratio goes up to 70% and 80%: ($\chi_{c3} = \frac{100\%}{100\%-70\%} = 3.33$) and ($\chi_{c4} = \frac{100\%}{100\%-80\%} = 5.00$). All four counterfactuals have realistic meanings.

Figure 8:
THE EFFECTS OF LGP EXPANSIONS ON FIRMS' FINANCING AND GROWTH



(a) Capital Policy

(b) Realized Output

(c) Participation Rate I

(d) Participation Rate II

Notes: This figure shows the policies in the capital, the realized output of firms, and participation rate with the median productivity over the dimension of net worth. In plot (a) of the capital policy, the k/n ratio will essentially decrease as the net worth grows over a certain scale. However, since our focus is on small and median-sized firms, we do not show these patterns.

The Effects of LGP Expansions on Firms' Financing and Growth Figure 8 shows the effects of loan guarantee program expansions on firms' financing and growth. We mainly focus on how the expansions of LGP affect the choices of capital, realized output, and participation

Table 8: Summary of Results from the Counterfactual Analyses

Model Outcomes	**Benchmark** $(\bar{\xi}_{bm}, \chi_{bm})$	**C1** $\bar{\xi}_{c1} = 0.173$	**C2** $\bar{\xi}_{c2} = 0.087$	**C3** $\chi_{c3} == 3.33$	**C4** $\chi_{c4} = 5.00$
Firm Financing					
LGP participation rate (%)	3.8	5.8	11.3	5.7	8.6
Guaranteed credit/total credit (%)	1.7	2.6	4.9	4.0	10.3
Mean cash/asset ratio (guaranteed) (%)	6.5	6.5	6.5	3.1	0.09
Mean cash/asset ratio (all firms) (%)	21.0	20.7	20.1	20.4	19.5
Mean debt/asset ratio (guaranteed) (%)	62.2	62.2	61.9	70.1	83.9
Mean debt/asset ratio (all firms) (%)	37.7	38.1	39.2	38.7	40.8
Distribution of Firm Financing					
Share of total output (Quantile 1, %)	6.15	6.19	6.17	6.18	6.20
Share of total output (Quantile 2, %)	10.05	10.02	10.00	10.04	10.12
Share of total output (Quantile 3, %)	18.28	18.28	18.37	18.40	18.61
Share of total output (Quantile 4, %)	65.53	65.50	65.45	65.38	65.07
Guaranteed credit/total credit (Quantile 1, %)	0.79	1.19	2.30	2.49	11.23
Guaranteed credit/total credit (Quantile 2, %)	1.15	1.71	3.31	3.69	13.68
Guaranteed credit/total credit (Quantile 3, %)	2.65	3.90	7.29	7.11	20.08
Guaranteed credit/total credit (Quantile 4, %)	1.64	2.44	4.63	3.49	8.21
Economic Outcomes					
Changes in Total Credit (%)	-	1.01	3.98	2.65	8.22
Changes in Aggregate TFP (%)	-	0.05	0.17	0.10	0.31
Changes in Total Output (%)	-	0.07	0.28	0.18	0.39
Changes in Total Consumption (%)	-	0.08	0.31	0.20	0.49
Changes in Total Welfare (%)	-	0.04	0.16	0.10	0.21

Note: This table reports the counterfactual results. The results are reported in two groups: (1) firm financing which shows how the counterfactual changes the financing patterns of firms in the model; and (2) economic outcomes which show how the counterfactual changes the aggregate economic conditions.

in the LGP as a function of firm size. First, in terms of choices of capital, the *participation cost reduction* has no effect conditional on net worth and being guaranteed while the *guaranteed ratio increment* would benefit smaller guaranteed firms more, as shown in plot (a). Second, in terms of realized output, the same patterns hold as well, as shown in plot (b). Third, however, both types of policies affect the participation rate. Plot (c) shows the changes in the participation rate of the *participation cost reduction.* Lowering the fixed participation cost would proportionally increase the participation rate across firm sizes. Median-sized firms benefit the most and increase their participation even more. Plot (d), on the other hand, shows the changes in participation rate following a *guaranteed ratio increment.* Since increases in the guaranteed ratio change the capital policy and the realized output, which benefits the smaller firms more, the participation rate increments are skewed towards smaller firms. These distributional results show that though all counterfactuals benefit the financing of firms in general, the effects are quite different across firms of different sizes.

The Effects of LGP Expansions on the Aggregate Outcomes Table 8 shows the effects of loan guarantee program expansions on aggregate financing, economic growth, and welfare. All four counterfactuals would improve aggregate TFP, output, consumption, and welfare.

With the *participation cost reduction*, we first find that decreasing the fixed participation cost significantly changes firm financing patterns. The participating rate increases from 3.8% to 5.8% and 11.3% and the ratio of guaranteed credit in the economy increases from 1.7% to 2.6% and 4.9%, respectively. Changes in the fixed participation cost do not substantially affect the guaranteed firm's cash ratio and debt ratio. Still, more firms are guaranteed, so the average credit ratio goes up, and the average cash ratio goes down. Given that most firms that benefit from these policies are small firms, the changes in aggregate outcomes are not substantial at first glance. Still, we find that reducing the fixed participation cost increases aggregate TFP, total output, employment, consumption, and economic welfare. Considering the small changes in total credit, the gains are substantial.

With the *guaranteed ratio increment*, we first show that increasing the guaranteed ratio also significantly changes firm financing patterns. The participating rate increases from 3.8% to 5.7% and 8.6%, and the ratio of guaranteed credit in the economy increases from 1.7% to 4.0% and 10.3%, respectively. Contrary to the *participation cost reduction*, guaranteed firms substantially decrease their cash ratio and increase their debt ratio. This reduces the average cash ratio and significantly increases the debt ratio. Finally, we also find that increasing the guaranteed ratio significantly increases the total output, employment, consumption, and economic welfare.

It is worth noticing that C1 (*participation cost reduction*) and C3 (*guaranteed ratio increment*) increase participation by the same amount, but they have different aggregate outcomes. Because C3 affects credit access over the whole distribution of firms, and not only self-selection into the program, total credit increases more, as well as output and welfare. In that sense, *guaranteed ratio increment* kills two birds with one stone: it can both increase participation and total output. But *participation cost reduction* is more "cost-effective" if the objective is to increase participation without significantly increasing the guaranteed portfolio.

5.5 The Role of Intertemporal Distortions

Here we examine how intertemporal distortions determine the aggregate impact of LGPs. Table 9 shows the aggregate impact of a higher guarantee ratio (policy C4) under some alternative assumptions on τ and ϵ. We first consider a lower τ ($\tau = 0$ as opposed to $\tau = 0.02$ in the benchmark). The impact on output and welfare is more than halved, and there is a smaller reduction in misallocations. This arises from a smaller-scale effect, as discussed earlier. In another counterfactual, we consider a higher ϵ ($\epsilon = 0.93$ as opposed to $\epsilon = 0.91$ in the benchmark). The effect of the policy on output, TFP, and welfare is lower than in the benchmark as well because of the milder intertemporal distortions.

Table 9: The effect of a higher guarantee ratio (C4) under alternative assumptions on intertemporal distortions

Model Outcomes	**Benchmark** ($\tau = 0.02, \epsilon = 0.91$)	**Lower τ** ($\tau = 0, \epsilon = 0.91$)	**Higher ϵ** ($\tau = 0.02, \epsilon = 0.93$)
Economic Outcomes			
Changes in Aggregate TFP (%)	0.31	0.21	0.20
Changes in Total Output (%)	0.38	0.16	0.23
Changes in Total Welfare (%)	0.21	0.08	0.13

Note: This table reports the effects of policy C4 under different assumptions on τ and ϵ.

Note though, that despite the fact that the lower τ and higher ϵ counterfactuals generate the same intertemporal distortion $(1-\tau)\epsilon$, the effects of the policy are stronger in the high ϵ counterfactual than in the low τ counterfactual. Indeed, with a higher ϵ, firms exit less frequently, which gives them time to reach their long-run scale. This reinforces the long-term scale channel as opposed to the case with a lower τ. However, the effect of the policy remains lower than in the benchmark because of the milder intertemporal distortions. LGPs' effects are thus particularly strong when intertemporal distortions come from profit erosion than when they come from the firm exit.

6 Conclusion

In this paper, we study the effect of short-term finance on firm growth and its aggregate implications. We explore such a relationship both empirically and theoretically. Empirically, using a unique firm-level dataset of a credit guarantee program in Morocco, we show that firms with guaranteed loans expand their production scale homogeneously and persistently with an increase in both labor and capital inputs and a decrease in their cash ratio.

We then build a heterogeneous firm model in which firms face collateral and working capital constraints. In the model, constrained firms preserve a large proportion of resources in unproductive cash instead of productive capital to finance short-run working capital. A loan guarantee program mitigates credit constraints by inducing firms to reduce their cash holdings and expand their production scale. Also, a loan guarantee program generates a permanent increase in production scale in the presence of intertemporal distortions.

Finally, we take our quantitative model to the Moroccan firm-level data and conduct counterfactual analyses to relax the severity of the short-term financial constraints. The model matches Moroccan firm-level moments well and replicates the patterns of our empirical findings. The gains from relaxing the severity of the short-term financial constraints by expanding the loan guarantee programs are substantial in terms of firm growth and welfare.

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Appendix to "Short-term Finance, Long-term Effects: Theory and Evidence from Morocco "

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Contents

A Sample Construction and Statistics

Merge Databases We pair the Tamwilcom guarantee dataset and the Orbis balance-sheet dataset in four rounds. In the first round, considering that the firm's registered ID with the chamber of commerce is not unique across regions, a unique combination of two variables of national ID and date of firm creation is applied to conduct the first round of pairing. This yields good pairing results owing to the good coverage of both variables. In the second round, we use the firm's national ID and name as a unique combination. As a first step, redundant elements in firm names are trimmed away, such as STE, SARL, and Société. With more compact firm names, the Levenshtein distance between two firm names is calculated to locate the closest match. A string distance of up to two generally indicates a good match. The third round of pairing relies on the combination of the firm name and address. Paired results from this step only yield a small number of matches. The final round is based on the firm's name and the date of firm creation; the pairing rate is low as well.

Potential Concerns One potential concern would be that some unidentified treated firms are mistaken as untreated control firms and are matched with other treated firms later in the procedure. This would bias the estimation downward. However, this concern is marginally relevant due to the very low treatment rate. If the total number of firms in Orbis is taken as a representation of the whole business world of Morocco, there are approximately 1.58 million firms, of which only 23,017 have been treated. The resulting treatment rate is only 1.5%, indicating a very small possibility of a treated firm being matched with another unpaired treated firm.

Another concern is survivor bias in sample construction. It mainly results from the fact that only businesses that actively report their balance sheet to the local trade register's office for the last five years are maintained in Orbis' online version. To reduce this bias, we complement the main online version with Orbis historical vintages, which have records of firms that have exited the market.

B Matching procedure

Caliper A caliper is implemented with the purpose of ensuring the common support assumption. A caliper refers to the maximum distance allowed between a treated firm and its controls. Any control firm that is beyond this caliper is dropped. This is to ensure that all control firms in the final sample are similar enough to the treated firm that it is matched with. The choice of the caliper is derived from the 0.9-quantile of the distribution of distances between observations in nearest neighbor pairwise matching with replacement, multiplied by 1.5. The choice is based on Jann (2017), Huber, Lechner, and Wunsch (2013), Huber, Lechner, and Steinmayr (2015) after considering the variance-bias trade-off: choosing a large caliper would include more control observations, thus decreasing variance; however, the bias would increase if a non-comparable and distant control is included.

Weighing The analysis unit is firm-year, based on a similar procedure in Brown and Earle (2017). Matched observations of treated firms are assigned with a weight of one, whereas those of control firms are allocated with a weight based on its distance from the corresponding treated firm. We first calculate the kernel weight of each matched control observation based on its distance from the treated firm, using the Epanechnikov kernel function with the same bandwidth used in the matching. Subsequently, the weight of each control observation is rescaled as the share of its kernel weight in the sum of kernel weights of all controls matched with the same treated firm. This weight rescaling intends to up-weight those control firms close to treated firms and down-weight those that are far away. For treated firms, only the firm-year observation of the guarantee receipt year is kept. This is to avoid the situation where a treated observation is matched with another observation from a treated firm in a year where it does not receive a guarantee. For control firms, multiple firm-year observations that belong to the same firm are maintained in the pool of potential controls for matching, provided that the firm's data covers a three-year history of selected financial variables. The matching is carried out with a replacement, which implies that one firm-year observation of an untreated firm can be selected more than once.

Balancedness tests Figure 5 represents the standardized mean difference (SMD) and variance ratios between the treated and control groups in the raw and matched sample.[1] The SMD measures the mean difference of a given variable between two groups, normalized by the standard deviation of that variable. Variance ratio refers to the ratio between the variances of a variable across two groups. A value of zero for the SMD and a value of one for the variance ratio indicate a good balance in the sample. As shown in the Figure, the matching procedure substantially improves the overall balancedness for most variables, except for cash. Guaranteed firms have a lower level of cash holding on average compared to their matched control firms, which also appears in Figure 1.

As a second balancedness test suggested by Caliendo and Kopeinig (2008), we evaluate the probability of obtaining a guarantee through a logit model based on the variables used in the matching. Ideally, a drop in R^2 indicates a good balance in the sample. We observe that the pseudo R^2 of the logit model falls from 0.11 with the raw sample to 0.01 with the matched sample. This confirms the loss of the predictive power of the selected variables after matching. It confirms that

[1] See Table 10 for the statistics represented in Figure 5.

the matching procedure has eliminated differences in the pre-treatment observable characteristics between the two groups and that the treatment status is "randomized" in the matched sample conditional on the selected variables.

C Robustness Checks

The first robustness test corresponds to concerns regarding the number of pre-treatment years used for matching. Existing literature suggests that we should rely on at least three years' pre-treatment performance for matching, which is our main estimation. In this robustness check, we extend the number of years to four and five. Table 1 reports the estimated results when we match on four years' data. As a result of the stricter matching requirement, the number of treated firms that have at least one matched control firm drops to 345. Most results in year $t + 1$ remain robust and significant on a similar level, consistent with our baseline results. When we increase the number of years used for matching to five, we only have 213 guaranteed firms that enter the final sample. The estimated results for the year $t + 1$ in Table 2 are mostly significant except for the coefficient on cash. This is also in line with the baseline.

The second robustness test is to correct the bias from the data attrition issue. The main concern arises from the loss of observations of small firms during matching. Considering that small firms often report very limited financial data, it could potentially lead to their exclusion in the matching process due to missing data points. In order to correct this bias, we use inverse probability weighting (ipw) (Amamou, Gereben, and Wolski, 2020) to increase the weight of under-represented SMEs and decrease the weight of those that are over-represented. As a first step, we calculate the number of small, medium, and large firms in the sample of Tamwilcom-guaranteed firms that can be merged with Orbis. As discussed earlier, this sample shares similar statistical properties with the sample of all Tamwilcom-guaranteed firms. The reason for choosing this merged sample rather than the full sample is that we can use the size information provided by Orbis. We assume that information on firm size composition in this merged sample can reflect that of the full sample. As a second step, we count the number of firms of different sizes in the processed sample after matching and divide the number of small, medium, and large firms in the processed sample by the number in the original sample before matching. The inverse of the proportion is then used as a weight to re-scale the representation of different-sized firms in the final sample. As Table 3 shows, estimation results are similar to the main ones, with the exception of total and fixed assets.

The third set of checks intends to test the robustness of the main results when we emphasize matching on cash-related variables to reduce the difference in cash level of treated and control firms after matching in Figure 1. As a first test, we use one-to-one nearest neighbor matching to ensure that only the closest control firm is selected. This is to see if the difference in gap results from any chosen control firm that is not similar enough to its matched neighbor. As we can see in Figure 1, the gap remains large and is very similar to the five-to-one nearest neighbor matching. In view of this, we rule out the possibility that remote control firms contribute to the difference in cash. As a further test, we only include logged cash and the ratio of cash to total assets in the matching process. This setup “forces" a good matching result on cash by not including other variables so that the measurement of Mahalanobis distance is only based on cash-related variables. In addition, we divide the variable of logged cash into 20 quantile intervals and apply exact matching on the interval. Figure 2 shows that this procedure manages to substantially improve the matching performance on cash. Furthermore, total assets are balanced as well due to the incorporation of the ratio of cash to total assets. However, we observe a gap in sales. In order to reduce this gap, we modified the setup to match on cash ratio and logged sales. As Figure 3 indicates, the good balancedness in cash, total assets, and current liabilities are preserved while the difference in sales is decreased. Estimation results for both matchings are reported in Table 4 and Table 5. They are consistent with the main results.

In the next robustness test, we include propensity score as one variable in the calculation of Mahalanobis distance. We exploit the predictive power of a logit model, where the dependent variable is a dummy of one if a firm is guaranteed in a certain year, and independent variables are the same as those selected for calculating Mahalanobis distance. Table 6 reports the estimation results, which are similar to our main results. We conduct another robustness test where we increase the number of nearest neighbors matched with guaranteed firms to ten. What we find is that the results are not sensitive to the number of controls chosen for the treated firm, as shown in Table 7. We also apply the matching procedure without replacement and confirm that estimation results stay similar, as shown in Table 8.

D Additional Tables and Figures

Table 1: Estimation Results of Year $t + 1$ from Matching on Four Pre-Treatment Years' Data

	(1)	(2)	(3)	(4)	(5)	(6)
	Sales	Total Assets	Current Liabilities	Cash	Costs of Employees	Fixed Assets
Guaranteed	0.130***	0.094**	0.129***	0.090	0.090***	0.146*
	(0.029)	(0.029)	(0.031)	(0.106)	(0.025)	(0.069)
N	13432	13723	13952	13531	12636	13460
adj. R^2	0.216	0.236	0.213	0.338	0.228	0.213
Group × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
City × Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table reports the coefficients of treatment ("Guaranteed") from DID regression in the robustness test, where we match on four pre-treatment years' data. Each outcome variable in each year is based on a different matched sample where we drop firms without data for that outcome variable in that year before matching and exclude outliers. The dependent variables are the log difference of six main outcome variables (sales, total assets, labor costs, fixed assets, cash, and current liabilities) in year $t + 1$ from year $t - 1$. "Guaranteed" indicates that a firm receives a Tamwilcom guarantee in year t. Group-year and city-year fixed effects are included. Standard errors are clustered at group-year level. Significance level: $^+$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 2: Estimation Results of Year $t + 1$ from Matching on Five Pre-Treatment Years' Data

	(1)	(2)	(3)	(4)	(5)	(6)
	Sales	Total Assets	Current Liabilities	Cash	Costs of Employees	Fixed Assets
Guaranteed	0.169***	0.137***	0.130***	0.015	0.081**	0.273***
	(0.039)	(0.032)	(0.036)	(0.133)	(0.029)	(0.075)
N	8664	8805	8902	8752	8343	8641
adj. R^2	0.265	0.236	0.133	0.361	0.223	0.229
Group × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
City × Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table reports the coefficients of treatment ("Guaranteed") from DID regression in the robustness test, where we match on five pre-treatment years' data. Each outcome variable in each year is based on a different matched sample where we drop firms without data for that outcome variable in that year before matching and exclude outliers. The dependent variables are the log difference of six main outcome variables (sales, total assets, labor costs, fixed assets, cash, and current liabilities) in year $t + 1$ from year $t - 1$. "Guaranteed" indicates that a firm receives a Tamwilcom guarantee in year t. Group-year and city-year fixed effects are included. Standard errors are clustered at group-year level. Significance level: $^+$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 3: Estimation Results of Year $t+1$ with Inverse Probability Weight

	(1)	(2)	(3)	(4)	(5)	(6)
	Sales	Total Assets	Current Liabilities	Cash	Costs of Employees	Fixed Assets
Guaranteed	0.129**	0.039	0.109**	-0.224	0.131**	0.003
	(0.046)	(0.037)	(0.041)	(0.176)	(0.040)	(0.103)
N	17199	17344	17520	17017	16571	17117
adj. R^2	0.201	0.222	0.193	0.323	0.319	0.201
Group × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
City × Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table reports the coefficients of treatment ("Guaranteed") from DID regression in the robustness test, where we use the technique of inverse probability weight to correct data attrition bias. Each outcome variable in each year is based on a different matched sample where we drop firms without data for that outcome variable in that year before matching and exclude outliers. The dependent variables are the log difference of six main outcome variables (sales, total assets, labor costs, fixed assets, cash, and current liabilities) in year $t+1$ from year $t-1$. "Guaranteed" indicates that a firm receives a Tamwilcom guarantee in year t. Group-year and city-year fixed effects are included. Standard errors are clustered at group-year level. Significance level: $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 4: Estimation Results of Year $t+1$ from Matching on Logged Cash and Cash Ratio

	(1)	(2)	(3)	(4)	(5)	(6)
	Sales	Total Assets	Current Liabilities	Cash	Costs of Employees	Fixed Assets
Guaranteed	0.217**	0.162**	0.203***	-0.067	0.088**	0.256*
	(0.080)	(0.052)	(0.050)	(0.114)	(0.032)	(0.114)
N	6109	6435	6604	6144	4963	6209
adj. R^2	0.233	0.231	0.101	0.325	0.359	0.215
Group × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
City × Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table reports the coefficients of treatment ("Guaranteed") from DID regression in the robustness test, where we only include logged cash and the ratio of cash to total assets from three pre-treatment years for matching. In addition, we divide the variable of logged cash into 20 quantile intervals and apply exact matching on the interval. Each outcome variable in each year is based on a different matched sample where we drop firms without data for that outcome variable in that year before matching and excluding outliers. The dependent variables are the log difference of six main outcome variables (sales, total assets, labor costs, fixed assets, cash, and current liabilities) in year $t+1$ from year $t-1$. "Guaranteed" indicates that a firm receives a Tamwilcom guarantee in year t. Group-year and city-year fixed effects are included. Standard errors are clustered at the group-year level. Significance level: $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 5: Estimation Results of Year $t+1$ from Matching on Logged Sales and Cash Ratio

	(1)	(2)	(3)	(4)	(5)	(6)
	Sales	Total Assets	Current Liabilities	Cash	Costs of Employees	Fixed Assets
Guaranteed	0.202^{**}	0.136^{**}	0.205^{***}	-0.091	0.096^{**}	0.243^{*}
	(0.071)	(0.052)	(0.050)	(0.115)	(0.031)	(0.104)
N	6478	6750	6873	6496	5335	6595
adj. R^2	0.324	0.215	0.137	0.297	0.364	0.196
Group × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
City × Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table reports the coefficients of treatment (“Guaranteed") from DID regression in the robustness test, where we only include logged sales and the ratio of cash to total assets from three pre-treatment years for matching. In addition, we divide the variable of logged cash into 20 quantile intervals and apply exact matching on the interval. Each outcome variable in each year is based on a different matched sample where we drop firms without data for that outcome variable in that year before matching and excluding outliers. The dependent variables are the log difference of six main outcome variables (sales, total assets, labor costs, fixed assets, cash, and current liabilities) in year $t+1$ from year $t-1$. “Guaranteed" indicates that a firm receives a Tamwilcom guarantee in year t. Group-year and city-year fixed effects are included. Standard errors are clustered at the group-year level. Significance level: $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 6: Estimation Results of Year t+1 with Propensity Score in Multivariate Matching

	(1)	(2)	(3)	(4)	(5)	(6)
	Sales	Total Assets	Current Liabilities	Cash	Costs of Employees	Fixed Assets
Guaranteed	0.139^{***}	0.093^{***}	0.143^{***}	-0.054	0.107^{***}	0.113^{+}
	(0.025)	(0.024)	(0.027)	(0.091)	(0.021)	(0.061)
N	18268	18464	18841	18141	17418	17976
adj. R^2	0.190	0.204	0.213	0.313	0.241	0.199
Group × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
City × Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table reports the coefficients of treatment (“Guaranteed") from DID regression in the robustness test, where we include propensity score as one variable in the calculation of Mahalanobis distance. Each outcome variable in each year is based on a different matched sample where we drop firms without data for that outcome variable in that year before matching and excluding outliers. The dependent variable in the logit model is a dummy of one if a firm is guaranteed in a certain year, and the independent variables are the same ones selected for calculating Mahalanobis distance in the main setup. Outcome variables are the log difference of six main variables (sales, total assets, labor costs, fixed assets, cash, and current liabilities) in year $t+1$ from year $t-1$. “Guaranteed" indicates that a firm receives a Tamwilcom guarantee in year t. Group-year and city-year fixed effects are included. Standard errors are clustered at the group-year level. Significance level: $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 7: Estimation Results of Year $t + 1$ from Matching on 10 Nearest Neighbors

	(1)	(2)	(3)	(4)	(5)	(6)
	Sales	Total Assets	Current Liabilities	Cash	Costs of Employees	Fixed Assets
Guaranteed	0.136***	0.084***	0.131***	0.135	0.098***	0.163*
	(0.023)	(0.022)	(0.025)	(0.101)	(0.023)	(0.064)
N	23583	24054	24569	23644	22796	23410
adj. R^2	0.253	0.253	0.249	0.348	0.278	0.246
Group × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
City × Year FE	Yes	Yes	Yes	Yes	Yes	Yes

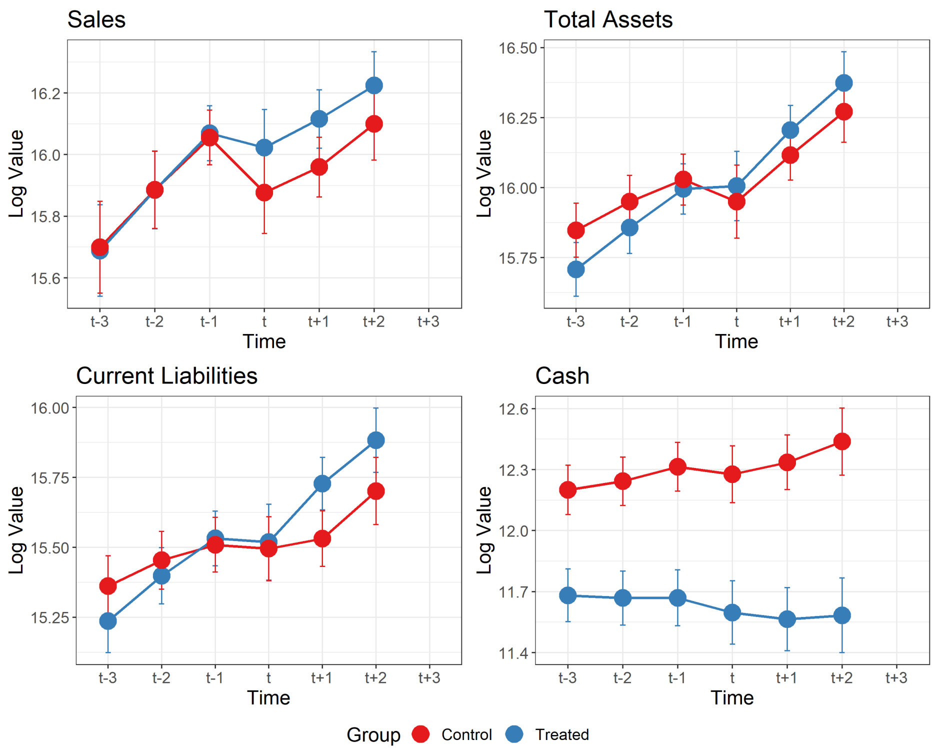
Note: This table reports the coefficients of treatment (“Guaranteed") from DID regression in the robustness test, where we match up to 10 nearest control firms for a treated firm. Each outcome variable in each year is based on a different matched sample where we drop firms without data for that outcome variable in that year before matching and excluding outliers. The dependent variables are the log difference of six main outcome variables (sales, total assets, labor costs, fixed assets, cash, and current liabilities) in year $t+1$ from year $t-1$. “Guaranteed" indicates that a firm receives a Tamwilcom guarantee in year t. Group-year and city-year fixed effects are included. Standard errors are clustered at the group-year level. Significance level: $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 8: Estimation Results of Year $t + 1$ from Matching without Replacement

	(1)	(2)	(3)	(4)	(5)	(6)
	Sales	Total Assets	Current Liabilities	Cash	Costs of Employees	Fixed Assets
Guaranteed	0.147***	0.105***	0.146***	-0.198*	0.086**	0.109^{+}
	(0.030)	(0.024)	(0.028)	(0.084)	(0.028)	(0.063)
N	16165	16631	16682	16131	14681	16226
adj. R^2	0.297	0.207	0.261	0.328	0.267	0.234
Group × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
City × Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table reports the coefficients of treatment (“Guaranteed") from DID regression in the robustness test, where we apply the matching procedure without replacement. Each outcome variable in each year is based on a different matched sample where we drop firms without data for that outcome variable in that year before matching and excluding outliers. The dependent variables are the log difference of six main outcome variables (sales, total assets, labor costs, fixed assets, cash, and current liabilities) in year $t+1$ from year $t-1$. “Guaranteed" indicates that a firm receives a Tamwilcom guarantee in year t. Group-year and city-year fixed effects are included. Standard errors are clustered at the group-year level. Significance level: $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Figure 1: Robustness: Trend Inspection from Matching with One Nearest Neighbor



Notes: This figure depicts the weighted average of the log values of sales, total assets, current liabilities, and cash in year $t-3$ to $t+2$ of treated and control firms from the robustness test, where we match only one nearest control firm for a treated firm. Confidence interval is at 95% level.

Table 9: Summary Statistics of Tamwilcom-Guaranteed Firms: Whole Sample vs. Merged Sample

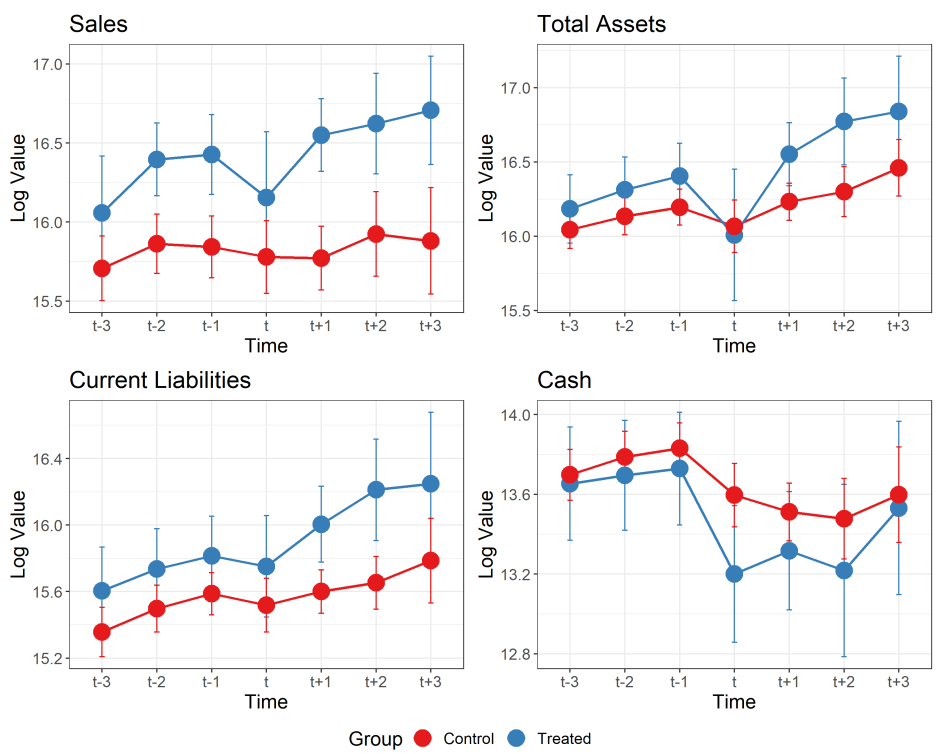
Statistics	Guaranteed Amount		Guaranteed Loan		Sales	
Sample	Whole	Merged	Whole	Merged	Whole	Merged
Mean	545	663	967	1,162	14,610	15,949
Std	1,336	1,467	3,401	3,598	28,120	28,314
Min	2	4	3	5	3	3
25%	35	42	50	60	775	1,148
Median	105	140	150	200	3,219	4,462
75%	400	560	550	800	14,176	17,039
Max	10,000	10,000	190,000	190,000	163,235	163,235

Notes: This table reports summary statistics of three variables (guaranteed firms' sales, guaranteed loan, and amount) from the whole Tamwilcom sample and the merged sample between the Tamwilcom database and Orbis. All variables are in thousands of Moroccan Dirhams.

Figure 2: Robustness: Trend Inspection from Matching on Log Cash and Cash Ratio

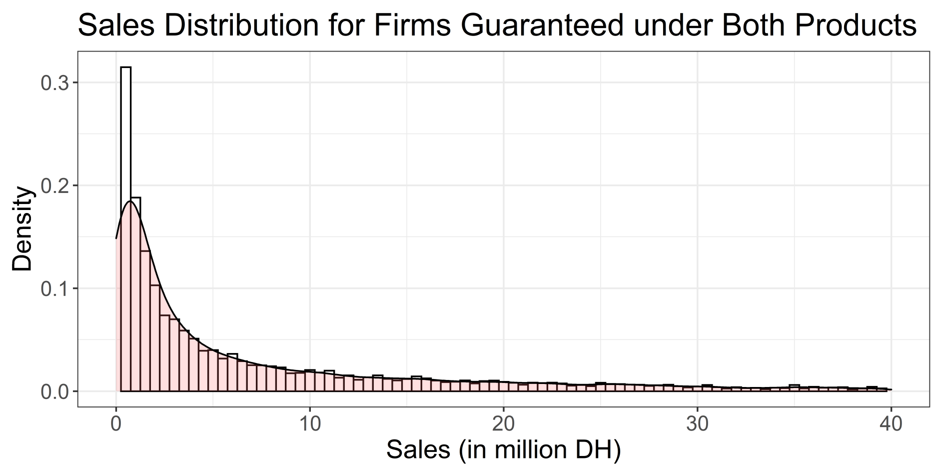
Notes: This figure depicts the weighted average of the log values of sales, total assets, current liabilities, and cash in year $t-3$ to $t+2$ of treated and control firms from the robustness test, where we only include logged cash and the ratio of cash to total assets from three pre-treatment years for matching. In this robustness test, we also divide the variable of logged cash into 20 quantile intervals and apply exact matching on this interval. The confidence interval is at 95% level.

Figure 3: Robustness: Trend Inspection from Matching on Log Sales and Cash Ratio



Notes: This figure depicts the log values of sales, total assets, current liabilities, and cash in year $t-3$ to $t+2$ of both treated and control firms from the robustness test, where we only include logged sales and the ratio of cash to total assets from three pre-treatment years for matching. In this robustness test, we also divide the variable of logged cash into 20 quantile intervals and apply exact matching on this interval. The confidence interval is at 95% level.

Figure 4: Sales Distribution of Firms Guaranteed Under Damane Exploitation and Damane Express



Notes: This figure presents the sales distribution (density) of firms guaranteed under Damane Exploitation and Damane Express. The sales number is from the Tamwilcom database.

Figure 5: Standardized Mean Difference and Variance Ratio in Raw and Matched Sample

Notes: This figure is a visualization of Table 10. The standardized mean differences ("Std-Dif") and variance ratios ("Ratio") of the raw sample and matched sample are reported by Stata *kmatch* package as in Jann (2017). All financial variables are log-transformed.

Table 10: Standardized Mean Difference and Variance Ratio: Raw and Matched Sample

Sample	Raw			Matched		
Mean	Treated	Untreated	StdDif	Treated	Untreated	StdDif
ln(total assets)$_{t-1}$	15.60	14.01	0.88	16.61	16.62	-0.01
ln(sales)$_{t-1}$	15.62	11.23	1.06	16.71	16.70	0.003
ln(current liabilities)$_{t-1}$	15.09	13.42	0.71	16.16	16.08	0.03
ln(cash)$_{t-1}$	11.35	10.76	0.25	12.21	12.90	-0.30
ln(total assets)$_{t-2}$	15.40	13.94	0.79	16.50	16.55	-0.03
ln(sales)$_{t-2}$	15.13	11.19	0.89	16.66	16.66	-0.001
ln(current liabilities)$_{t-2}$	14.88	13.28	0.64	16.06	16.04	0.01
ln(cash)$_{t-2}$	11.35	10.77	0.26	12.13	12.81	-0.30
ln(total assets)$_{t-3}$	15.12	13.82	0.67	16.39	16.48	-0.05
ln(sales)$_{t-3}$	14.39	10.78	0.72	16.60	16.61	-0.004
ln(current liabilities)$_{t-3}$	14.48	12.96	0.50	15.97	15.99	-0.01
ln(cash)$_{t-3}$	11.31	10.78	0.24	12.13	12.74	-0.28
ln(age)	5.18	5.15	0.07	5.43	5.45	-0.06
Variances	Treated	Untreated	Ratio	Treated	Untreated	Ratio
ln(total assets)$_{t-1}$	2.17	4.35	0.50	1.65	1.64	1.01
ln(sales)$_{t-1}$	2.26	32.33	0.07	1.35	1.34	1.01
ln(current liabilities)$_{t-1}$	3.32	7.66	0.43	1.96	1.91	1.03
ln(cash)$_{t-1}$	5.14	5.56	0.92	4.57	3.72	1.23
ln(total assets)$_{t-2}$	2.46	4.34	0.57	1.73	1.71	1.01
ln(sales)$_{t-2}$	7.32	31.99	0.23	1.37	1.38	0.99
ln(current liabilities)$_{t-2}$	3.72	8.60	0.43	2.01	1.95	1.03
ln(cash)$_{t-2}$	4.95	5.27	0.94	4.55	3.81	1.20
ln(total assets)$_{t-3}$	3.09	4.47	0.69	1.79	1.77	1.01
ln(sales)$_{t-3}$	15.34	34.52	0.44	1.37	1.41	0.98
ln(current liabilities)$_{t-3}$	6.67	11.31	0.59	2.08	1.94	1.07
ln(cash)$_{t-3}$	4.78	5.00	0.96	4.51	3.78	1.19
ln(age)	0.23	0.20	1.13	0.22	0.18	1.27

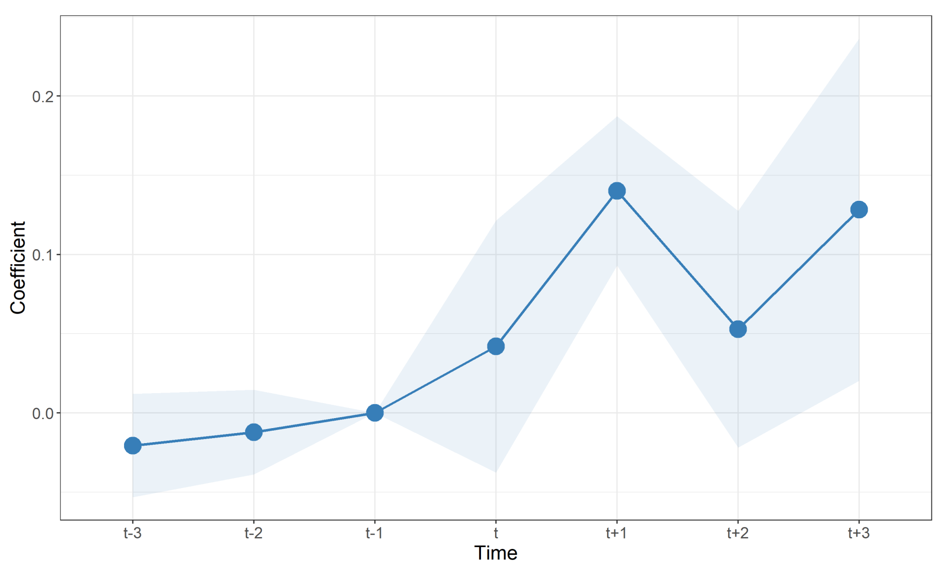
Notes: This table reports the standardized mean differences (“StdDif") and variance ratios (“Ratio") of the raw sample and the matched sample, reported by Stata *kmatch* package (see Jann (2017)). All variables are log-transformed.

Table 11: Summary Statistics: Guaranteed Firms VS. Non-Guaranteed Firms

Statistic	N	Mean	St. Dev.	Pctl(25)	Median	Pctl(75)
Guaranteed firms (treated sample)						
Sales Growth	3,178	0.152	1.836	−0.108	0.073	0.290
Total Assets Growth	3,184	0.177	1.728	−0.015	0.148	0.367
Costs of Employees Growth	3,091	0.204	0.597	−0.017	0.130	0.331
Fixed Assets Growth	3,184	0.099	2.308	−0.323	−0.053	0.340
Current Liabilities Growth	3,184	0.189	1.537	−0.091	0.123	0.388
Cash Growth	3,124	0.058	1.984	−0.942	0.066	1.038
Non-guaranteed firms (control sample)						
Sales Growth	15,921	0.086	2.214	−0.126	0.034	0.224
Total Assets Growth	15,932	0.095	1.804	−0.048	0.087	0.265
Costs of Employees Growth	15,338	0.138	0.573	−0.038	0.089	0.258
Fixed Assets Growth	15,932	−0.043	2.374	−0.377	−0.096	0.182
Current Liabilities Growth	15,951	0.094	1.558	−0.137	0.045	0.290
Cash Growth	15,674	0.104	1.608	−0.624	0.076	0.860

Notes: The summary statistics are based on the matched sample of treated firms and control firms. The growth rate of financial variables is the first difference between logged variables.

Figure 6: Coefficients on Sales Growth in Three Years Before and After the Treatment



Notes: The dots give the coefficients from the main regression (1). The outcome variable is the log differences of sales in years $t-3$, $t-2$, t, $t+1$, $t+2$, $t+3$, compared to the base year $t-1$, the year before the treatment. The shaded area around the dots is the 95% confidence interval.

Table 12:
DISTRIBUTION STATISTICS OF FIRM CHARACTERISTICS

Assets Quantile	Assets	Sales/Asset	Debt/Asset	Cash/Asset
Orbis Sample				
1	77	1.21	0.24	0.59
2	338	1.24	0.53	0.25
3	1,102	1.02	0.61	0.15
4	3,509	0.89	0.65	0.10
5	41,965	0.68	0.65	0.06
Guaranteed Sample				
1	770	1.69	0.56	0.18
2	2,462	1.31	0.62	0.08
3	5,422	1.21	0.65	0.06
4	12,866	1.12	0.66	0.05
5	54,923	0.91	0.68	0.03
Non-Guaranteed Sample (Control)				
1	2,897	2.02	0.60	0.12
2	8,704	1.54	0.64	0.08
3	16,971	1.32	0.64	0.06
4	33,254	1.08	0.63	0.06
5	111,372	0.72	0.60	0.04
Non-Guaranteed Sample (Whole)				
1	73	1.20	0.23	0.60
2	309	1.25	0.52	0.26
3	996	1.01	0.61	0.16
4	3,166	0.87	0.65	0.11
5	40,929	0.65	0.65	0.06

Notes: This table reports the means of indicated financial variables and ratios based on five quantile groups of total assets. The unit of total assets is a thousand. Observations with ratios of current liabilities/total assets and cash/total assets bigger than one or smaller than 0 are dropped. Orbis sample comprises all the firms in Morocco. The guaranteed sample refers to the whole sample of guaranteed firms. Non-guaranteed sample (whole) is composed of all firms that do not possess a credit guarantee. Non-guaranteed sample (control) refers to those non-guaranteed firms that are selected during the matching process for the empirical analysis.

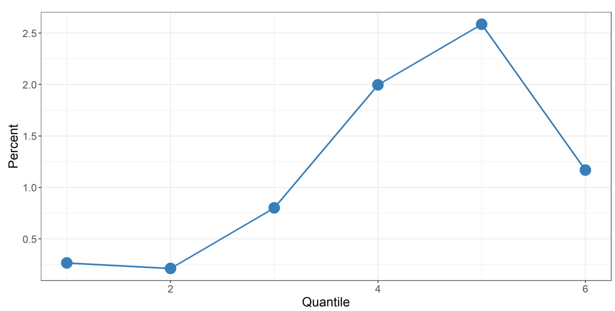
Table 13: Participation Rate by Size

Size	Participation Rate (%)
Small company	2.51
Medium-sized company	15.40
Large company	11.44
Very large company	1.22

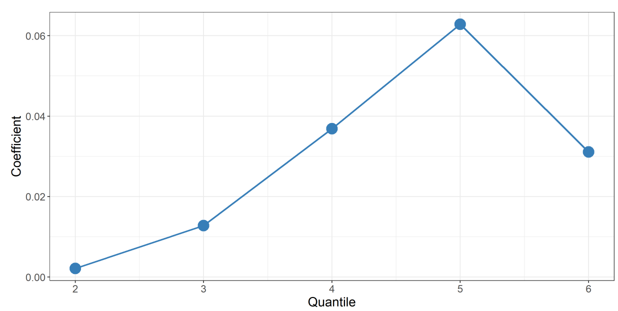
Table 14: Probability of Successful Pairing between Tamwilcom and Orbis by Size

Size	Probability (%)
Small company	30.37
Medium sized company	52.54
Large company	74.41
Very large company	79.03

Figure 7:
DISTRIBUTION OF PARTICIPATION RATE



(a) Distribution by Total Assets Quantile Bin



(b) Coefficient of Quantile Regression

Notes: The cut points of total assets quantile bins are set at 0.1, 0.5, 0.75, 0.9, 0.99. In Figure 7 (a), the participation rate is calculated as the ratio of the number of guaranteed firms to the total number of firms in each bin. In Figure 7 (b), the coefficient is from the following regression: Participation$_{it}$ = $\sum_{q=1}^{6} \beta_q$ Quantile Bin$_q$ + δ_j + δ_t, where i indexes individual firms, j indexes sector, and t indexes year. Participation$_{it}$ is a dummy variable of one if the firm is guaranteed and zero otherwise. Quantile Bin$_q$ is a dummy variable of one of the firm's total asset is located in quantile q ($q \in [1, 6]$), and zero otherwise. δ_j and δ_t refer to sector and year fixed effects. Observations in quantile one are dropped automatically by Stata due to collinearity. Coefficients of β_q are reported in Figure 7 (b).

E Proofs in the Theoretical Model

E.1 The entrepreneur's program in the special case

The first-order conditions of Lagrangian associated with objective (13) are the following:

$$
\begin{aligned}
/d_t &: d_t^{-\eta} - \eta_t &&= 0 \qquad (1)\\
/n_t &: \beta\epsilon v'(n_t) - \eta_t &&= 0 \qquad (2)\\
/k_t &: -\gamma_t + [\psi'(k_t) + 1 - \delta] + \lambda_t(\theta - a) &&= 0 \qquad (3)\\
/c_t &: -\gamma_t + (1 + r_t) + \lambda_t + \zeta_t &&= 0 \qquad (4)
\end{aligned}
$$

where η_t is the shadow price of the budget constraint (14), and γ_t, λ_t and ζ_t the shadow prices of, respectively, the net worth allocation constraint (15), the working capital constraint (16) and the non-negative cash constraint (17), normalized by $[\eta_t(1-\tau)]^{-1}$. The envelope theorem yields

$$
v'(n_{t-1}) - \gamma_t\eta_t(1-\tau) = 0 \qquad (5)
$$

We use the first-order conditions to derive the equations (18) and (20) in the paper. FOC equation (3) and equation (4) yield the relationship between MBK and MBC equation (18) immediately. Considering a sufficiently small SME who needs positive cash holdings ($\zeta = 0$), FOC equation (2), combined with equation (5) evaluated in $t+1$, together with equation (4) evaluated in $t+1$, and finally replace both η_t and η_{t+1} using equation (1), yield equation (20).

E.2 Proof of Proposition 2

Point (i) derives immediately from the long-term Euler equation (22) and from the stationarity of the households' consumption that implies $\beta(1 + r_{t+1}) = 1$.

To establish point (ii), we use the expression for λ_t^* (4.2), where we replace λ_t^* with its long-term value λ^{LT}. We obtain an implicit definition of the long-run capital stock k^{LT}:

$$
\lambda^{LT} = \frac{\psi'(k^{LT}) + 1 - \delta - (1 + r_t)}{1 + a - \theta}
$$

we then replace $1 + r_t$ with $1/\beta$. Then, we define the optimal capital stock as k^{opt}. Noting that, k^{opt} is determined by $\psi'(k^{opt}) + 1 - \delta = (1 + r_t)$, we replace $1 - \delta - (1 + r_t)$ with $-\psi'(k^{opt})$. This yields point (ii).

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