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Financial constraints matter

Empirical evidence on borrowing behavior, microfinance and firm productivity

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Financial constraints matter: Empirical evidence on borrowing behavior, microfinance and firm productivity

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Abstract
This paper examines the effect of financial constraints on firm performance using a sample of small business owners who are client at a microfinance institution (MFI). In developing countries, a lack of access to finance is seen as a key obstacle to successful entrepreneurship and economic growth. However, empirical evidence on this is still fragmented and sparse. This study contributes to the literature by applying an alternative measure of financial constraints based on actual lending and borrowing behavior to test how borrowing affects firm productivity. We use survey data of 615 entrepreneurs from Tanzania to analyze the relationship between financial constraints and labour productivity. Using OLS regression and propensity score matching techniques the results show that financial constraints impede labour productivity and are important barriers to successful entrepreneurship. Further tests suggest that financial constraints matter regardless of the measurement method used, thereby comforting researchers in a fragmented field which applies a wide range of financial constraints variables.

Keywords: Entrepreneurship; credit constraints; access to finance; firm performance

JEL classification: D22, D24, G29, L25, L26, O16

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1. Introduction

The vast majority of economic activity in poorer regions in the world is conducted by small business owners that run micro and small enterprises (Mutandwa *et al.*, 2015). Microenterprises rank financial constraints as key obstacle to firm growth (Ayyagari *et al.*, 2008; Nichter and Goldmark, 2009; Buera *et al.*, 2015). Many firms in developing areas face severe financial constraints because of the high risk environment in which these firms function. Banks are unwilling to operate in these areas because their traditional loan products cannot fill the institutional voids. Most firms are informal (Williams, 2015). Traditional banks are often unable to provide the usual lending facilities to microenterprises as credit contracts are not easily enforced and business owners lack proper financial records. This limits the access to finance for microenterprises and makes them financially constrained.

However, relatively little is known empirically about the impact of credit obstacles to the performance of micro and small enterprises. Certainly, there is a large literature that stipulates how access to finance hinder economic activity. For example, Evans and Jovanovic (1989) provide a simple model to explain why financial constraints impede entrepreneurial start-up and reduce firm performance (see also Ahlin and Jiang, 2008). In this framework, financial constraints give rise to two inefficiencies. First, entrepreneurs with high entrepreneurial abilities cannot set-up their own firm because they have too few assets and instead opt for wage labour. This mechanism has received wide empirical support (e.g. Black and Strahan, 2002; Paulson and Townsend, 2004), but is not the focus of this paper. The second inefficiency that arises from financial constraints in the Evans and Jovanovic model is that there are firms that are willing to invest more in capital, but cannot, and therefore underinvest which reduces the performance. The theoretical implication is that financial constraints should reduce firm performance and this hypothesis is at the core of our empirical study. That is, the following main research question is addressed in this empirical study: “Do financial constraints matter to the performance of microenterprises in the context of a developing country?”

Our main research challenge is to analyze how financial constraints matter to entrepreneurship in the context of developing countries. To measure such credit obstacles is notoriously difficult in both developing countries and for small firms in general, but we argue that in this study we

benefit from data on the *actual* borrowing behavior by microenterprises at a microfinance institution (MFI) to create an alternative measure of financial constraints. Moreover, to investigate what the economic effects of financial constraints are on performance, one has to take into account that financially constrained entrepreneurs may have ex ante different characteristics than non-constrained entrepreneurs. Our detailed survey allows us to control for such factors. For example, in developing countries households often need to find financing for funerals or sick family members. Since access to finance is limited, entrepreneurs may be tempted to use microfinance loans for non-business purposes.

This paper contributes to a growing field of studies that emphasize the importance of access to finance by exploiting the unique set-up of microfinance to obtain a reliable and easy to replicate measure of financial constraints based on actual borrowing behavior. We contribute to the empirical literature that examines what the effects of credits are on firm performance as other studies find mixed results (see Banerjee *et al.*, 2015). In particular, using firm-level surveys for entrepreneurs in Tanzania, our results show that being financially constrained reduces labour productivity by 21 to 23 percent. In sensitivity tests, a range of indicators for financial constraints are used and later combined in a single factor to capture this more broadly. These results are robust and suggest that a range of measures can be applied to capture financial constraints among microenterprises in the context of a developing country. Furthermore, using propensity score matching to account for selection into borrowing effects, the results also yield similar negative economic effects of financial constraints on labour productivity, thus suggesting a causal link between financial constraints and firm performance. This study thereby complements and confirms the general results from the existing literature on the importance of financial constraints in developing countries. Elevating financial constraints matters to successful entrepreneurship.

The paper commences as follows. Section 2 discussed related literature. Section 3 explains how MFI's are typically structured around a borrowing cycle and our related financial constraints measure. Section 4 describes the data and methodology. Section 5 presents the main results. Section 6 tests the robustness of the key findings. Section 7 concludes.

2. Related literature

As a starting point of this paper we use the Evans and Jovanovic (1989) model. Two central outcomes of this model are, first, that financial constraints impede entrepreneurial start-up opportunities. That is, entrepreneurs with high entrepreneurial abilities are not able to start profitable investment projects or their own business, because they cannot obtain the required assets for their firm. This idea could explain the empirical observation that more wealthy individuals are more likely to become entrepreneurs since more wealthy individuals may rely on their own assets (see Black and Strahan, 2002; Paulson and Townsend, 2004). This problem is especially relevant in developing countries, because often entrepreneurs lack collateral or proper credit histories. As a result, most banks are unwilling to lend to these kind of individuals when they would like to start a new enterprise.

Microfinance has been highly popularized as an instrument to tackle these kinds of financial constraints in such risky environments over the past decades. Using novel lending products, microfinance institutions (MFIs) have been able to overcome the problems related to the risky environment and make money available to those that are traditionally “unbankable”. The idea here is that access to credit through microfinance should enable high ability, low asset entrepreneurs to start their firm. Microfinance may contribute to income growth by increasing investments in income generating activities and possible diversification of sources of income, which reduces the entrepreneurs’ vulnerability. Without access to credit, entrepreneurs can undertake only a limited number of opportunities, and as a result their firms stay smaller, grow slower and cannot improve productivity. Ahlin and Jiang (2008) further model how microfinance brings an improvement in the credit market by enabling entrepreneurs in general to venture a business instead of only working for wages or subsist.

Once entrepreneurs are able to start their firm, the Evans and Jovanovic (1989) model’s second key implication is that high ability entrepreneurs perceive good business opportunities, but they cannot engage in those activities due to a lack of credit. That is, a further inefficiency arises from financial constraints: there are entrepreneurs that are willing to invest more in business capital, but they cannot, and therefore underinvest in their firm. Assuming that these additional investments would have been profitable, foregoing the investments means a reduction in firm

performance. Consequently, financial constraints should reduce firm performance. In addition, according to Carreira and Silva (2010) financially constrained firms both underinvest and hold little savings. A lack of savings means small business opportunities cannot easily be exploited, and a negative event may not be easy to overcome. The lack of saving and underinvestment reduces the performance and could even negatively affect economic growth more generally (Ahlin and Jiang, 2008).

Financial constraints matter strongly in developing countries. For example, the World Bank Enterprise Surveys asks respondents to what degree financing is an obstacle to the operations of the business from which a "financial constraint" dummy can be derived. Doing so using firm surveys across 51 countries, Love and Mylenko (2003) show that countries with greater financial development have fewer financially constrained firms, suggesting that this topic is particularly pertinent in the context of developing countries (Carreira and Silva, 2010). Not surprisingly, in developing areas given the limited number of registered firms and low banking outreach, microenterprises rank financial constraints as the most important obstacle for their operations (Ayyagari *et al*., 2008; Rijkers *et al*., 2010; Dethier *et al*., 2011). Bigsten *et al.* (2003) analyze the demand for credit in six African economies and highlight troubles to obtain access to finance among small firms. More generally, using firm-level data from 18 OECD countries, Buera and others (2011) show that financial constraints have a negative effect on labour productivity. Similarly, consistent with the prevalence of financial constraints is that several studies find that many microenterprises from developing countries can potentially earn high returns, but have to leave profitable investment opportunities unexploited (Vijverberg, 1991; De Mel *et al*., 2011; Kremer *et al.*, 2013).

There are several closely related papers that analyze the impact of financial constraints on business outcomes in developing countries, although they all apply different measures of financial constraints and firm performance. To start, Daniels and Mead (1998) study the determinants of profits in Kenya and show that a dummy capturing whether the entrepreneur has received any type of credit does not explain firm performance. Masakure *et al.* (2008) analyze profitability of microenterprises in Ghana and use two dummies related to the recipient of formal credit or informal credit to capture financial constraints. They find a ("counter

intuitive") negative effect of formal credit on profitability, which they attribute to the high average interest rates such loans carry. That explanation is supported also by their finding of a positive effect of access to bank credit among the highest quantile of profitable firms. Masakure *et al.* (2008) further show that another indicator of the lack of financial constraints, personal credit recipient, is associated with high profitability, thus suggesting financial constraints depress performance. Similarly, Rijkers and others (2010) find that perceived major problems in obtaining formal bank loans reduces productivity among manufacturing firms in Ethiopia. Kinda and Loening (2010) use data on Tanzanian non-farm enterprises and show that about 61 percent of the entrepreneurs interviewed consider financing as a major constraint to business operations. Using this perception measure they find a negative relationship with sales growth. De Mel and colleagues (2011) use an intervention in Sri Lanka to test the effect of additional loans granted to entrepreneurs on profitability in terms of returns on capital but do not find any link. Murisa and Chikweche (2013) use a qualitative approach and link access to loans to firm growth in Zimbabwe. Nagler and Naudé (2014) use a dummy for perceived access to credit and show that this hampers labour productivity of firms in Ethiopia and Malawai, but has no effect on firm performance in Nigeria and Uganda. More recently, Bokpin *et al.* (2018) show that alleviating credit constraints as measured by the availability of overdraft facilities is associated with higher firm productivity in South Africa.

Interestingly, most empirical studies analyze the impact of microfinance on social outcomes and consumption, and, only recently, studies attempt to demonstrate its impact on firm performance yet find mixed results. For Thailand, Coleman (2006) shows that microfinance raises the number of assets held by the entrepreneur and increases sales. For South-Africa, Karlan and Zinman (2009) estimate that consumer credit raises income. Kaboski and Townsend (2012) show that Thai entrepreneurs that receive microfinance increase profits and income but have lower asset growth rates. For Kenya, Dupas and Robinson (2013) find that access to financial services increases the level of productive investments by entrepreneurs. For Ghana, Fafchamps et al. (2014) show that cash grants have no effect on profits, although in-kind transfers raise profitability of microenterprises. For India, Banerjee *et al.* (2015) find no effect of microcredit on the profits of the microenterprise, but show increased investments in durable goods.

3. Measuring financial constraints

Obtaining a good measure of financial constraints in developing countries and of small firms more generally is typically difficult. Official firm-level data is often missing or unreliable (Claessens and Tzioumis, 2006), therefore surveys often rely on "perceived" financial obstacles by the entrepreneur. For example, the World Bank Enterprise Surveys ask respondents to what degree financing is an obstacle to the operations of the business from which a "financial constraint" dummy is derived (Love and Mylenko, 2003). Others have used similar self-reported data to study financial constraints in developing countries (e.g. Masakure *et al.*, 2008; Rijkers *et al.*, 2010; Nagler and Naudé, 2014).

To measure financial constraints, our study uses data on actual borrowing behavior at the MFI. At an MFI, in order to get access to finance, entrepreneurs voluntarily form an "borrowing group" which consists of four to five members. Entrepreneurs join these groups with other entrepreneurs, who are not relatives. Borrowing groups are united in higher entities, the so-called "Market Enterprise Committees" that provide the loans and collect payments at weekly meetings. Under joint liability, other group members co-guarantee each other's loan. If the group does not meet its collective responsibility to repay all of its members' loans, then each group member is denied future credit.

The MFI follows a stepwise approach to lending activity by granting small but increasing amounts of credits to borrowers. Entrepreneurs build-up a credit history as they repay the first loans within a period of six months. In this way, MFI's typically circumvents the issue of lack of credit history that hampers traditional loan extension (see Murisa and Chikweche, 2013). Every successful completion of a loan "cycle" gives the entrepreneur access to a larger loan amount. This *sequestration of loan cycles* generally continues five times until the largest loan amount possible within the MFI is reached. In this standard setting entrepreneurs have an incentive to repay because in the next loan cycle they can obtain more financing.

Banerjee and Duflo (2014) suggest that entrepreneurs who borrow less than they are allowed are not financially constrained, because these entrepreneurs have easy access to additional funds which they do not require. Conversely, those who borrow as much as possible cannot

access sufficient funding and are thus classified as financially constrained. In our sample, the maximum possible loan amount for each entrepreneur can be derived from the total number of loans that the entrepreneur has repaid, as each repayment takes the entrepreneur to a higher loan cycle with an associated fixed maximum borrowing amount. This maximum is then compared to the actual amount borrowed in the latest loan. A dummy variable is created where borrowing equal to the maximum amount possible is associated with financial constraints. Not borrowing or less than the maximum implies no financial constraints. A potential drawback of this measure is that entrepreneurs who have ample business opportunities will be more likely to borrow the maximum amount (and vice versa), and thus will possibly be wrongly classified as financially constraint. This could lead to an underestimated effect of financial constraints on firm performance as entrepreneurs with very good prospects are grouped as financially constrained but typically will have better business outcomes than their peers who do not have good business prospects.

Using our proposed alternative measure of financial constraints - "*FinCon*", based on actual borrowing behavior - suggests that 59 percent of the entrepreneurs in our sample is classified as financially constrained. Figure 1 shows the five loan cycles in the studied scheme and the associated maximum borrowing amount. The percentages indicate the share of entrepreneurs in the total sample that fall in each category. The largest group (35%) is in the second loan cycle and borrows the maximum amount possible (400,000 TZS). The largest group of non-financially constrained entrepreneurs (24%) is in the fifth loan cycle and thus does not borrow or less than the maximum amount (2,000,000 TZS). The number of financially constrained entrepreneurs falls as the number of completed loans, and thereby the maximum possible loan, increases. This is an intuitive outcome because access to more finance at some point saturates the demand for credit. We will compare our results using *FinCon* against several other indicators of financial constraints.

4. Data and Method

4.1. Data

Data was collected among entrepreneurs in 2010 who were registered at a microfinance institution (MFI) in Tanzania in the area of the city Dar es Salaam. Tanzania is among the world's poorest countries with a gross domestic product per capita (in PPP) of $1.423. Access to credit in Tanzania is very difficult as there are not many entrepreneurs with official bank accounts and there are still relatively few microfinance institutions (Kinda and Loening, 2010).

The firm-level surveys were conducted in Swahili by 15 interview teams who were recruited by a local organization. Interviews took place at the household of the entrepreneur. The questionnaire was divided into two parts, one related to socio-economic variables and one related to medical data. The latter was not used in this study. The socio-economic questionnaire first started with the collection of key household related data such as household size. The next section was addressed to the entrepreneur and collected key business related information. The next section covered the role of the MFI and the structure of microfinance. The next section included the household assets and consumption. Finally, a section asked entrepreneurs about their willingness to take risk. These socio-economic interviews took about 30 minutes to complete.

The target sample consisted of a random draw of 1,660 members from two of the six branches of the MFI. The total number of clients at those two branches was 4,438. The draw was stratified on loan cycle in order to get a decent number of respondents in each category. The sample only included members who were part of a loan group and who had repaid their first loan. From this sample 674 entrepreneurs were interviewed, leaving 55% of the sampling list not surveyed. The main reason was that it was not possible to reach or trace the members and 6% refused to participate. Post hoc analysis shows no systematic differences between the interviewed and the non-interviewed entrepreneurs on the sampling list in terms of age, gender and loan size. Of the 674 entrepreneurs, 21 members of the MFI did not own a business at the time of the interview and were dropped from the analysis. The main sample only includes members who were part of a loan group, who had repaid their first loan and were business owners such that

they classify as entrepreneurs. Due to non-response and some missing values on the variables used in this study, our main sample consists of 615 entrepreneurs.

4.2. Dependent variable: productivity

Our main measure of firm performance is labour productivity. Ideally, a measure of firm productivity is applied because it indicates if firms use and allocate resource inputs most efficiently for productive uses (Hsieh and Klenow, 2009; Dethier *et al*., 2011). However, productivity differences across microenterprises in developing countries are challenging to estimate because these firms do not provide financial accounts nor is there reliable data on capital inputs (Claessens and Tzioumis, 2006; De Mel *et* al., 2009). In such settings it is therefore common to focus on labour productivity instead of firm productivity, which indicates how efficiently labour is used in the production of output.

To derive the labour productivity, first, sales are calculated based on self-reported sales of the microenterprises. For each month entrepreneurs indicate whether it was a month with high, average or low sales. Then they are asked to indicate the value of sales in a typical month with high, average and low sales. From these questions the total amount of sales for a year is calculated (see Nagler and Naudé, 2014). By differentiating between high, average and low, the sales take into account the seasonality which may be an important factor in the performance of many entrepreneurs (see also Willebrands *et al.*, 2012 who use the same method to derive sales of entrepreneurs in Nigeria and Boermans and Willebrands, 2017 for Tanzania). Next, output per worker is derived by dividing total sales by the number of employees and adjusted for the number of months that the microenterprise was open (see e.g. Masakure *et al*., 2008; Kinda and Loening, 2010). The analysis uses the natural logarithm of labour productivity normalized by sector (see further Appendix 1). This way, the firm performance measure is unaffected by price, technology and other relevant sector differences such as capital intensity (Rijkers *et al.*, 2010; Buera *et al*., 2011, Dethier *et al.*, 2011).

For robustness purposes, labour productivity is decomposed to show how productivity in general is affected by sector. In addition, further decomposition depicts how sales are affected more broadly by firm size. Finally, a measure of profitability is used. Although capturing profits is a

notorious task in our context (see De Mel *et al.*, 2009), monthly sales and expenditure data are used to obtain an estimated profitability measure, where we set estimated losses equal to one so we can take the natural log of this measure (Vijverberg, 1991; Kremer *et al.*, 2013; Fafchamps *et al.*, 2014). Table 1, Panel A shows the sample characteristics of the dependent variables.

4.3. Independent variables: financial constraints

Because we use an alternative measure of financial constraints (*FinCon*) based on actual borrowing behavior as preferred measure (as stipulated in Section 3), we also use several other related measures of financial constraints. First, because the borrowing of credit is a group activity, in some cases entrepreneurs pay for others within their borrowing group within the loan cycle. We use the measure "*Lending to others MFI*" to signify that entrepreneurs do not face financial constraints because they are able to grant credits. In a way, this a reverse measure based on *actual* lending behavior. "*Lending to others MFI*" is a categorical variable where "0" = no lending to others, "1" = one contribution for loan repayment, "2" = two to three contributions, and "3" = more than three times lending to others to contribute to loan repayment. Second, we asked entrepreneurs to indicate if in addition to lending to others within the borrowing group they have extended loans to others outside their household. Again, we interpret this measure "*Lending to others externally*" as in indication of lower financial constraints.

Finally, we use the amount of savings as an additional measure of financial constraints. Typically, financially constrained firms hold little savings (Musso and Schiavo, 2008; Carreira and Silva, 2010; Buera *et al*., 2011). Firms with large amounts of savings can utilize this source for investment, especially in our context where there is a thin line between household and business. Within a realistic time period, entrepreneurs can self-finance business activities by saving or internal funding, thereby overcoming the financial constraints. In order to obtain another measure of financial constraints, the survey contains the following two questions: "what is your current balance on a formal savings account?" And, "what do you currently have in total in informal savings?" The latter question is important because many entrepreneurs do not have any official savings and because holding informal savings is very common in developing areas.

Based on these items we construct a total savings variable "*Saving*". Table 1, Panel B shows the sample characteristics of the dependent variables.

4.4. Control variables

We include three sets of control variables as presented in Table 1, Panel C, along with a correlation matrix. First, a standard set of demographics that may affect firm performance includes (i) age (e.g. Masakure *et al*., 2008; Daniels and Mead, 1998; Vijverberg, 1991).) as well as a squared term to pick up non-linearities (see Nichter and Goldmark, 2009; Nagler and Naudé, 2014), (ii) gender (a male dummy) where typically males perform better (e.g. Daniels and Mead, 1998; Bigsten *et al*., 2003; Masakure *et al.*, 2008; Rijkers et al., 2010) and, (iii) education level measured in years, as well as a threshold effect for attainment of secondary education (see Nichter and Goldmark, 2009), even though there is no strong consensus what role relatively education plays for firm performance in the context of a developing country (e.g. Eijdenberg and Borner, 2017).

Second, we use a set of standard firm characteristics, including firm age, expressed as an indicator for young firms (less than five years old) (e.g. Vijverberg, 1991; Carreira and Silva, 2010), level of competition perceived (indicator high/low) (see Black and Strahan, 2002; Rijkers *et al*., 2010; Dethier *et al.*, 2011; Nagler and Naudé, 2014), an indicator for recent business obstacles experienced (see Ayyagari *et al*., 2008; Rijkers *et al*., 2010), no fixed business location dummy which is associated with lower performance (e.g. Vijverberg, 1991) and a variance of sales measure to capture volatility, where more variance should be compensated with higher returns (e.g. Nichter and Goldmark, 2009)

Third, at the household level, we include household size, and, an household asset factor based on 27 items is included (see Appendix 2), although prior studies find no link with firm performance for either measures (Daniels and Mead, 1998; Masakure *et al.*, 2008). At the level of the entrepreneur we further control for risk propensity (e.g. Zhao *et al*., 2010; Willebrands *et al*., 2012; Kremer *et al.*, 2013; Boermans and Willebrands, 2017), whether the business owner contracted a severe illness in the past twelve months as well as an indicator for a funeral within the household in the past twelve months as we expect these events hamper firm

productivity. Lastly, we control for consumption uptake defined in five quantiles because we expect that entrepreneurs who have too low nutritional intake cannot perform well. Finally, our preferred dependent variable includes sales, firm size measured by the number of workers, number of months open as well as sector level information.

[Insert Table 1 Panels A-C here]

4.5. Estimation strategy

We analyse the effect of financial constraints on firm performance using a standard OLS regression model with Huber-White robust standard errors:

$$(1) \qquad Productivity = \beta_0 + \beta_1 FinCon_i + \beta_k Controls_i + \varepsilon_i$$

where in our preferred model *Productivity* stands for normalized within-sector labour log of productivity, the β_1 measures the direct impact of financial constraints (*FinCon*) and β_k includes the set of control variables and ε_i is the error term.

5. Main results

The OLS regression results in Table 2, Column (1) show that financial constraints, as measured by the actual borrowing behavior, *FinCon*, have a significant negative effect on labour productivity, without including any control variables. The magnitude of the effect of financial constraints on labour productivity is meaningful in economic terms. On average, an entrepreneur who is financially constrained has a 21.4 percent lower labour productivity compared to microenterprises that are not financially constrained. Columns (2) to (4), that include supplementary control variables, further confirm that financial constraints are associated with lower labour productivity. Keeping all else constant yields an estimated effect of financial constraints in the range of 20.5 to 23.2 percent. This is in line with other empirical studies that use a binary approach to measure financial constraints (Masakure *et al.*, 2008; Rijkers *et al.*, 2010).

Most of the control variable have the expected sign. Column (2) includes standard demographics of the entrepreneur. First, we find that males are more productive than females. The difference is in the range of 20 to 26 percent and is comparable to the findings of inter alia Rijkers *et al.* (2010) who find that females have about 37 percent lower productivity among small firms from Ethiopia (see also Daniels and Mead, 1998). Second, for age we find a jointly significant non-linear effect. That is, entrepreneurs become more productive as they are older, however, at some age the effect of age on productivity turns negative. In our estimated this turning-point lies around 45 years and is in line with previous findings (e.g. Nagler and Naudé, 2014). Third, for education we find no significant effect on productivity, both in terms of number of years as well as for an indicator that the entrepreneur has finalized his or her secondary education. Although most scholars point to a positive role of education in general (e.g. Nichter and Goldmark, 2009), some have also found no effect in line with our results (e.g. Eijdenberg and Borner, 2017 in Tanzania). Note that these findings are robust in Column (3) and Column (4) when additional controls are included.

Second, Column (3) includes standard firm-level characteristics. First, we find that younger firms are less productive. Specifically, on average and keeping other things constant, younger firms have a 25 to 28 percent lower labour productivity than older firms. This is comparable to other studies (Vijverberg, 1991; Carreira and Silva, 2010). Second, firms that face more competition are more productive. We find that competition increases labour productivity by about 33 percent. This effect is consistent with Black and Strahan (2002), although the size of the effect that we find appears to be larger in economic terms. Third, entrepreneurs who indicate that their business did not encounter any obstacles are more productive, although this effect is insignificant in Column (3) and only significant at the ten percent level in Column (2). Still, the results may suggest that labour productivity and encountering business obstacles are intricately related as hypothesized by Rijkers and others (2010). Fourth, entrepreneurs working without a fixed business location do not have a different productivity compared to those with a fixed business location, although the sign of the effect is consistently negative and almost significant (see also Vijverberg, 1991). Lastly, businesses with a higher variance in sales tend to be associated with higher productivity, although this effect is only significant at the ten percent

level in Column (2) and insignificant in Column (4). This finding would be in line with the general notion that there is a trade-off between expected returns and expected volatility.

Finally, Column (4) includes additional control variables showing the richness of our dataset. First, illness has a negative effect on productivity. That is, entrepreneurs who indicate that they faced a severe illness have on average 27 percent lower labour productivity than their peers, ceteris paribus. Second, facing a funeral within their family did not appear to affect productivity, although the sign is negative and near significant, potentially suggesting that business funds are transferred to the household to cover funeral costs. Third, having more household assets is not related to productivity, as also found by Daniels and Mead (1998) and Masakure *et al.* (2008), but is in contrast to the model outcomes of Ahlin and Jiang (2008). Fourth, greater willingness to take risks is associated with lower productivity. Although this is in contrast to the Entrepreneurial Orientation Literature for advanced economies (e.g. Zhao *et al*., 2010), it is in line with more recent behavioral analysis that suggest that a greater willingness to take risk does not necessarily translate into better firm performance in developing countries (e.g. Willebrands *et al*., 2012; Boermans and Willebrands, 2017). Fifth, entrepreneurs with a larger household are associated with higher productivity. One potential reason is that they can rely on cheap labour from household members. Finally, very low levels on nutritional uptake in terms of consumption units is associated with lower productivity. Moreover, our consumption quantiles are jointly significant and looking at the estimated signs for each bucket it suggests that higher consumption is associated with higher productivity, although this variable may be endogenous in the sense that entrepreneurs who are more productive can afford higher consumption.

The coefficient of determination in all models is quite low compared to other studies on firm performance. This is due to the fact that typically especially firm size and sector have large explanatory power and in our setting these variables are part of the dependent variable which is normalized by sector and size. Other studies that analyze normalized within sector labour productivity also find a low R-squared (Hsieh and Klenow, 2009). We test this further in the sensitivity analysis in section 5.

[Insert Table 2 here]

6. Model extensions and sensitivity analysis

In this section, model extensions and sensitivity tests are discussed. First, alternative measures of financial constraints are presented (Section 6.2). Second, relevant interaction effects with the financial constraints measures are analyzed (Section 6.2). Third, financial constraints measures are combined in a factor analysis (Section 6.3). Fourth, alternatives measures of the dependent variable are applied as a robustness test (Section 6.4). Fifth, to account for selection effects a propensity score matching model is estimated (Section 6.5).

6.1. Alternative financial constraints measures and productivity

Table 3 uses three alternative measures of financial constraints and includes the full set of control variables corresponding to Table 2, Column (4). The control variables are not presented for sake of brevity. First, in Column (1) we find that actual lending to others within the MFI is not associated with labour productivity, although the sign is positive and near significant. This seems to suggest that there is no relation between financial constraints and firm productivity in contrast to our previous results. Second, Column (2) shows that actual lending to others externally is related to labour productivity. That is, entrepreneurs who have been able and willing to grant credit to others are about 26 percent more productive than others, ceteris paribus. This effect is large and comparable to our main results in Table 2 with our preferred measure of financial constraints. Third, Column (3) shows that savings is positively related to labour productivity. This is consistent with our main results showing a significant negative effect of financial constraints on performance. Specifically, we find that a one standard deviation decrease in savings is associated with a drop in labour productivity by 22 percent. This is comparable to the results of existing literature (Musso and Schiavo, 2008; Carreira and Silva, 2010). Finally, in Column (4) we include all measures of financial constraints in a single estimation model. These findings confirm our prior results: financial constraints have a significant negative effect on labour productivity. In this specification the impact of each measure is lower than before because we now include several measures in a single regression. Still, doing so yields rather comparable results: i.e. the estimated effect of financial constraints defined by actual borrowing behavior suggest a decrease in labour productivity of about 15 percent, ceteris paribus.

[Insert Table 3 here]

6.2. Interaction effect with financial constraints and impact on productivity

A range of interaction terms are included to test for non-linear effect. First, we separately interact the alternative measures of financial constraints with our preferred measure *FinCon* (not presented here, see Appendix 3). First, the inclusion of the interaction with "Lending to others MFI" is not significant and renders the main effect of this variable insignificant, while the *FinCon* term is still significant and has an estimated coefficient of -0.191 ($p<0.05$). Second, the interaction with "Lending to others externally" is insignificant, but the two main effects for "Lending to others externally" and *FinCon* are unaffected and significant, with for *FinCon* an estimated coefficient of -0.202 ($p<0.05$). Third, for Saving and *FinCon* there is a positive and significant interaction effect with an estimated cross term of 0.274 ($p<0.05$) with a significant main effects for Saving of 0.050 ($p<0.10$) and for *FinCon* of -0.268 ($p<0.01$). Using the models estimates we find that once an entrepreneurs has a level of Saving of at least TZS 827,500, this compensates for the negative effect of being financially constrained, ceteris paribus. To put this finding in perspective, note that in our sample, only 6.2 percent of the entrepreneurs have such an amount of Saving. In addition, only in the fourth loan cycle, the loan granted to entrepreneurs is higher than this amount. In our sample only 7.2 percent of the entrepreneurs have reached this loan amount in our sample. Obviously, savings acts as a moderator to the impact of financial constraints (*FinCon*) for the effect on labour productivity.

Finally, as a last robustness test and in line with the model estimated in Table 3, Column (4), we include all financial constraints measures and respective interaction terms in a single regression. This yields similar outcomes as described in this section, suggesting that financial constraints (*FinCon*) are moderated by the presence of a relatively very high amount of saving only and impede labour productivity.

6.3. Factor analysis of financial constraints

We use all four measures of financial constraints to obtain a single factor using Varimax rotations. As expected, all item get positive loadings except our *FinCon* variable. This factor

explains 39 percent of the variance. A higher score implies lower financial constraints, where the mean is by construction 0 (S.D = 0.43). Next we use this factor in our regression model (Eq. 1) – not presented here. The estimated coefficient of the factor is 0.44 (t-value = 4.73; r^2 = 0.15). Thus, a one standard deviation decrease on the factor – i.e. higher financial constraints - reduces within sector labour productivity by 19 percent, which is congruent with our main findings.

6.4. Alternative firm performance measures

In this part we further specify our main model with alternative firm performance measures to replace our labour productivity measure. Our dependent variable consist of several factors which can be decomposed, which we do in Columns (1) to (4) to yield results comparable to Table 2, Column (4) and Table 3, Column (4).

First, we rerun our analysis with labour productivity without sectoral productivity adjustments. Although we cannot fully control for difference between sectors, adding dummies as control variables should yield somewhat related findings. Table 4, Column (1) shows a negative effect of financial constraints of 19.6 percent on labour productivity compared to 20.5 percent before. In Column (2) we again find a significant negative effect of financial constraints measure of 16.5 percent compared to 15.4 percent before. In addition, the impact of the other three measures are also very similar.

Second, the absence of an output per worker adjustment in Column (3) which includes firm size gives a negative effect of financial constraints on sales of 23.0 percent. In Column (4), the addition of further financial constraints measures reduces this only to 19.7 percent, while the other financial constraints measures all have a significant effect, including the “Lending to others MFI” at the ten percent level, which is associated with a 5.9 percent increase in output.

Finally, in Columns (5) and (6) we use a profitability measure, although we acknowledge that this may not be the best performance indicator in our context (De Mel *et al.*, 2011). Still, using profitability shows that financial constraints as measured by actual borrowing behavior has a significant negative effect on profitability in Column (5) at the ten percent level and a near

significant effect in Column (6). The other measures of financial constraints have the expected signs and are similar to our previous findings.

Using the same variables but differently decomposed, our coefficient of variation increases from 12.8 percent in Table 2, Column (4) to 22.6 percent in Table 4, Column (1) with the absence of the between sector labour productivity decomposition. The absence of an output per worker adjustment further increases the coefficient of determination to 28.2 percent in Table 4, Column (3). The size of the r-squared is now very comparable to other studies using similar firm performance measures, i.e. a type of labour productivity measure (see Rijkers *et al.*, 2010; Kinda & Loening, 2010; Murisa and Chikweche, 2013; Nagler and Naudé, 2014; Bokpin *et al.*, 2018).

In terms of additional controls, in Table 4, against the benchmark of the "Other services" sector, the findings signify that significant sector level effects, where Capital Intensive and Retail sectors tend to perform the best. On average, the Capital Intensive sector and Retail sector have a labour productivity that are 78.3 percent and 82.3 higher (Column 1), sales that are about 75 percent and 69 percent higher (Column 3), and, profits that are about 56 percent and 44 percent higher. Finally, in Columns (3) to (6) related to output and profitability we further show the strong link with firm size, which has a significant positive effect on firm performance in all specifications.

[Insert Table 4 here]

6.5. Propensity score matching results

From a methodological point of view it could be argued that better performing microenterprises face lower financial constraints because more successful entrepreneurs find it easier to access finance either externally or through internal funding. Conversely, entrepreneurs that perform badly will face greater financial constraints. Therefore, financial constraints may lack randomization and there may be endogeneity biases from simultaneity (Persson and Tabellini, 2005). In order to mitigate possible selection bias, propensity score matching (PSM) is used. In this manner the performance of financially constrained entrepreneurs are compared with non-

constrained peers that share similar *observable* characteristics (Rosenbaum and Rubin, 1983). If OLS is correctly specified, it is a more efficient method than PSM, however, PSM allows for more direct comparison between individuals and may avoid misspecification issues because it allows for arbitrary heterogeneous effects of the independent variable (non-parametric).

Under the assumption that all relevant differences between those that are and are not financially constrained can be captured by a set of observable variables (selection on observables), we can isolate the 'impact' of financial constraints on firm performance, and obtain reliable and relevant estimates of the size of this effect. One advantage of the data is that we have a relative homogenous group of entrepreneurs since they are all clients at the same MFI in an urban area for at least one year and have repaid their first loan. This means we may already account for certain unobservables, e.g. those with certain entrepreneurial ability may self-select into microfinance borrowing schemes. In addition, we must observe entrepreneurs who are financially constrained and those that are not, that share similar characteristics (common support), otherwise PSM fails (Leuven and Sianesi, 2003). PSM estimates the 'impact' of financial constraints on firm performance by looking at the average treatment effect on the treated.

The PSM average treatment effects in Table 5 support our main findings. The estimates in the first row related to *FinCon* for all four columns show that financial constraints have a significant negative 'impact' on normalized within sector labour productivity. This effect is robust across specifications. The presence of financial constraints reduces labour productivity by 18 to 22 percent, which is comparable to the 21 to 23 percent lower labour productivity presented in the OLS estimations in Table 2.

In addition, savings dummies are used to estimate the impact of savings on firm performance. Specifically, first a group of entrepreneurs that has no savings is defined (34% has no savings). Here the results show that not having any savings has a significant negative 'impact' on labour productivity. Entrepreneurs without savings have 27 to 36 percent lower labour productivity compared to peers with similar characteristics, apart from savings.

Next, using our alternative 'positive' measures of financial constraints, confirms the importance of lending to others within the MFI for labour productivity, although not significant in Columns (1) and (2) where we use a limited set of controls. Columns (3) and (4) suggest that entrepreneurs who are able to contribute to others for their installments within the MFI have a 12 to 15 percent higher productivity. Our previous results in Table 3 did not find an impact, while Table 4 suggested a positive effect around 5 percent, thus much lower than our 'causal' estimates. The impact of lending to others externally is significant and comparable to our prior findings in Table 2 and Table 3. Finally, a dummy for entrepreneurs who have above average saving is derived (35%). Although the results are weaker, the estimates still show that this high saving group has 16 to 22 percent higher labour productivity relative to those with below average saving levels. Hence, the findings based on propensity score matching techniques strongly suggest that financial constraints have a negative impact on firm performance.

[Insert Table 5 here]

7. Conclusion

Access to finance is important for entrepreneurs to develop their enterprises. In this paper we analyze the effects of financial constraints based on borrowing behavior of entrepreneurs at a microfinance institution on firm performance. The empirical analysis shows the primacy of access to finance in facilitating successful entrepreneurship. Firm performance is measured using normalized within sector labour productivity. The results show that in general, financial constraints have an adverse impact on the firm productivity. The findings are robust when using several alternative measures of financial constraints, thus comforting researchers in a fragmented field which applies a wide range of financial constraints variables. Our study thereby confirms that financial constraints matter to small firms in developing countries.

Our behavioral measurement of financial constraints using actual borrowing information is a good alternative to various proxies used in the existing literature. Instead of asking entrepreneurs if they have access to credit, or whether they perceive access to credit as a barrier to performance, this study takes into account actual borrowing behavior and limitations to borrowing more. The measure provides an objective assessment of financial constraints by

making use of actual business decisions instead of self-reported measures. In addition, our financial constraints measure can easily be replicated by other researchers working with data on microfinance.

Our study is not without limitation. First, a potential weakness of the financial constraints measure is that it could get positively associated with performance, because entrepreneurs with high returns may be classified as financially constrained. If microenterprises with better performance also face high growth opportunities they will continue to borrow the maximum amount possible. This will mark them as financially constrained. This would lead to the counter-intuitive result of a positive association between financial constraints and performance. Such concern is, however, contradicted by the empirical estimates which demonstrate that entrepreneurs who take up the maximum possible loan amount actually perform worse, but the size of the estimated effect may be underestimated. Another potential drawback of our measure is that in theory, entrepreneurs who borrow the maximum amount may be alleviated from being financially constrained, as the maximum may be 'exactly' equal to their required amount. The financial constraints variable cannot pick this up, but as our loan cycle information shows, most entrepreneurs continue to borrow in a later stage. The results based on propensity score matching partially overcome this possible source of endogeneity as driver of our results and suggest that entrepreneurs facing greater financial barriers tend to underperform compared to their peers who are not restricted by financing conditions.

This study carries several practical implications. First of all, microfinance institutions and the banking sector more generally need to expand in the African continent to foster entrepreneurship. Our paper highlights the necessity to alleviate financial constraints. Even stronger, giving affordable credits to microenterprises pays off in terms of raising labour productivity and profits, thus highlighting business opportunities for both credit suppliers and receivers. International donors must support initiatives that improve access to finance as a development strategy. At the level of the entrepreneur, it is important to raise awareness of the existence of microfinance institutions and inform local communities about the opportunities and risks associated with obtaining informal and formal credits to foster financial inclusion. Furthermore, because informality is associated with the inability to gain access to credit for firm

expansion, one issue to be addressed further is how to move from the informal sector into formal entrepreneurship. Movement towards formality should gain a priority in the policy agenda of microfinance institutions since these organizations often attract informal entrepreneurs, yet the MFI's do not require any official registration of the firms of the entrepreneurs at some point in the loan cycle.

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Appendix 1: Sectoral heterogeneity and firm performance

Table A.1 shows that there is a wide variation across sectors in absolute labour productivity, employment (firm size in terms of number of workers), sales and months open. The within sector variation of these measures is much lower than in the overall sample, i.e. the standard deviation of the overall sample is 731,590 for absolute labour productivity, against lower scores within the different sectors. This indicates that the microenterprises within the same sector are relatively homogenous and justifies the normalization within sectors.

In terms of labour productivity, the Food, Retail and Capital Intensive sectors have a significantly higher than average labour productivity than the other sectors. Furthermore, the Capital Intensive sector has the highest average sales and this sector includes a range of activities such as ICT shops, music stores, pharmacies, supermarket chains and transport. What these firms have in common is that selling requires a relatively large investment in assets or that they generally have high margins. The lowest average revenue and labour productivity are found in the Service sector, which is the least capital intensive and includes barbers, beauty salons and tailoring. There is not much between sector variation in terms of months open, although our measures still picks up the within sector variation in this regard.

Table A.1. Descriptive statistics for firm performance at sectoral level

	labour productivity		**firm size**		**sales**		**months open**		
	mean	*SD*	*mean*	*SD*	*mean*	*SD*	*mean*	*SD*	*obs*
Food	728,106	713,021	0.3	0.6	10.4	16.5	11.8	0.7	101
Retail	630,958	681,519	0.3	0.6	9.5	12.9	11.5	1.6	81
Capital intensive sector	628,624	550,626	0.8	2.1	15.3	12.8	11.6	1.4	77
Clothing	504,850	577,762	0.6	1.7	8.1	11.8	11.5	1.2	98
Snacks & drinks	429,970	474,602	0.9	1.5	7.8	8	11.4	1.8	77
Restaurants	395,339	386,216	1.3	1.5	9.2	10.8	11.5	1.3	88
Services	313,650	475,927	0.7	1.1	4.9	5.9	11.6	1.3	93
Total	519,662	731,590	0.7	1.4	9.2	19.9	11.6	1.4	615

Notes: Sales is measured in millions TZS.

Appendix 2: Asset wealth factor

At the household level we also control for asset wealth based on an asset factor of 27 household items (Cronbach's alpha = 0.82). We list summary measures of these 27 household items and their respective (Varimax-rotated) factor loadings. Using principal components we create a single household asset factor, which explains 51% of the underlying variation; the Kaiser-Meyer-Olkin (KMO) measure the sampling adequacy is 0.80.

Table B.1. Asset wealth factor of the entrepreneur's household

Item	Median	Mean	SD	Min.	Max.	Loadings
Sewing machine	0	0.35	0.83	0	9	0.36
Cloth ironer	1	0.91	0.51	0	3	0.50
Table	1	1.55	0.88	0	6	0.53
Soda	1	1.46	1.28	0	10	0.48
Mosquito net	2	2.10	1.25	0	8	0.66
Paraffin lamp	1	1.22	0.91	0	6	0.22
Bed	2	2.28	1.30	1	8	0.69
Refrigerator/freezer	0	0.49	0.61	0	4	0.59
Electrics/gas/other stove	0	0.84	0.97	0	4	0.35
Radio/cassette	1	0.78	0.56	0	3	0.55
Video/dvd player	1	0.55	0.59	0	3	0.60
PC	0	0.08	0.30	0	2	0.43
Television	1	0.66	0.57	0	4	0.46
HiFi	0	0.04	0.21	0	2	0.28
Watch	1	0.76	0.78	0	5	0.56
Mobile/phone	2	1.84	0.88	0	7	0.59
Motorcycle	0	0.05	0.24	0	2	0.26
Bicycle	0	0.20	0.46	0	4	0.29
Car/truck	0	0.05	0.26	0	3	0.33
Wheelbarrow	0	0.05	0.22	0	2	0.25
Cart	0	0.06	0.27	0	2	0.21
Fan	1	0.83	0.86	0	6	0.67
Cattle	0	0.09	0.85	0	15	0.01
Goats	0	0.07	0.58	0	6	0.18
Sheep	0	0.04	0.57	0	10	0.03
Acres of land	0	0.77	3.56	0	50	0.03
Acres of land (12 months ago)	0	0.80	3.60	0	40	0.03

n=615. The average household size is 3.3.

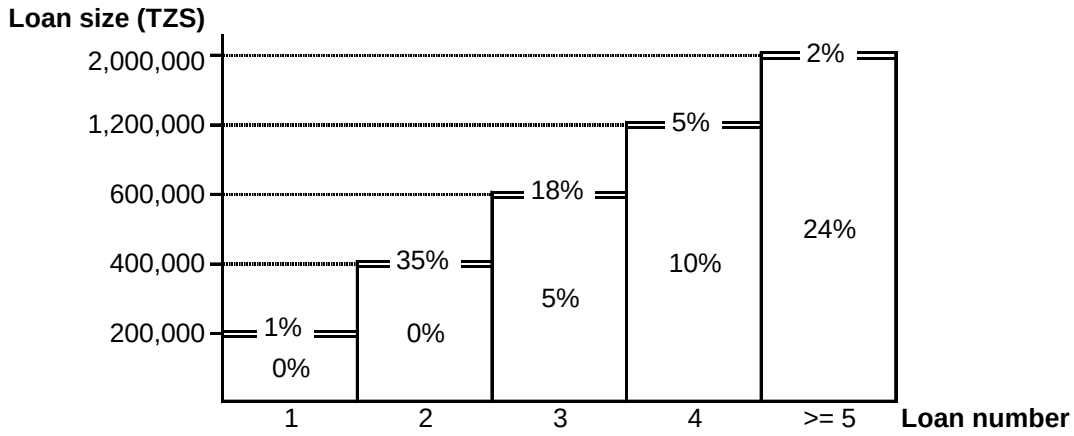
Appendix 3: Details on the interaction terms

Table C.1. Interaction effects with financial constraints on labour productivity

	(1)	(2)	(3)	(4)
FinCon (FC)	-0.191*	-0.202**	-0.268***	-0.220*
	[0.102]	[0.0998]	[0.0920]	[0.123]
Lending to others MFI	0.0338			0.0343
	[0.0473]			[0.0471]
FC*LendMFI	-0.00484			-0.0167
	[0.0655]			[0.0653]
Lending to others externally		0.254**		0.258**
		[0.117]		[0.121]
FC*LendExt.		0.0400		-0.0124
		[0.160]		[0.164]
Saving			0.0500	0.0324
			[0.127]	[0.129]
FC*Saving			0.274**	0.268*
			[0.124]	[0.137]
Controls	YES	YES	YES	YES
Observations	602	606	607	601
R-squared	0.129	0.146	0.138	0.155

Notes: Dependent variable is within sector labour productivity. Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.10.

Fig. 1 Loan cycle cohorts used to measure financial constraints



Note: Percentages relate to the share in the total sample. On April 1, 2010 the exchange rate for $1 was 1,355 TZS.

Table 1, Panel A. Descriptive statistics on the dependent variables

		Mean	Std. Dev.	Min	Max
1	Labour productivity (log-normalized within sector)	0	1.00	-3.63	2.71
2	Labour productivity (abs. within sector)	519,662	731,590	11,389	1,132,962
3	Sales (logs)	15.42	1.11	11.16	19.74
4	Profits (logs)	14.43	1.12	8.85	17.34
5	Firm size	0.70	1.40	0.00	15.00
6	Months open	11.57	1.35	1.00	12.00

Table 1, Panel B. Descriptive statistics on the independent variables

		Mean	Std. Dev.	Min	Max
1	*FinCon*	0.59	0.49	0.00	1.00
2	Lending to others MFI	1.07	1.22	0.00	3.00
3	Lending to others externally (indicator)	0.38	0.49	0.00	1.00
4	Savings	0.23	0.43	0.00	3.70
5	No savings (indicator)	0.34	0.47	0.00	1.00

Table 1, Panel C. Descriptives statistics and correlations on the control variables

		Mean	Std. Dev.	Min	Max	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Male	0.34	0.47	0.00	1.00	1.00												
2	Age	37.88	8.56	18.00	75.00	-0.02	1.00											
3	Education (in years)	7.75	2.78	0.00	14.00	0.01	-0.19	1.00										
4	Secondary schooling	0.07	0.25	0.00	1.00	-0.04	-0.11	0.61	1.00									
5	Young firm	0.18	0.39	0.00	1.00	-0.05	-0.17	-0.03	-0.03	1.00								
6	Competition	0.73	0.44	0.00	1.00	0.07	-0.01	-0.10	-0.13	0.04	1.00							
7	Business obstacles	0.15	0.36	0.00	1.00	-0.06	-0.03	-0.11	-0.12	-0.09	-0.26	1.00						
8	No business location	0.11	0.31	0.00	1.00	-0.04	-0.04	-0.09	-0.09	-0.00	-0.04	-0.00	1.00					
9	Volatility	7.22	2.42	0.00	23.00	-0.10	-0.03	-0.07	-0.03	-0.07	-0.03	-0.04	-0.02	1.00				
10	Illness	0.03	0.18	0.00	1.00	-0.00	-0.00	-0.04	-0.02	-0.02	-0.01	-0.08	-0.04	-0.02	1.00			
11	Funeral	0.01	0.11	0.00	1.00	-0.04	-0.03	-0.00	-0.03	-0.02	-0.04	-0.01	-0.05	-0.01	-0.02	1.00		
12	Household asset	-0.00	0.94	-1.78	4.21	-0.13	-0.24	-0.29	-0.23	-0.12	-0.07	-0.06	-0.07	-0.02	-0.02	-0.04	1.00	
13	Risk propensity	3.36	0.96	1.00	7.00	-0.06	-0.02	-0.03	-0.06	-0.06	-0.02	-0.08	-0.01	-0.05	-0.02	-0.02	-0.01	1.00
14	Household size	3.32	1.65	1.00	7.00	-0.04	-0.19	-0.00	-0.03	-0.05	-0.10	-0.03	-0.08	-0.01	-0.01	-0.03	-0.34	-0.02

Table 2 Baseline - Effect of financial constraints on labour productivity

	(1)	(2)	(3)	(4)
FinCon	-0.214***	-0.232***	-0.215***	-0.205***
	[0.0798]	[0.0817]	[0.0801]	[0.0789]
Male		0.264***	0.201**	0.264***
		[0.0852]	[0.0826]	[0.0809]
Age		0.0386	0.0322	0.0301
		[0.0296]	[0.0297]	[0.0280]
Age^2		-0.000479	-0.000425	-0.000432
		[0.000361]	[0.000362]	[0.000336]
Education (in years)		-0.0152	-0.00765	-0.0157
		[0.0196]	[0.0197]	[0.0197]
Secondary schooling		0.201	0.242	0.270
		[0.170]	[0.166]	[0.178]
Young firm			-0.281***	-0.253**
			[0.109]	[0.108]
Competition			0.331***	0.325***
			[0.0871]	[0.0887]
Business obstacles			0.226*	0.171
			[0.117]	[0.117]
No business location			-0.122	-0.115
			[0.142]	[0.139]
Volatility			0.0308*	0.0230
			[0.0182]	[0.0186]
Illness				-0.270**
				[0.133]
Funeral				-0.404
				[0.406]
Household asset				-0.00559
				[0.0538]
Risk propensity				-0.148***
				[0.0390]
Household size				0.0787**
				[0.0363]
Consumption Q1				-0.366**
				[0.154]
Consumption Q2				0.0877
				[0.133]
Consumption Q4				-0.0209
				[0.134]
Consumption Q5				0.121
				[0.142]
Observations	615	610	608	607
R-squared	0.011	0.031	0.082	0.128

Notes: Dependent variable is within sector labour productivity. Robust standard errors in brackets.
*** p<0.01, ** p<0.05, * p<0.10.

Table 3 Additional main results on the effects of financial constraints

	(1)	(2)	(3)	(4)
FinCon				-0.154**
				[0.0781]
Lending to others MFI	0.0435			0.0367
	[0.0323]			[0.0321]
Lending to others externally		0.259***		0.221***
		[0.0764]		[0.0771]
Saving			0.220**	0.195**
			[0.0957]	[0.0983]
Controls	YES	YES	YES	YES
Observations	602	606	607	601
R-squared	0.159	0.172	0.162	0.187

Notes: Dependent variable is within sector labour productivity. Robust standard errors in brackets.
*** p<0.01, ** p<0.05, * p<0.10.

Table 4 Alternative firm performance measures

	(1) LP*	(2) LP*	(3) Sales	(4) Sales	(5) Profits	(6) Profits
FinCon	-0.196**	-0.165**	-0.230***	-0.197**	-0.163*	-0.133
	[0.0840]	[0.0836]	[0.0824]	[0.0807]	[0.0848]	[0.0821]
Lending to others MFI		0.0351		0.0596*		0.0580*
		[0.0347]		[0.0335]		[0.0346]
Lending to others externally		0.254***		0.314***		0.517***
		[0.0824]		[0.0782]		[0.0834]
Saving		0.186*		0.246***		0.289***
		[0.101]		[0.0891]		[0.0983]
Sector controls:						
Capital Intensive	0.783***	0.761***	0.751***	0.726***	0.555***	0.502***
	[0.154]	[0.151]	[0.146]	[0.141]	[0.156]	[0.146]
Clothing	0.587***	0.583***	0.493***	0.490***	0.220	0.222
	[0.144]	[0.144]	[0.137]	[0.135]	[0.141]	[0.135]
Retail	0.827***	0.795***	0.697***	0.663***	0.438***	0.419***
	[0.161]	[0.162]	[0.158]	[0.158]	[0.146]	[0.146]
Food	0.714***	0.757***	0.568***	0.618***	0.337**	0.421***
	[0.164]	[0.162]	[0.157]	[0.152]	[0.145]	[0.139]
Snacks & drinks	0.405**	0.406**	0.440***	0.447***	0.213	0.215
	[0.170]	[0.170]	[0.166]	[0.163]	[0.165]	[0.159]
Firm size			0.138***	0.124***	0.0871***	0.0686*
			[0.0455]	[0.0472]	[0.0320]	[0.0354]
Controls	YES	YES	YES	YES	YES	YES
Observations	607	601	607	601	603	597
R-squared	0.226	0.248	0.282	0.317	0.271	0.334

Notes: LP* is our log labour productivity measure without sectoral demeaning. Sales captures output in log. Profits are the estimated yearly profits by the entrepreneur in log. Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.10.

Table 5 Impact of financial constraints (ATT) on labour productivity

	(1)	(2)	(3)	(4)
Financial constraints:				
FinCon	-0.22***	-0.17**	-0.19**	-0.18*
No savings	-0.27***	-0.29***	-0.31***	-0.36***
Lending to others MFI	0.07	0.09	0.15**	0.12*
Lending to others externally	0.30**	0.22**	0.25***	0.23**
Mean savings	0.21**	0.16*	0.19**	0.22**

Notes: *** p<0.01, ** p<0.05, * p<0.10 based on bootstrapped standard errors (500 replications) using psmatch2 in Stata (see Leuven and Sianesi, 2003). In Columns (1) and Columns (3) kernel density propensity scores are applied for the matching of the treated and controls. Columns (2) and (4) are based on nearest neighbour matching (n = 5) with caliper 0.10. For Columns (1) and (2), the matching is done on a limited set of control variables, i.e. those related to demographics and firm characteristics as in the Table 2, Column (3). Column (3) and (4) apply the full set of controls as in Tabl2 2, Column (4).