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Training and employee productivity: Does the relationship vary with regulation? An empirical analysis of the microfinance sector in Bangladesh

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A B S T R A C T

Training and productivity have been found positively correlated in theory and practice. The pattern of the relationship, however, was not explored in pre - and post-regulation in the conceived sector. This paper aims to observe the effects of regulation and training expenses along with other covariates on employee productivity in the Microfinance sector of Bangladesh. Using annual data of MRA-licensed MFIs, we have estimated both panel and cross-sectional regression models. The regression results confirm the theoretical relationship between training expenses and employee productivity. The regulation also worked positively in enhancing employee productivity. However, in the early stage of regulation, the average productivity gain due to regulation was substantial and was showing an increasing trend but then it declined and reached a constant level of about 4% - 5% each year. Between 2008 and 2011, both regulation and training positively contributed to the gains in average productivity of the employees. After 2012, there was a positive trend of average productivity elasticity of training expenses but there was a flat effect of regulation after 2012. Regulation was found to short-run shifter in the average productivity of employees while training expenses had a positive trend effect.

1. Introduction

The literature on the effect of training on productivity and wages showed that both employers and employees can benefit from training (Ben Jemaa Cherif, 2022; Ozkeser, 2019; Konings & Vanormelingen, 2015). Firms took action to enhance the skills of their existing manpower to maximize the potential payoffs or to cope with the competition risks in the respective sector. Bangladesh is a low-skilled labor-abundant country. The laborers lack human capital and technical knowledge. It was, therefore, warranted to manage some skill-enhancing training facilities for the existing manpower or the potential manpower. The efforts and intentions varied by the nature of the sector. Financial management training in the financial sector was quite relevant and crucial. The Microfinance sector in Bangladesh was considered a quasi-formal financial sector prior to the establishment of the Microcredit Regulatory Authority (MRA) in 2006. With the inception and proliferation of microfinance organizations, the landscape of financial inclusion and outreach of financial services in Bangladesh had changed substantially. A significant portion of the unserved/ underserved had been brought under the veil of financial services. Consequently, the scope for new entrepreneurship, self-employment, employment for new workers, (Khaleque et.al., 2021; Khaleque, 2011), and higher income opportunities have opened up for households in both rural and urban areas. The gains have been reflected in the overall reduction of extreme and moderate poverty in Bangladesh. There are around 739 regulated MFIs – six very large, 33 large, 143 medium, and 57 MRA-licensed MFIs where there are around 39.26 million members (29.74 million borrowers). The countrywide beneficiaries are serving through 24,837 branches. About 56% of the borrowers belong to very large MFIs and one-fourth belong to large MFIs. About 2.07 lakh people are employed in this sector. The MRA-registered MFIs supplied BDT 1919 billion in 2022 and had an outstanding of BDT 1242 billion – very large MFIs had a market share of about 60% of the outstanding balance and the large MFIs had a share of 25% of the outstanding balance (MRA, 2022).

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With the addition of Grameen Bank and other government organizations/private organizations supplying microcredit along with MRA-registered MFIs, the sector showed a wider landscape: 66.43 million members (44.66 million borrowers), BDT 2261 billion loans, BDT 1595 billion outstanding, and BDT 799 billion members' savings. The aggregate statistics showed that since 2016 the number of borrowers increased by about 4% whereas the disbursement increased by about 21%. The general trend shows that over time the employee's productivity in terms of providing financial services to the respective clients has increased. The average amount of outstanding balance handled by an MFI employee has grown by about 6.4% annually – 6.42 million per staff in 2016 and 9.27 million per staff in 2022. This gain in productivity is an aggregate form that mostly comes from the sectoral maturity, regulation, and potential development strategies of the MFIs. In the early development phase of MFIs, the sector experts and researchers highlighted the issues of indebtedness of microcredit borrowers, overlapping in borrowing (Osmani et al. 2015), diversion of loan use (Khaleque 2011), mission drift, sustainability of microfinance institutions, and efficiency of microfinance institutions.

Studies showed that although large MFIs were operating efficiently compared to small MFIs (Quayes and Khalily, 2013), as aggregate, the sector was suffering from inefficiencies and there was scope for improving efficiencies in increasing the outreach of microfinance services (Mia et.al., 2019). Studies showed that regulation contributed to enhancing the efficiency, particularly the cost-efficiency of the microfinance sector in Bangladesh both in the short run (Khalily et.al., 2014) and in the long run (Rahman et.al., 2023). Azad et al. (2016) found a slow positive technical progress in the early stage of regulation compared to the pre-regulation stage. Khalily et al. (2014) explained the sources of improved cost efficiency. They identified a set of factors affecting the cost efficiency of MFIs in Bangladesh. The set of explanatory variables included productivity gain in terms of borrowers per staff, years under regulation, market share, dependency on grants, and age of partnership with Palli Karma-Sahayak Foundation (PKSF) as the key determinants of cost inefficiency. They also showed that the employee productivity gains were achieved through the regulation process, market share, age of partnership with PKSF, and training expenses of the MFIs. Their study showed a 0.2% productivity gain from a 10% increase in training expenses in the unbalanced panel model whereas that was about 0.37% in the balanced panel model. Prior to the study of Khalily et al. (2014), the importance of staff productivity in improving the efficiency of the microfinance sector in Bangladesh was not highlighted in the literature on the efficiency of the microfinance sector of Bangladesh. Their model, however, did not show the time effect on inefficiency and it mostly overlapped in the variable 'years under regulation'. Time and regulation were in composite form. Hence, it is quite important to measure the exact effect of regulation on productivity gain in relation to training expenses along with other covariates. The relationship between training and employee productivity is well-evident in management literature but the patterns of the relationship at various phases of the microfinance sector are not studied.

The study aims to explore the effectiveness of training on employee productivity in a regulated and non-regulated stage of the Microfinance sector of Bangladesh. The prime objective of the study was to test the general relationship between training and employee productivity in the microfinance sector of Bangladesh, and secondly, to understand whether the relationship satisfies the prior theoretical relationship in relation to the stage of regulation in this sector. The null hypothesis of the first case is that the theoretical relationship between training and productivity does not prevail in this sector whereas the alternative hypothesis supports the theoretical relationship. The null hypothesis of the second case is that regulation has no effect on employee productivity and the effects of training on employee productivity remains stable with the duration of regulation.

2. Literature Review

Training is considered a systematic approach to sharing improved knowledge, skills, and competence of workers to enhance the productivity of the employees and the organizations (Goldstein & Ford 2002, Jehanzeb & Bashir 2013, Sheeba 2011). It is a means of motivating and retaining high-quality human resources within an organization (Hutchings et. al. 2009). It also acts as an intervention to improve service quality and efficiency in rendering services through the transfer of technical skills to employees (Manju & Suresh 2011). The literature suggested a positive effect of training on productivity (see Colombo & Stanca 2014). Training helps both the employees and employers (Colombo & Stanca 2008, Galanou & Priporas 2009). It improves the decision-making process and interpersonal relations. Thereby, it impacts employee performance (Rohan & Madhumita 2012). Training not only reduces absenteeism but also reduces the turnover rate of employees (Deckop et al. 2006) through improving employee commitment and satisfaction (Anis et al. 2010). Olasanmi et. al. (2021) found that organizational and technical factors had a significant influence on employees' productivity in the listed manufacturing firms in Southwestern Nigeria. Taiwo (2010) mentioned wages, a conducive work environment, supervision, and training development as the determinants of employee productivity. Leblebici (2012) highlighted workplace conditions along with treatment fairness, communication, and safety working conditions to explain employee productivity. The study of Zwick (2002) showed that firms achieved a structural productivity gain of 0.3%. The firms can gain more than the employees. For example, Sepulveda (2010) found that in US manufacturing industries, there was a weak effect of job training on wage growth, and firms appropriated most of the benefits of the training. Job experience significantly increased wages and productivity and it was slightly higher for females (Holzer, 1990).

3. Conceptual Framework

Employee productivity is primarily determined by employee characteristics and the characteristics of the organization. The employee characteristics include age, sex, education, job experience, innate capabilities, etc. The organizational characteristics

include organizational nature (small, medium, or large), intention for employee development and retention, organizational leadership, working environment, adoption of technology-based operation and management strategies, etc. Training, on-job or off-job, plays a positive role in improving employee's skills and productivity. Organizations spend on the training and development of employees to attain comparative advantage in the respective sector and to attain higher organizational productivity through employee productivity gains. Such gain is feasible as training and development increase employees' efficiency, reduce supervision costs, and make the organization viable and flexible.

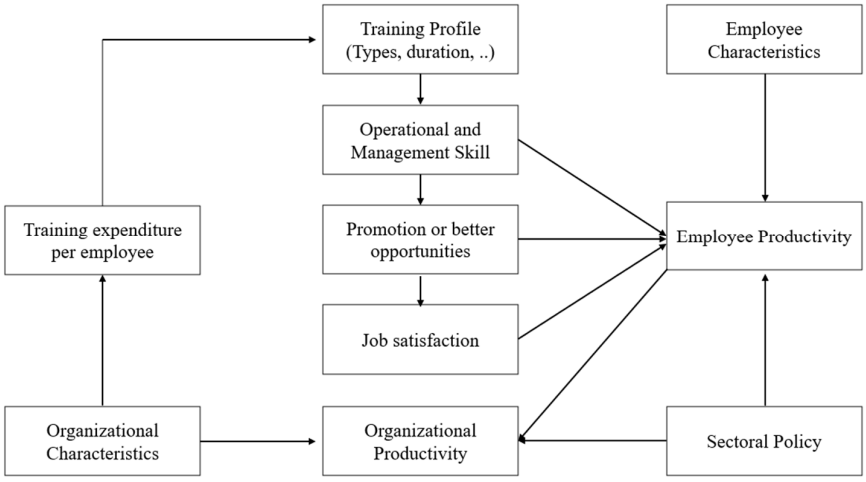

Fig. 1. Proposed conceptual framework

The current framework provides a generic view of the relationship between training and employee productivity using organizational characteristics, employee characteristics, and sectoral policies. However, in modeling the relationship some of the variables are omitted due to data deficiency. It is assumed that such omission may have effects on the relationship between training and productivity, but it will not substantially alter the generic relationship between training and productivity.

4. Materials and Methods

4.1 Data

To test the stated hypotheses of this paper, we have used cross-sectional information from 321 NGO-MFIs for the pre-regulation period and 534 NGO-MFIs for the regulation period, data from a large number of MFIs has been included in pre – and post – regulation period. The data have been extracted from the audited financial reports of the licensed NGO-MFIs. To distinguish between the regulated period and the non-regulation period, we have considered 2008 as the regulation year as MRA started issuing licenses between 2006 and 2007. The balanced panel data was constructed based on the information from 264 NGO-MFIs.

4.2 Econometric Model Specification

Productivity can be analyzed at a marginal level or average level. Average productivity is simply the ratio of output and the amount of input used in the process of generating the output whereas marginal productivity implies the extra gain in output due to an additional increase of the respective input holding other inputs constant. In this article, we have considered two outputs – the volume of outstanding and number of clients served by the employees, and two inputs – the number of employees and the amount of investment as a proxy of capital as the change in investment between the investment in the previous year and investment in a current year represents the capital stock. Since the two outputs – outstanding loan and number of borrowers – are expected to be highly correlated, this paper applies the single output and many input cases in analyzing the productivity. However, separate production functions are estimated to understand the responses of the respective output to the respective inputs. To understand the relationship between the stated output and inputs, let us consider the following model:

$$Y_{it} = \alpha + X_{it}\beta + v_i + \in_{it} \tag{1}$$

In this general specification, the left term of the above equation is the dependent variable and X_{it} is the vector of the explanatory variable for $i = 1,2, \dots n$ and for each i, $t = 1,2, \dots T$. The term α is a constant, β is a vector of the regression coefficient, v_i is the unit-specific error term which differs between units but for any particular unit its value is constant, and $\in_{it}$ is the "usual" error term with the usual properties (mean 0, uncorrelated with itself, uncorrelated with **x**, uncorrelated with v, and homoscedastic). The term $\in_{it}$ can also be decomposed into two parts as additive form as $\in_{it} = \varphi_t + \omega_{it}$ where ω_{it} is the conventional error term and better describes φ_t. The key objective is to estimate the vector of regression coefficient under

various assumptions of v_i and $\in_{it}$. Whatever the properties of v_i and $\in_{it}$, if equation (1) is true, the time-averaged model must also be true.

$$\bar{Y}_i = \alpha + \bar{X}_i\beta + v_i + \bar{\in}_i \tag{2}$$

The subtraction of Eq. (2) from Eq. (1) will also be true.

$$(Y_{it} - \bar{Y}_i) = (X_{it} - \bar{X}_i)\beta + (\in_{it} - \bar{\in}_i) \tag{3}$$

The β estimator of the model (3) is called the fixed effect estimator or within estimator, whereas the β estimator of the model (2) is known as the between estimator. A random-effects estimator, a weighted average estimate produced by the between and within estimators. In particular, the random-effects estimator can equivalently be estimated from the following model.

$$(Y_{it} - \theta\bar{Y}_i) = (1 - \theta)\alpha + (X_{it} - \theta\bar{X}_i)\beta + (\in_{it} - \theta\ \bar{\in}_i) \tag{4}$$

Here, the term θ is a function of σ_v^2 and $\sigma_\in^2$ and the estimator of θ is given by

$$\theta = 1 - \sqrt{\frac{\sigma_\in^2}{T\sigma_v^2 + \sigma_\in^2}}$$

We have assumed that the production function follows the general form of the following Cobb-Douglas production function as is formed as follows:

$$Y_{it} = \beta_0 L_{it}^{\beta_2} K_{it}^{\beta_3} e^{u_i} \tag{5}$$

Here, Y_{it} is the output (volume of outstanding or the number of borrowers) of an MFI at time t, L_{it} is the number of staffs working in the MFI at t, K_{it} is the volume of capital investment by the MFI at time t, and u_i is the stochastic disturbance term. To estimate the above exponential model as shown by equation (1), we have transformed the equation as follows:

$$lnY_{it} = \beta_1 + \beta_2 lnL_{it} + \beta_3 lnK_{it} + u_i \tag{6}$$

Here $\beta_1 = ln\beta_0$. We are assuming that the stochastic disturbance term satisfies the standard assumptions of zero mean, constant variance, and zero covariance with the level of inputs. Since the model is linear in parameters and we are dealing with panel data, the panel regression technique has been used to estimate the coefficients of the model. From this specification, we define $\frac{Y_{it}}{L_{it}}$ as the average productivity of employee whereas the coefficients of lnL_{it} and lnK_{it} represents the marginal productivities of the respective variable as they represent the output elasticities for the respective inputs. Under the constant returns to scale assumption, that is, $\beta_2 + \beta_3 = 1$, the Eq. (6) can be expressed as follows:

$$ln\left(\frac{Y_{it}}{L_{it}}\right) = \beta_1 + \beta_3 ln\left(\frac{K_{it}}{L_{it}}\right) + u_i \tag{7}$$

Beyond the output-input relationship, it is expected that the average productivity will be influenced by a set of explanatory variables. To control those explanatory variables on the average productivity of the employee, we propose the following extended model:

$$ln\left(\frac{Y_{it}}{L_{it}}\right) = \beta_1 + \beta_3 ln\left(\frac{K_{it}}{L_{it}}\right) + \beta_4 REGUY + \beta_5 lnTE + \beta_6 ED_{GENDER} + \beta_7 PKSF_{PO} + \beta_m MFI_{dum} + u_i \tag{8}$$

Regulation: In the extended model, $REGUY$ is a discrete-time variables explaining the number of years under regulation. Bangladesh lagged in microfinance regulation until 2006 when a regulatory authority was established in the name of Microcredit Regulatory Authority (MRA). Since then, MRA has granted a license to more than 700 Microfinance Institutions (MFIs) and has been supervising those with prudential and non-prudential regulations. Before the establishment of MRA, NGO-MFIs used to charge different fees such as admission fee, passbook fee, loan application form fee, and insurance fee. Thus, MFIs used to earn a handsome amount of money. MRA set the maximum chargeable amount of taka BDT 25 for admission fees, passbook fees, and loan application form fees. Prior to such regulation, MFIs charged over 30% flat rate which has been set at 27% under the declining balance method. There is the provision of a minimum 6% interest rate on members' savings. In addition, NGO-MFIs are forced to create a reserve fund of 10% of their total income surplus and every MFI must maintain a 15% liquidity fund of its entire compulsory, voluntary, and term deposit, or whatever name assigned to the deposit funds, in the savings account with a scheduled bank adjacent to the MFI's branch offices. The total voluntary deposit or term deposit of an MFI should not be more than 25% of the total capital of the organization. MRA also practices fixing the total salary by 40% of its total service charge and the salary gap between higher and lower staff will be minimal. Even under such extensive regulation and binding constraints, MFIs can operate profitably if the employees work efficiently and effectively.

Training Expenditure: The sustainable development policy of MFIs will focus on the enhancement of employees' performance to survive in this sector. In this respect, effective investment in employees' skills and capacity development can assist the organization in absorbing the regulation cost shocks. Therefore, it is quite expected that MFIs will reap the benefit of the capacity-enhanced employees in generating higher output (managing a larger volume of outstanding).

Gender of Executive Director: The performance of such economic institutions is influenced to a great extent by the characteristics of the head of the respective institution. The extended model includes the gender of the Executive Director or head of the institutions to control the influence of the senior-management team on employee performance. The inclusion of this variable will help to understand the gender role of the head of the organization.

Partnership and MFI Dummy: Before MRA, PKSF, the apex development organization, had been working to enable the poor to come out of the low productivity trap by increasing capacity, technology transfer, value chain development, and other technical services through its partner organizations. PKSF closely works to build and strengthen the institutional capacity of the Partner Organizations (Pos) and to enhance their ability to provide various financial and non-financial services to the poor in a sustainable manner. Therefore, POs of PKSF were under some sort of informal regulations of PKSF. Over time MFIs were growing in size in terms of outreach and outstanding. Some MFIs' dummies are incorporated into the model to capture the size effect on employee productivity.

5. Results

5.1 Trend of outreach, disbursement, and employee productivity

Table 1 presents the recent trend of outreach, disbursement, beneficiaries, and employee productivity in the microfinance sector of Bangladesh. The microfinance sector of Bangladesh flourishes over time in terms of outreach and depth. The number of branches grew over time and the employment in this sector also increased from 1.22 lacs in 2016 to 2.07 lacs in 2022. Nearly 38.26 million members are being served through 23543 branches. Among the members, about 77.7% are borrowers. According to MRA statistics, in 2022, 1918.83 billion taka was disbursed with an average disbursement of about 64,520 taka per borrower (Table 1).

Table 1
Outreach and disbursement Scenarios of MRA-licensed MFIs in Bangladesh

Year	Branches	Employees (Lac)	Members (Million)	Borrowers (Million)	Disbursement (Billion)	Average disbursement per borrower	Disbursement per employee (Million)
June 2016	16204	1.22	27.58	23.11	782.67	33,867	6.42
June 2017	17120	1.39	29.9	25.98	1045.78	40,253	7.52
June 2017	18196	1.53	31.22	25.4	1201.91	47,319	7.86
June 2019	18977	1.62	32.37	25.76	1403.2	54,472	8.66
June 2020	20898	1.71	33.31	26.15	1362.75	52,113	7.97
June 2021	20955	1.76	35.19	27.8	1512.09	54,392	8.59
June 2022	23543	2.07	38.26	29.74	1918.83	64,520	9.27

Source: Annual Report (MRA, 2022)

Note: The monetary figures are in BDT while the rest data data are in numbers.

The descriptive statistics show that the amount of disbursement handled by an employee increased from 6.42 million taka in 2016 to 9.27 million taka in 2022. We find a rising productivity of the employee.

5.2 Input-output relationship – the estimated production function in the microfinance sector

The production function was estimated using random effect and fixed effect models. Two output indicators were used – outstanding balance and borrowers and two inputs were considered – the number of employees and amount of capital invested. The variables were transformed in accordance with the specification of Eq. (6). Table 2 presented the estimated production functions in the microfinance sector of Bangladesh. Two output indicators were used to estimate the input-output relationship in the microfinance sector: outstanding and number of borrowers. The production functions were estimated using panel fixed effect and random effect models. The elasticity of outstanding balance with respect to the number of employees was 0.68 in the random effect model which was 0.50 in the fixed effect model respectively. The elasticity of outstanding balance with respect to capital was about 0.36 in random effect and fixed effect models. On the other hand, the elasticities of borrowers with respect to the number of employees and amount of capital investment were 0.73 and 0.1 in the random effect model which was 0.44 and 0.1 in the fixed effect model. The relationship of the output variables with respect to inputs is found statistically significant at a 1 percent level of significance in each model (Table 2). The input-output relationships for both indicators of output showed a positive significant relation with respect to both inputs in both models. We also observed that the sector exhibits a decreasing return to scale in the case of both output indicators. However, a constant return was observed in the random effect model in the case of outstanding output. The decreasing return to scale could be due to the market saturation condition as well as to the loan management capacity of the existing borrowers.

Table 2
Input-output relationship – the estimated production function

Explanatory variables	Log of outstanding		Log of borrowers	
	Fixed Effect Model	Random Effect Model	Fixed Effect Model	Random Effect Model
Log of number of employees	0.503***	0.681***	0.439***	0.731***
	(0.020)	(0.011)	(0.013)	(0.010)
Log of capital investment	0.357***	0.364***	0.099***	0.099***
	(0.007)	(0.007)	(0.004)	(0.005)
Constant	10.703***	9.933***	5.470***	4.334***
	(0.102)	(0.078)	(0.062)	(0.059)

Source: Author's estimate
Note: Detailed of the model's statistics are given in Appendix Table 3. Note: 0.01 - ***; 0.05 - **; 0.1 - *; Figures in parentheses are standard errors

The production functions showed that the outputs were very responsive to the number of employees in the sector. For example, a one percent increase in the number of employees increased about 0.503% outstanding loans that suggested a higher amount of disbursement of the microfinance institutions in the fixed effect modelIn the random effect, the effect was 0.681%. This high responsiveness of the output to employee input was very consistent with the management strategies of microfinance institutions. The door-to-door microfinance service, group lending, flexible credit program, or even individual lending strategy is largely dependent on a labor-intensive management strategy rather than a capital-intensive management strategy.

5.3 Trend of average productivity elasticities of training expenses

Based on two output indicators – outstanding and number of borrowers - two productivity variables are used to understand the effects of regulation and training along with other variables. The first one is outstanding per employee and the second one is the number of borrowers per employee. We have estimated four models: Model 1 includes capital investment per employee as the only key determinant of average productivity, Model 2 includes a log of training expense as an additional explanatory variable, for Model 3, years under regulation is added along the variables in Model 2. Model 3 is extended by adding the gender of the head of the organization. These models are estimated using random effect and fixed effect specifications. In each model, the capital investment per employee is found statistically significant at a 1 percent level. From the random effect models, we can see that a one percent increase in capital investment per employee increases the average productivity (outstanding per employee) by about 0.36% in model 1 and 0.34% in model 2.

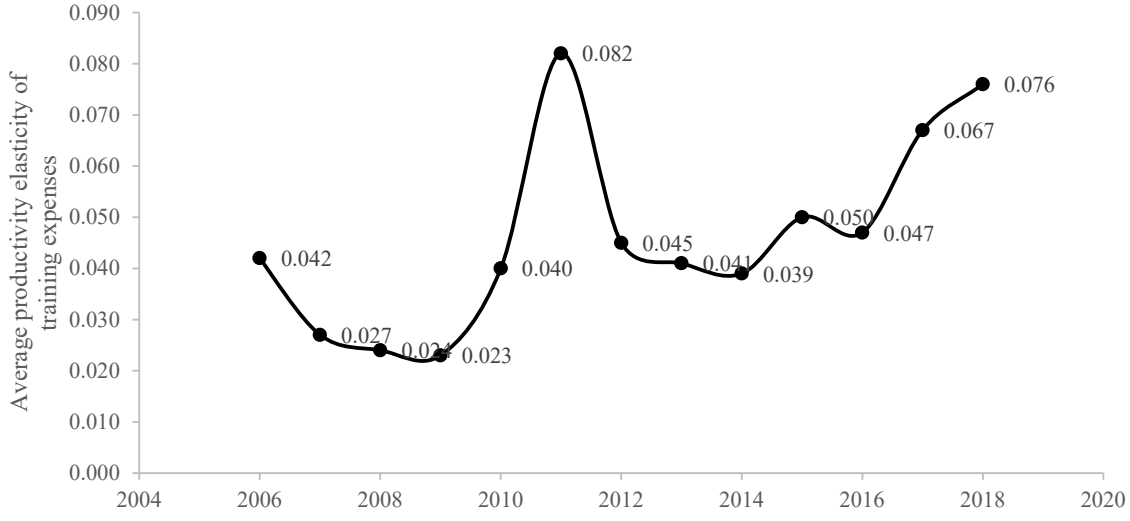

Fig. 2. Trend of average productivity elasticity of training expenses

Source: Authors' presentation based on regression results
Note: The regression model includes other explanatory variables.

The average productivity elasticities of training expenses have been estimated for several cases: (i) all samples – unbalanced data, (ii) balanced panel for the period 2012-2018, and (iii) balanced panel for the period 2005-2018. For each case, the specified models are estimated using fixed effect and random effect models. For all samples – unbalanced data, the estimated coefficients of log of training expenses in the random effect model for the specifications of model 2, model 3, and model 4 are 0.068, 0.047, and 0.045 respectively (see Table 4) whereas estimated coefficients in the fixed effect models are 0.073, 0.047, and 0.045 respectively. We observe a difference in the estimated coefficient of log of training expenses in model 2 due to the difference in estimation technique, however, both random effect and fixed effect models yield identical coefficients in model 3 and model 4 (see Table 5). From model 2, we can see that a one percent increase in training expense increases the

average productivity by about 0.07% holding the effect of log of capital investment per employee constant which is 0.047% in model 3 and 0.045% in model 4 (see Table 4). The regulated time effects are estimated at 0.087 in model 3, 0.083 in model 4 (see Table 4) in the random effect model which are 0.09 and 0.09 in model 3 and model 4 respectively in the fixed effect model (see Table 5). The results suggest that the average contribution of an additional year under regulation to productivity gain is about 9%. Results from the balanced panel for the period 2012-2018 also show a similar pattern but the magnitudes are low compared to the unbalanced all samples panel analysis. The average productivity elasticity of training expense is about 0.05 in fixed-effect models and 0.046 in random-effect models. The effects of regulation are also similar, about 0.02-0.024 (see Table 6 and Table 7). We observe a strong effect of training and regulation in the case of panel analysis for the periods 2005-2018. The average productivity elasticities are between 0.126-0.166 in the fixed effect model and between 0.119-0.153 in the random effect models. The effects of regulation on productivity are about 0.09 in both models (see Table 8 and Table 9).

The results were consistent with Khalily et al. (2014) in signs and significance. The results presented an average scenario but not their trend. To understand the trend, we estimated the models using the cross-sectional regression technique each year. The estimated average productivity elasticity of training expenses is presented in Fig. 2 (see Table 10 for detailed results).

The regression results showed that training expenses enhance employee's productivity. Between 2006-2009, the average productivity elasticity of training expenses was about 0.023 to 0.042. The average productivity elasticity of training expenses followed a sharp increasing trend between 2009-2011. After 2011, the average productivity elasticity of training expenses declined sharply from 0.082 in 2011 to 0.045 in 2012 and continued till 2014. After 2014, there was a positive trend of average productivity elasticity of training expenses. We found that regulation improved employee's productivity. However, different dynamics of the patterns were observed. In the early stage of regulation, the average productivity gain due to regulation was high and was showing an increasing trend but then it declined and reached a constant level of about 4% - 5% each year. Between 2008 and 2011, both regulation and training positively contributed to the gains in average productivity of the employees. After 2012, there was a positive trend of average productivity elasticity of training expenses but there was a flat effect of regulation after 2012 (Fig. 2).

5.4 Trend of the effect of regulation on average productivity over time

We observed a strong positive relationship between the log of outstanding per employee and the log of training expenses per employee with a strong positive intercept in 2007 (prior regulation), 2008 (formal initiation of binding regulation year), and 2009 (just after one year of formal regulation). In each year, we observed a priori relationship between the log of outstanding per employee and the log of training expenses per employee. The key observation was that there was a big shift in intercept in 2008 compared to 2007 whereas a short shift in 2009 compared to 2008. The average productivity elasticity of training expenses, albeit a little bit high in 2008 and 2009 compared to 2007, can be treated as almost similar in each year, we observed a large shift in intercept. Figure 3 presents the effects of regulation on average productivity over time. These results suggested that regulation had a strong intercept differential effect compared to a slight slope differential effect. The regulation had a strong short-run average effect on productivity (See Table 10 for detailed results).

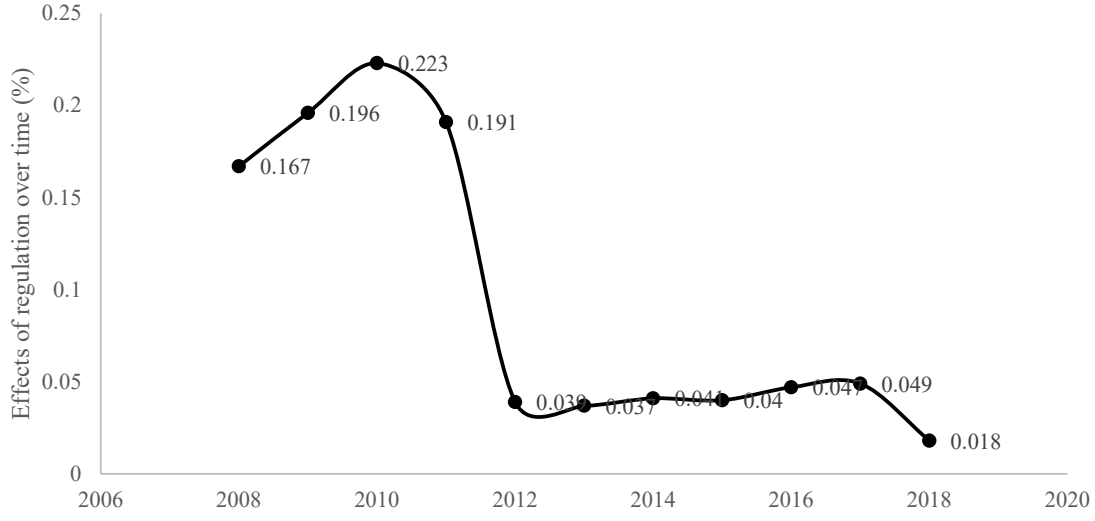

Fig. 3. The effect of regulation on average productivity over time

Source: Author's presentation based on regression results
Note: The regression model includes other explanatory variables.

In the early stage of regulation, the regulation made a difference in average productivity at the mean level and this has been presented in Fig. 4 which shows the relationship between the log of outstanding per employee and the log of training expenses per employee. The slopes of log of training expenses in 2007, 2008, and 2009 signified that the changes in the average productivity were similar but the different intercepts suggested that there was a gain in the average productivity of the employee in this early stage of regulation.

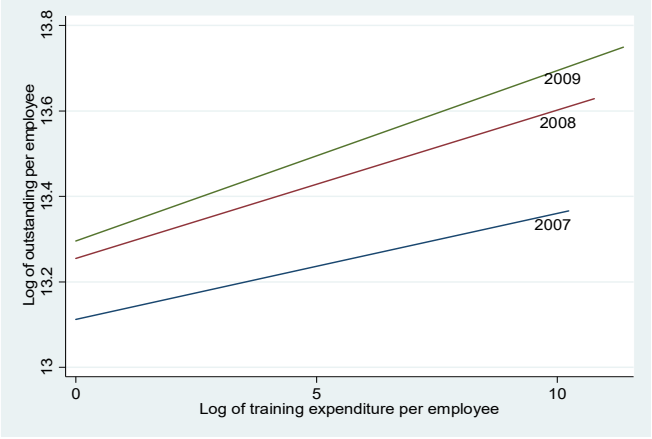

Fig. 4. Relationship between the log of outstanding per employee and log of training expenses per employee

The analysis of the effect of regulation and training expenses showed a gray effect when productivity was defined in terms of the number of borrowers per employee. In 2009, the regulation was found to be a significant determinant of employee productivity, and that effect continued in 2010. After 2010, the coefficients of the regulation variable became insignificant. On the other hand, the effect of training expense was found to have a weak positive significance in an intermittent way (Fig. 4).

6. Discussion

The findings of the study satisfied the priori theoretical relationship between training expenses and employee productivity. We found that, on average, for a one percent increase in training expenses, the average employee productivity increased by about 4.5% holding other things remaining the same in the estimated model. This finding was consistent with Kaur (2016), Afroz (2018), Colombo and Stanca (2014), Tahir et al. (2014), and Imran and Tanveer (2015). The current study showed that regulation had a positive effect on the average productivity of employees. The literature on regulation and productivity showed that regulatory reform helped to sustain productivity growth (Casu, 2013; Zhao et al., 2010). Supervision and regulation helped the institutions to improve efficiency (Chortareas et al., 2012; Drake et al., 2006). Such efficiency achieved through employee productivity gain could be due to the forced increased workload of the employees. The binding regulatory arrangements and enforcement could create such an environment and the firms were supposed to respond immediately to such changes. The regulation had some cost effects and binding threshold effects. Firms responded immediately to the binding regulation through human resource management and operational strategies to cope with the intended cost shocks of regulation. Therefore, there could be an immediate effect on the volume of outstanding per employee, largely, and on the number of borrowers/members per employee, modestly, or largely subject to the scope of expansion of operation. The present study showed that regulation had a very strong short-run positive impact on employee productivity when productivity was defined in terms of the number of borrowers per employee. We also observed a similar short-run effect of the training expenses on the log of the number of borrowers per employee.

7. Conclusion

Productivity is influenced by individual effort (exerting effort, holding attitudes and beliefs), individual capacity (knowledge, skills, and abilities), task capacity (technology, task design, and physical inputs), and uncontrollable interference. We studied the impact of training expenses on employee productivity using data from MRA-licensed MFIs of Bangladesh. The study confirmed the theoretical and empirical evidence of the relationship between productivity and training. The study assessed the relationship between pre- and post-regulation in the sector. The finding showed that in the early stage of regulation, the average productivity gain due to regulation was substantial and was showing an increasing trend but then it declined and reached a certain level each year. Regulation was found to be a short-run shifter in the average productivity of employees and training expenses have a significant positive trend effect.

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Appendix

Table 3

Input-output relationship – the estimated production function

Explanatory variables	Log of outstanding		Log of borrowers	
	Fixed Effect Model	Random Effect Model	Fixed Effect Model	Random Effect Model
Log of number of employees	0.503***	0.681***	0.439***	0.731***
	(0.020)	(0.011)	(0.013)	(0.010)
Log of capital investment	0.357***	0.364***	0.099***	0.099***
	(0.007)	(0.007)	(0.004)	(0.005)
Constant	10.703***	9.933***	5.470***	4.334***
	(0.102)	(0.078)	(0.062)	(0.059)
σ_u^2	0.491	0.299	0.822	0.326
σ_ϵ^2	0.409	0.409	0.249	0.249
ρ	0.590	0.348	0.916	0.633
$corr(v_i, X_{it})$	0.706		0.899	
R^2	0.568		0.424	
$\bar{R}^2$	0.507		0.342	
R_w^2	0.568	0.564	0.424	0.415
R_o^2	0.927	0.928	0.935	0.937
R_b^2	0.964	0.963	0.956	0.956
$\mathcal{L}l$	-1,957.80		164.85	
F	2,458.871		1,372.977	
df_a	528.000		528.000	
df_b	2.000		2.000	
rmse	0.409	0.415	0.249	0.278

Note: 0.01 - ***; 0.05 - **; 0.1 - *; Figures in parentheses are standard errors

Table 4

Employees' productivity relationship with explanatory variables (Random Effect Model)

Explanatory variable	Model 1	Model 2	Model 3	Model 4
	Coefficient	Coefficient	Coefficient	Coefficient
Log of capital investment per employee	0.364***	0.344***	0.207***	0.209***
	(0.007)	(0.006)	(0.007)	(0.007)
Log of training expense		0.068***	0.047***	0.045***
		(0.004)	(0.004)	(0.004)
Years under regulation			0.087***	0.083***
			(0.003)	(0.003)
Gender of ED (Male=1)				0.142***
				(0.026)
Constant	10.096***	9.875***	11.009***	10.889***
	(0.073)	(0.072)	(0.072)	(0.076)
σ_u^2	0.328	0.329	0.326	0.326
σ_ϵ^2	0.412	0.398	0.344	0.343
ρ	0.388	0.407	0.473	0.476
R_w^2	0.424	0.463	0.596	0.600
R_o^2	0.404	0.421	0.460	0.458
R_b^2	0.405	0.385	0.316	0.309
rmse	0.413	0.399	0.350	0.349
Number of Observation		4268		
Number of Groups		529		

Note: 0.01 - ***; 0.05 - **; 0.1 - *; Figures in parentheses are standard errors

Table 5
Employees' productivity relationship with explanatory variables (Fixed Effect Model)

Explanatory variable	Model 1	Model 2	Model 3	Model 4
	Coefficient	Coefficient	Coefficient	Coefficient
Log of capital investment per employee	0.356***	0.335***	0.177***	0.181***
	(0.007)	(0.007)	(0.007)	(0.007)
Log of training expense		0.073***	0.047***	0.045***
		(0.004)	(0.004)	(0.004)
Years under regulation			0.096***	0.090***
			(0.003)	(0.003)
Gender of ED (Male=1)				0.170***
				(0.029)
Constant	10.189***	9.947***	11.304***	11.148***
	(0.074)	(0.073)	(0.074)	(0.078)
σ_u^2	0.367	0.370	0.403	0.404
σ_ϵ^2	0.412	0.398	0.344	0.343
ρ	0.442	0.465	0.578	0.581
$corr(v_i, X_{it})$	0.093	0.049	0.045	0.038
R^2	0.424	0.463	0.598	0.602
$\bar{R}^2$	0.343	0.387	0.541	0.545
R_w^2	0.424	0.463	0.598	0.602
R_o^2	0.404	0.419	0.443	0.441
R_b^2	0.405	0.378	0.265	0.260
$\mathcal{L}l$	-1,988.27	-1,837.68	-1,221.80	-1,201.64
F	2,752.054	1,612.859	1,851.222	1,410.085
df_a	528.000	528.000	528.000	528.000
df_b	1.000	2.000	3.000	4.000
rmse	0.412	0.398	0.344	0.343
Number of Observation		4268		
Number of Groups		529		

Note: 0.01 - ***; 0.05 - **; 0.1 - *; Figures in parentheses are standard errors

Table 6
Employees' productivity relationship with explanatory variables (Fixed Effect Model): year 2012-2018

Explanatory variable	Model 1	Model 2	Model 3	Model 4
	Coefficient	Coefficient	Coefficient	Coefficient
Capital investment per employee	0.332***	0.320***	0.271***	0.272***
	(0.007)	(0.007)	(0.011)	(0.011)
Log of training expense		0.050***	0.049***	0.049***
		(0.005)	(0.005)	(0.005)
Years under regulation			0.024***	0.024***
			(0.004)	(0.004)
Gender of ED (Male=1)				0.288
				(0.283)
Constant	10.411***	10.217***	10.617***	10.348***
	(0.073)	(0.074)	(0.100)	(0.283)
σ_u^2	0.387	0.387	0.390	0.398
σ_ϵ^2	0.268	0.263	0.261	0.261
ρ	0.676	0.684	0.690	0.699
$corr(v_i, X_{it})$	0.191	0.180	0.233	0.179
R^2	0.513	0.530	0.536	0.537
$\bar{R}^2$	0.431	0.451	0.459	0.459
R_w^2	0.513	0.530	0.536	0.537
R_o^2	0.442	0.445	0.450	0.425
R_b^2	0.438	0.430	0.477	0.404
$\mathcal{L}l$	-65.92	-16.96	3.12	3.73
F	2,505.415	1,339.776	917.347	688.280
df_a	396.000	396.000	396.000	396.000
df_b	1.000	2.000	3.000	4.000
rmse	0.268	0.263	0.261	0.261
Number of Observation		2779		
Number of Groups		397		

Note: Balanced panel for the period 2012-2018 and number of MFIs is 397, 0.01 - ***; 0.05 - **; 0.1 - *; Figures in parentheses are standard errors

Table 7

Employees' productivity relationship with explanatory variables (Random Effect Model): year 2012-2018

Explanatory variable	Model 1	Model 2	Model 3	Model 4
	Coefficient	Coefficient	Coefficient	Coefficient
Capital investment per employee	0.341***	0.330***	0.293***	0.293***
	(0.007)	(0.007)	(0.010)	(0.010)
Log of training expense		0.047***	0.046***	0.046***
		(0.005)	(0.005)	(0.005)
Years under regulation			0.020***	0.020***
			(0.004)	(0.004)
Gender of ED (Male=1)				0.003
				(0.065)
Constant	10.314***	10.130***	10.420***	10.418***
	(0.074)	(0.075)	(0.094)	(0.110)
σ_u^2	0.355	0.355	0.331	0.332
σ_ϵ^2	0.268	0.263	0.261	0.261
ρ	0.638	0.645	0.617	0.617
R_w^2	0.513	0.530	0.536	0.536
R_o^2	0.442	0.446	0.453	0.453
R_b^2	0.438	0.433	0.474	0.474
rmse	0.269	0.265	0.266	0.266
Number of Observation		2779		
Number of Groups		397		

Note: Balanced panel for the period 2012-2018 and number of MFIs is 397, 0.01 - ***; 0.05 - **; 0.1 - *; Figures in parentheses are standard errors

Table 8

Employees' productivity relationship with explanatory variables (Fixed Effect Model): year 2005-2018

Explanatory variable	Model 1	Model 2	Model 3	Model 4
	Coefficient	Coefficient	Coefficient	Coefficient
Capital investment per employee	0.591***	0.522***	0.411***	0.412***
	(0.036)	(0.034)	(0.035)	(0.035)
Log of training expense		0.166***	0.127***	0.126***
		(0.026)	(0.024)	(0.024)
Years under regulation			0.094***	0.092***
			(0.014)	(0.015)
Gender of ED (Male=1)				0.050
				(0.136)
Constant	7.696***	7.258***	8.269***	8.234***
	(0.392)	(0.361)	(0.355)	(0.369)
σ_u^2	0.329	0.340	0.316	0.316
σ_ϵ^2	0.732	0.663	0.592	0.593
ρ	0.168	0.208	0.222	0.221
$corr(v_i, X_{it})$	-0.030	-0.071	0.054	0.058
R^2	0.597	0.672	0.740	0.740
$\bar{R}^2$	0.564	0.643	0.715	0.714
R_w^2	0.597	0.672	0.740	0.740
R_o^2	0.597	0.657	0.722	0.722
R_h^2	0.584	0.566	0.622	0.623
$\mathcal{L}l$	-209.76	-189.54	-166.70	-166.62
F	268.161	184.236	169.591	126.610
df_a	14.000	14.000	14.000	14.000
df_b	1.000	2.000	3.000	4.000
rmse	0.732	0.663	0.592	0.593
Number of Observation		210		
Number of Groups		15		

Note: Balanced panel for the period 2005-2018 and number of MFIs is 15, 0.01 - ***; 0.05 - **; 0.1 - *; Figures in parentheses are standard errors

Table 9
Employees' productivity relationship with explanatory variables (Random Effect Model): year 2005-2018

Explanatory variable	Model 1	Model 2	Model 3	Model 4
	Coefficient	Coefficient	Coefficient	Coefficient
Capital investment per employee	0.588***	0.528***	0.420***	0.420***
	(0.035)	(0.033)	(0.033)	(0.034)
Log of training expense		0.153***	0.119***	0.119***
		(0.024)	(0.022)	(0.022)
Years under regulation			0.095***	0.093***
			(0.014)	(0.015)
Gender of ED (Male=1)				0.048
				(0.132)
Constant	7.729***	7.292***	8.233***	8.200***
	(0.384)	(0.358)	(0.349)	(0.365)
σ_u^2	0.274	0.284	0.280	0.297
σ_ϵ^2	0.732	0.663	0.592	0.593
ρ	0.123	0.156	0.183	0.201
R_w^2	0.597	0.671	0.740	0.740
R_o^2	0.597	0.659	0.723	0.723
R_b^2	0.584	0.579	0.632	0.632
rmse	0.730	0.662	0.590	0.590
Number of Observation	210			
Number of Groups	15			

Note: Balanced panel for the period 2005-2018 and number of MFIs is 15, 0.01 - ***; 0.05 - **; 0.1 - *; Figures in parentheses are standard errors

Table 10
Employee's productivity (log of amount of outstanding per employee) in different years

Year	Large MFI Dummy		Gender of ED		Member of PKSF: Yes=1		Years under regulation		Log of training expenses				Model's statistics	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Constant	SE	N	R^2
2005	1.033	(0.948)	-0.974	(0.710)	-1.344	(1.638)			0.183*	(0.101)	13.444***	(1.517)	23	0.039
2006	0.330	(0.357)	0.192	(0.194)	0.137	(0.526)			0.042	(0.027)	12.420***	(0.543)	89	0.014
2007	0.027	(0.348)	-0.331*	(0.172)	0.249	(0.410)			0.027	(0.024)	13.032***	(0.414)	107	0.013
2008	-0.037	(0.174)	-0.152*	(0.089)	0.383**	(0.168)	0.167	(0.103)	0.024*	(0.014)	13.028***	(0.165)	116	0.122
2009	0.084	(0.190)	-0.135	(0.089)	0.381***	(0.138)	0.196**	(0.075)	0.023*	(0.013)	12.944***	(0.138)	122	0.208
2010	0.008	(0.169)	-0.098	(0.087)	0.201	(0.122)	0.223***	(0.062)	0.040***	(0.013)	12.999***	(0.138)	116	0.312
2011	0.116	(0.193)	0.369	(0.492)	0.230	(0.154)	0.191**	(0.074)	0.082***	(0.017)	12.690***	(0.207)	110	0.305
2012	0.171	(0.179)	0.027	(0.093)	0.367***	(0.062)	0.039**	(0.019)	0.045***	(0.016)	13.259***	(0.156)	529	0.109
2013	0.243	(0.180)	0.000	(0.093)	0.322***	(0.062)	0.037**	(0.017)	0.041***	(0.015)	13.422***	(0.156)	529	0.097
2014	0.268	(0.170)	-0.032	(0.088)	0.297***	(0.058)	0.041**	(0.016)	0.039***	(0.014)	13.509***	(0.153)	529	0.105
2015	0.377**	(0.176)	-0.026	(0.091)	0.325***	(0.060)	0.040**	(0.016)	0.050***	(0.014)	13.503***	(0.169)	529	0.118
2016	0.375**	(0.165)	-0.015	(0.085)	0.324***	(0.057)	0.047***	(0.015)	0.047***	(0.015)	13.536***	(0.173)	529	0.145
2017	0.397**	(0.165)	0.127	(0.085)	0.374***	(0.056)	0.049***	(0.015)	0.067***	(0.015)	13.321***	(0.187)	529	0.184
2018	0.331*	(0.170)	0.073	(0.088)	0.381***	(0.058)	0.018	(0.016)	0.076***	(0.016)	13.629***	(0.203)	529	0.152

Note: 0.01 - ***; 0.05 - **; 0.1 - *; Figures in parentheses are standard errors

Table 11
Employee's productivity (log of amount of outstanding per employee) in different years under regulation

Year(s) under regulation	Large MFI Dummy		Gender of ED		Member of PKSF: Yes=1		Log of training expenses				Model's statistics	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Constant	SE	N	R^2
0	0.121	(0.197)	-0.122	(0.096)	0.149	(0.172)	0.045***	(0.014)	12.837***	(0.174)	338	0.034
1	-0.053	(0.170)	0.003	(0.083)	-0.040	(0.061)	0.034***	(0.012)	13.416***	(0.103)	280	0.019
2	-0.043	(0.197)	0.034	(0.085)	0.098	(0.067)	0.037**	(0.014)	13.449***	(0.117)	264	0.018
3	-0.006	(0.208)	-0.145	(0.095)	0.079	(0.090)	0.052***	(0.016)	13.622***	(0.133)	317	0.045
4	0.173	(0.191)	0.018	(0.085)	0.264***	(0.061)	0.046***	(0.017)	13.517***	(0.143)	469	0.052
5	0.253	(0.189)	0.120	(0.097)	0.242***	(0.060)	0.065***	(0.016)	13.431***	(0.140)	529	0.063
6	0.286*	(0.166)	-0.004	(0.086)	0.198***	(0.053)	0.057***	(0.013)	13.713***	(0.124)	529	0.063
7	0.331*	(0.170)	0.013	(0.090)	0.273***	(0.055)	0.034**	(0.014)	13.896***	(0.128)	472	0.069
8	0.357**	(0.179)	0.114	(0.091)	0.257***	(0.056)	0.075***	(0.017)	13.664***	(0.140)	428	0.114
9	0.433**	(0.177)	0.079	(0.094)	0.377***	(0.057)	0.038**	(0.018)	13.973***	(0.149)	377	0.145
10	0.447**	(0.174)	0.099	(0.100)	0.404***	(0.061)	0.089***	(0.022)	13.683***	(0.172)	302	0.221
11	0.320	(0.278)	-0.149	(0.183)	0.400***	(0.121)	0.086**	(0.041)	13.942***	(0.330)	81	0.191

Note: 0.01 - ***; 0.05 - **; 0.1 - *; Figures in parentheses are standard errors

Table 12
Employee's productivity (log of borrowers per employee) in different years

Year	Large MFI Dummy		Gender of ED		Member of PKSF: Yes=1		Years under regulation		Log of training expenses				Model's statistics	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Constant	SE	N	R^2
2005	0.484	(0.684)	0.489	(0.512)	4.354***	(1.183)			-0.017	(0.073)	0.000	(1.095)	23	0.397
2006	0.318	(0.424)	0.080	(0.230)	1.741***	(0.625)			0.034	(0.032)	2.523***	(0.645)	90	0.063
2007	0.633	(0.612)	0.657**	(0.303)	1.700**	(0.720)			0.052	(0.042)	1.892**	(0.728)	107	0.087
2008	0.106	(0.236)	0.050	(0.121)	0.826***	(0.208)	-0.013	(0.139)	-0.001	(0.019)	4.021***	(0.202)	119	0.119
2009	0.100	(0.272)	0.023	(0.127)	0.422**	(0.199)	0.218**	(0.108)	0.036*	(0.019)	3.914***	(0.199)	122	0.143
2010	0.092	(0.216)	-0.090	(0.111)	0.381**	(0.157)	0.199**	(0.079)	0.014	(0.016)	4.085***	(0.177)	116	0.178
2011	0.094	(0.188)	0.196	(0.479)	0.338**	(0.150)	0.081	(0.071)	-0.008	(0.016)	4.422***	(0.201)	112	0.057
2012	0.056	(0.149)	-0.033	(0.077)	0.154***	(0.051)	0.016	(0.016)	0.024*	(0.013)	4.553***	(0.130)	529	0.026
2013	0.090	(0.148)	-0.005	(0.077)	0.127**	(0.051)	0.009	(0.014)	0.016	(0.013)	4.619***	(0.128)	529	0.013
2014	0.107	(0.144)	-0.025	(0.075)	0.094*	(0.049)	0.013	(0.013)	0.009	(0.012)	4.664***	(0.129)	529	0.008
2015	0.121	(0.146)	-0.018	(0.076)	0.116**	(0.050)	0.011	(0.014)	0.025**	(0.012)	4.588***	(0.140)	529	0.018
2016	0.128	(0.123)	-0.052	(0.064)	0.143***	(0.042)	0.006	(0.011)	0.001	(0.011)	4.792***	(0.129)	529	0.025
2017	0.146	(0.149)	-0.007	(0.077)	0.119**	(0.051)	-0.000	(0.014)	0.022	(0.014)	4.685***	(0.169)	529	0.013
2018	0.124	(0.163)	0.110	(0.085)	0.080	(0.056)	-0.008	(0.015)	0.028*	(0.015)	4.611***	(0.196)	529	0.007

Note: 0.01 - ***; 0.05 - **; 0.1 - *; Figures in parentheses are standard errors

Table 13
Employee's productivity (log of borrowers per employee) in different years under regulation

Year(s) under regulation	Large MFI Dummy		Gender of ED		Member of PKSF: Yes=1		Log of training expenses				Model's statistics	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Constant	SE	N	R^2
0	0.388	(0.277)	0.350**	(0.135)	1.082***	(0.234)	0.039**	(0.019)	3.025***	(0.236)	342	0.098
1	-0.101	(0.140)	0.040	(0.069)	0.131**	(0.051)	0.017*	(0.010)	4.603***	(0.085)	280	0.020
2	0.011	(0.170)	0.028	(0.073)	0.223***	(0.058)	0.006	(0.012)	4.618***	(0.101)	264	0.043
3	-0.020	(0.187)	-0.169**	(0.085)	0.086	(0.081)	-0.008	(0.014)	4.939***	(0.120)	318	0.036
4	0.135	(0.148)	0.002	(0.066)	0.162***	(0.048)	0.016	(0.013)	4.620***	(0.108)	470	0.025
5	0.134	(0.157)	0.008	(0.081)	0.108**	(0.050)	0.036***	(0.013)	4.557***	(0.117)	529	0.019
6	0.193	(0.136)	-0.024	(0.070)	0.087**	(0.044)	0.023**	(0.011)	4.675***	(0.101)	529	0.015
7	0.168	(0.132)	0.017	(0.070)	0.119***	(0.043)	0.008	(0.011)	4.734***	(0.099)	472	0.015
8	0.136	(0.152)	0.040	(0.078)	0.111**	(0.048)	0.024*	(0.014)	4.646***	(0.119)	428	0.018
9	0.157	(0.147)	-0.043	(0.078)	0.126***	(0.048)	-0.014	(0.015)	4.959***	(0.124)	377	0.014
10	0.202	(0.177)	0.039	(0.102)	0.087	(0.062)	0.018	(0.022)	4.656***	(0.176)	302	0.005
11	0.187	(0.226)	-0.119	(0.149)	0.184*	(0.098)	0.018	(0.034)	4.692***	(0.269)	81	0.031

Note: 0.01 - ***; 0.05 - **; 0.1 - *; Figures in parentheses are standard errors