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The effect of financial literacy on financial policies

Evidence from a randomised control experiment in Mozambique

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The Effect of Financial Literacy on Financial Policies – Evidence from a Randomized Control Experiment in Mozambique

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Abstract

This paper evaluates the impact of managers financial literacy on firm financial policies and performance. A randomized control trial with 74 medium-size and large companies in Mozambique identifies a positive treatment effect on firm return on assets of an 18-hours executive education programme in finance for top managers. Using survey data as well as accounting data, we find that managers adjust financial policies in response of the treatment. We find a significant and large treatment effect on working capital management (net working capital, changes in net working capital, and the average collection period). Our results suggest that relatively small interventions such as financial education improve financial practices and decision-making and may ultimately affect economic development.

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1 Introduction

Management quality varies substantially across countries and is strongly associated with firmlevel productivity, profitability, Tobin's Q, sales growth, survival rates (Bloom and van Reenen (2012)). One potentially important dimension of managerial human capital is financial expertise. In the context of small and micro-entrepreneurs in developing countries, it has been shown that financial literacy does impact revenues and survival rates (Drexler, Fischer, and Schoar, 2014 and Anderson-Macdonald, 2014) and, hence, ultimately economic development.

There is also research in finance that links managerial human capital on executive level, firm policies, and firm value, mostly for large, listed companies (e.g., Bertrand and Schoar, 2003; Adams, Almeida, and Ferreira, 2005; Kaplan, Klebanov, and Sorensen, 2012; and Graham, Li, and Qiu, 2013). With respect to financial expertise, it has been shown that financial expertise is related to different financial policies. Custódio and Metzger (2014) study chief executive officers (CEOs) who have working experience in finance and document that firms with financial expert CEOs, hold less cash, more debt, and engage in more share repurchases. Moreover, these financial expert CEOs are better able to raise external funds even when credit conditions are tight, and they were more responsive to the dividend and capital gains tax cuts in 2003. With respect to investment policy, they show that financial expert CEOs are more aware of common mistakes firms do when making capital budgeting decisions. Typical firms use companywide discount rates to evaluate investment projects rather than a project-specific one. This has been called the weighted average cost of capital (WACC) fallacy (Graham and Harvey, 2001; and Kruger, Landier, and Thesmar, 2011). Given that CEOs effectively control and decide over a large share of economic activity, the impact of the financial expertise of CEOs on economic development is potentially large.

Very little is known about financial practices of large firms in less developed environments where financial education might be less common. Our paper contributes to this discussion in three ways. First, we provide detailed evidence from a developing country (Mozambique) on financial practices of large firms and executives' financial education. We find that there is substantial heterogeneity in financial experience by CEOs in Mozambique. About 50% of the CEOs have a background in finance, either by education or work experience. These differences in financial expertise may not have real consequences though. However, by analysing financial practices in firms with and without financial expert CEOs, we find large differences in their

practices. Figure 1 shows selected financial practices by firms that are led by a financial expert CEOs vs. a "regular" CEO. The data comes from detailed interviews with CEOs and CFOs of 62 of the largest companies in Mozambique in 2015. Financial expertise is defined by having a background in finance (top panel) and by holding an MBA degree (bottom panel). We focus on different valuation techniques. We find significant differences between these two groups in the way they evaluate projects. While a large majority of CEOs with a background in finance is making use of sophisticated valuation techniques such as NPV (70%) or conducts sensitivity analysis (63%), this is relatively uncommon for CEOs without such a background. Only 25% and 33%, respectively, of such CEOs use these techniques. They are, on the contrary, more likely to use less sophisticated valuation techniques such as hurdle rates (63%) or multiples (75%). Consistently, these techniques are usually not used by CEOs with a background in finance. The picture looks qualitatively similar when we split the sample by CEOs with and without an MBA degree. These findings are consistent with Bertrand and Schoar (2003) who found CEOs with MBA are much more likely to follow textbook rules and Custódio and Metzger (2014) for the US.

However, a clear interpretation of these documented correlations is difficult though. Researchers have examined whether corporate outcomes are affected by CEO characteristics, but no consensus has been reached yet (see also Chemmanur and Simonyan, 2017 for a survey of the literature). Bertrand and Schoar (2003) show that individual manager fixed effects matter for investment and financial policies of firms. However, Fee, Hadlock and Pierce (2013) cast doubt on the methodology for identifying managerial style effects on policy choices. They argue that CEO turnover events are endogenous and that managerial "style changes" are anticipated by corporate boards at the time of the CEO selection decision. One important caveat in these studies is the endogenous matching between firms and managers that may bias the estimates. The literature on the effects of managerial human capital mostly relies on large, and mostly on cross sectional analysis that does not allow causal inference. At most, these studies use firmlevel panel data, which allow estimating fixed effects models that consider the effect of unobserved firm and CEO characteristics that are time invariant. However, the estimated effects using these models might still be biased due to unobserved time variation at the firm and CEO levels. In fact, it is quite plausible that firm time-varying characteristics unobserved by the econometrician such as some strategic decisions drive both financial policies and the characteristic of the CEO that is appointed. In the context of financial literacy, Custódio and Metzger (2014) show that firms run by managers that have past work experience in finance

have better access to external financing and allocate the firms' financial resources more efficiently. At the same time, they also provide evidence that financial expert CEOs are more likely to be appointed by more mature firms, even after controlling for firm fixed effects.

In order to identify the treatment effect of financial expertise on firm policies, we would like to randomize financial literacy across firms. One way of doing so would be an actual random allocation of CEOs to firms. Unfortunately, these experiments are not feasible in the context of large firms. We propose a solution by randomizing financial expertise of top managers by, at the same time, keeping the match between CEOs and firms constant. We treat financial expertise by offering free MBA-style lectures on corporate finance to top managers of large firms in Mozambique. To address concerns of endogenous selection into the treatment, we randomly staggered the timing of the treatment of firm that expressed their interest in participating. Firms were randomly allocated in two cohorts: a treatment group and a control group. Randomization was done in a stratified way so that both groups are balanced in terms of industries. One cohort - the treatment group - received the treatment in May 2017, while the second group - the control group - receive the same treatment in November 2018. During the fifteen months period both firms were contacted in order to collect financial data and conduct follow-up survey on financial practices. Note that the control group was also offered the course at a later stage; this works as an incentive to participate in the experiment and provide detailed financial data. This approach to the experiment design is also new, and alleviates the concern of control group participation, which is common in the literature on RCTs. Moreover, if we believe that there is an effect from the expectation to receive a treatment, this should also alleviate those concerns, as both groups will share this expectation. We then measure the effects of the treatment by comparing the firm level outcomes of the treatment group with the same outcomes for the control group, using a differences-in-differences (DID) estimator.

The main results of the RCT can be summarized as follows: first, treated firms report high intentions to change financial policies after the participation in the course (92% of the firms intend to adjust their working capital management, 85% their risk management, 64% their valuation techniques, and 64% their capital structure). The survey also reveals that there a sizeable fraction of firms is not able to adjust their capital structure (25%) or risk management practices (20%) because they are subsidiaries and these policies are set somewhere else in the business group.

Second, 36.4% of treated firms report that they have implemented changes in working capital management 15 months after the treatment. Corresponding figures for other financial policies are lower (13.5% respectively). Moreover, firms report that they implemented these changes *because* of the treatment (i.e., the course they participated in 15 months ago). While these results are suggestive of a treatment effect, we can also make use of the control group to address the concern that we may capture a pure time-effect, for instance. Indeed, it might be the case that changes in the economy may have lead companies change their financial policies, irrespective of the treatment. When we compare differences between the means of treatment and control group (using a one-sided t-test), we find a large and significant difference for changes in working capital management (significant at the 1%-level) and changes in capital structure (significant at the 10%-level). We do not find statistically significant differences for changes in risk management or valuation techniques.

Third, make use of accounting data to validate the survey evidence and to analyse potential implications for firms' efficiency. Using a difference-in-difference estimator, we find a significant and large treatment effect in net working capital, changes in net working capital and average collection period. We also find some evidence that managers change their capital structure after the treatment. The effects on working capital management are large and significant: net working capital decreases by 0.86 standard deviations for the treated firms when compared to the control group. The effects on firm performance are economically relevant: ROA increases up to 18 percentage points for treated group when compared to the control firms.

Overall, our randomized control trial shows that financial expertise of managers has a large impact on firm performance through the adoption of financial practices that promote value creation. Moreover, our results suggest that relatively small interventions such as financial education improve financial practices and decision-making and may ultimately affect economic development.

2 Experimental setup and data

To identify the causal impact of financial education or expertise, we run a randomized experiment where participants are randomly allocated to an executive education module in finance. In this experiment, we evaluate the role of financial literacy in a developing country -

Mozambique. Management practices in developing countries have been reported to be different from the most common management patterns in developed countries (Bloom and Van Reenen 2007, 2010). Financial practices, although not documented in the literature, may exhibit similar differences.

We have chosen Mozambique to conduct the main experiment for two main reasons. First, Mozambique, being a developing country, is expected to face financial literacy constraints at the senior manager level, even in the case of large firms. Therefore, we expected to be able to better observe and measure the effects from financial literacy at the executive level, assuming financial literacy matters for financial policies. Second, most large companies' headquarters are located in a single city – Maputo, which eased the organization of the training courses, and helped participation rates.

We focused the intervention on medium size and large firms because they control a large fraction of assets in the economy, and therefore any efficiency gains that occur for these firms are more likely to be economically relevant. In fact, some capital allocation inefficiencies that are previously documented in the literature are only applicable to large and multi-divisional firms. Krüger, Landier and Thesmar (2015) show that firms do not properly adjust for risk in their capital budgeting decisions, and that conglomerates underinvest (overinvest) in relatively safe (risky) divisions. In addition, financial literacy has been studied at the micro level (see for instance Drexler, Fischer, and Schoar, 2014), but little is known at the level of large corporations beyond the fact that there is a correlation between financial expertise and financial polices (Custódio and Metzger 2014; Güner, Malmendier and Tate, 2008).

The sample selection procedure in place followed three major guidelines. First, company's headquarters should be in Maputo. This enabled in-person interactions with participants, which was crucial throughout the project to engage the participants with the program and facilitate data collection. This requirement also reduced treatment non-compliance as it minimized the participants' cost of attending the training. Second, companies' dimension had to be large enough such that companies would produce financial reports and follow international accounting standards.² Last, we aimed to include a diverse set of industries. Because there is no exhaustive company lists or industry directory available for Mozambique, we used the set of

² Notice that public disclosure of financial statements was not required.

companies in the reports "Top-100 Companies in Mozambique" published annually by KPMG Mozambique as our initial sample. These are publicly available reports used by local and foreign investors, public administration and other institutions. Each report lists and ranks the 100 largest companies (according to total revenue) from the pool of companies that fill-in the KPMG annual survey. Although the survey is non-mandatory, companies tend to participate as this is one of the most relevant and visible business storefronts available. For each company, it provides main financial figures such as revenues, net income, assets, liabilities, equity, number of employees and new investments.³

The experiment started with a pilot project in 2015 where we collected information about managers, including demographics and financial literacy, as well as firm characteristics and firm financial policies, and the development of the financial system (e.g. bank credit availability, risk hedging instruments). We then used this information to better design the executive education programme. In the remaining of this section we describe in detail each stage of the research project (Figure 2).

2.1 Exploration project

The exploration project run between June and July 2015. During this period, we contacted 218 companies obtained from KPMG "Top-100 companies in Mozambique" reports from 2010-2014, and we had 65 meetings (Table 1). Out of the 65 meetings, we were able to fill in 63 questionnaires.⁴ The questionnaires were conducted during a 30-minute face-to-face interview. The interview was conducted at company's premises by a member of the research team. Although we specifically invited the CEO, sometimes our request was forwarded to the CFO, to a member of the accounting team, or in a few cases, to a non-finance related staff.

These questionnaires surveyed financial practices, manager characteristics and overall business aspects of the companies, following Graham, Harvey (2001, 2002). We also used the survey to assess the relevance and interest of managers for a free of charge Executive Programme on Financial Management. We asked specifically which topics they would find more relevant,

³ The reports also display financial information on the top-10 companies per industry. Some of them do not figure amongst the top-100 companies (main tables).

⁴ Two participants were busy at the scheduled time and committed to send us the questionnaire later by e-mail, which did not happen. These 63 pilot questionnaires correspond to 62 business groups (in this case single companies), as we surveyed separately two managers from the same company.

including capital budgeting, risk management, capital structure, payout policy and mergers and acquisitions. Finally, we inquired the executives about the time of the year that would suit them better to attend the course given the company business cycle.

2.2 The experiment

This subsection describes the experimental phase that took place between February 2017 and December 2018.

2.2.1 Experimental design

We designed a randomized experiment with staggered implementation. Specifically, we offered all participating companies the possibility to attend a free of charge executive-level training in finance. They were told that the cohort would be split into two editions as a way of reducing cohort size and promoting the discussion and participation in class. Our choice for this implementation method was motivated by the need to engage both groups and promote cooperation for survey and financial data sharing over the length of the project. Participants were also told that allocation for the two editions would be randomized within industry.

The randomization procedure was done at company level and stratified by industry. However, there were several business groups in our sample (i.e. the manager is in charge of several companies belonging to the same group). Given that the intervention is at manager level, we could not allow for treatment and control companies within manager. Therefore, after an initial random assignment on the pool of companies, we observed the assignment of the most relevant company in each business group and extend that assignment to all companies within manager.⁵

2.2.2 Intervention (Executive Programme 1st Edition)

The intervention consisted of an 18-hour Executive-level Programme in Finance - "Finance and Strategy – Value Creation in Emerging Markets" - promoted under Imperial College Executive Education branding. The course was offered in Maputo, free of charge and limited to companies participating in the research project. Nevertheless, information about the course was openly

⁵ In some cases, defining a company as the most relevant within a business group derived directly from the meeting with the manger. In other cases, we looked at financial information, whenever possible.

available in IC Exec. Education webpage, including a market price of £5.000 per participant / free of charge for invited participants.⁶

The first edition of the course took place in May 2017. Between February and April 2017, we made a new round of contacts with Mozambican companies to advertise the programme. We contacted 459 companies, all appearing at least once in any table of the KPMG reports between 2009 and 2015. In the first communication (by email) we explicitly informed about the programme and sent the webpage url. Upon 109 positive response, we conducted 109 face-to-face meetings to present further details about the programme. Interested managers formalized their interest on behalf of the company through the submission of an application form. With this form, we obtained information on manager characteristics such as demographics, education background and professional experience, as well as company characteristics. We allow each company to send up to two attendees, whereas at least one was a senior manager (CEO or CFO).⁷ We received application forms from 111 participants, corresponding to 74 firms.

We performed the randomization procedure described above only after this stage, i.e. 2-weeks before the first edition. We did so to minimize the risk of a pitch different to treatment and control firms, which could have a pervasive effect on take-up rates. Moreover, we conducted randomization on the entire sample of companies (459 companies). 223 companies were assigned to treatment group and 236 to control group.

Conditional on the treatment assignment, participants that have formalized their interest were offered a seat in one of the two editions. We had 33 business groups on the treatment group and 41 on the control group (56 and 55 managers, respectively). 46 managers effectively participated in the programme, representing 31 business groups. In order to engage the control group, and account for networking effects we held a kick-off event around the same date. 17 people attended the event, representing 14 business groups.

In class, the participants were required to fill-in a pre-learning survey. This survey was adapted from the pilot project survey and collected information on current financial practices in the company. In the end of the programme, participants filled in a post-learning survey. This last

⁶ While the programme's webpage was online, the Executive Education team received a sizeable number of emails from people interested in attending the course.

⁷ We required one application form per attendee.

survey was split into a confidential part, where participants were asked to evaluate the course and a non-confidential part, where they describe their expectations about future changes in the company towards financial practices.

3.2.2.1. Course Content, Duration and Objectives

The course was organized in 4 modules of 9 hours each. The main modules were:

(1) Managing working capital: this topic covered the concept of net working capital and the impact of efficient working capital management on cash flows and cash holdings. This module also covered cash management, and management of account receivables and account payables.

(2) Capital Budgeting and Valuation: this module covered standard techniques of firm and project valuation such as discounted cash flows methods, net present value, internal rate of return, payback period. It also covered asset pricing models such as CAPM as a tool to estimate project discount rates. Some common valuation mistakes such as the misuse of the weighted average cost of capital irrespective of the specific risk of the project will also be covered in the course.

(3) Capital Structure: this module presented a practical view of assessing the optimal capital structure of the firm, listing the advantages and disadvantages of debt financing such as the tax shield of debt and bankruptcy costs, respectively.

(4) **Risk Management**: this module covered the identification of risks and associated potential costs, analysis of the causes of risk of financial loss, determination of various hedging strategies, implementation of the risk management strategies, and management and monitoring of results. The approach to this topic will have in mind that an effective risk management program will reduce losses and improve financial performance.

By the end of the 4 modules the executives were supposed to be able to:

- (1) read, understand and process (for instance calculate basic financial ratios) financial information from financial reports.
- (2) Understand the impact of efficient working capital management on firm liquidity and funding needs

- (3) understand the appropriate valuation techniques to use when making capital budgeting decisions, and avoid common mistakes in valuation, for instance do not take the time value of money into account.
- (4) trade-off the costs and benefits of a given financial structure and source of financing.
- (5) identify sources of risk and risk management practices, for instance hedging using insurance or financial instruments.

The course was organized as a **general course in corporate finance**, but emphasized topics identified as the major weaknesses of the managers at the pilot stage. We also used the survey conducted at the pilot stage and face-to-face interviews to evaluate the trade-off between the executives' willingness to participate and the course content and duration. This also helped to design a schedule to maximize participation.

The case studies used to illustrate each one of the topics featured large firms in emerging markets. For instance, the following Harvard Business School case studies were used: New Earth Mining (evaluating a new investment opportunity in South Africa), Mozal (large investment project in Mozambique), Supply Chain Finance at Procter and Gamble and Fibria (working capital management and its liquidity consequences in US and Brazil). Note that no 'optimal policy' or one size fits all solution was prescribed in the treatment. Instead, managers were given a set of tools to apply in the context of their own firms. The course was delivered both in Portuguese and in English, by the same instructor. The participants who attend a minimum of 80% of the classes received a participation certificate from Imperial College Business School.

2.2.3 Follow-up - 15 months

From September to November 2018 we interviewed the participants from the first edition of the programme (treatment group). We were able to meet 22 participants, representing 22 firms. We run a follow-up survey and assessed implemented changes. During these meetings we also requested access to financial data between 2013 and 2018. We provided companies with a template spreadsheet with balance sheet, income statement and statement of cash flows items to fill in. 19 companies have shared their financial data.

2.2.4 Executive Programme 2nd Edition

Between September and November 2018, we contacted and invited companies in the control group that have been enrolled in the programme. In these meetings, we run the pre-learning questionnaire where we ask which financial practices have changed since 2017, current financial practices and expectation of future changes. This survey is intended to provide a counterfactual in terms of implemented changes in financial practices. We conducted 40 interviews, representing 40 business groups. Similar to the treatment group, we requested financial data to this group and 28 have shared it.

In the few cases where the enrolled manager was replaced, the new manager taking over this role was briefed on the programme and invited to participate in the second edition as a representative of that company.

The second edition of the course took place in November 2018. The course contents and teaching method were replicated from the first edition. At the end of the programme, participants filled in a post-learning questionnaire equal to the one used in the first edition. We had 17 attendees, representing 13 business groups.

3.3. Data and summary statistics

Our final sample includes data from three main sources: KPMG reports, manager's surveys and hand collected firm financial data. Financial data was available in dollars and/or Metical depending on the source. We have converted all values in Metical to Dollars using the exchange rate of the reporting date. Table 2 panel A shows summary statistics for the participating firms (treatment and control groups). The average firm in our sample has total assets of 165,867 thousand dollars, total revenue of 75,794 thousand dollars, and about 1,500 employees.

Panel B of table 2 shows summary statistics for the managers in the sample. 70% of the managers are Mozambican, and 30% are foreigners. 41% of the managers are the CEO of the company and 33% the CFO. Managers are in general highly educated, with more than 90% having an undergraduate degree or higher. A large fraction also has a finance or accounting related education, with only 21% of them reporting no education in finance or accounting. Interestingly, 26% of the executives are female.

3 The Effect of Financial Education on Financial Policies

This section analyses the effect of financial education on financial policies. We measure the intentions of treated firms to implement changes of financial policies after the courses in May 2017 and November 2018, respectively. We make also use of our staggered treatment design that is defining treatment and control firms. We then compare implemented changes of financial policies of firms taught in May 2017 (treated firms) and firms yet to be treated in November 2018 (control firms) in September-October 2018, i.e., before the delivery of the second course. We use both, survey evidence and accounting data to measure the outcomes of interest.

3.1 Intention to Change Financial Policies (Exit survey)

We start our analysis by evaluating the intentions of treated firms to change financial policies. We focus on valuation techniques, working capital management, capital structure, and risk management, the main themes of the delivered courses. Table 4 shows evidence of the exit survey by the participants at the end of the courses. We provide evidence on manager level (left) as well as firm level (right).

Panel A of Table 4 shows the results for the first cohort that was treated in May 2017. The survey shows a couple of interesting findings. i) managers / firms aim to implement changes in *all* financial policies. Among firms that have the discretion to set their own policies, between 64% and 92% intend to implement changes in their policies that were discussed in the course. These numbers drop to 50% to 85% but are still very sizeable if we treat no answers as "no". ii) Depending on the policy, there is substantial heterogeneity in the intention intensity. Working capital management and risk management are the policies that managers / firms are most likely to change (92% and 86%). There are fewer intended changes of capital structure and valuation techniques (64% each). iii) Capital structure appears to be the policy where managers have the least discretion over. 33% of the companies (9 out of 27) say that they cannot change the capital structure themselves. This may partly be driven by companies being subsidiaries of larger (international firms) that determine the capital structure as well as by limited access to loans in the capital / banking market of Mozambique.

Panel B shows corresponding results for the second cohort that was treated in November 2018. While there are some differences in the numbers, the overall picture remains robust. Panel C pools the two cohorts. Overall, the exit surveys provide strong evidence that treated firms intend to implement changes in financial policies.

3.2 Implemented Changes of Financial Policies (15-months survey)

Even though firms seem committed to change corporate policies, there are reasons why they may not implement changes in the end. E.g., firms may not have the resources or the personnel to do so, there might be other items on the agenda with higher priorities, etc. Moreover, there might be reasons, unrelated to the treatment that lead firms to change their policies. To better understand the effect of the treatment itself we explicitly ask firms whether they changed firm polices because of the course. More importantly, we also survey the population of control firms. This allows us to compare changes in financial polices between treatment and control firms as well.

Table 5 shows the results. First, between 13.6% and 36.4% of the firms mention that they have implemented changes of financial policies in the preceding 15 months. Not unexpectedly, implementations rates are much smaller compared to the intentions that were reported in the exit survey but still sizeable. The ordering of the magnitudes of different policies is relatively consistent across surveys with working capital management being most affected and valuation and capital structure the least. One exception is risk management that ranked very high on the list at the exit survey but is at part with valuation and capital structure in the 14 months survey. Second, analyzing the motivation for implementation changes in financial policies, firms seem to respond to the treatment. Almost all firms that reported that they implemented changes in financial policies declared that they did so because of the course (second column of Table 5). While these results are suggestive, we can also make use of the control group to address the concern that we may capture a pure time-effect, for instance. Indeed, it might be the case that changes in the economy may have lead companies change their financial policies, irrespective of the treatment.

We conducted the survey for the control group at the same time of the survey for the treatment group, before the second intervention of November 2018 (when the treatment group participated in the course). The middle panel of Table 5 shows the corresponding evidence for the control group. Only a very small fraction of firms reports that they changed financial policies over the preceding 15 months. The policy that has been changed most frequently is risk

management (changed by 9.1% of the firms). In particular, working capital management which was most affected in the treatment group (36.4%) was changed by only one firm in the control sample (3%).

The right panel of Table 5 test for statistical differences between the means of treatment and control group (using a one-sided t-test). We find a large and significant difference of 33.3 percentage points of firms having implemented changes in working capital management. This difference is significant at the 1%-level. The difference in terms of changes in capital structure is significant at the 10%-level. We do not find statistically significant differences for changes in risk management or valuation techniques.

Overall, the comparison of treatment and control group is consistent with the self-reported treatment effect of the course on certain financial policies. Moreover, the 15-months survey results are also in line with the intentions by the treated firms to change financial policies during the exit survey after the treatment. Implementation rates are, however, lower compared to the intentions by the treatment group.

3.3 Implemented Changes of Financial Policies (Accounting data)

While the last sections make use of survey data by treatment and treatment & control firms, we can also measure potential changes of financial policies in the financial reports. The financial statements contain information that allow us to investigate potential changes in working capital management and capital structure; changes in risk management and valuation techniques are difficult to measure without survey data. However, the financial data also allows us to measure potential valuation effects of the treatment.

Differences-in-differences estimator

Table 5 shows the diff-in-diff estimator for changes in financial policies based on firm financial data. We find that treated firms significantly decrease net working capital, changes in net working capital, and their average collection period. Treated firms decrease their net working capital levels by 0.85 standard deviations and their net working capital investment by one standard deviation. Differences in net working capital and changes in net working capital are significant at 1% level. The difference in average collection period is 77 days, which represents 0.86 standard deviations. This difference is significant at 5% level. We find no statistically

significant differences in leverage and return on assets using the differences in differences estimator. However, the difference in return on assets is economically relevant at 0.37 standard deviations, with a p-value of 0.25.

Figure 3 shows the average financial outcomes for firms in the treatment and control groups over the 2014-2018 period. The figures illustrate the negative changes in net working capital, net working capital investment and average collection period for the treated firms when compared to control firms after the intervention. Figure 4 shows mean and median ROA for treatment and control group before and after the treatment took place. The positive impact of the intervention on ROA is visible. The graphical analysis on financial outcomes and performance suggests that the parallel trends assumption is not violated, as treated and control groups seem to follow similar trends before the intervention across the different financial variables.

Overall these results are consistent with our survey-level evidence, where managers mostly reported intentions and realized changes in net working capital.

Regression results

Table 6 reports the estimates of treatment effects on main financial policies using ordinary least squares (OLS) to compare treatment and control firms in the cross section, and firm fixed effects exploiting within firm variation. Columns (1) to (3) show the treatment effect on net working capital using OLS. We find a point estimate of -0.50 in all specifications, which corresponds to a negative impact on net working capital of 0.86 standard deviations. Specification in column (1) has robust standard errors. Following Bloom et al. (2013) we also estimate our results with alternative standard errors. Specification (2) has clustered standard errors at firm level and specification in column (3) has bootstrapped standard errors. Column (4) shows the firm fixed effect estimate, with clustered standard errors at firm level. We find a similar point estimate of 0.5. Estimates are statistically significant across specifications.

Columns (5)-(8) show the treatment effect on changes in net working capital. The point estimate is -0.29 when estimated using OLS and -0.31 with firm fixed effects. The negative impact on changes in net working capital is equivalent to a one standard deviation and statistically significant across specifications.

Columns (9)-(12) show the impact on average collection period. We find a difference between treatment and control group between 73 and 84 days when using the OLS estimator. This effect is statistically significant and represents a change between 0.82 and 0.93 standard deviations. The treatment effect on average collection period is smaller when using firm fixed effects at 0.62 standard deviations but statistically significant.

Columns (13)-(16) show the estimated treatment effect on firm leverage. Our point estimate is between -0.08 and -0.12 and statistically significant when standard errors are clustered at the firm level and with firm fixed effects. The impact of the treatment on leverage is modest: between 0.22 and 0.34 standard deviations, which is consistent with the reported intentions of managers from survey data.

Table 7 shows regression on firm performance measured by ROA. Columns (1) to (5) show the treatment effect on ROA using OLS. We find a positive impact on firm performance between 0.17 and 0.18 that is also statistically significant, except for specification with year fixed effects and clustered standard errors at firm level. The effects is equivalent to 0.37 standard deviations of ROA. When using firm fixed effects we estimate the treatment effect to be 0.146 (0.32 standard deviations) but not statistically significant.

Overall results suggest that relaxing constraints on financial literacy of managers can improve firm performance.

4 Conclusion

This paper evaluates the impact of managers' financial literacy on firm financial policies and performance. A randomized control trial with 74 medium-size and large companies in Mozambique shows a positive effect on firm return on assets of an 18-hours executive education programme in finance for top managers. Our results suggest that the deficiency of managerial financial literacy at large firms can be an important constraint to firm growth.

Using survey data and firm financial information, we find that managers changed firm financial policies after a financial education intervention. We find a significant and large treatment effect in net working capital, changes in net working capital and average collection period. We also find some evidence that managers change their capital structure after the treatment.

The effects on working capital management are large and significant: net working capital decreases by 0.86 standard deviations for the treated firms when compared to the control group. This is likely to alleviate, at least in the short run, potential financial constraints. The effects on firm performance are economically relevant: ROA increases up to 18 percentage points for treated group when compared to the control firms.

These results confirm that financial expertise of managers has a large impact on firm performance through the adoption of financial practices that promote value creation and alleviate financial constraints at the firm level. Moreover, our results suggest that relatively small interventions such as financial education improve financial practices and decision-making and may ultimately affect economic development.

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6 Figures

Figure 1: Financial literacy and financial policies

These graphs display the percentage of managers using different valuation techniques. Source: Survey Jun-Jul 2015.





Figure 2: Timeline

This timeline illustrates the project's field work carried out between June 2015 and November 2018. For each stage, it explains the work performed, the information collected and number of participations (managers and respective companies).

JUN – JUL 2015	FEB – APR 2017		MAY 2017	SEP - NOV 2018	NOV 2018
 Interviews with executives from companies in KPMG '100 top companies' reports from 2010-2014. 	- Meetings to present the programme. Companies were invited to enroll in the Programme.	R A N D O M	TREATMENT GROUP - 18-hour Executive Programme (1st edition), Portuguese and English sessions. - - Pre-learning questionnaire (current financial practices,	 Interviews with treated firms from the first edition. 15 month survey on financial practices. 	- Follow-up event.
 Survey on executive characteristics such as demographics, education background, professional experience and risk preferences, company characteristics, financial practices and interest to participate in a executive 	- Application form (including manager's demographics, education background and professional experience) and company characteristics.	I Z A T I O N	manager's risk preferences) - Post-learning questionnaire (relevance of the course, expectation of future changes in financial policies and course evaluation)	- Financial data request.	
education course.		of firms that were interested in the program	- Kick-off event.	- Interview with control firms.	- 18-hour Executive Programme (2nd edition), Portuguese session.
				 15 month survey on financial practices Pre-learning questionnaire (current financial practices, manager's risk preferences) Financial data request. 	- Post-learning questionnaire (relevance of the course, expectation of future changes in financial policies and course evaluation).

Figure 3: DiD Graphs on Financial Outcomes

The graphs present mean financial outcomes over time for 73 firms included in the treatment and control samples. Financial outcomes are Net working Capital (nwc_sales), Changes in Net Working Capital (deltanwc_sales), Average Collection Period (avgcollectperiod) and Leverage (lev). The vertical line corresponds to the date of the treatment (May 2017).



Figure 4: DiD Graphs on Firm performance

The graphs present mean and median return on assets (roa) over time for 73 firms included in the treatment and control samples. The vertical line corresponds to the date of the treatment (May 2017).



7 Tables

 Table 1: Number of participating managers and companies per stage

The table displays the number of participating companies in different stages of the project.

Time	What	No. of firms
Exploration		
JUN-JUL 2015	Explorative survey on financial practices and financial literacy	62
Experiment		
FEB-APR 2017	Invitations and applications to the program; randomization	
	- Invitations	109
	- Applications	74
	Randomization (After application form)	
	- Treated companies	33
	- Control companies	41
MAY 2017	Intervention I (treatment group)	
	- Programme attendees	31
	- Control event attendees	14
SEP-NOV 2018	15month survey / collection of financial data	
	- Treated companies	22 / 19
	- Control companies	40 / 28
NOV 2018	Intervention II (control group)	
	- Programme attendees (note that there will be a second course in April 2019)	13

Table 2: Summary Statistics

Panel A displays summary statistics for the main financial variables of 73 firms participating in the program (Treated/Control Sample). Financial data is obtained from KPMG 'Top 100 firms' Mozambique report and hand collected. The sample period is 2008-2018. Panel B displays demographic, educational and professional characteristics of managers reported in the application forms. We first present the characteristics of the entire pool of managers. In the last three columns, we restrict the analysis to the top manager of each company, where top manager is defined as the most senior participant filling in the application form. The (descending) order of seniority considered is CEO, CFO, accountant or related, other directors or staff and sales manager or related. In the few cases, we observe more than one manager in the top position (which happened due to manager turnover during the project), we considered the manager with the longest reported tenure.

	1		<u>Tre</u>	eated/Contro	ol Sample			1
	Mean	Stdev	p10	p25	p50	p75	p90	#
Size (total assets) 000usd	165,867.40	439,766.30	3,358.08	6,537.50	19,538.00	112,620.00	413,610.00	448
Sales 000usd	75,794.35	134,349.10	4,496.17	8,453.00	19,291.00	79,165.00	262,321.00	449
Current Assets	51,165.15	97,686.12	2,282.00	4,759.50	11,721.00	48,426.50	148,724.00	416
Current Liabilities	35,711.11	67,230.37	985.00	3,516.00	10,027.00	35,204.00	109,540.00	443
Net Working Capital	13,236.92	67,921.13	-14,473.00	- 1,851.00	924.00	4,955.00	35,592.00	415
Net Working Capital/Sales	0.12	0.58	-0.38	-0.07	0.07	0.25	0.60	415
Net Working Capital Change/Sales	0.00	0.29	-0.25	-0.06	0.01	0.09	0.25	351
Average Collection period	89.91	89.45	4.84	27.45	61.98	131.96	199.82	148
ROA	0.18	0.46	-0.04	0.02	0.08	0.17	0.38	433
Leverage	0.22	0.35	0.00	0.11	0.15	0.37	0.62	403
Cash/Assets	0.13	0.14	0.01	0.03	0.07	0.18	0.31	148
# Employees	1,518.79	22,930.52	14.00	64.50	150.50	405.00	812.00	436

Panel A: Firm characteristics

Panel B: Manager characteristics

		Managers			Top manager	r
	Obs.	Mean/%	Cum. %	Obs.	Mean/%	Cum.%
Male	111	74%	-	74	78%	-
Age (years)	107	42,96	-	71	44,69	-
Nationality	111			74		
Mozambican	78	70%	70%	50	68%	68%
Portuguese	23	21%	91%	19	26%	93%
Other	10	9%	100%	5	7%	100%
Role in the company	111			74		
CEO	45	41%	41%	42	57%	57%
CFO	37	33%	74%	24	32%	89%
Accountant or related	14	13%	87%	5	7%	96%
Other directors or staff	10	9%	96%	2	3%	99%
Sales manager or related	5	5%	100%	1	1%	100%
Current tenure (years)	110	6,42	-	73	7,67	-
Education level	98			68		
High/Technical School	7	7%	7%	5	7%	7%
Undergraduate	47	48%	55%	28	41%	49%
Masters	16	16%	71%	12	18%	66%
Post-Graduation	12	12%	84%	10	15%	81%
MBA	14	14%	98%	11	16%	97%
PHD	2	2%	100%	2	3%	100%
Background in Accounting and/or Finance	75			52		
Accounting and Finance	32	43%	43%	22	42%	42%
Accounting	18	24%	67%	10	19%	62%
Finance	9	12%	79%	8	15%	77%
None	16	21%	100%	12	23%	100%

Table 3: Intention to implement Changes of Corporate Policies (Exit Survey)

The table displays the intentions of managers to change corporate policies. The data was collected in the exit survey at the end of the course. "N/A" means that a corporate policy cannot be changed because firm does not have discretion over that policy (e.g., subsidiary of a foreign firm). "Miss." refers to a missing answer. Depending on the specification, we disregard this answer in the aggregation or, being conservative, interpret it as a "No". The left tables show the raw answers of the individual managers. The right tables aggregate answers on firm level. A firm intends to change a policy, if at least one managers intends to do so. Source: Exit survey of cohort 1 (May 2017), Exit survey of cohort 2 (November 2018).

Panel A: Cohort 1 (May 2017)

	Y	No	N/A	Miss	#	% Vos	% Yes (incl. missings, excl. N/A)
	es	110	$1 \mathbf{V} \mathbf{A}$	141155.	#	1 65	CAU. 19/A)
Working capital	27	5	2	6	40	84%	71%
Risk management	22	3	8	7	40	88%	69%
Valuation	15	9	3	13	40	63%	41%
Capital structure	10	6	10	14	40	63%	33%

Managers Intention to implement changes in corporate policies

Firms Intention to implement changes in corporate policies

	Yes	No	N/A	Miss.	#	% Yes	% Yes (incl. missings, excl. N/A)
Working capital	22	2	1	2	27	92%	85%
Risk management	18	3	4	2	27	86%	78%
Valuation	14	8	2	3	27	64%	56%
Capital structure	9	5	9	4	27	64%	50%

Panel B: Cohort 2 (November 2018)

				N	lanage r	·s									
		Intention to implement changes in corporate policies													
						%	% Yes (incl. missings,								
	Yes	No	N/A	Miss.	#	Yes	excl. N/A)								
Working capital	8	3	1	5	17	73%	50%								
Working capital Risk management	8 11	3 3	1 0	5 3	17 17	73% 79%	50% 65%								
Working capital Risk management Valuation	8 11 7	3 3 4	1 0 2	5 3 4	17 17 17	73% 79% 64%	50% 65% 47%								

Firms Intention to implement changes in corporate policies

	Yes	No	N/A	Miss.	#	% Yes	% Yes (incl. missings, excl. N/A)
Working capital	7	2	1	3	13	78%	58%
Risk management	9	2	0	2	13	82%	69%
Valuation	5	4	2	2	13	56%	45%
Capital structure	5	4	2	2	13	56%	45%

Panel C: Pooled cohorts 1 & 2

Managers Intention to implement changes in corporate policies

	Yes	No	N/A	Miss.	#	% Yes	% Yes (incl. missings, excl. N/A)
Working capital	35	8	3	11	57	81%	65%
Risk management	33	6	8	10	57	85%	67%
Valuation	22	13	5	17	57	63%	42%
Capital structure	17	11	12	17	57	61%	38%

Firms Intention to implement changes in corporate policies

,		Yes	No	N/A	Miss.	#	% Yes	% Yes (incl. missings, excl. N/A)
6	Working capital	28	4	2	5	39	88%	76%
6	Risk management	27	5	4	3	39	84%	77%
6	Valuation	18	12	4	5	39	60%	51%
6	Capital structure	14	9	10	6	39	61%	48%

Table 4: Implemented Changes of Corporate Policies after 15 Months (15M Survey)

The table displays the implemented changes of corporate policies by managers 15 months after the first treatment (May 2017) and before the second treatment in November 2018. The data was collected through a survey in Sep-Oct 2018. "N/A" means that a corporate policy cannot be changed because firm does not have discretion over that policy (subsidiary of a foreign firm). Depending on the specification, we disregard this answer in the aggregation or, being conservative, interpret it as a "No". The middle of part of the table shows the corresponding answers by control firms (i.e., firms that participated in the experiment but were not taught in the course in May 2017). The right part of the table shows the difference between treatment and control firms and p-values of the corresponding one-sided t-tests. Source: 15M survey (Sep-Oct 2018).

Firms

After 12 months, have you implemented changes in corporate policies?

<u>Treated</u>									<u>Control</u> <u>Diff</u>				<u>erence</u>		
	Yes	Yes (b/c of course)	No	N/A	#	% Yes	% Yes (incl. N/A)	Yes	No	#	% Yes	Diff	P(T <t)< th=""><th>Diff (incl. N/A)</th><th>P(T<t)< th=""></t)<></th></t)<>	Diff (incl. N/A)	P(T <t)< th=""></t)<>
Working capital	8	7	14	4	26	36.4%	30.8%	1	32	33	3.0%	33.3%***	0.00	27.7%***	0.00
Risk management	3	3	19	4	26	13.6%	11.5%	3	30	33	9.1%	4.5%	0.30	2.4%	0.38
Valuation	3	2	19	4	26	13.6%	11.5%	2	31	33	6.1%	7.6%	0.17	5.5%	0.23
Capital structure	3	2	19	4	26	13.6%	11.5%	1	32	33	3.0%	10.6*	0.07	8.5%	0.10

Table 5: Diff: Impact on Firm Financial Policies

The table displays the difference in difference estimator for firm financial outcomes. The sample includes 73 treated and control firms that participated in the program. The sample period is 2008-2018.

Firms

		<u>Treated</u>			<u>Control</u>		<u>Difference</u>			
	Baseline	Follow up	#	Baseline	Follow up	#	Diff	P(T <t)< th=""></t)<>		
Net working capital	-0.036	-0.361	157	0.212	0.382	258	-0.496***	0.010		
Changes in net working capital	-0.002	-0.214	133	-0.001	0.079	218	-0.292***	0.004		
Average collection period	72.875	85.810	46	76.93	162.973	102	-77.163**	0.046		
Leverage	0.189	0.123	154	0.249	0.292	249	-0.109	0.383		
ROA	0.148	0.146	165	0.226	0.053	268	0.171	0.252		

Table 6: Impact on Firm Financial Outcomes

The table displays the difference in difference estimator for firm financial outcomes. The sample includes 73 treated and control firms that participated in the program. The sample period is 2008-2018.

	Net working capital				Net working capital change				Avg. collection period				Leverage			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
T	0.40(**	-	0.407*	-	-	0.007*	-	-	72.110*	02 555**	72.110*	5(220*	0.100	0.120**	0.100	0.070*
I reatment x post	-0.496**	0.49/***	-0.496*	0.503**	0.292**	-0.28/*	0.292**	0.314**	-/3.110*	-83.333**	-/3.110*	-36.229*	-0.109	-0.120**	-0.109	-0.0/8*
	[-1.981]	[-2.757]	[-1.723]	[-2.500]	[-1.979]	[-1.743]	[-1.976]	[-2.082]	[-1.906]	[-2.068]	[-1.662]	[-1.941]	[-1.187]	[-2.025]	[-1.144]	[-1.935]
Treatment	0.248***	-0.253*	0.248***		-0.000	-0.002	-0.000		-4.053	-3.359	-4.053		-0.060*	-0.060	-0.060**	
	[-4.275]	[-1.749]	[-4.394]		[-0.012]	[-0.108]	[-0.013]		[-0.306]	[-0.140]	[-0.310]		[-1.866]	[-0.832]	[-2.035]	
Post	0.170	1.063	0.170	0.140	0.080	-0.384	0.080	0.084*	86.046***	155.889	86.046**	83.549***	0.042	0.238***	0.042	0.016
	[1.189]	[1.486]	[1.101]	[1.249]	[1.076]	[-0.711]	[1.246]	[1.764]	[2.775]	[1.541]	[2.454]	[3.191]	[0.515]	[-3.573]	[0.505]	[0.429]
Constant	0.212***	0.277**	0.212***		-0.001	-0.020	-0.001		76.928***	85.845***	76.928***		0.249***	0.271***	0.249***	0.228***
	[6.129]	[2.253]	[5.610]		[-0.069]	[-0.366]	[-0.079]		[9.617]	[6.228]	[9.462]		[9.055]	[4.067]	[10.681]	[6.257]
Observations	415	415	415	415	351	351	351	351	148	148	148	148	403	403	403	403
R-squared	0.076	0.101	0.076	0.047	0.028	0.064	0.028	0.028	0.125	0.156	0.125	0.222	0.012	0.023	0.012	0.003
Firm fixed effects				Yes				Yes				Yes				Yes
Year dummies		Yes				Yes				Yes				Yes		
Bootstrap s.e. Clustered s.e.			Yes				Yes				Yes				Yes	
(firm)		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes

Table 7: Impact on firm performance

The table displays the difference in difference estimator for firm financial outcomes. ROA is defined as operational income over total assets. The sample includes 73 treated and control firms that participated in the program. The sample period is 2008-2018.

	ROA										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)				
Treatment x post	0.171*	0.171**	0.176*	0.176	0.176**	0.146	0.146				
Treatment	-0.078*	[2.213] -0.078* [-1.889]	[1.802] -0.081* [-1.820]	[1.493] -0.081 [-0.879]	[1.972] -0.081* [-1.928]	[1.249]	[1.293]				
Post	-0.173*** [-4 270]	-0.173*** [-4 350]	-0.106 [-1.641]	-0.106 [-1 535]	-0.106** [-2.029]	-0.172** [-2 463]	-0.172** [-2 274]				
Constant	0.226***	0.226***	0.125***	0.125***	0.125***	[2.100]	[2.27]				
	[0.102]	[0.123]	[5:050]	[5:090]	[
Observations	433	433	433	433	433	433	433				
R-squared	0.012	0.012	0.069	0.069	0.069	0.015	0.015				
Firm fixed effects						Yes	Yes				
Year dummies			Yes	Yes	Yes						
Bootstrap s.e.		Yes			Yes	Yes					
Clustered s.e. (firm)				Yes		Yes					

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