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Returns to Interest-free Microcredit: evidence from a Randomised Experiment in Pakistan

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ABSTRACT

The existing experimental evidence on returns to capital is based on randomisation of either interest-bearing loans or grants. This paper reports on a field experiment conducted in Pakistan in which interest-free loans were randomly provided to microenterprises. The study was conducted in co-operation with Akhuwat Islamic Microfinance. We find that treatment leads to a substantial increase in working capital and in business profits. Using randomised treatment as an instrument for capital, we find average monthly returns to capital of 8.6 to 11.9 percent a month. These returns are higher than the interest rates charged by conventional microfinance institutions in Pakistan.

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Returns to capital; microenterprises; randomised experiment; akhuwat microfinance; asia; pakistan

1. Introduction

In developing countries, a large share of the labour force is employed by microenterprises operating in the informal sector. Microfinance has played an important role in providing much needed capital to these microenterprises. It is axiomatically believed that small firms have the potential, in terms of returns to capital, to repay loans with high interest rates – a fundamental claim which is at the core of the global microfinance movement.

However, credible and well-identified studies, which have established the impact of microfinance on business returns, are limited (Armendariz and Morduch 2010; Morduch 1999). At the start of the microfinance revolution, the emphasis was mainly on uptake and repayment, however, as microfinance has matured and become a well-funded innovation, the emphasis has gradually shifted to the impact of the intervention. For long, many scholars and policy makers have considered microfinance a 'development success' – a narrative which has become part of a widely accepted discourse. However, three recent randomised studies which do not find an impact of microfinance on various outcomes, have challenged this popular narrative and generated mixed reactions among researchers and policy makers (Bauchet et al. 2011).[1]

In addition to this empirical evidence, news reports of suicides committed and hardships faced by microfinance borrowers in India and elsewhere, have also raised questions on the effectiveness of microfinance.[2] As a consequence of suicides in Andhra Pradesh, India, the state government introduced tough legislation seeking stringent regulation of microfinance activities. The microfinance industry suffered a further setback when the state's politicians encouraged borrowers to stop repayment of their loans. Nine distinguished professors, in their reaction to this crisis, criticised the Andhra Pradesh's government for enacting a law which in essence encouraged borrowers to 'default en masse'.[3] In an article, these academics maintained that lending to the poor itself is not the main

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innovation of microfinance, rather its main innovation is lending to the poor at 'lower interest rates' than informal money lenders.

While microfinance institutions (MFIs) do tend to charge lower interest rates as compared to money lenders, a relevant concern is whether these interest rates are affordable. Or in other words, is the so called 'lower interest rate' low enough compared to a borrower's repayment capacity? The debate about repayment capacity essentially boils down to returns on marginal capital – an estimate which may be used to benchmark the pricing of microfinance products. Estimates of returns to capital provide an upper bound of interest rates that micro-entrepreneurs may be able to afford without harming themselves. However, credible estimates of the returns to microfinance are limited.

This paper adds to the existing body of work, which is reviewed in the next section, by estimating the effect of a randomised increase in the capital stock of microenterprises on their profitability and their rate of return to capital. The experiment was conducted in Pakistan in collaboration with Akhuwat Islamic Microfinance.

While estimating returns to microfinance, using a randomised approach is by itself of interest, it is not particularly novel. Indeed, while the paper is similar to other papers in this genre it is unique mainly due to the contrast between traditional microfinance and Akhuwat's approach. Unlike traditional MFIs, Akhuwat provides loans on an interest-free basis. Thus, this study uses interest-free loans to provide exogenous shocks to capital stock instead of grants (De Mel, McKenzie, and Woodruff 2008; McKenzie and Woodruff 2008) or interest-bearing loans (e.g. Banerjee et al. 2015; Crépon et al. 2015; Karlan and Zinman 2011). Akhuwat's lending model is unique as well. Akhuwat offers loans to individuals rather than to a group, and collateral is provided not by the group but through community pressure and religious sanctity as loans are publicly distributed in mosques and churches. While the loans are interest free or rather the real interest is negative, borrowers are expected to make voluntary contributions at the time of repaying their loan instalments. Akhuwat's model clearly offers a lower repayment burden, and payment of interest even if it is in the form of voluntary contributions, offers greater flexibility.[4] At the same time, such an approach may encourage riskier investments. However, little is known about returns to interest-free credit. As pointed out by Mahmud (2015), 'Islamic microfinance is still in its nascent stages and rigorous evaluation of Islamic MFIs or of the interest free lending model is scant', and it this gap which the current paper attempts to address.

Furthermore, it is the first study which estimates returns to capital through a randomised experiment in Pakistan, a country where microfinance has made significant progress over the years but where this is still a large untapped market.[5] The findings may be expected to provide useful feedback to policy debates around the pricing of microcredit products in Pakistan.[6]

The rest of the paper is organised as follows. Section 2 provides a brief literature review on returns to capital in microenterprises. Section 3 describes the context of the experiment. Section 4 discusses the experiment, the data, and data related issues. Section 5 outlines the empirical framework. Section 6 discusses the results while Section 7 contains concluding remarks.

2. Literature Review

There is a small but growing body of empirical and theoretical literature which establishes the importance of access to capital in business creation and survival (Giné and Mansuri 2011). Entrepreneurs normally require minimum initial investment to meet start-up costs. In imperfect credit markets, these costs serve as an entry barrier and as a result, different theoretical models predict a long-term low-growth poverty trap (Banerjee and Newman 1993). Market imperfections have severe implications, especially for poor entrepreneurs without collateral, because it systematically rations them out from credit markets. As a result, conditional on embarking on an entrepreneurial path, poor households are more likely to face credit constraints which may hamper their ability to develop and grow their businesses and as a result may remain in perpetual poverty (Yunus

and Weber 2007). To address the problem of systematic exclusion, microfinance institutions have played an important role in providing access to capital for the unbanked poor.

However, how much difference does microfinance make? It is generally believed that once poor entrepreneurs, who are more likely to face binding credit constraints as compared to relatively wealthy entrepreneurs, are given access to capital, they will generate high returns to capital (De Mel, McKenzie, and Woodruff 2008; Karlan and Morduch 2010). A number of non-experimental studies support this claim. For instance, based on their study in Mexico, McKenzie and Woodruff (2006) found an annual return of 180% for smaller firms and 40 to 60% for larger firms. In Ghana, annual returns to capital were 50% on traditional crops and 250% on non-traditional crops (Udry and Anagol 2006).

Although non-experimental studies find large impacts of access to capital on business returns, they yield potentially contaminated estimates. McKenzie and Woodruff (2006) identify two potential sources of bias in non-randomised studies which estimate returns to marginal capital. First, the investment decision of entrepreneurs is influenced by market specific profitability. As a result, returns to capital are not only driven by marginal investment but also by market gains. Firms tend to invest more in profitable markets, and therefore, it is difficult to separate the effect of marginal investment from the initial market conditions. The second source of bias arises from self-selection as it is likely that relatively able entrepreneurs are more likely to participate in microcredit programmes. Besides determining participation, entrepreneurial ability is also a key determinant of business performance and hence it is difficult to isolate returns to capital from returns to entrepreneurial ability.

In order to tackle these biases, a set of recent studies has used randomised designs to examine the impact of microcredit on business returns. Following-up on their earlier non-randomised study, McKenzie and Woodruff (2008) conducted a field experiment in Mexico, in which cash and in-kind grants were randomly allocated to microenterprises. The analysis showed that in treated firms, monthly profits rose and were equivalent to a 46% monthly return on capital. Effects were higher for the in-kind treatment. De Mel, McKenzie, and Woodruff (2008) conducted a similar experiment in Sri Lanka. The treatment was given in the form of either small or relatively large cash and in-kind grants. Consistent with studies conducted in Mexico, depending on the type of intervention, the paper reported a significant increase in capital stock ranging from 23 to 71% and an increase in monthly profits of between 15 to 21%. Using randomised treatment as an instrument for capital stock, the paper found an average annual real return to capital of 55 to 63%.

In another experiment in Sri Lanka, De Mel, McKenzie, and Woodruff (2014) provided business training and a combination of business training and cash grants to two groups of randomly sampled women. For existing business owners, the paper found no impact of training on business profits, sales, and capital stock. The combination of training and the cash grants, on the other hand, led to a significant increase in business profitability in the first eight months. The impact was short lived and disappeared in the second year. For potential owners, the training-only treatment had a significant impact on business profits, however, the combination of training and the cash grant had no impact on business profits.

Unlike, the papers by McKenzie and Woodruff (2008) and De Mel, McKenzie, and Woodruff (2008, 2014) where researchers provided grants to micro-entrepreneurs, a related strand of the literature works with microfinance companies to estimate the impact of access to credit on business returns. Banerjee et al. (2015) worked with Spandana, a microfinance institution in India, to identify the impact of (potential) access to credit on various outcome indicators. As part of its expansion plans, Spandana opened new branches in randomly selected villages. The follow-up surveys revealed that credit uptake was 19%. The intention-to-treat (ITT) estimates showed that households in the treated areas were 1.7 percentage points more likely to have opened new businesses as compared to non-treated areas, however, there was no effect on business profits in the treated areas. Crépon et al. (2015) carried out a similar study in partnership with Al Amana microfinance in rural Morocco in which the researchers studied the impact of access to capital on credit uptake and business

profitability. As was the case in India, about two years after branch openings, credit uptake was 16%. The ITT estimates showed that treatment significantly reduced credit constraints. Households in treatment areas were able to upscale their activities involving non-livestock agriculture and livestock, and income earned from agriculture by households residing in the treatment areas recorded a statistically significant increase. However, income from livestock and other businesses did not respond to increased access to credit. Karlan and Zinman (2011) worked with First Macro Bank in Philippines and provided random access to credit to 1,600 marginally creditworthy applicants. Eleven to 22 months after the intervention, the authors found that those who were allocated credit did not increase investment in their businesses and in fact they reduced their overall number of business activities.

The estimates of the effect on business expansion, profits and returns to capital based on papers where researchers have provided grants to micro-entrepreneurs is in marked contrast to the outcomes in papers where researchers have worked with microfinance organisations. While the former strand of literature finds very large effects, the latter finds little or no effects. In part this may be explained by the different approaches, Banerjee et al. (2015) and Crépon et al. (2015) examine the effect of access to credit and not actual uptake of credit. This is likely to underestimate the effect of credit on business success. While Karlan and Zinman (2011) estimate the effect of credit uptake and not just access, they work with an unusual sample of borrowers who were deemed unworthy of credit. The results reported in their paper maybe attributed to the nature of their sample rather than microcredit, per se, and may not be generalised to other credit worthy micro-entrepreneurs.

This paper contributes to the literature on the impact of microcredit by offering estimates of the rate of return to interest-free loans in the case of Pakistan. The paper falls in the second strand of the literature in the sense that we work with a microfinance company that offers loans to micro-enterprises as opposed to researchers providing grants which is perhaps a more artificial setting. At the same time, similar to the first strand of the literature we work with firms that actually receive credit as opposed to potential access to credit and we estimate the average treatment effect on the treated as opposed to the ITT.

3. Akhuwat and its lending approach

Akhuwat Microfinance was established in 2001, in Pakistan, by a group of volunteers. The purpose of Akhuwat is to provide interest free loans to credit constrained poor households.[7] Akhuwat follows four guiding principles derived from Islamic traditions.[8] The first principle forbids charging of interest on loans.[9] The second principle recognises the role of religious centres in economic development. The third guiding principle is volunteerism, which encourages flow of capital from the rich to the poor and sharing of knowledge, skills, and time for social emancipation in general and poverty alleviation in particular. The fourth principle is self-reliance. Although Akhuwat does not charge any interest, it encourages its borrowers to donate towards Akhuwat's cause. These donations are voluntary and are expected to instil the value of helping others amongst its borrowers.

Akhuwat started with an initial donation of Rs.10,000 (USD 96) and since then it has registered remarkable growth. As of February 2015, Akhuwat had 343 branches in 210 cities and towns and had disbursed more than Rs.13.6 billion in revolving credit to about 0.8 million families (see Table 1). Akhuwat offers a range of products tailored to the different needs of low-income households (see Table 2). One of Akhuwat's flagship products is the family enterprise loan, which targets poor micro-entrepreneurs. The amount of this loan for first time borrowers is Rs. 10,000.[10] Akhuwat's lending follows poverty-based eligibility criteria. In order to be eligible, the monthly per-capita income of the borrowing households should not exceed Rs.1,000.[11] This cap is substantially lower than Pakistan's national poverty line of Rs. 2,333 per adult equivalent per month in 2010–11.[12]

Applicants may approach Akhuwat's offices and in the first stage of the application process a two-page form needs to be completed. This form asks for basic personal and business information, references, and the intended purpose of the loan. If a borrower meets the initial criteria, the

Table 1. Akhuwat's – Basic Characteristics (as of February, 2015).

INDICATOR	
Total Benefiting Families	797,148
Male	61%
Female	39%
Amount Disbursed	PKR 13,613,206,842
Percentage Recovery	99.89%
Active Loans	345,690
Outstanding Loan Portfolio	PKR 4,226,267,871
Number of Branches	343
Number of Cities and Towns	210

Note: PKR – Pakistani Rupees

Table 2. Products of Akhuwat Microfinance.

Loan Product	Purpose	Amount in Rupees
Family Enterprise Loan	For starting or expanding business	10,000–30,000
Liberation Loan	To help repay loans taken from money lenders	Normally up to 50,000 but higher amounts also possible with approval of executive director.
Education Loan	Financing of education related expenses	Up to 25,000
Health Loan	Health related expenses	10,000–20,000
Emergency Loan	For meeting various emergencies	5,000–10,000
Housing Loan	Construction or renovation of house	30,000–70,000
Marriage Loan	Marriage related expenses	Up to 20,000
Silver Loan	Medium size loan for mature businesses who have completed 3 or more of Akhuwat's loan cycles.	Up to 50,000

Source: Adapted from http://www.akhuwat.org.pk/loan_products.asp [Last accessed: 22 June 2016]

applications enter the second stage. In this stage, the branch managers conduct a rigorous economic and social appraisal. In the appraisal phase, personal and family information, income and expenditure of the household, viability of the business plan, assessment of credit needs and the credentials of the guarantors are verified. The appraisal process may also include interviews with the applicants and guarantors. After passing through to the second stage, successful applications are submitted to a credit committee for final approval.

As part of the process, the loan application must be signed by at least one family member of the applicant and guarantors. After appraisal, which takes approximately three weeks, and if a loan is approved, disbursement takes place in a mosque in front of at least one guarantor, the Imam and community members.[13] This creates community pressure on the borrower for effective utilisation and timely repayment of loans. In each Akhuwat-linked mosque, loan disbursements take place twice a month and normally 100–150 loans are given out. Borrowers are required to repay their loans in 10 equal monthly instalments.

Since its inception, Akhuwat Microfinance has substantially departed from conventional MFIs in many ways (see Table 3).[14] The most prominent ones are its unique lending model and approach to sustainability. Akhuwat, despite individual lending, has consistently maintained higher repayment rates as compared to conventional MFIs.[15] Akhuwat has a lower default rate of 0.15% compared to 2.29% for other MFIs in Pakistan.[16] This is notable as group lending is believed to be superior to individual lending in terms of repayment rates.[17] The success of microfinance institutions is attributed mainly to their innovative group lending technology in which credit discipline is enforced

Table 3. Akhuwat vs. Conventional MFIs.

Akhuwat	Conventional MFIs
Individual Lending	Group Lending
Interest free lending	Normally charges more than 30% interest
Charity from community and voluntary donations from borrowers as a main source of funding	Deposits, loans and grants as a main source of funding
Marketing and implementation of programmes through mosques and churches	Programme implementation through their own branch networks
Community, family pressure, religious sanctity	Mainly peer pressure
Depth of outreach	Breadth of outreach

through a joint liability contract (Morduch 1999). The incentive structure under joint liability mitigates the problems of adverse selection and moral hazard in credit markets.

Akhuwat tackles the issues of adverse selection and moral hazard in a different way. Akhuwat has made the involvement of religious centres an integral part of its lending model. Involvement of religious centres discourages wilful defaults because borrowers supposedly attach religious sanctity to the loans which are disbursed in places of worship. The other factors which may explain high repayment rates are pressure from the family member (who signs the application) and the guarantor(s).

Conventional MFIs follow a standard market-based approach to achieve sustainability, that is, by charging high interest rates. There are two main reasons for this. First, due to small loan sizes, the transaction costs of MFIs are generally high. In order to cover these costs, MFIs charge high interest rates. Second, in the absence of physical collateral, lending to the poor is considered a high-risk activity. MFIs price their microfinance loans commensurate with the risk and therefore charge high interest rates. In contrast to conventional MFIs, Akhuwat approaches sustainability in a different way. It uses the physical network of mosques and churches as a cost reduction strategy and spirituality or religiosity to enforce credit discipline.[18] For sustainability, Akhuwat's model of microfinance relies on volunteerism and religious traditions, which encourages flow of capital from rich to the poor.

Conventional MFIs generally rely on savings/deposits, equity, loans and grants to finance their operations. Akhuwat has two main sources of funding, one is charity from community members and the other one is voluntary donations from borrowers. At the time of loan disbursement, each borrower is given a donation box to be displayed at their business location. Borrowers and other community members deposit their voluntary contributions in these boxes which are handed over to Akhuwat at the time of monthly instalment payment. This practice has turned borrowers into donors. Therefore, apart from the lender-borrower relationship, this step has defined a new relationship of donee-donor between Akhuwat and its borrowers. In an interview with the first author, the CEO of Akhuwat stated that besides interest-free lending, through the practice of voluntary donations Akhuwat intended to create institutional ownership and feel-good-factor because it relieved borrowers from obligatory service fees and also gave them an institutionalised way of helping others.

4. The experiment and the data

4.1 The experiment

The experiment to identify the effect of an exogenous shock to the capital stock of microenterprises on business performance was designed in collaboration with Akhuwat. Based on discussions with Akhuwat staff, it was agreed that we would work with four of their largest branches located in four different cities (Chiniot, Faisalabad, Rawalpindi and Lahore) of Pakistan's Punjab province and focus on applicants who had applied for their Family Enterprise Loan, a product which accounts for

approximately 91% of Akhuwat's loan portfolio. Treatment consisted of an interest-free loan of Rs. 10,000 randomly allocated to eligible applicants. The loan had to be repaid in ten equal monthly instalments.[19] Contractually, the borrowers were expected to spend the entire loan on business purposes; however, since the loans were disbursed in cash, ensuring compliance was difficult.[20]

It is Akhuwat's usual practice to allocate loans to eligible candidates on a first come, first served basis. However, to support the experimental design, Akhuwat agreed on a one-time exception to this rule and agreed to randomly allocate loans to eligible candidates.[21] It was also agreed that those who were refused a loan, due to the experiment, would be compensated by being offered a larger loan at the end of the experiment, that is, after 10 months. This arrangement was kept confidential so that the firms in the control group did not alter their behaviour in anticipation of getting larger loans in the future. At the time of submitting their applications, all applicants were informed about the random draw and the consequence of this random draw was explained to them.

As described in the previous section, all those interested in an Akhuwat loan need to go through a two-stage process and this was maintained for the experiment. Applications were first screened for eligibility, subsequently they were subjected to a social and economic appraisal and this led to a group of 488 eligible applicants of which 243 were randomly assigned to treatment and 245 to control (see Figure 1). Prior to embarking on field work, based on existing papers and power calculations we were aiming for a sample size of about 500 firms equally divided between treatment and control. While we fell short of this target, the sample size that we do have is comparable to other papers in this genre and allows us to detect a small to medium effect (see Table 4).[22]

4.2 The Data

This study relies on a three-period panel dataset (see Figures 1 and 2). Prior to randomisation, in June 2010, we conducted a baseline survey. The survey contained eight sections and gathered information on the composition of the household, socio-economic traits, information on the micro-enterprise such as the nature of the business, value of business assets, profits, hours worked by the entrepreneur, and number of employees. Information on profits was gathered by asking a direct question on the 'usual' monthly profits of the business enterprise and by computing a measure of profits (indirect) based on revenue and expenditure information. Working capital or current capital, that is, the value of liquid assets (cash and inventory) available to finance the day-to-day operations of the microenterprise was computed by excluding the value of items such as land and building from the firm's business assets. The final section of the survey contained a set of 60 questions designed to gather information on the personality of the entrepreneurs. We used the Urdu version of the NEO-FFI instrument.[23] This is a local version of an internationally developed and widely used personality assessment tool which provides a measure of the five domains of personality (neuroticism, extra-version, openness to experience, agreeableness, conscientiousness) and has been adapted to suit the local environment. The 60 questions, 12 for each of the five personality traits are scored on a scale of 1 to 5. Five months after the disbursement of the loan we conducted a mini follow-up survey which gathered information only on the outcome variables while a comprehensive follow-up survey was undertaken after the loan had been repaid – that is, ten months after loan disbursement. The process of randomisation and data collection is illustrated in Figures 1 and 2.

4.3 Sample attrition

While the baseline survey covered 488 observations, in the mini-follow-up survey we were able to gather information on 453 firms and in the final survey we were able to locate and survey 454 firms. The 7% attrition rate for microenterprises which are often peripatetic is quite low. There is no evidence that dropping out of the sample is systematic. At baseline, there are no statistically significant differences in the outcome variables for enterprises that remained in the sample and

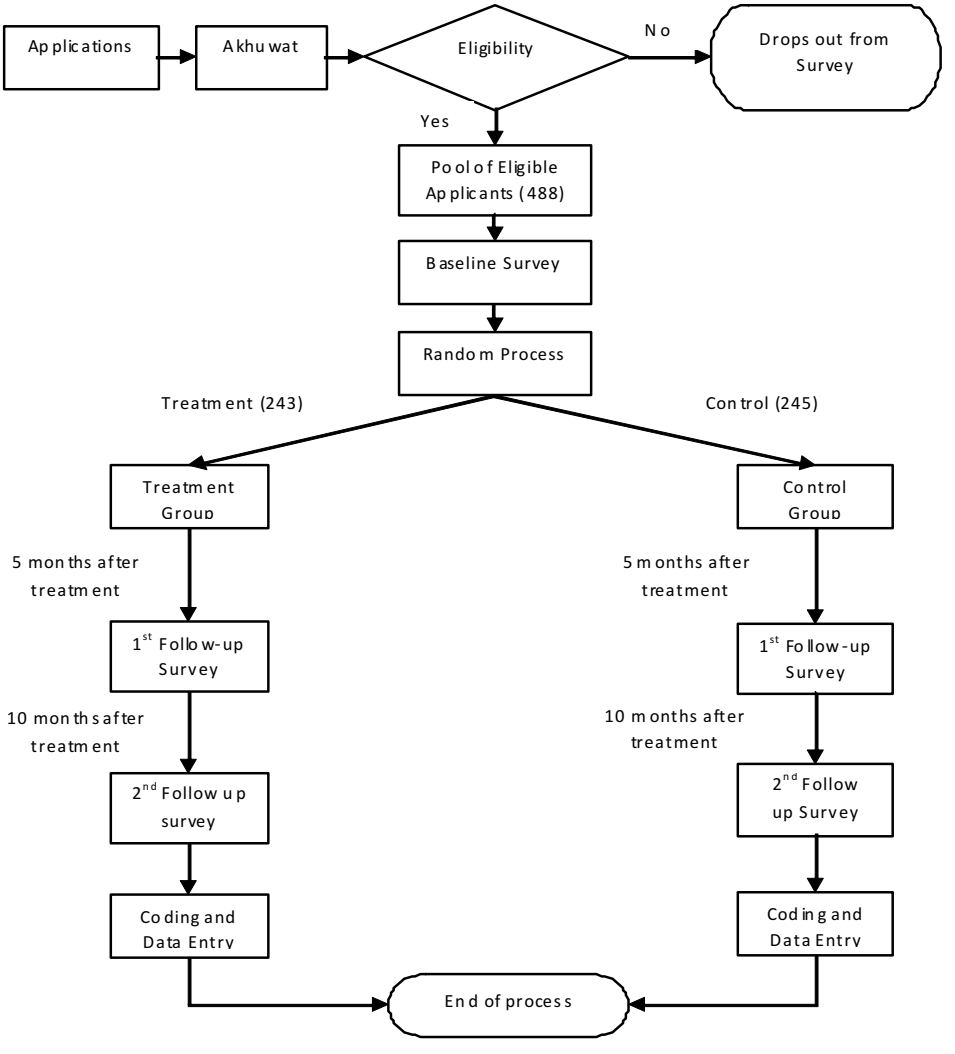

Figure 1. Randomisation and Data Collection Flowchart.

Table 4. Sample Size for Different Level of Standardised Effects and Power.

		Significance Level = 0.05	
		Sample Size for Treatment, Control	
	Standardised Effect Size	Power = 0.8	Power = 0.9
Small	0.2	310, 310	429, 429
Medium	0.5	50, 50	69, 69
Large	0.8	20, 20	27, 27

those that dropped out (Table 5). A probit regression of the probability of dropping out from the sample on the outcome variables is statistically insignificant (Table 6).

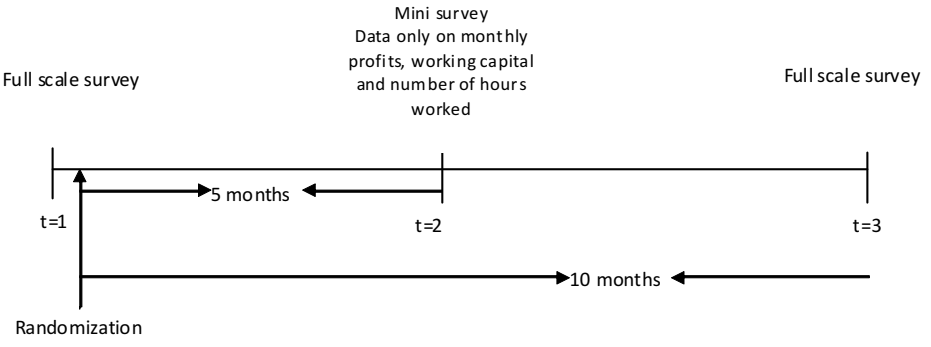

Figure 2. Timeline of Experiment and Data Collection.

Table 5. Comparison of Means of Attrited and Unattrited Microenterprises.

H_0: **Both Groups have Equal Means**	**Attrited**		**Unattrited**		|*t-stat*|
	Mean	S.D	Mean	S.D	
Monthly Profits (direct)	8,131	1,388	8,172	1,364	0.172
Monthly Profits (indirect)	7831	1,497	7,767	1,5234	0.236
Capital Stock	23,991	3,941	24,053	4,185	0.084
Number of Hours Worked	9.38	1.95	9.89	2.09	1.390

4.4 Descriptives

Our baseline data reveals that the average entrepreneur in our sample has about 5 years of education and is 38 years old. The majority of the entrepreneurs are men (76%). All the businesses are informal enterprises and only 2% have bank accounts in the name of their businesses. The bulk of the enterprises operate in either the retail sector (34%) or the services sector (35%) while 13% are engaged in manufacturing activities. About 47% of the entrepreneurs do not keep any written record of their business activities, while the remainder either keep informal notes or record them in a register. A majority of the firms have a fixed work location (82%). On average, the total value of the business assets is Rs. 30,026 while working or current capital amounts to an average of Rs. 24,048. The average, microentrepreneur works for 9.86 hours a day and based on the direct profit measures earns about Rs. 8,170 per month. Thus, the treatment of Rs. 10,000 is equivalent to 122% of the average income and 42% of average working capital.

One of the key variables in our analysis is profits and as mentioned earlier we have two measures of profit – obtained by asking a direct question on profits and using an indirect approach – that is, subtracting expenses from revenues. De Mel, McKenzie, and Woodruff 2009a; 2009b) argue that data on profits obtained using the direct approach is more reliable as compared to the indirect approach. In our baseline data the correlation between the two measures is 0.87 which may be compared with the correlation of 0.70 reported in De Mel, McKenzie, and Woodruff (2008). While in our case there is a very high correlation between the direct and indirect profits, this is not always the case.[24]

Descriptive statistics conditional on treatment status are provided in Table 6. Across the board, there are no statistically significant differences in the outcome variables or other characteristics whether observed or typically unobserved such as the personality traits. The two groups are clearly balanced suggesting that randomisation has been successful in delivering a comparable treatment and control group.

Table 6. Determinants of Attrition.

Attrition	Coefficients (S.E)
Direct Monthly Profits	−0.000 (0.00)
Working Capital	0.000 (0.00)
Number of Hours Worked	−0.060 (0.04)
Number of Attrited Microenterprises	*34*
Number of Unattrited Microenterprises	*454*
LR Chi2(3)	*2.00*
Prob>Chi2	*0.5728*

5. The Empirical Approach

Our aim is to identify the effect of access to credit on the business performance of microenterprises. In particular we are interested in estimating the effect of a loan provided by Akhuwat on profits, on the capital stock of the enterprise and subsequently estimating the rate of return to capital. In response to the infusion of additional capital provided by the loan, which is supposed to be spent on business purposes, we expect that firm profits and capital stock (post-experiment) will increase. It is also possible that profits increase not just due to credit access but also due to additional work effort generated due to the loan. While the experiment lasts for a short-time, given the nature of the businesses and of the loan product, we expect that the funds are used quickly and should translate into positive effects, if at all, within a short span of time.

Thus, in the first step of our empirical assessment we estimate the impact of treatment on profits, capital stock, and the number of hours worked. We use the following specification,

$$Y_{it} = \alpha + \beta_T Treatment_{it} + \sum_{t=2}^{3} \omega_t + \lambda_i + \varepsilon_{it} \tag{1}$$

In this specification, Y_{it} is the outcome of interest (either in level or log form), $Treatment_{it}$ indicates whether firm *i* received a loan or not; ω_t captures fixed wave effects; λ_i represents time-invariant firm fixed effects and $\varepsilon_{it}$is the idiosyncratic error term. Since access to treatment is exogenous and we have a comparable control group (see Table 7), there is no reason to expect that a firm's treatment status and the idiosyncratic error term are correlated. Consequently, the coefficient of interest, β_T, may be interpreted as the causal effect of an Akhuwat loan on the outcomes of interest. We estimate (1) using OLS and provide estimates based on cross-section (single) and panel data.

In addition to (1) we are also interested in estimating the rate of return to capital. While this may be indirectly obtained from (1), for ease of exposition we use the following equation to estimate returns to capital.

$$profit_{it} = \alpha + \beta_c Captial_{it} + \sum_{t=2}^{3} \omega_t + \lambda_i + \varepsilon_{it} \tag{2}$$

In (2) $profit_{it}$ represents the monthly profits of microenterprise *i* at time *t*. $Captial_{it}$ represents capital stock, as in (1) λ_i captures firm fixed effects and ε_{it} is the idiosyncratic error term. In (2), it is obvious that capital stock is endogenous. To obtain causal effects we estimate (2) using instrumental variables with randomised treatment serving as an instrument for capital.

6. Results

Cross-section and panel data estimates of (1) are provided in Table 8 and estimates of (2) are in Table 9. The cross-section estimates show that regardless of whether the direct or the indirect measure of profit is used, access to credit leads to an increase in monthly profits. The increase is Rs.241 or about

Table 7. Descriptive Statistics and Verification of Randomisation.

H_0: Both Groups have Equal Means	Treatment		Control		|t-stat|
	Mean	SD	Mean	SD	
Total number of the HH members	5.59	2	5.69	2.1	0.546
Household monthly income	12,855	5,148	12,427	4,485	0.978
Household assets	765,696	777,594	732,726	873,910	0.440
Household monthly expenditure	12,793	5,072	12,707	4,486	0.199
Number of school going children	1.49	1.58	1.64	1.75	0.976
Presence of Chronic ill in the Household	0.239	0.583	0.188	0.441	1.090
Years of education of borrower	5.06	3.87	4.72	4.35	0.910
Age	38.4	10.1	38.9	10.4	0.511
Monthly Profits	8,153	1,407	8,186	1,324	0.260
Revenues	9,834	3,149	9,861	2,581	0.105
Monthly sales	24,939	32,641	27,098	32,481	0.733
Business assets	30,121	49,589	29,932	43,030	0.045
Hours of work in a day	9.87	2.18	9.84	1.98	0.146
Capital Stock	24,125	3,999	23,973	4,330	0.404
Credit requirement	23,798	17,892	23,318	16,503	0.308
Neuroticism	2.49	0.654	2.48	0.65	0.212
Extraversion	3.49	0.655	3.52	0.642	0.528
Openness	3.31	0.75	3.23	0.802	1.110
Agreeableness	3.63	0.628	3.59	0.696	0.635
Conscientiousness	3.86	0.678	3.86	0.673	0.042
N	243		245		

Notes: The baseline data was collected in June 2010. The variable Monthly Profits was measured by asking a direct question from the respondents on their monthly business profitability. Capital stock excludes value of land and buildings.

3% in the case of the direct measure and is statistically significant. Based on the indirect measure, the increase in profit (Rs. 220) is slightly smaller (2.6 percent) and is not as precise. Working capital increases by Rs. 2,448 or about 10% and is statistically significant. This is the increase in capital stock

Table 8. Impact of Treatment on Business Outcomes.

	Cross-section/Single Difference		Panel			
			Fixed Effects		Random Effects	
Impact of Treatment on:	Levels (1)	Logs (2)	Levels (3)	Logs (4)	Levels (5)	Logs (6)
Direct Monthly Profits	241	0.0273	275	0.033	274	0.033
	(124)	(0.0148)	(39)	(0.005)	(38)	(0.005)
Indirect Monthly Profits †	220	0.0258	193	0.025	201	0.026
	(139)	(0.0171)	(108)	(0.014)	(98)	(0.012)
Working Capital	2,448	0.10	2,305	0.091	2,319	0.092
	(394)	(0.0159)	(163)	(0.007)	(160)	(0.006)
Number of Hours worked in a Day	0.027	−0.0002	0.027	0.005	0.032	0.004
	(0.216)	(0.0231)	(0.122)	(0.014)	(0.128)	(0.015)
Number of microenterprises	454	454	454	454	454	454
Number of observations	454	454	1361	1361	1361	1361

Notes: Standard errors are clustered at the microenterprise level and reported in parentheses. The data was collected in three waves (t = 1,2,3). The baseline data (t = 1) was gathered in June 2010 and a detailed follow up survey was conducted after 10 months (t = 3). In between the two rounds, at t = 2, we also collected a self-reported data on three core variables of interest i.e. business profits, working capital and hours of daily work. Variable Direct Monthly Profits was measured by asking a direct question from the respondents on their monthly business profitability. Working Capital excludes value of land and buildings.

† Variable Indirect Monthly Profits was measured through revenues minus expenses approach. We have data for this variable for only two periods i.e. t = 1 and t = 3. For analysis involving this variable, we use 908 microenterprise-period observations instead of 1361 observations.

Table 9. Returns to Capital.

	Two Stage Instrumental Variable Regression							
	Direct Monthly Profits				Indirect Monthly Profits †			
	Level FE (1)	Log FE (2)	Level RE (3)	Log RE (4)	Level FE (5)	Log FE (6)	Level RE (7)	Log RE (8)
Working Capital/Log of Working Capital	0.119 (0.014)	0.361 (0.044)	0.118 (0.013)	0.355 (0.041)	0.086 (0.049)	0.284 (0.156)	0.088 (0.042)	0.273 (0.132)
First-Stage Regression								
Coefficient onTreatment Dummy	2,305 (131)	0.091 (0.005)	2,318 (127)	0.092 (0.005)	2,249 (151)	0.090 (0.006)	2,333 (268)	0.094 (0.011)
Number of microenterprises	454	454	454	454	454	454	454	454
Number of observations	1361	1361	1361	1361	908	908	908	908

Notes: Standard errors are clustered at the microenterprise level and reported in parentheses. The data was collected in three waves (t = 1,2,3). The baseline data (t = 1) was gathered in June 2010 and a detailed follow up survey was conducted after 10 months (t = 3). In between the two rounds, at t = 2, we also collected a self-reported data on three core variables of interest i.e. business profits, working capital and hours of daily work. Variable Direct Monthly Profits was measured by asking a direct question from the respondents on their monthly business profitability. Working Capital excludes value of land and buildings.
† Variable Indirect Monthly Profits was measured through revenues minus expenses approach. We have data for this variable for only two periods i.e. t = 1 and t = 3. For analysis involving this variable, we use 908 microenterprise-period observations instead of 1361 observations.

after the repayment of the interest free loans. There is no evidence that treatment leads to an increase in the number of hours worked.

The fixed and random effects reveal a similar story, although the effects are now more precisely estimated. Based on the fixed effect estimates, directly measured monthly profits increase by Rs.275 or 3.3% while the corresponding increases on the basis of the random effect is Rs.193 or 2.5%. The increase in working capital is Rs. 2,305 or 9%. There is no effect of treatment on hours worked by the entrepreneur. The random effects are similar in magnitude and statistical significance.

To obtain unbiased estimates of returns to capital, we use random treatment as an instrument to obtain IV estimates of (2). De Mel, McKenzie, and Woodruff (2008) argue that such an instrument is only valid if it affects capital and not other factors of production such as entrepreneurial effort. As shown in the previous section, treatment increases capital stock, however, it has no effect on number of hours worked. As already shown in Table 8, treatment has a large effect on capital stock and since treatment is randomised there is no reason to expect that it is correlated with the error term in (2). Based on the fixed effects model we find a 11.9% monthly return to capital. Random effects model yields a similar result. The indirect measure of profits yields a smaller rate of return (8.6 to 8.8%) but it is still large. The log-log specification yields similar results. At baseline, with an average capital of Rs. 24,053, a microenterprise earns an average monthly profit of Rs. 8,172. The elasticity of 0.361 implies that the average monthly return is 12.3% $\left(i.e.\ \frac{8,172}{24,053} \times 0.361\right)$.

7. Concluding remarks

Due to high-risk lending and transaction costs, microfinance institutions charge high interest rates from their borrowers. In part, this high rate of borrowing is based on the assumption that the rate of return to marginal capital in microenterprises is very high. However, this may not always be true. The high interest rate charged by microfinance institutions and various reports in the popular press on the inability of microfinance borrowers to repay has generated intense debate about the pricing of microfinance loans vis-à-vis the repayment capacity of borrowers. The repayment capacity of

microenterprises depends on their returns on marginal capital. A credible estimate of returns to capital in microenterprises is, therefore, of great interest to policy makers for developing a sustainable microfinance sector.

To generate evidence on returns to capital in microenterprises, we conducted a randomised experiment in Pakistan, in collaboration with Akhuwat microfinance. Each microenterprise in the treatment group was given an interest-free loan of Rs.10,000 which had to be repaid in 10 months. After 10 months, and post-repayment of their loan, we estimated the effect of this exogenous access to credit on their capital stock, profits and on returns to capital. Depending on the estimator we found that treatment led to a statistically significant and large increase in the capital stock of treated microenterprises – estimates ranged between Rs. 2,305 to Rs. 2,448. Compared to the control group, the monthly profits of treatment group also increased. The effects were between Rs. 241 to Rs. 275. The estimated monthly returns to capital were 8.6 to 11.9% (annual returns of 103.2 to 142.8%) which are substantially higher than the market interest rates of 12.5% and the microfinance annual lending rate of 33.5% in Pakistan.[25]

The estimated monthly returns to capital in this paper (8.6 to 11.9%) fall between the estimated monthly returns in Sri Lanka (4.6 to 5.3%) and Mexico (46%). Due to differences in the context, inter-country comparisons are not very useful. What is perhaps more relevant is that the estimated annual returns to these Akhuwat-financed microenterprises is higher than the average annual lending rate (33.5%) charged by microfinance providing organisations in Pakistan. Despite access to interest-free loans, or rather loans with a negative real interest rate, which may encourage inefficient use of capital, the returns in this case are substantially higher than the rate of borrowing. It is hard to isolate the exact reasons for the high returns. It is likely that Akhuwat's loan appraisal system, the requirement to involve family members and display support of guarantors, and perhaps most notably the religious sanctity attached to the loan lead to high repayment rates and judicious use of capital.

Regardless of the reasons, our results show large gains from access to capital. However, we hasten to add that these results are only valid for microenterprises that are eligible for Akhuwat's microcredit. Furthermore, following the logic of Akhuwat's loan product we stopped our analysis at the end of ten months. Whether such gains persist in the long-rum is still an open question. However, given the rapid growth and continued expansion of Akhuwat it does seem that Akhuwat's Islamic microfinance model and more generally, Islamic microfinance, is likely to be a viable and valuable source of credit for some of the world's smallest microenterprises.

Notes

1. Banerjee et al. (2015); Karlan and Zinman (2011); and Crépon et al. (2015).
2. On 16 December 2010, the BBC reported that microcredit had turned out to be a 'big curse' for many poor borrowers in the State of Andhra Pradesh. According to the State government, more than 80 people committed suicide after defaulting on their mounting debt. The media reports blamed multiple lending, over-indebtedness, coercive recovery methods, exorbitant interest rates and MFI's grow-at-any-cost strategy as reasons for this crisis. In Andhra Pradesh, households spend more than 60% of their annual income on debt repayments. More than one third of total microcredit borrowers live in Andhra Pradesh with an exposure of more than $4 billion. The problem was dubbed to be of comparable magnitude to the subprime debacle. Sources: http://www.bbc.co.uk/news/world-south-asia-11997571 [Last accessed: 22 June 2016] http://www.nytimes.com/2010/11/18/world/asia/18micro.html?_r=1&pagewanted=all [Last accessed: 22 June 2016].
3. Source: Microcredit is not the enemy – published on 13 December 2010 in Financial Times http://www.ft.com/intl/cms/s/0/53e4724c-06f3-11e0-8c29-00144feabdc0.html#axzz20z2pMDKl] [Last accessed: 22 April 2012].
4. Although voluntary, these contributions may be considered as the cost of borrowing. Akhuwat's financial statements for the year 2019 reveal that borrowers voluntarily contribute up to 1% of the loan amount. According to our calculations, the cost of borrowing arising from voluntary contributions is approximately 1.34% per year. As per Akhuwat's financial statements, the money generated through these contributions is used exclusively to write off outstanding loans of any deceased/disabled borrowers and to pay for funeral costs.
5. Despite this growth, microfinance sector in Pakistan has reached only 7% of the potential market Source: State Bank of Pakistan second quarterly report for year 2006, http://www.sbp.org.pk/reports/quarterly/FY06/second/microfinance.pdf [Last accessed on 8 January 2010].

6. Pricing of microcredit is a contentious issue. One school of thought – the institutionalists – favours charging high interest rates with a view to make microfinance institutions self-sustainable. The other school of the thought – welfarists – considers charging high interest rates tantamount to 'mission drift'. In support of high interest rates, the usual argument is that the poor primarily look for access to credit and not necessarily 'cheap credit'. The hidden assumption in this argument is that small firms have enough potential in terms of returns on capital to repay loans with high interest rates.
7. Besides microfinance products, Akhuwat has recently announced establishment of Akhuwat University and Akhuwat telemedicine clinics. For more details on Akhuwat and its approach, please see Maazullah (2016).
8. These principles were mentioned during an interview with the Berkley Center for Religion, Peace & World Affairs on 1 November 2010, http://berkleycenter.georgetown.edu/interviews/a-discussion-with-dr-amjad-saqib-executive-director-akhuwat [Last accessed: 22 June 2016].
9. Islamic traditions encourage Qarz-e-Hasana which is a form of interest-free loans.
10. Akhuwat's average loan size of Rs. 11,300 (approximately USD 120 US) is very small compared to Rs. 20,238 for all other MFIs in Pakistan (Pakistan Microfinance NetworkJulySep 2011). Coleman (2006) argues that offering smaller loans raises the cost of participation for wealthy individuals and as a result only lower-income households participate
11. In practice there are variations, as our sample shows that this condition is not strictly followed. The median per capita monthly income in our sample is Rs. 2,247.
12. The poverty line is based on the Cost of Basic Needs (CBN) approach. For details, see Ministry of Planning, Development and Reform (2016). Based on this poverty line, in 2010-11, the poverty headcount rate in urban areas was 26.2%. In our sample, the median household has an income (Rs.2,247) just below the poverty line of Rs. 2,333 per adult equivalent per month and 53% of our sample has an income below the poverty line. Based on these figures, Akhuwat is clearly a pro-poor programme.
13. Each branch of Akhuwat is attached to at least one mosque or church in its area of operations and most of the times the branch is physically located inside or just outside a mosque or church.
14. Conventional MFIs refer to those institutions which follow standard group lending approaches like Grameen Bank.
15. While Akhuwat's focus remains on individual lending, in some of its branches it has recentlyintroduced group lending.
16. http://www.sbp.org.pk/SME/pdf/DFG-Mar.pdf[LastaccessedonSeptember26,2009].
17. For detailed reviews, see Morduch (1999) and Armendariz de Aghion and Morduch (2005).
18. Although, Akhuwat was mainly founded on ideological grounds, its operations are secular. It partners with mosques and other places of worship such as churches.
19. These businesses are typically very small ranging from fruit and vegetable vending on carts, grocery stores, food stalls, carpeting, welding, masonry, tailoring, embroidery and selling clothes.
20. Akhuwat staff tries to ensure compliance by regularly visiting the businesses. The post-experiment survey shows that, on average, 32% of the loan amount was spent on inventory, 54% on tools, and 8.5% on furniture/carts/display cases and the remainder on renting locations and other miscellaneousactivities.
21. This was decided in a meeting with the CEO of Akhuwat held on July 3, 2009 in Lahore, Pakistan.
22. Due to sample attrition the sample size falls to 454 firms. We relied on Cohen (1988) to determine the adequacy of our sample size of 454. Cohen considers a standardized effect of 0.2 'small', 0.5 'medium' and 0.8 'large'. With the available sample size, a significance level of 0.05 and power of 0.8, we should be able to detect a standardized effect of 0.22, which is quite small. Table 5 provides sensitivity analysis of sample size to different levels of standardized effect sizes and power.
23. Copyrights of the Urdu version of the NEO–FFI (Neuroticism, Extraversion, Openness to experience – Five Factor Inventory) were purchased from Pakistan's National Institute of Psychology.
24. For instance, the correlation between profits derived from direct and revenue minus expenses approach was 0.26 in Côte d'Ivoire, negative and close to zero in Ghana (Vijverberg and Mead 2000) and 0.24 in Zimbabwe (Daniels 2001).
25. Source:http://www.sbp.org.pk/reports/annual/arFY11/Urdu/Stats/eng/Chapter-1.pdf[Lastaccessed: June22,2016].

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No potential conflict of interest was reported by the author(s).

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