THE HUMAN CAPITAL OF FIRMS AND THE FORMAL TRAINING OF WORKERS

The case of firms in the Middle East and North Africa

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Abstract

The benefits of formal training are numerous, and yet in many regions few firms utilize them. This study builds on the literature by exploring how two forms of human capital—the quality of management practices and the proportion of university educated employees—influence the adoption of formal training. Using both cross-sectional and panel firm-level data for 29 economies in Eastern Europe and Central Asia and six economies in the Middle East and North Africa, the study finds that firm management practices are positively correlated with the implementation of formal training in Eastern Europe and Central Asia but not in the Middle East and North Africa. The proportion of university educated workers is positively correlated with formal training in both regions, but the finding is more robust for the Middle East and North Africa. These findings imply significant heterogeneity across regions in the determinants of formal training, suggesting that policies should be context specific.

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I.   Introduction

Human capital investments at work account for more than one-half of the human capital accumulated over the life cycle (Heckman et al., 1998). The contribution of work experience to human capital accumulation, acquired either through learning on the job or formal training, might be as important as the contribution of education itself (Jedwab et al., 2021). Firm-specific investment in human capital through employee training can generate rewards for firms and for workers because it can increase firm performance by providing workers with necessary skills, increasing innovation and generally raise the level of competitiveness (Almeida and Aterido, 2015). It can also update skills of workers in the fast changing world of digitization and automation through retraining, especially in the context of an aging workforce in advanced economies (Brunello and Wruuck, 2020). The wage returns to training can be high for workers (Konings and Vanormelingen, 2015, Almeida and Faria, 2014). In developing economy contexts, it can help compensate for low quality schooling.

However, investments in workers by firms have been inadequate. The incidence of formal training across firms has been low, especially in the Middle East and North Africa (MENA) region. World Bank Enterprise Survey 2019/2020 data across 35 economies in the Europe and Central Asia region (ECA) and MENA region show that on average only 39 percent of medium and large firms provide formal training. For six developing MENA economies – the Arab Republic of Egypt, Jordan, Lebanon, Morocco, Tunisia, and the West Bank and Gaza - the figure is lower, with 29 percent of percent formal medium and large businesses providing formal training. Around 20 percent of formal medium and large enterprises in the developing MENA economies (2019/2020) indicated that an inadequately educated labor force is a major or severe constraint to the operations of their business. Firms have disincentives to provide general skills training to their workers due to externalities, and also may face challenges in acquiring finance to fund costly training. European governments have responded by funneling subsidies to encourage training in firms (Brunello and Wruuck, 2020).

In this study, we add to the literature by exploring whether the existing base of human capital in the firm is an important determinant of whether firms invest in training. We capture human capital in two forms – one is the management practices of the firm and second is the share of workers with university degrees – by harnessing firm-level surveys that contain a unique module on management practices and a survey question on the share of workers that are university educated. We also account for manager experience. The data on management practices was only collected for medium and large enterprises, which defines our sample. Our findings show that both management practices and the share of university educated workers matter overall, but there are strong differences by region. The share of university educated workers is a strong predictor of both the incidence and intensity of training in the developing MENA region. This is also true for the ECA region, but the result is not as robust. In

contrast, management practices are a strong predictor of training in the ECA region but not in the MENA region. This study builds on several studies that have explored the determinants of training (Frazer, 2006; Rosholm et al, 2007; Pierre and Scarpetta, 2013; Almeida and Aterido, 2015; Liaqat and Nugent, (2015,2016)).

Training represents investments in future productivity that come at a cost (Wolter and Ryan, 2011). Becker (1962) noted that firms receive little benefit in providing formal training if it is general as opposed to firm specific as workers may leave and general skills are transferable. However, extensions of the original model noted that firms may invest in general skills to attain informational advantages and monopsony power (Katz and Ziderman, 1990; Acemoglu and Pischke, 1998). Firms with better managerial quality may be better able to understand these advantages. Improving the managerial quality of a firm may lead to greater incidence of training. The measurement of managerial quality in accordance with Bloom et al. (2013) captures several dimensions including problem resolution, monitoring of performance indicators, production targets (ease of attainment, length of focus, and knowledge), basis of bonuses, promotion of non-managers and dismissal.[2] Adoption of best management practices may lead to greater incidence of training in order to facilitate understanding of best practices among employees and also upgrade skills to increase performance. Managerial quality may also entail the understanding of the importance of human capital in the firm and thus facilitate greater investments in workers. Furthermore, managers may also understand the importance of training to gauge the ability of individuals and thus gain additional information (Acemoglu and Pischke,1998). Training can allow workers to signal their ability and attract workers of high ability (Autor, 2001; Cappelli, 2004). On the other hand, greater managerial quality may imply a lesser need for formal training. Managers may be better at hiring skilled workers that require little training, may implement automated systems with clear instructions for workers, or may decide informal direct communication with employees may substitute for the need of costly formal training. Automated systems developed by managers may facilitate adaptation of the firm to employee turnover with the understanding that costly training may provide little benefit to the firm when the trained worker leaves, which could be likely if the training largely constitutes general skills as opposed to firm-specific skills. Thus, the nature of the relationship between management practices and the prevalence of formal training is an empirical question.

The share of highly educated workers in a firm may has several implications for training. High education levels may signal high ability, and thus firms may be determined to retain these workers by investing in them, especially in developing economies where the supply of highly educated individuals is low. Thus, the correlation between highly educated workers and the provision of formal training may be

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[2] See Bloom et al. (2013): https://people.stanford.edu/nbloom/sites/default/files/mia.pdf, pp 21.

positive. Furthermore, highly educated workers may require repeated training throughout their career as they develop different skill sets with experience. Also the cost of training may decline with higher educated workers who may have developed learning skills, thereby incentivizing firms to invest in training (Bassanini et al., 2007). However, the hiring of highly educated workers may obviate the need for formal training, especially if they are of high ability and can quickly learn on the job. Furthermore, highly educated workers may entail a larger flight risk as they have more bargaining power and are therefore more likely to move to other firms. Accordingly, firms with a larger share of educated workers may be less likely to invest in formal training. Finally, the share of highly educated workers in a firm may proxy for the level of general human capital in the economy. Assuming that in general human capital is low in an economy, firms may implement training programs to invest in high ability individuals that may not have the required education in order to compensate for the lack of education, or the presence of low-quality education. Thus, formal training may be more prevalent across firms that in economies with low human capital. Whether the portion of university education workers is positively or negatively related to formal training is an open empirical question.

The challenge of low provision of formal training provided by firms is especially a concern for the MENA region. Liaqat and Nugent (2015) note that high youth unemployment, lengthy school-to-work transitions, and a sizeable gap between the skills firms want and young graduates possess are characteristics of the region. Thus, workers in the region are well poised to benefit from formal training. However, as mentioned earlier, the incidence of training is particularly low. Also noted is that firm-supplied training is found to be more effective than government-supplied training, therefore the lack of formal training by firms cannot be easily substituted. This study provides additional focus on the MENA region given the well-documented low prevalence of formal training in the private sector.

Our empirical strategy is to exploit firm-level variation in formal training, management practices and worker education, while accounting for several confounding factors. We employ two samples. The first sample is a pooled cross-section of 8,470 firms across 35 economies. This includes two waves for economies in the MENA and ECA regions (2013 and 2019/2020) where we estimate the effect of management practices and worker education on the presence of formal training (extensive) and proportion of workers trained in manufacturing firms (intensive). Several firm-level factors are accounted for, including country fixed effects. A second sample entails a subsample of panel firms interviewed across both waves for both regions. In these estimations, firm-level fixed effects are used to account for time-invariant firm-level omitted variables. An important concern is endogeneity. Although employee training could potentially lead to better management practices, this is unlikely as the training captured is only directed to employees, and furthermore even though training may affect some of the management practices, it is unlikely to affect the aggregate score. This is distinct from the emerging literature that has documented the effects of external *management* training that specifically

targets improving management practices (McKenzie and Woodruff, 2017; Higuchi et al, 2019). More of concern is that training might attract high ability workers who tend to be more educated. This is most likely if the presence of training programs is the key attraction for highly educated workers. However, the presence of training programs could be correlated to several other features of firms that highly educated workers find attractive. We account for these firm characteristics to the extent the data allows us.

Our findings indicate that, accounting for a broad range of country and firm-specific controls, formal training is positively related to worker education for the ECA and MENA regions, although the finding for the latter is more robust. Good management practices are related to formal training for the ECA region but not the MENA region. The relationship between worker education and training has been documented before, although we look specifically at university education while other studies look at secondary education or the occupation level to determine skill levels. Furthermore, we validate the findings using panel estimations. Our study also builds on and confirms several findings in the literature on formal training including the positive correlation with firm size and quality certification (Almeida and Aterido, 2015; Liaqat and Nugent, 2015). Our study provides several policy implications. To the extent that there is a causal mechanism running from university education to training, increasing university education of workers in MENA can incentivize firms to invest in more training, potentially updating skills that are more robust to automation and digitization and developing soft skills. However, given the documented high unemployment among university graduates in the region, this may not be enough and may need to be coupled with reforms that strengthen the private sector and improve the business environment. Furthermore, if the prevalence of training is to adapt and update skills of educated workers towards work in the private sector, then the policy implication is not only to increase university education, but also to ensure it serves the private sector as well. Finally, firms with better management practices tend to provide more training in ECA but not in MENA. This warrants further investigation and may be because managerial practices are quite poor in the region. These findings are important for the MENA context given the low provision of training in the formal private sector.

In summary, our study makes several contributions to the literature. First it explores the role of management practices and education of workers on formal training both at the intensive and extensive margin. Second it utilizes a panel data set to account for several firm-level characteristics to validate the findings. And finally, it updates several studies in the literature by employing recent firm-level data that includes economies across Europe, Central Asia, and the MENA region. The rest of the paper is structured as follows. Section II describes the data. Section III provides the empirical specification and identification strategy, while section IV provides the results, section V provides robustness checks, and section VI concludes.

II. Data

The main source of firm-level data is the World Bank's Enterprise Surveys (ES). This includes two samples of medium and large enterprises.[3] The first sample includes cross-sectional firm-level surveys for 35 economies across ECA and MENA, all surveyed circa 2013 and 2019/2020, right before the Covid-19 pandemic. The second sample consists of a subsample of panel firms that were interviewed across both waves for both the ECA and MENA regions. The panel sample has far fewer firms for two reasons. One is the high attrition due to firm exit given the gap between the two waves. Second is that only 50 percent of the 2019/2020 can be panel firms in accordance with the ES methodology. Both samples have a special module on management practices that was only implemented for medium and large firms, where management practices were more likely to matter. The surveys are otherwise similar to the ES, collecting information on a representative sample of formal (registered) private firms operating in the manufacturing or services sectors. The ES data are fully comparable across countries and are collected via face-to-face interviews with business owners or top managers by using a global methodology. The selection of firms in each country is done by stratified random sampling with three levels of stratification: sector of activity, firm size, and location within the country. The data have been widely used by several studies to explore the private sector in developing economies (EBRD-EIB-WB, 2016; Paunov, 2016; Besley and Mueller, 2018; Chauvet and Ehrhar, 2018; Hjort and Poulsen, 2019; Falciola et al., 2020). A considerable advantage of these data sets is that they are composed of a set of economies surveyed around a similar time frame, employing a consistent methodology. Previous studies have typically included older enterprise surveys that did not follow the consistent global methodology of the ES (Almeida and Aterido, 2015; Liaqat and Nugent, 2015). Furthermore, those early surveys did not contain information on management practices or the share of the workforce with a university degree.

The key outcome variable is the presence of formal training. This is derived from the survey question: *Over fiscal year [Insert last complete fiscal year], did this establishment have formal training programs for its permanent, full-time workers?* Formal training is defined as training that has a structured and defined curriculum. It may include classroom work, seminars, lectures, workshops, and audio-visual presentations and demonstrations. However, it excludes training to familiarize workers with equipment and machinery on the shop floor, training aimed at familiarizing workers with the establishment's standard operation procedures, or employee orientation at the beginning of a worker's tenure. A second

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[3] Medium and large enterprises are defined as having 20 or more employees. The choice of medium and large enterprises is due inclusion of management practices measures that were only collected for medium and large firms. There are some small firms that are in the sample for two reasons. One is that some of these firms were identified as medium or large firms in the sample frame, and thus were administered the management practices module. Second is that some of these small firms grew to become medium firms between the 2013 and 2019/2020 waves, and thus they are retained to maintain the panel component. We retain these firms in the sample given that they are very likely to have attributes similar to medium and large firms as identified in the sample frames.

variable used is the share of workers in the firm that received formal training. This question is only asked for manufacturing firms. Figure 1 presents the incidence rates of formal training across medium and large firms in the sample at the country level. Figure 2 provides the share of workers in medium and large manufacturing firms that received training across countries. Figures 5 and 6 repeats the same for the two waves – 2013 and 2019/2020 for the MENA and ECA regions respectively. A few fairly consistent patterns are apparent. Training in both the intensive and extensive margin seems to be low in the MENA economies in comparison to other economies in ECA. Egypt and the West Bank and Gaza are in the bottom four economies of the sample in terms of incidence of training. Morocco is the only economy in the top half of the sample of economies. With regards to intensity of training (only manufacturing firms), Egypt and the West Bank and Gaza are the worst performing, with no economy in MENA in the top half of the sample. Second, over time the finding is mixed. On average, the share of firms offering formal training in the MENA region has increased, although the intensity of training has marginally decreased (figure 5). In ECA, slight declines in both the incidence and intensity of formal training are observed (figure 6). [4]

The key explanatory variable is the quality of management practices, consistent with the methodology implemented by Bloom et al., (2013). This consists of eight components: (i) Problem resolution, (ii) Number of performance indicators measured, (iii) Level of ease or difficulty to achieve production or service provision targets, (iv) Knowledge of production or service provision targets, (v) Basis of manager bonuses, (vi) Length of focus of production targets, (vii) Promotion of non-managers, and (viii) Dismissal of underperforming managers. The scoring for each component is provided in table A2. The management practices module is only implemented for medium and large firms. Apart from Tunisia, MENA economies are in the bottom half of the sample with regards to management scores (figure 4). Across both the MENA and ECA regions, average management scores have mostly declined between 2013 and 2019 (figures 5 and 6).

A second variable of interest that was only captured for these surveys is *What percentage or how many of this establishment's permanent full-time employees employed at the end of fiscal year [Insert last complete fiscal year] had a university degree?* This question is typically not asked in the standard ES module, although the literature has used proxies. These include defining the skill of the worker in terms of occupation or the share of workers that have received secondary education (Almeida and Aterido, 2015; Liaqat and Nugent, 2015). The share of workers with university education employed in formal medium and large private firms in the MENA region (32 percent) is higher than ECA (27 percent). With the exception of Tunisia, MENA economies are in the top half of the sample with regards to share of

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[4] For the share of workers that received formal training, zero is imputed for firms that did not offer formal training. However, if we restrict the sample to just firms that offer formal training, we see the same trends for the ECA and MENA regions over time.

workers employed with a university education (figure 3).[5] The share of university educated workforce has increased across both the ECA and MENA regions between 2013 and 2019/2020, with the latter experiencing a larger increase (figures 5 and 6).

Several control variables are also employed that were obtained from the Enterprise Surveys. These include firm size, age, outward orientation, quality certification, access to finance, informality, and perceptions of education quality and labor regulations. Summary statistics for all the variables are provided for the whole sample (table 1), the MENA cross-section sample (2013-2019/2020) in table A2, the ECA cross-section sample (2013-2019/2020) in table A3, the MENA panel sample (table A4) and the ECA panel sample (table A5).

The data reveals some similarities and differences between firms that provide training and those that do not across both regions (table A1). Firms that provide training in both MENA and ECA tend to be larger, younger, exporters, foreign-owned, and digitally connected as proxied by owning a website. In MENA, firms that offer formal training are more likely to be in the service sectors, while in ECA there does not seem to be noticeable differences. Across both regions, training firms are not more likely to be run by women than non-training mangers. However, firms that provide training are more likely to have a female owner in the MENA region, with no noticeable differences in the ECA region.

III. Empirical strategy

The following equation is estimated for the cross-section sample.

$$Train_i = \beta_0 + \beta_1 MGMT_i + \beta_2 Size_i + \beta_3 Age_i + \beta_4 ManagerExp_i + \beta_5 UniEdu_i + +\beta_6 Manf_i + \beta_z Z_i + \delta_1 D_c + \delta_2 D_t + \epsilon_i \quad (1)$$

Where $Train$ is either (i) whether or not a firm offers formal training or (ii) the share of workers receiving formal training only in manufacturing firms. The variable $UniEdu$ is the share of workers with a university degree. $MGMT$ is the average management practices score.[6] To control for as many

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[5] The share of workers with university education in medium and large firms can be higher than the share of the population in general with a university degree. Take Egypt for example. Around 43 percent of all workers in formal firms (largely manufacturing and services) have a university education. In general, about 19 percent of the population has university education, according to the 2018 Egypt Labor Market Panel Survey (ELMPS).

[6] We also alternatively used Z-scores instead of the average scores for management practices. The results are largely unchanged. For the cross-sectional sample, the coefficient and statistical significance for management practices is the same for both the MENA and ECA subsamples. For the panel estimations, there a slight improvement in the statistical significance of management practice variable for the ECA subsample. The results are the same for the panel MENA subsample.

confounding factors as possible, several firm-level variables are accounted for. These include firm size ($Size$), firm age (Age), manager experience in the same sector ($ManagerExp$), and whether the sector of activity is in the manufacturing sector ($Manf$). Other control variables (Z) include whether the firm purchased fixed assets, exporter status, foreign ownership, whether the top manager is a woman, the proportion of temporary workers, presence of checking or savings account, ISO quality certification, website ownership, whether the firm competes against informal firms, and perceptions of whether the firm finds labor regulations to be major or severe constraint, or the inadequately educated workforce to be a major or severe constraint. Country fixed effects (D_c) are included to account for time invariant country-specific omitted variables as well as year fixed effects (D_t). ϵ_i is the standard error term with the usual desirable properties. Survey weights are used, and the standard errors are clustered at the location-sector-size strata level.

We utilize the same specification for the Panel sample as presented in equation (2) below, by replacing country fixed effects with firm-fixed effects (D_i). Standard errors are clustered at the country level for the panel estimations.

$$Train_{it} = \beta_0 + \beta_1 MGMT_{it} + \beta_2 Size_{it} + \beta_3 Age_{it} + \beta_4 ManagerExp_{it} + \beta_5 UniEdu_{it} + \beta_6 Manf_{it} + \beta_z Z_{it} + \gamma_1 D_i + \gamma_2 D_t + \epsilon_{it} \quad (2)$$

The rationale for several of the control variables is based on the literature. Firm characteristics are included, such as size, age, access to finance, and outward orientation – both in terms of exporter status and foreign ownership (Almeida and Aterido, 2015). Other covariates that have been accounted for in previous estimations include quality certification and website ownership. Perceptions of labor regulations have been used to proxy for labor regulation stringency while senior management time spent in dealing with requirements of government regulations and average number of visits or required meetings with tax officials have been used to proxy for enforcement (Liaqat and Nugent, 2015). The perceptions of whether the inadequately educated workforce is a major or severe constraint to operations has been used to account for perceptions of education quality of the workforce at large (Liaqat and Nugent, 2015). We also include the following additional control variables: whether the top manager of the firm is a woman, the share of temporary workers, whether the firm purchased fixed assets, and finally whether the firm competes with informal firms.

There are a number of challenges with the empirical estimations. An important concern is simultaneity bias. One possibility is that training could lead to better management practices. This would imply that our estimates are biased upwards for the effect of management practices on training. This may be

unlikely as the training captured is only directed to employees, and furthermore even though training may affect some of the management practices, it is unlikely to affect the aggregate score. It is also possible that training could attract high ability workers who tend to be more educated. This is only likely if the presence of training programs is the key attraction for highly educated workers. However, the presence of training programs could be correlated to several other features of firms that highly educated workers find attractive, and we account for these firm characteristics to the extent the data allows us. For the panel samples, we account for firm-level fixed effects that capture time invariant firm-level omitted variables.

IV. Results

Table 2 presents the base results for three pooled cross-section samples: (i) All firms, (ii) the MENA sample and (ii) the ECA sample, including all firms surveyed in 2013 and 2019. For the overall sample we find that both management practices and the proportion of university educated workers are positively related to the presence of formal training (Table 2, column 1). The coefficients for both variables are statistically significant at the 1 percent level.[7] Consistent with the literature, we find that the size of the firm (based on the number of employees) and quality certification are positively related to the prevalence of worker training. Furthermore, firms that invest, have their own website, and find the existing workforce to be inadequately educated are more likely to have formal training. The findings show some differences when splitting the sample into MENA (table 2, column 2) and ECA (table 2, column 3). For MENA, the coefficient for management practices is positive but not statistically significant. In contrast, for ECA, the coefficient for management practices is positive and highly statistically significant at the 1 percent level. For both the ECA and MENA regions, the coefficient for the proportion of university educated workers is positive and statistically significant at the 1 percent level. In terms of magnitude, an increase in the share of university educated permanent employees increases the probability of formal training by 0.486 in MENA, and 0.193 in ECA. A one unit increase in the management practices score increases the probability of formal training by 0.454. Other covariates such as the size of the firm, whether the firm invested, and ISO quality certification are positively related to the presence of formal training across the samples with coefficients being statistically significant at least at the 10 percent level.

In columns 4, 5 and 6 of table 2 we replicate the same estimations as in columns 1, 2 and 3 using the share of workers that received formal training as the outcome variable. Note that this information is only available for manufacturing firms.[8] The findings are largely consistent. For the both the ECA and

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[7] We also explored the results by splitting into the 2013 and 2019 waves. For the overall sample including MENA and ECA, management practices and share of university educated workers are positively related to the incidence of formal training, regardless of whether it is the 2013 wave or the 2019 wave. For the share of workers trained in manufacturing firms, the results largely stand for the 2019 wave but are statistically insignificant for the 2013 wave. For MENA the findings for university education are largely driven by the 2019 sample. While the findings for ECA is mostly driven for both the 2013 and 2019 samples for management practices, the coefficient for university educated workers is statistically insignificant for the outcome variable of share of workers trained in manufacturing firms for the 2013 wave. Results are available from the authors upon request.

[8] We also ran the estimations for the incidence of training for the manufacturing firms alone. The sign and statistical significance of the coefficient for management practices is the same for both MENA and ECA manufacturing firms and the whole sample (manufacturing plus services). However, for the ECA sample of manufacturing firms, there is no statistically significant relationship between proportion of university educated workers and the incidence of formal training. For the MENA subsample, the sign and statistical significance of the coefficient of the proportion of university educated workers are retained. These results are available upon request.

MENA samples, the proportion of university educated workers is positively related to the share of workers receiving formal training, with a coefficient statistically significant at the 1 percent level for MENA and 5 percent level for ECA. However, the coefficient for management practices is negative but not statistically significant for the MENA region. For the ECA sample, we see the opposite. The coefficient for management practices is positive and statistically significant at the 1 percent level. In terms of magnitude, a 1 percent increase in the share of university educated workers increases the share of workers that received formal training by 0.78 percent in MENA and 0.11 percent in ECA. A 1 percent increase in the management score increases the share of workers that received formal training in ECA by 0.67 percent. One interesting result for the ECA sample is that the coefficient for the proportion of temporary workers is negative and statistically significant at the 1 percent level. This implies that the larger the proportion of temporary workers, the lower the proportion of workers that receive formal training.

In table 3 we explore whether different types of management practices matter. We run the estimations replacing the overall score with the 8 subcomponents. For the overall sample (column 1) as well as the ECA sample (column 3), four subcomponents of management practices have statistically significant coefficients – (i) Number of production or service provision performance indicators monitored, (ii) Personnel's knowledge of production or service provision targets, (iii) Basis for promoting non-mangers, and (iv) When underperforming managers were dismissed or reassigned. However, for the MENA subsample, only the coefficient for the number of production or service provision performance indicators monitored is statistically significant (column 2). The results are starker when the outcome variable is the share of workers that received formal training (manufacturing firms only). None of the management practices subcomponents has statistically significant coefficients for the MENA sample. For the overall as well as ECA samples, the number of production or service provision performance indicators monitored score and Personnel's knowledge of production or service provision targets score have positive coefficients that are statistically significant at the 1 percent level. These results confirm the fact that management practices, regardless of types, are far less a contributing factor to the use of formal training by firms in MENA than the rest of the sample.

In table 4, we turn to the MENA panel estimations.[9] In column 1 we present the findings with whether or not the firm provides formal training. In column 2 we present the findings with the share of workers

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[9] We also conducted panel estimations for the whole sample (as opposed to the regional breakdown). The coefficient of the management score is positive and statistically significant for the intensity but not the incidence of training. The coefficient for the proportion of university educated students is statistically insignificant. These results are available upon request.

with formal training (manufacturing firms only).[10] The coefficient for the proportion of workers with university education is positive and statistically significant at the 1 percent level for both outcome variables. The magnitudes are larger in the panel sample than the cross-sectional sample. The coefficient for the overall management practices score is positive but not statistically significant for both outcome variables. In columns 3 and 4 of table 4, we explore whether the subcomponents of management practices matter. For the incidence of formal training (column 3) only one subcomponent has a positive and statistically significant coefficient - Action when problem in the production/service provision arose. However, the management practices subcomponent on when underperforming managers were dismissed or reassigned is negatively related to the prevalence of training, statistically significant at the 5 percent level. One plausible explanation is that the firms that are slow in dismissing managers are more likely to stick with personnel, and thus more likely to train. The results change somewhat when exploring the results for the share of workers that received formal training (manufacturing firms only, column 3). Only one of the management practices subcomponents has a statistically significant coefficient (10 percent level) - Personnel's knowledge of production or service provision targets. Similar to the findings for the prevalence of formal training, the management practices subcomponent on when underperforming managers were dismissed or reassigned is negatively related to the share of workers trained. Broadly speaking, these findings are not too different from what was observed from the cross-sectional sample – management practices matter less for the MENA region, while the coefficient for the share of university educated workers is a strong predictor of formal training. However, while the coefficient of the number of performance indicators subcomponent was statistically significant in the cross-section, it is no longer significant in the panel estimations. Thus, the findings with regards to the subcomponent scores are not consistent across the panel and cross-section samples for the MENA region.

In table 5, we turn to the ECA panel estimation results. In column 1 we present the findings on whether or not the firm provides formal training. In column 2 we present the findings with the share of workers with formal training (manufacturing firms only). The coefficient for the overall management score is positive and statistically significant at the 10 percent level for the incidence of formal training and 1 percent for the intensity of formal training. The magnitudes are larger for the panel sample than the cross-sectional sample. The coefficient for the share of university educated workers is positive but statistically insignificant for the incidence of formal training. However, the coefficient for the share of university educated workers is negative and statistically significant at the 5 percent level. These findings

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[10] We also ran the estimations for the incidence of training for manufacturing panel firms. The coefficient of the overall management score remains statistically significant at the 5 percent level for the ECA manufacturing subsample but is statistically insignificant for the MENA manufacturing subsample. The coefficient for the proportion of university educated workers is statistically insignificant for the ECA manufacturing panel subsample, and statistically significant at the 10% level for the MENA manufacturing panel subsample.

run counter to the pooled cross-sectional results for the ECA sample. In columns 3 and 4 of table 5, we explore whether the subcomponents of management practices matter. For the incidence of formal training, two of the management score coefficients are positive and statistically significant – (i) the action when problem in the production/service provision arose score, and the (ii) Personnel's knowledge of production or service provision targets score. However, the basis for promoting non-managers score is negative and statistically significant at the 10 percent level. For the incidence of training, 3 scores have a positive and statistically significant coefficient – (i) Personnel's knowledge of production or service provision targets score, (ii) Focus of production targets score, and (iii) When underperforming managers were dismissed or reassigned score. However, the basis for promoting non-managers score is negative and statistically significant at the 10 percent level. In terms of comparisons across panel and cross-section ECA samples, only the management practices subcomponent on personnel's knowledge of production or service provision has a statistically significant coefficient across both samples. Overall, the findings show some heterogeneity across the components of the management score in the ECA sample, but the main finding that firms with better management practices seem to have higher incidence and intensity of formal training remains.

The 2019/2020 surveys have a question on the type of training provided. There are six types of training indicated in the survey: (i) Numeracy and math skills, (ii) Problem solving or critical thinking skills, (iii) foreign language skills, (iv) Managerial and leadership skills, (v) Interpersonal and communication skills, and (vi) Job-specific technical skills. In table 6 we present the findings for the MENA region (2019/2020) for each type of training. The incidence of certain types of training in the MENA region are quite low. The highest incidence is job-specific technical training (25.1 percent), followed by interpersonal and communication skills (1.7 percent) and manager and leadership skills (0.95 percent). Incidence of numeracy and math skills (0.04 percent), problem solving or critical thinking (0.03 percent) and foreign language skills (0.08 percent) are extremely low. We present the findings for all types of training for completeness, but the results for types of training with low incidence should be interpreted with caution. We find no statistically significant relationship between management practices and any of the training types. However, the proportion of university education has a positive and highly statistically significant coefficient (1 percent level) for training that entails job-specific technical skills. In contrast, for the ECA sample, the overall management score has positive and statistically significant coefficients for managerial and leadership skills training and job-specific technical skills training. The share of university educated workers is positively related to foreign language skills training and interpersonal and communication skills training. Since this information is only available for the latest round of the survey, we are unable to employ panel estimation techniques. The one insight that can be drawn from these findings is that firms in the developing MENA region do train workers when they are highly educated, but the training is largely towards job-specific skills. This may be one way in which

they exert monopsony power over their workers. On the other hand, it may also be that highly educated workers typically acquire skills meant for the public sector, and thus require training to adjust to work in private sector firms. For the ECA region we see heterogeneity in the effects of management practices and the share of educated workers across types of training (table 7).

V. Robustness checks: Skills, gender composition and regulations and enforcement

In this section we consider as robustness checks a number of additional variables that could be correlated with the prevalence of formal training or have been found to by the literature to be of importance. These include the skill level of production workers in manufacturing firms, the gender composition of workers, and labor regulations and enforcement. In table 8 we include a variable that captures the skill level of the worker mostly based on the occupation. This is to account for the possibility that the portion of university educated workers may simply be capturing skilled workers, and also to check if our results stand after accounting for a more commonly used measure in the literature. In the survey, highly skilled workers were defined as those who were professionals and tasks required extensive theoretical and technical knowledge. The question was only asked of manufacturing firms. In table 8 we provide estimations for the MENA cross section sample (columns 1 and 2), MENA panel sample (columns 3 and 4) and the ECA cross section sample (columns 5 and 6), and the ECA panel sample (columns 7 and 8), alternating between the prevalence of formal training and the share of workers that received formal training as outcome variables. For each of the estimations, we account for the share of high-skilled production workers. As shown in table 8, for both the MENA cross-section and panel samples, the coefficient for the share of university educated workers is positive and statistically significant at the 1 percent level even after accounting for the proportion of skilled production workers. There is no statistically significant relationship between either the proportion of university educated workers or the proportion of highly skilled production workers with the prevalence of formal training for the ECA cross section and panel samples. Consistent with the base line estimates, the coefficient for the share of university educated workers is negative for the ECA panel sample when the outcome variable is the share of workers receiving formal training. The coefficient for management practices is positive and statistically significant at the 1 percent level across all the ECA samples. In summary, the relationship between university educated workers and training holds for the MENA region even after accounting for skilled workers.

In table 9 we replicate the same estimations presented in table 8 by substituting skilled workers with the proportion of women workers in the firm. The coefficient for the proportion of university educated workers remains statistically significant at the 1 percent level for the MENA cross-section sample after

accounting for the proportion of women workers (table 9 columns 1 and 2). This is true regardless of whether the outcome variable is the incidence or the intensity of formal training. The coefficient for the proportion women workers is positive but statistically insignificant for the MENA cross-section sample. However, the results change somewhat for the MENA panel sample (table 9, columns 3 and 4). The positive coefficient of the proportion of women gains statistical significance at the 1 percent level and 5 percent level for the incidence and intensity of formal training, respectively. The statistical significance for the coefficient of the share of university educated workers drops to 10 percent with the incidence of formal training outcome variable. For the intensity of training outcome variable, the coefficient of the proportion of university educated workers is statistically significant at the 5 percent level. Thus, at least for the MENA panel sample, accounting for the share of women workers lowers the statistical significance of the proportion of university educated workers. Part of the reason could be that in the developing MENA economies, a significant share of women workers is university educated. For the ECA cross-sectional sample the coefficient for the share of women workers is negative and statistically insignificant for incidence of training, but statistically significant at the 5 percent level for the intensity of training (table 9, columns 5 and 6). This is a sharp difference from the MENA sample where the relationship between women workers and formal training is positive. This finding is stronger for the ECA panel subsample where the coefficient of the share of women workers is negative and statistically significant for both the incidence and intensity of training. The coefficient of the management practices variable is positive and statistically significant at the 1 percent level for the ECA cross-section sample. For the ECA panel sample, the coefficient for the management practices score is positive but only statistically significant for the intensity of training outcome variable.

In table 10, we explore the relationship between labor regulations and perceptions of the workforce in the economy using cell averages consistent with Liaqat and Nugent (2015). A cell is defined by the location (within each country as defined by the strata), size and sector of the firm. Each cell average excludes the responding firm's answer. The labor regulations cell average is average of the responses that state that labor regulations are major or severe obstacle to the running of the business. The labor regulations cell average may capture the stringency of labor regulations, with more stringent regulations restricting worker mobility and therefore incentivizing firms to invest in workers. The cell average of the perceptions of education of the workforce could proxy for the general perception of the education of labor, or the difficulty of hiring educated workers. The proportion of time spent dealing with government regulations and the average number of visits from tax officials can proxy for regulation enforcement. The findings in table 10 largely show statistically insignificant coefficients for the proportion of time spent dealing with government regulations and the average number of visits from tax officials can proxy for regulation enforcement. The coefficient for the cell average of labor regulations is positive and only statistically significant (10 percent level) for the MENA cross-section

when the outcome variable is the incidence of formal training (column 1). The coefficient is not statistically significant for the MENA panel estimations regardless of the training outcome variable. Similarly, the inadequately educated workforce cell average is negative and only statistically significant (at the 5 percent level) for the developing MENA cross-section sample alone when the outcome is the intensity of formal training. While not robust, both findings do hint at the possibility that in MENA, labor regulation stringency may incentivize firms to invest while negative perceptions of an inadequately educated workforce may discourage investment in workers through training. Regardless, the coefficient for the share of university educated workers is positive and statistically significant at the 1 percent level for both the MENA cross sectional and panel estimations.

For the ECA samples, the coefficient of the inadequately educated workforce cell average is statistically insignificant for both the cross-section and panel estimations. The labor regulations cell average variable is positive but statistically insignificant with regards to the incidence of formal training for the ECA cross section sample. However, the coefficient is statistically significant at the 10 percent level for the training intensity outcome variable. For the ECA panel estimations, the coefficients for the labor regulations cell average are positive and statistically significant at the 1 percent level. The coefficient for the management practices is positive and statistically significant at least at the 5 percent level for both the ECA cross sectional and panel estimations. To summarize, while there is some hint that labor regulations may be positively correlated with formal training, and the low perceptions of the education of the workforce may reduce training, the findings are not robust.

VI.   Conclusions

This study explored the relationship between human capital in the firm in two forms – management practices and the share of university educated workers – and the incidence and intensity of formal training. It provided insights for the MENA region where training provisions by firms have been known to be low. The study also harnessed firm-level panel data from the developing MENA region to validate the findings. The findings show that the share of university educated workers is a robust predictor of formal training in MENA, while management practices is a robust predictor of formal training in ECA.

The study provides some important policy implications. First, increasing university education in the workforce in the MENA region may incentivize firms to invest more in their workers. This has positive implications of improving the workforce by retraining and updating skills. However, the high unemployment among the university graduates documented in the region suggests that this is not sufficient and would need to be coupled with regulatory reforms that strengthen the private sector and improve the business environment. Furthermore, if the prevalence of training is to adapt and update skills of educated workers towards work in the private sector, then the policy implication is not only to

increase university education, but also to ensure it serves the private sector as well. Second, good management in firms in the MENA region may not be enough and government interventions to improve the university education of the workforce may be needed. Third, unlike the MENA region, in ECA, better management practices are likely to lead to greater incidence and intensity of formal training.

The study has a number of limitations. Despite the robustness checks, and the use of panel estimations, we cannot completely rule out the possibility of simultaneity bias between our key variables – management practices and share of university educated workers – and our outcome variables of incidence and intensity of formal training. Regardless, the study leverages new data and points to interesting directions for future research. For one, it would be interesting to theoretically explore why certain types of management practices are more likely to lead to training, and what types of training are more likely. Second, it may be worth investigating if policies that led to increases in university education had corresponding effects on firm behavior as the pool of workers available to firms became more educated and possibly more valuable.

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Table 1: Summary Statistics - Full Sample

Variable	Obs	Mean	Std. Dev.	Min	Max
Firm offers formal training Y/N	8,470	0.393	0.488	0	1
Share of workers received formal training (0 if no training)	5,988	0.167	0.312	0	1
Overall management score	8,470	0.521	0.197	0	1
MG1 Action when problem in the production/service provision arose	8,470	0.679	0.291	0	1
MG2 Number of production or service provision performance indicators monitored	8,470	0.429	0.334	0	1
MG3 Level of ease or difficulty to achieve targets	8,470	0.581	0.353	0	1
MG4 Personnel's knowledge of production or service provision targets	8,470	0.360	0.382	0	1
MG5 What managers' performance bonuses were usually based on	8,470	0.420	0.404	0	1
MG6 Focus of production targets	8,470	0.603	0.378	0	1
MG7 Basis for promoting non-mangers	8,470	0.704	0.414	0	1
MG8 When underperforming managers were dismissed or reassigned	8,470	0.391	0.453	0	1
Share of permanent full-time employees with a university degree (0 to 1)	8,470	0.252	0.236	0	1
Train: Numeracy or math skills	6,147	0.007	0.085	0	1
Train: Problem solving or critical thinking skills	6,147	0.016	0.125	0	1
Train: Foreign language skills	6,147	0.013	0.112	0	1
Train: Managerial and leadership skills	6,147	0.036	0.186	0	1
Train: Interpersonal and communication skills	6,147	0.037	0.190	0	1
Train: Job-specific technical skills	6,147	0.280	0.449	0	1
Top manager experience in sector (years)	8,470	20.795	10.977	1	60
Log of age of firm	8,470	2.811	0.668	0	5.050
Proportion of permanent full-time workers that are female	8,190	0.349	0.289	0	1
Proportion of temporary workers (out of all workers)	8,470	0.031	0.092	0	0.929
Log of size	8,470	3.897	0.862	1.099	8.006
Senior management time spent in dealing with requirements of government regulations (%)	8,470	10.586	16.830	0	100
Average number of visits or required meetings with tax officials	8,470	1.222	2.209	0	30
Firm purchased fixed assets Y/N	8,470	0.519	0.500	0	1
Direct exports 10% or more of sales Y/N	8,470	0.316	0.465	0	1
Foreign ownership Y/N	8,470	0.124	0.329	0	1
Female top manager Y/N	8,470	0.138	0.345	0	1
Establishment has checking or savings account Y/N	8,470	0.962	0.191	0	1
ISO Certification Ownership Y/N	8,470	0.356	0.479	0	1
Website Y/N	8,470	0.729	0.445	0	1
Firm identifying inadequately educated workforce as a major or severe constraint	8,470	0.256	0.436	0	1
Firm identifying labor regulations as a major or severe constraint Y/N	8,470	0.083	0.277	0	1
Share of High-Skilled Production Workers (manf only)	5,907	0.393	0.294	0	1
Inadequately Educated Workforce (cell average)	8,428	0.232	0.191	0	1
Labor Regulations obstacle (cell average)	8,428	0.083	0.121	0	1
Competes against unregistered firms Y/N	8,470	0.351	0.477	0	1
Manufacturing Sector Y/N	8,470	0.566	0.496	0	1

Table 2: Determinants of Formal Training

Model	OLS					
Outcome Variable	Firm offers formal training Y/N			Share of workers received formal training (0 if no training)		
Sample	All Firms	MENA 2013-2019	ECA 2013-2019	Manf. Firms	MENA Manf. Firms (2013-2019)	ECA Manf. Firms (2013-2019)
	(1)	(2)	(3)	(4)	(5)	(6)
Share of permanent full-time employees with a university degree (0 to 1)	0.257***	0.486***	0.193***	0.164***	0.332***	0.108**
	(0.051)	(0.094)	(0.057)	(0.045)	(0.080)	(0.052)
Overall management score	0.376***	0.072	0.454***	0.177***	-0.038	0.233***
	(0.048)	(0.101)	(0.054)	(0.043)	(0.080)	(0.049)
Top manager experience in sector (years)	0.000	-0.005***	0.002	0.001*	-0.001	0.002*
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Log of age of firm	-0.018	0.036	-0.028	-0.012	0.018	-0.019
	(0.016)	(0.024)	(0.018)	(0.013)	(0.017)	(0.015)
Proportion of temporary workers (out of all workers)	-0.044	-0.122	-0.013	-0.159**	0.098	-0.243***
	(0.156)	(0.175)	(0.183)	(0.078)	(0.185)	(0.078)
Log of size	0.050***	0.040*	0.048***	0.004	-0.010	0.005
	(0.012)	(0.024)	(0.014)	(0.009)	(0.020)	(0.010)
Senior management time spent in dealing with requirements of government regulations (%)	0.001	-0.001	0.001*	0.000	-0.000	0.001
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Average number of visits or required meetings with tax officials	0.002	0.034*	-0.002	0.001	0.008	-0.001
	(0.004)	(0.019)	(0.004)	(0.004)	(0.006)	(0.004)
Firm purchased fixed assets Y/N	0.145***	0.112***	0.149***	0.084***	0.060*	0.086***
	(0.020)	(0.042)	(0.022)	(0.016)	(0.031)	(0.019)
Direct exports 10% or more of sales Y/N	-0.012	-0.064	0.008	-0.013	-0.024	-0.007
	(0.024)	(0.041)	(0.028)	(0.018)	(0.029)	(0.023)
Foreign ownership Y/N	0.058**	0.019	0.068**	0.003	0.016	0.004
	(0.027)	(0.062)	(0.029)	(0.022)	(0.043)	(0.025)
Female top manager Y/N	0.010	0.034	0.005	0.005	-0.007	0.002
	(0.033)	(0.085)	(0.035)	(0.023)	(0.043)	(0.024)
Establishment has checking or savings account Y/N	0.053	0.030	0.092*	0.024	0.018	0.023
	(0.040)	(0.064)	(0.050)	(0.026)	(0.019)	(0.040)
ISO Certification Ownership Y/N	0.131***	0.182***	0.114***	0.070***	0.111**	0.060***
	(0.025)	(0.054)	(0.028)	(0.017)	(0.043)	(0.019)
Website Y/N	0.053**	0.013	0.068***	0.005	0.003	0.006
	(0.022)	(0.036)	(0.025)	(0.016)	(0.023)	(0.020)
Firm identifying inadequately educated workforce as a major or severe constraint	0.056**	0.028	0.058**	0.029	0.009	0.039
	(0.025)	(0.052)	(0.028)	(0.022)	(0.038)	(0.025)
Firm identifying labor regulations as a major or severe constraint Y/N	0.032	-0.007	0.046	-0.010	-0.021	-0.006
	(0.034)	(0.053)	(0.039)	(0.029)	(0.031)	(0.038)
Competes against unregistered firms Y/N	0.044**	-0.002	0.057**	0.025	0.007	0.033
	(0.021)	(0.036)	(0.025)	(0.017)	(0.026)	(0.021)

	(1)	(2)	(3)	(4)	(5)	(6)
Manufacturing Sector Y/N	-0.077***	-0.013	-0.090***			
	(0.023)	(0.047)	(0.026)			
Constant	-0.329***	-0.105	-0.254**	-0.154***	-0.066	-0.120
	(0.076)	(0.160)	(0.105)	(0.056)	(0.090)	(0.087)
Country Fixed Effects	YES	YES	YES	YES	YES	YES
Year Fixed effects	YES	YES	YES	YES	YES	YES
Number of observations	8,470	2,554	5,916	5,988	1,988	4,000
Adjusted R2	0.212	0.243	0.203	0.167	0.187	0.157

note: *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered at the strata level (firm size, sector, and within country location)

Table 3: Determinants of Formal Training - Type of Management Score

Model	OLS					
Outcome Variable	Firm offers formal training Y/N			Share of workers received formal training (0 if no training)		
Sample	All Firms	MENA 2013-2019	ECA 2013-2019	Manf. Firms	MENA Manf. Firms (2013-2019)	ECA Manf. Firms (2013-2019)
	(1)	(2)	(3)	(4)	(5)	(6)
Share of permanent full-time employees with a university degree (0 to 1)	0.253***	0.479***	0.190***	0.158***	0.317***	0.098*
	(0.051)	(0.094)	(0.057)	(0.044)	(0.080)	(0.052)
MG1 Action when problem in the production/service provision arose	0.030	-0.012	0.059	0.028	0.006	0.039
	(0.035)	(0.066)	(0.041)	(0.033)	(0.049)	(0.042)
MG2 Number of production or service provision performance indicators monitored	0.117***	0.137**	0.118***	0.084***	0.053	0.099***
	(0.034)	(0.063)	(0.038)	(0.026)	(0.043)	(0.030)
MG3 Level of ease or difficulty to achieve targets	0.001	-0.072	0.017	0.007	-0.033	0.017
	(0.034)	(0.058)	(0.040)	(0.025)	(0.044)	(0.029)
MG4 Personnel's knowledge of production or service provision targets	0.124***	0.018	0.127***	0.092***	0.007	0.104***
	(0.028)	(0.058)	(0.031)	(0.022)	(0.046)	(0.025)
MG5 What managers' performance bonuses were usually based on	0.054**	0.003	0.073**	0.009	-0.027	0.025
	(0.027)	(0.044)	(0.031)	(0.021)	(0.029)	(0.025)
MG6 Focus of production targets	-0.020	-0.000	-0.016	-0.032	-0.030	-0.026
	(0.032)	(0.073)	(0.035)	(0.028)	(0.040)	(0.032)
MG7 Basis for promoting non-mangers	0.025	0.024	0.027	-0.024	0.018	-0.042
	(0.026)	(0.045)	(0.029)	(0.021)	(0.032)	(0.025)
MG8 When underperforming managers were dismissed or reassigned	0.053**	-0.051	0.064***	0.025	-0.029	0.036
	(0.022)	(0.043)	(0.024)	(0.019)	(0.022)	(0.022)

Top manager experience in sector (years)	0.000	-0.006***	0.001	0.001	-0.001	0.002*
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Log of age of firm	-0.017	0.035	-0.027	-0.013	0.016	-0.021
	(0.016)	(0.024)	(0.018)	(0.012)	(0.017)	(0.014)
Proportion of temporary workers (out of all workers)	-0.028	-0.097	0.016	-0.158**	0.088	-0.222***
	(0.158)	(0.183)	(0.182)	(0.075)	(0.184)	(0.073)
Log of size	0.047***	0.034	0.045***	0.003	-0.013	0.004
	(0.012)	(0.024)	(0.014)	(0.009)	(0.020)	(0.010)
Senior management time spent in dealing with requirements of government regulations (%)	0.001	-0.001	0.001*	0.000	-0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Average number of visits or required meetings with tax officials	0.002	0.033*	-0.002	0.001	0.008	0.000
	(0.004)	(0.017)	(0.004)	(0.003)	(0.006)	(0.004)
Firm purchased fixed assets Y/N	0.147***	0.116***	0.148***	0.084***	0.060*	0.082***
	(0.020)	(0.041)	(0.022)	(0.016)	(0.031)	(0.019)
Direct exports 10% or more of sales Y/N	-0.013	-0.064	0.007	-0.015	-0.025	-0.009
	(0.024)	(0.040)	(0.028)	(0.018)	(0.028)	(0.022)
Foreign ownership Y/N	0.052*	0.014	0.062**	-0.003	0.011	-0.004
	(0.027)	(0.061)	(0.029)	(0.023)	(0.044)	(0.026)
Female top manager Y/N	0.010	0.039	0.006	0.006	-0.006	0.003
	(0.033)	(0.083)	(0.035)	(0.022)	(0.037)	(0.024)
Establishment has checking or savings account Y/N	0.052	0.017	0.086*	0.017	0.016	0.002
	(0.040)	(0.063)	(0.050)	(0.027)	(0.017)	(0.041)
ISO Certification Ownership Y/N	0.129***	0.168***	0.113***	0.070***	0.107**	0.059***
	(0.025)	(0.054)	(0.028)	(0.017)	(0.042)	(0.019)
Website Y/N	0.058***	0.008	0.075***	0.011	0.003	0.015
	(0.022)	(0.036)	(0.025)	(0.015)	(0.023)	(0.019)
Firm identifying inadequately educated workforce as a major or severe constraint	0.056**	0.035	0.058**	0.031	0.015	0.043*
	(0.026)	(0.053)	(0.028)	(0.021)	(0.036)	(0.025)
Firm identifying labor regulations as a major or severe constraint Y/N	0.024	-0.022	0.040	-0.015	-0.026	-0.008
	(0.034)	(0.053)	(0.039)	(0.028)	(0.031)	(0.036)
Competes against unregistered firms Y/N	0.043**	-0.007	0.055**	0.025	0.000	0.030
	(0.021)	(0.037)	(0.024)	(0.016)	(0.026)	(0.021)
Manufacturing Sector Y/N	-0.073***	-0.006	-0.087***			
	(0.023)	(0.048)	(0.026)			
Constant	-0.276***	-0.023	-0.190*	-0.100*	-0.035	-0.028
	(0.077)	(0.163)	(0.110)	(0.057)	(0.087)	(0.091)
Country Fixed Effects	YES	YES	YES	YES	YES	YES
Year Fixed effects	YES	YES	YES	YES	YES	YES
Number of observations	8,470	2,554	5,916	5,988	1,988	4,000
Adjusted R2	0.217	0.253	0.208	0.179	0.193	0.173

note: *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered at the strata
level (firm size, sector, and within country location)

Table 4: Determinants of Formal Training - MENA Panel Estimations

Model	Firm and Year Fixed Effects			
Outcome Variable	Firm offers formal training Y/N	Share of workers received formal training (0 if no training)	Firm offers formal training Y/N	Share of workers received formal training (0 if no training)
Sample	MENA 2013-2019	MENA 2013-2019 Manf. Firms	MENA 2013-2019	MENA 2013-2019 Manf. Firms
	(1)	(2)	(3)	(4)
Share of permanent full-time employees with a university degree (0 to 1)	0.373***	0.258***	0.419***	0.234***
	(0.074)	(0.072)	(0.121)	(0.089)
Overall management score	0.059	0.109		
	(0.291)	(0.114)		
MG1 Action when problem in the production/service provision arose			0.222**	0.017
			(0.102)	(0.057)
MG2 Number of production or service provision performance indicators monitored			0.189	0.033
			(0.124)	(0.046)
MG3 Level of ease or difficulty to achieve targets			-0.125	-0.075
			(0.096)	(0.092)
MG4 Personnel's knowledge of production or service provision targets			0.026	0.150*
			(0.150)	(0.087)
MG5 What managers' performance bonuses were usually based on			-0.086	-0.078
			(0.085)	(0.071)
MG6 Focus of production targets			-0.073	0.062
			(0.226)	(0.101)
MG7 Basis for promoting non-mangers			0.147	0.144
			(0.177)	(0.106)
MG8 When underperforming managers were dismissed or reassigned			-0.166**	-0.091*
			(0.083)	(0.048)
Control Variables	YES	YES	YES	YES
Firm Fixed Effects	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Number of observations	554	395	554	395
Adjusted R2	0.249	0.212	0.311	0.289

note: *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Standard errors clustered at the country level. Controls are not shown but are the same as in the base estimations in table 2, These include top manager experience in sector (years), log of age of firm, proportion of temporary workers (out of all workers), log of size of the firm, senior management time spent in dealing with requirements of government regulations (%), average number of visits or required meetings with tax officials, whether firms purchased fixed assets, exporter status, foreign ownership, female top manager, checking or savings account, ISO certification, website ownership, inadequately educated workforce as a major or severe constraint, labor regulations as a major or severe constraint, informal competition, and manufacturing sector. Estimates also include a constant. Note that some control variables do not vary over time.

Table 5: Determinants of Formal Training - ECA Panel Estimations

Model	Firm and Year Fixed Effects			
Outcome Variable	Firm offers formal training Y/N	Share of workers received formal training (0 if no training)	Firm offers formal training Y/N	Share of workers received formal training (0 if no training)
Sample	ECA 2013-2019	ECA 2013-2019 Manf. Firms	ECA 2013-2019	ECA 2013-2019 Manf. Firms
	(1)	(2)	(3)	(4)
Share of permanent full-time employees with a university degree (0 to 1)	0.084	-0.499**	0.039	-0.448**
	(0.469)	(0.210)	(0.450)	(0.199)
Overall management score	0.325*	0.595***		
	(0.193)	(0.123)		
MG1 Action when problem in the production/service provision arose			0.274**	0.120
			(0.115)	(0.130)
MG2 Number of production or service provision performance indicators monitored			0.203	0.062
			(0.155)	(0.117)
MG3 Level of ease or difficulty to achieve targets			0.091	0.120
			(0.086)	(0.115)
MG4 Personnel's knowledge of production or service provision targets			0.219*	0.170**
			(0.112)	(0.075)
MG5 What managers' performance bonuses were usually based on			0.035	-0.030
			(0.106)	(0.088)
MG6 Focus of production targets			0.027	0.190*
			(0.107)	(0.103)
MG7 Basis for promoting non-mangers			-0.180*	-0.121*
			(0.103)	(0.071)
MG8 When underperforming managers were dismissed or reassigned			-0.040	0.108*
			(0.071)	(0.065)
Control Variables	YES	YES	YES	YES
Firm Fixed Effects	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Number of observations	1,254	827	1,254	827
Adjusted R2	0.197	0.240	0.277	0.345

note: *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered at the country level. Controls are not shown but are the same as in the base estimations in table 2, These include top manager experience in sector (years), log of age of firm, proportion of temporary workers (out of all workers), log of size of the firm, senior management time spent in dealing with requirements of government regulations (%), average number of visits or required meetings with tax officials, whether firms purchased fixed assets, exporter status, foreign ownership, female top manager, checking or savings account, ISO certification, website ownership, inadequately educated workforce as a major or severe constraint, labor regulations as a major or severe constraint, informal competition, and manufacturing sector. Estimates also include a constant. Note that some control variables do not vary over time.

Table 6: Determinants of Types of training - MENA Cross section

Model	OLS					
Outcome Variable	Train: Numeracy or math skills	Train: Problem solving or critical thinking skills	Train: Foreign language skills	Train: Managerial and leadership skills	Train: Interpersonal and communication skills	Train: Job-specific technical skills
Sample	MENA 2019					
	(1)	(2)	(3)	(4)	(5)	(6)
Share of permanent full-time employees with a university degree (0 to 1)	0.002	0.001	-0.001	0.014	-0.021	0.538***
	(0.001)	(0.001)	(0.002)	(0.015)	(0.041)	(0.112)
Overall management score	0.0001	-0.002	-0.004	0.023	0.023	0.040
	(0.001)	(0.001)	(0.002)	(0.021)	(0.018)	(0.125)
Top manager experience in sector (years)	0.00003	0.0001	0.00005	-0.0003	-0.00003	-0.009***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.002)
Log of age of firm	-0.000	-0.001	-0.001	0.002	-0.009	0.072*
	(0.001)	(0.001)	(0.001)	(0.004)	(0.008)	(0.037)
Proportion of temporary workers (out of all workers)	0.002	-0.003	-0.006	0.139	0.143	-0.561**
	(0.004)	(0.003)	(0.007)	(0.132)	(0.170)	(0.262)
Log of size	0.000	0.001	0.000	0.022**	0.003	0.029
	(0.001)	(0.000)	(0.001)	(0.010)	(0.007)	(0.030)
Senior management time spent in dealing with requirements of government regulations (%)	0.0002	-0.0001	-0.0002	0.0004	0.0034	0.0007
	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)	(0.004)
Average number of visits or required meetings with tax officials	0.0001	0.0002	-0.0002	-0.003	0.006	0.048*
	(0.000)	(0.000)	(0.000)	(0.003)	(0.004)	(0.027)
Firm purchased fixed assets Y/N	-0.001	-0.000	0.001	-0.006	0.005	0.146**
	(0.001)	(0.000)	(0.001)	(0.011)	(0.011)	(0.060)
Direct exports 10% or more of sales Y/N	0.002	-0.000	0.000	-0.000	-0.004	-0.015
	(0.001)	(0.001)	(0.002)	(0.007)	(0.010)	(0.061)
Foreign ownership Y/N	-0.001	0.004	0.004	-0.000	-0.002	-0.134*
	(0.001)	(0.003)	(0.004)	(0.011)	(0.033)	(0.078)
Female top manager Y/N	-0.001	-0.000	0.006	-0.014**	-0.012	-0.063
	(0.001)	(0.000)	(0.004)	(0.007)	(0.018)	(0.099)
Establishment has checking or savings account Y/N	-0.002	0.001	0.001	0.004	-0.053	0.046
	(0.003)	(0.001)	(0.003)	(0.010)	(0.071)	(0.093)
ISO Certification Ownership Y/N	-0.001	0.001	0.000	-0.002	0.033	0.113
	(0.001)	(0.001)	(0.001)	(0.007)	(0.022)	(0.070)
Website Y/N	-0.000	-0.001	0.002	0.001	0.011	-0.002
	(0.001)	(0.001)	(0.001)	(0.010)	(0.013)	(0.042)
Firm identifying inadequately educated workforce as a major or severe constraint	-0.001	-0.000	0.001	-0.015*	-0.017	0.073
	(0.001)	(0.002)	(0.002)	(0.008)	(0.019)	(0.065)
Firm identifying labor regulations as a major or severe constraint Y/N	-0.001	0.001	-0.004	0.037**	-0.031	-0.028
	(0.001)	(0.002)	(0.003)	(0.018)	(0.027)	(0.082)
Competes against unregistered firms Y/N	-0.000	0.001	-0.000	0.001	0.022**	-0.118**

	(0.001)	(0.001)	(0.001)	(0.007)	(0.010)	(0.046)
Manufacturing Sector Y/N	-0.001	-0.001	0.001	-0.017*	-0.038*	-0.007
	(0.001)	(0.001)	(0.001)	(0.009)	(0.023)	(0.053)
Constant	0.004	-0.001	0.002	-0.013	0.068	-0.244
	(0.004)	(0.001)	(0.008)	(0.036)	(0.083)	(0.228)
Country Fixed Effects	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES
Number of observations	1,489	1,489	1,489	1,489	1,489	1,489
Adjusted R2	-0.006	-0.004	0.003	0.069	0.182	0.269

note: *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered at the strata level (firm size, sector, and within country location)

Table 7: Determinants of Types of training – ECA Cross section

Model	OLS					
Outcome Variable	Train: Numeracy or math skills	Train: Problem solving or critical thinking skills	Train: Foreign language skills	Train: Managerial and leadership skills	Train: Interpersonal and communication skills	Train: Job-specific technical skills
Sample	ECA 2019					
	(1)	(2)	(3)	(4)	(5)	(6)
Share of permanent full-time employees with a university degree (0 to 1)	0.0004	0.034	0.029**	-0.001	0.048*	0.061
	(0.010)	(0.025)	(0.013)	(0.027)	(0.029)	(0.057)
Overall management score	0.008	0.028	0.011	0.129***	0.012	0.264***
	(0.011)	(0.019)	(0.010)	(0.031)	(0.025)	(0.059)
Top manager experience in sector (years)	-0.0001	-0.0004	-0.00001	-0.001	-0.0001	0.003**
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Log of age of firm	0.002	-0.007	0.003	-0.001	-0.011	-0.009
	(0.005)	(0.007)	(0.004)	(0.008)	(0.012)	(0.018)
Proportion of temporary workers (out of all workers)	-0.020*	-0.039**	-0.025	0.030	-0.072**	0.089
	(0.012)	(0.016)	(0.016)	(0.071)	(0.035)	(0.176)
Log of size	-0.001	0.010**	0.003	-0.003	0.021***	0.022*
	(0.003)	(0.004)	(0.003)	(0.006)	(0.007)	(0.013)
Senior management time spent in dealing with requirements of government regulations (%)	0.0001	-0.0003	-0.0003	0.001*	0.001	0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Average number of visits or required meetings with tax officials	0.001	-0.002	0.001	-0.006***	0.001	0.0002
	(0.002)	(0.001)	(0.001)	(0.002)	(0.004)	(0.005)
Firm purchased fixed assets Y/N	0.006	0.008	0.002	0.009	-0.003	0.103***
	(0.005)	(0.008)	(0.005)	(0.011)	(0.011)	(0.023)
Direct exports 10% or more of sales Y/N	0.015*	0.006	0.005	0.010	-0.009	0.005
	(0.009)	(0.012)	(0.008)	(0.014)	(0.015)	(0.032)
Foreign ownership Y/N	-0.002	-0.013	0.032**	0.031	0.037	-0.011
	(0.005)	(0.008)	(0.013)	(0.025)	(0.023)	(0.035)
Female top manager Y/N	-0.000	-0.007	-0.006	-0.014	0.031	-0.032
	(0.006)	(0.009)	(0.007)	(0.015)	(0.020)	(0.029)
Establishment has checking or savings account Y/N	0.003	0.012	-0.005	-0.013	0.015	0.016
	(0.004)	(0.008)	(0.016)	(0.029)	(0.017)	(0.071)
ISO Certification Ownership Y/N	-0.004	-0.008	0.004	-0.005	-0.027**	0.097***
	(0.004)	(0.007)	(0.008)	(0.011)	(0.012)	(0.031)
Website Y/N	0.002	-0.005	-0.003	0.016	0.017*	0.041
	(0.006)	(0.009)	(0.004)	(0.014)	(0.010)	(0.026)
Firm identifying inadequately educated workforce as a major or severe constraint	-0.002	-0.011	0.003	0.019	0.011	0.041
	(0.005)	(0.008)	(0.006)	(0.014)	(0.013)	(0.026)
Firm identifying labor regulations as a major or severe constraint Y/N	0.012	0.005	-0.014*	0.027	-0.025	0.034
	(0.015)	(0.008)	(0.008)	(0.024)	(0.017)	(0.046)
Competes against unregistered firms Y/N	0.005	0.001	-0.011***	0.014	0.013	0.009
	(0.005)	(0.010)	(0.004)	(0.012)	(0.012)	(0.028)
Manufacturing Sector Y/N	0.000	-0.010	-0.003	-0.026**	-0.032***	-0.017

	(1)	(2)	(3)	(4)	(5)	(6)
	(0.005)	(0.008)	(0.005)	(0.012)	(0.012)	(0.027)
Constant	-0.020	-0.025	-0.016	-0.040	-0.070*	-0.041
	(0.013)	(0.024)	(0.017)	(0.041)	(0.037)	(0.150)
Country Fixed Effects	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES
Number of observations	4,658	4,658	4,658	4,658	4,658	4,658
Adjusted R2	0.028	0.023	0.081	0.050	0.052	0.144

note: *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered at the strata level (firm size, sector, and within country location)

Table 8: Robustness - Accounting for Skills

Model	OLS - Country and Year Fixed Effects		Firm and Year Fixed Effects		OLS - Country and Year Fixed Effects		Firm and Year Fixed Effects	
Outcome Variable	Firm offers formal training Y/N	Share of workers received formal training (0 if no training)	Firm offers formal training Y/N	Share of workers received formal training (0 if no training)	Firm offers formal training Y/N	Share of workers received formal training (0 if no training)	Firm offers formal training Y/N	Share of workers received formal training (0 if no training)
Sample Sector	Manf.	Manf.	Manf.	Manf.	Manf.	Manf.	Manf.	Manf.
Sample	MENA Firms - Pooled Cross section		MENA Firms - Panel		ECA Firms - Pooled Cross section		ECA Firms - Panel	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Share of permanent full-time employees with a university degree (0 to 1)	0.443***	0.324***	0.348***	0.362***	0.102	0.103*	-0.386	-0.573**
	(0.127)	(0.088)	(0.099)	(0.115)	(0.070)	(0.054)	(0.430)	(0.236)
Overall management score	0.117	-0.017	-0.361	-0.118	0.463***	0.215***	0.694***	0.584***
	(0.133)	(0.084)	(0.302)	(0.226)	(0.072)	(0.050)	(0.246)	(0.128)
Share of High-Skilled Production Workers (manf only)	0.075	0.109**	0.056	0.212*	-0.076	-0.023	-0.097	-0.019
	(0.077)	(0.052)	(0.141)	(0.112)	(0.056)	(0.041)	(0.152)	(0.139)
Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Country Fixed Effects	YES	YES	NO	NO	YES	YES	NO	NO
Firm Fixed Effects	NO	NO	YES	YES	NO	NO	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Number of observations	1,953	1,902	392	376	3,954	3,835	817	787
Adjusted R2	0.238	0.199	0.299	0.252	0.218	0.155	0.301	0.236

note: *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered at the strata level (firm size, sector, and within country location) for cross-section, clustered at the country level for panel. Controls are not shown but are the same as in the base estimations in table 2, These include top manager experience in sector (years), log of age of firm, proportion of temporary workers (out of all workers), log of size of the firm, senior management time spent in dealing with requirements of government regulations (%), average number of visits or required meetings with tax officials, whether firms purchased fixed assets, exporter status, foreign ownership, female top manager, checking or savings account, ISO certification, website ownership, inadequately educated workforce as a major or severe constraint, labor regulations as a major or severe constraint, informal competition, and manufacturing sector. Estimates also include a constant. Note that some control variables do not vary over time.

Table 9: Robustness - Gender Composition of Workforce

Model	OLS - Country and Year Fixed Effects		Firm and Year Fixed Effects		OLS - Country and Year Fixed Effects		Firm and Year Fixed Effects	
Outcome Variable	Firm offers formal training Y/N	Share of workers received formal training (0 if no training)	Firm offers formal training Y/N	Share of workers received formal training (0 if no training)	Firm offers formal training Y/N	Share of workers received formal training (0 if no training)	Firm offers formal training Y/N	Share of workers received formal training (0 if no training)
Sample Sector	All	Manf.	All	Manf.	All	Manf.	All	Manf.
Sample	MENA Firms - Pooled Cross section		MENA Firms - Panel		ECA Firms - Pooled Cross section		ECA Firms - Panel	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Share of permanent full-time employees with a university degree (0 to 1)	0.539***	0.346***	0.278*	0.235**	0.189***	0.095*	0.051	-0.478**
	(0.097)	(0.079)	(0.166)	(0.107)	(0.057)	(0.051)	(0.486)	(0.218)
Overall management score	0.063	-0.037	-0.076	0.017	0.475***	0.236***	0.318	0.527***
	(0.100)	(0.082)	(0.262)	(0.073)	(0.053)	(0.049)	(0.203)	(0.131)
Proportion of permanent full-time workers that are female	0.099	0.001	0.177***	0.184**	-0.059	-0.063**	-0.501**	-0.290***
	(0.068)	(0.047)	(0.062)	(0.080)	(0.037)	(0.032)	(0.196)	(0.102)
Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Country Fixed Effects	YES	YES	NO	NO	YES	YES	NO	NO
Firm Fixed Effects	NO	NO	YES	YES	NO	NO	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Number of observations	2,472	1,955	529	385	5,718	3,901	1,209	804
Adjusted R2	0.257	0.197	0.267	0.240	0.210	0.160	0.260	0.271

note: *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered at the strata level (firm size, sector, and within country location) for cross-section, clustered at the country level for panel. Controls are not shown but are the same as in the base estimations in table 2, These include top manager experience in sector (years), log of age of firm, proportion of temporary workers (out of all workers), log of size of the firm, senior management time spent in dealing with requirements of government regulations (%), average number of visits or required meetings with tax officials, whether firms purchased fixed assets, exporter status, foreign ownership, female top manager, checking or savings account, ISO certification, website ownership, inadequately educated workforce as a major or severe constraint, labor regulations as a major or severe constraint, informal competition, and manufacturing sector. Estimates also include a constant. Note that some control variables do not vary over time.

Table 10: Robustness - Regulation and Perceptions

Model	OLS - Country and Year Fixed Effects		Firm and Year Fixed Effects		OLS - Country and Year Fixed Effects		Firm and Year Fixed Effects	
Outcome Variable	Firm offers formal training Y/N	Share of workers received formal training (0 if no training)	Firm offers formal training Y/N	Share of workers received formal training (0 if no training)	Firm offers formal training Y/N	Share of workers received formal training (0 if no training)	Firm offers formal training Y/N	Share of workers received formal training (0 if no training)
Sample Sector	**All**	**Manf.**	**All**	**Manf.**	**All**	**Manf.**	**All**	**Manf.**
Sample	**MENA Firms - Pooled Cross section**		**MENA Firms - Panel**		**ECA Firms - Pooled Cross section**		**ECA Firms - Panel**	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Share of permanent full-time employees with a university degree (0 to 1)	0.466***	0.300***	0.239***	0.227***	0.186***	0.104**	0.014	-0.531**
	(0.095)	(0.077)	(0.081)	(0.067)	(0.057)	(0.051)	(0.522)	(0.207)
Overall management score	0.085	-0.050	0.172	0.124	0.460***	0.244***	0.466**	0.710***
	(0.103)	(0.078)	(0.251)	(0.112)	(0.054)	(0.050)	(0.206)	(0.169)
Inadequately Educated Workforce (cell average)	0.048	-0.366**	-0.049	-0.015	0.094	-0.014	0.053	-0.150
	(0.148)	(0.148)	(0.342)	(0.223)	(0.060)	(0.072)	(0.169)	(0.218)
Labor Regulations obstacle (cell average)	0.287*	0.149	0.322	-0.063	0.100	0.154*	1.198***	0.890***
	(0.156)	(0.095)	(0.393)	(0.106)	(0.093)	(0.082)	(0.399)	(0.317)
Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Country Fixed Effects	YES	YES	NO	NO	YES	YES	NO	NO
Firm Fixed Effects	NO	NO	YES	YES	NO	NO	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Number of observations	2,616	2,043	552	401	5,943	4,024	1,260	833
Adjusted R2	0.238	0.197	0.237	0.197	0.202	0.158	0.235	0.282

note: *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered at the strata level (firm size, sector, and within country location) for cross-section, clustered at the country level for panel. Controls are not shown but are the same as in the base estimations in table 2, These include top manager experience in sector (years), log of age of firm, proportion of temporary workers (out of all workers), log of size of the firm, senior management time spent in dealing with requirements of government regulations (%), average number of visits or required meetings with tax officials, whether firms purchased fixed assets, exporter status, foreign ownership, female top manager, checking or savings account, ISO certification, website ownership, inadequately educated workforce as a major or severe constraint, labor regulations as a major or severe constraint, informal competition, and manufacturing sector. Estimates also include a constant. Note that some control variables do not vary over time.

Table A1: Characteristics of Training Firms

	MENA2013		**MENA2019**		**ECA2013**		**ECA2019**	
	Training Firms	Non-Trainers	Training Firms	Non-Trainers	Training Firms	Non-Trainers	Training Firms	Non-Trainers
Small Firms (%)	37	68	44	71	54	69	57	73
Medium Firms (%)	40	27	42	24	33	27	31	23
Large Firms (%)	23	5	14	5	13	5	12	4
Young Firms (5 years or less)	9	18	7	7	12	14	11	13
Manufacturing firms (%)	37	43	29	37	25	32	27	28
Exporter (%)	29	21	23	17	17	14	19	15
Foreign Owned (%)	11	6	12	6	12	6	10	6
Female Top Manager (%)	5	5	6	5	19	19	19	20
Female Owner (%)	36	26	24	15	35	32	32	31

Note: This sample includes small, medium and large firms. Regression estimation samples exclude small firms as data on management practices is only available for medium and large enterprises

Table A2: Management Practices Scoring

MG1 Problem resolution (r1)	Score
Action when problem in the production/service provision arose	
Most structured: We fixed it and took action to make sure that it did not happen again, and had a continuous improvement process to anticipate problems like these in advance	1
Second most structured: We fixed it and took action to make sure it did not happen again	0.667
Second least structured: We fixed it but did not take further action	0.333
Least structured: No action was taken	0

MG2 Number of performance indicators monitored (r3)	Score
Number of production or service provision performance indicators monitored	
10 or more indicators	1
3-9 indicators	0.667
1-2 indicators	0.333
No indicators	0

MG6 Length of focus of production targets	Score
Focus of production targets	
Combination of short-term and long-term targets	1
long-term only	0.667
short-term only	0.333
No targets or targets not achieved	0

MG3 Level of ease or difficulty to achieve production or service provision targets (r6)	Score
Level of ease or difficulty to achieve targets	
No targets or targets not achieved	0
Achieved without much effort	0.2
Only achieved with extraordinary effort	0.4
Achieved with some effort	0.6
Achieved with normal amount of effort	0.8
Achieved with more than normal effort	1

MG4 Knowledge of production or service provision targets (r7)	Score
Personnel's knowledge of production or service provision targets	
All managers and most workers	1
Most managers and most workers	0.667
Most managers and some workers	0.333
Only senior managers	0
No targets	0

MG5 Basis of bonuses (r9)	Score
What managers' performance bonuses were usually based on	
Their own performance as measured by targets	1
Their team or shift performance as measured by targets	0.75
Their establishment's performance as measured by targets	0.5
Their company's performance as measured by targets	0.25
No performance bonuses	0

MG7 Promotion of non-mangers	Score
Basis for promoting non-mangers	
Based solely on performance and ability	1
Based partly on performance and ability, and partly on other factors (for example, tenure or family connections)	0.667
Based mainly on factors other than performance and ability (for example, tenure or family connections)	0.333
Non-managers are normally not promoted	0

MG8 Dismissal	Score
When underperforming managers were dismissed or reassigned	
Within 6 months of underperformance	1
After 6 months	0.5
Rarely or never	0

Note: "Don't know" responses are equated to 0, assigning the worst level of management practices

Table A2: Summary Statistics - MENA Cross Sample (2013-2019/2020)

Variable	Obs	Mean	Std. Dev.	Min	Max
Firm offers formal training Y/N	2,554	0.243	0.429	0	1
Share of workers received formal training (0 if no training)	1,988	0.090	0.235	0	1
Overall management score	2,554	0.486	0.199	0	1
MG1 Action when problem in the production/service provision arose	2,554	0.602	0.334	0	1
MG2 Number of production or service provision performance indicators monitored	2,554	0.360	0.336	0	1
MG3 Level of ease or difficulty to achieve targets	2,554	0.551	0.369	0	1
MG4 Personnel's knowledge of production or service provision targets	2,554	0.260	0.334	0	1
MG5 What managers' performance bonuses were usually based on	2,554	0.560	0.428	0	1
MG6 Focus of production targets	2,554	0.569	0.378	0	1
MG7 Basis for promoting non-mangers	2,554	0.693	0.399	0	1
MG8 When underperforming managers were dismissed or reassigned	2,554	0.293	0.395	0	1
Share of permanent full-time employees with a university degree (0 to 1)	2,554	0.255	0.220	0	1
Train: Numeracy or math skills	1,489	0.0004	0.021	0	1
Train: Problem solving or critical thinking skills	1,489	0.0003	0.016	0	1
Train: Foreign language skills	1,489	0.001	0.028	0	1
Train: Managerial and leadership skills	1,489	0.009	0.097	0	1
Train: Interpersonal and communication skills	1,489	0.016	0.127	0	1
Train: Job-specific technical skills	1,489	0.251	0.434	0	1
Top manager experience in sector (years)	2,554	24.341	11.647	1	60
Log of age of firm	2,554	2.990	0.733	0	5.050
Proportion of permanent full-time workers that are female	2,472	0.253	0.274	0	1
Proportion of temporary workers (out of all workers)	2,554	0.038	0.097	0	0.826
Log of size	2,554	3.845	0.824	1.897	7.601
Senior management time spent in dealing with requirements of government regulations (%)	2,554	10.023	23.423	0	100

Variable	Obs	Mean	Std. Dev.	Min	Max
Average number of visits or required meetings with tax officials	2,554	0.943	1.326	0	13
Firm purchased fixed assets Y/N	2,554	0.317	0.465	0	1
Direct exports 10% or more of sales Y/N	2,554	0.334	0.472	0	1
Foreign ownership Y/N	2,554	0.067	0.249	0	1
Female top manager Y/N	2,554	0.058	0.234	0	1
Establishment has checking or savings account Y/N	2,554	0.926	0.262	0	1
ISO Certification Ownership Y/N	2,554	0.262	0.440	0	1
Website Y/N	2,554	0.662	0.473	0	1
Firm identifying inadequately educated workforce as a major or severe constraint	2,554	0.220	0.414	0	1
Firm identifying labor regulations as a major or severe constraint Y/N	2,554	0.105	0.306	0	1
Share of High-Skilled Production Workers (manf only)	1,953	0.369	0.269	0	1
Inadequately Educated Workforce (cell average)	2,539	0.205	0.196	0	1
Labor Regulations obstacle (cell average)	2,539	0.093	0.124	0	1
Competes against unregistered firms Y/N	2,554	0.454	0.498	0	1
Manufacturing Sector Y/N	2,554	0.681	0.466	0	1

Table A3: Summary Statistics - ECA 2013-2019 (pooled cross-section)

Variable	Obs	Mean	Std. Dev.	Min	Max
Firm offers formal training Y/N	5,916	0.427	0.495	0	1
Share of workers received formal training (0 if no training)	4,000	0.190	0.328	0	1
Overall management score	5,916	0.529	0.196	0	1
MG1 Action when problem in the production/service provision arose	5,916	0.697	0.277	0	1
MG2 Number of production or service provision performance indicators monitored	5,916	0.444	0.331	0	1
MG3 Level of ease or difficulty to achieve targets	5,916	0.587	0.349	0	1
MG4 Personnel's knowledge of production or service provision targets	5,916	0.383	0.389	0	1
MG5 What managers' performance bonuses were usually based on	5,916	0.388	0.392	0	1
MG6 Focus of production targets	5,916	0.610	0.378	0	1
MG7 Basis for promoting non-mangers	5,916	0.706	0.417	0	1
MG8 When underperforming managers were dismissed or reassigned	5,916	0.414	0.462	0	1
Share of permanent full-time employees with a university degree (0 to 1)	5,916	0.251	0.239	0	1
Train: Numeracy or math skills	4,658	0.009	0.093	0	1
Train: Problem solving or critical thinking skills	4,658	0.019	0.136	0	1
Train: Foreign language skills	4,658	0.015	0.122	0	1
Train: Managerial and leadership skills	4,658	0.041	0.198	0	1
Train: Interpersonal and communication skills	4,658	0.041	0.199	0	1
Train: Job-specific technical skills	4,658	0.286	0.452	0	1
Top manager experience in sector (years)	5,916	19.989	10.657	1	60
Log of age of firm	5,916	2.771	0.646	0	5.030
Proportion of permanent full-time workers that are female	5,718	0.370	0.288	0	1
Proportion of temporary workers (out of all workers)	5,916	0.030	0.091	0	0.929

Log of size	5,916	3.909	0.870	1.099	8.006
Senior management time spent in dealing with requirements of government regulations (%)	5,916	10.714	14.931	0	100
Average number of visits or required meetings with tax officials	5,916	1.285	2.359	0	30
Firm purchased fixed assets Y/N	5,916	0.565	0.496	0	1
Direct exports 10% or more of sales Y/N	5,916	0.313	0.464	0	1
Foreign ownership Y/N	5,916	0.137	0.344	0	1
Female top manager Y/N	5,916	0.157	0.363	0	1
Establishment has checking or savings account Y/N	5,916	0.970	0.170	0	1
ISO Certification Ownership Y/N	5,916	0.377	0.485	0	1
Website Y/N	5,916	0.744	0.437	0	1
Firm identifying inadequately educated workforce as a major or severe constraint	5,916	0.264	0.441	0	1
Firm identifying labor regulations as a major or severe constraint Y/N	5,916	0.079	0.269	0	1
Share of High-Skilled Production Workers (manf only)	3,954	0.401	0.300	0	1
Inadequately Educated Workforce (cell average)	5,889	0.238	0.189	0	1
Labor Regulations obstacle (cell average)	5,889	0.081	0.120	0	1
Competes against unregistered firms Y/N	5,916	0.328	0.470	0	1
Manufacturing Sector Y/N	5,916	0.540	0.498	0	1

Table A4: Summary Statistics - MENA Panel Sample

Variable	Obs	Mean	Std. Dev.	Min	Max
Firm offers formal training Y/N	554	0.253	0.435	0	1
Share of workers received formal training (0 if no training)	395	0.090	0.218	0	1
Overall management score	554	0.494	0.199	0	1
MG1 Action when problem in the production/service provision arose	554	0.639	0.304	0	1
MG2 Number of production or service provision performance indicators monitored	554	0.345	0.337	0	1
MG3 Level of ease or difficulty to achieve targets	554	0.560	0.383	0	1
MG4 Personnel's knowledge of production or service provision targets	554	0.268	0.339	0	1
MG5 What managers' performance bonuses were usually based on	554	0.554	0.430	0	1
MG6 Focus of production targets	554	0.559	0.390	0	1
MG7 Basis for promoting non-mangers	554	0.741	0.383	0	1
MG8 When underperforming managers were dismissed or reassigned	554	0.289	0.415	0	1
Share of permanent full-time employees with a university degree (0 to 1)	554	0.280	0.238	0	1
Top manager experience in sector (years)	554	24.134	11.579	1	60
Log of age of firm	554	3.086	0.686	0.693	5.050
Proportion of permanent full-time workers that are female	529	0.240	0.285	0	1
Proportion of temporary workers (out of all workers)	554	0.037	0.088	0	0.669

| Variable	Obs	Mean	Std. Dev.	Min	Max
Log of size	554	4.278	1.044	2.303	7.601
Senior management time spent in dealing with requirements of government regulations (%)	554	7.964	21.105	0	100
Average number of visits or required meetings with tax officials	554	1.204	1.722	0	13
Firm purchased fixed assets Y/N	554	0.312	0.464	0	1
Direct exports 10% or more of sales Y/N	554	0.336	0.473	0	1
Foreign ownership Y/N	554	0.083	0.276	0	1
Female top manager Y/N	554	0.038	0.191	0	1
Establishment has checking or savings account Y/N	554	0.904	0.294	0	1
ISO Certification Ownership Y/N	554	0.336	0.473	0	1
Website Y/N	554	0.657	0.475	0	1
Firm identifying inadequately educated workforce as a major or severe constraint	554	0.181	0.385	0	1
Firm identifying labor regulations as a major or severe constraint Y/N	554	0.079	0.271	0	1
Share of High-Skilled Production Workers (manf only)	392	0.371	0.273	0	1
Inadequately Educated Workforce (cell average)	544	0.182	0.179	0	1
Labor Regulations obstacle (cell average)	544	0.094	0.121	0	1
Competes against unregistered firms Y/N	554	0.478	0.500	0	1
Manufacturing Sector Y/N	554	0.729	0.445	0	1

Table A5: Summary Statistics - ECA Panel Sample

Variable	Obs	Mean	Std. Dev.	Min	Max
Firm offers formal training Y/N	1254	0.423	0.494	0	1
Share of workers received formal training (0 if no training)	827	0.230	0.354	0	1
Overall management score	1254	0.516	0.191	0	0.958
MG1 Action when problem in the production/service provision arose	1254	0.684	0.262	0	1
MG2 Number of production or service provision performance indicators monitored	1254	0.423	0.325	0	1
MG3 Level of ease or difficulty to achieve targets	1254	0.572	0.353	0	1
MG4 Personnel's knowledge of production or service provision targets	1254	0.352	0.370	0	1
MG5 What managers' performance bonuses were usually based on	1254	0.411	0.394	0	1
MG6 Focus of production targets	1254	0.578	0.365	0	1
MG7 Basis for promoting non-mangers	1254	0.697	0.416	0	1
MG8 When underperforming managers were dismissed or reassigned	1254	0.408	0.460	0	1
Share of permanent full-time employees with a university degree (0 to 1)	1254	0.244	0.227	0	1
Top manager experience in sector (years)	1254	21.179	11.000	1	60
Log of age of firm	1254	2.889	0.625	0.000	5.030
Proportion of permanent full-time workers that are female	1209	0.384	0.296	0	1
Proportion of temporary workers (out of all workers)	1254	0.023	0.079	0	0.882
Log of size	1254	4.197	0.993	1.099	8.006

|					
Senior management time spent in dealing with requirements of government regulations (%)	1254	12.089	16.738	0	100
Average number of visits or required meetings with tax officials	1254	1.275	2.493	0	30
Firm purchased fixed assets Y/N	1254	0.511	0.500	0	1
Direct exports 10% or more of sales Y/N	1254	0.292	0.455	0	1
Foreign ownership Y/N	1254	0.093	0.291	0	1
Female top manager Y/N	1254	0.143	0.350	0	1
Establishment has checking or savings account Y/N	1254	0.960	0.196	0	1
ISO Certification Ownership Y/N	1254	0.410	0.492	0	1
Website Y/N	1254	0.774	0.418	0	1
Firm identifying inadequately educated workforce as a major or severe constraint	1254	0.253	0.435	0	1
Firm identifying labor regulations as a major or severe constraint Y/N	1254	0.084	0.277	0	1
Share of High-Skilled Production Workers (manf only)	817	0.433	0.287	0	1
Inadequately Educated Workforce (cell average)	1247	0.230	0.192	0	1
Labor Regulations obstacle (cell average)	1248	0.086	0.141	0	1
Competes against unregistered firms Y/N	1254	0.359	0.480	0	1
Manufacturing Sector Y/N	1254	0.683	0.466	0	1

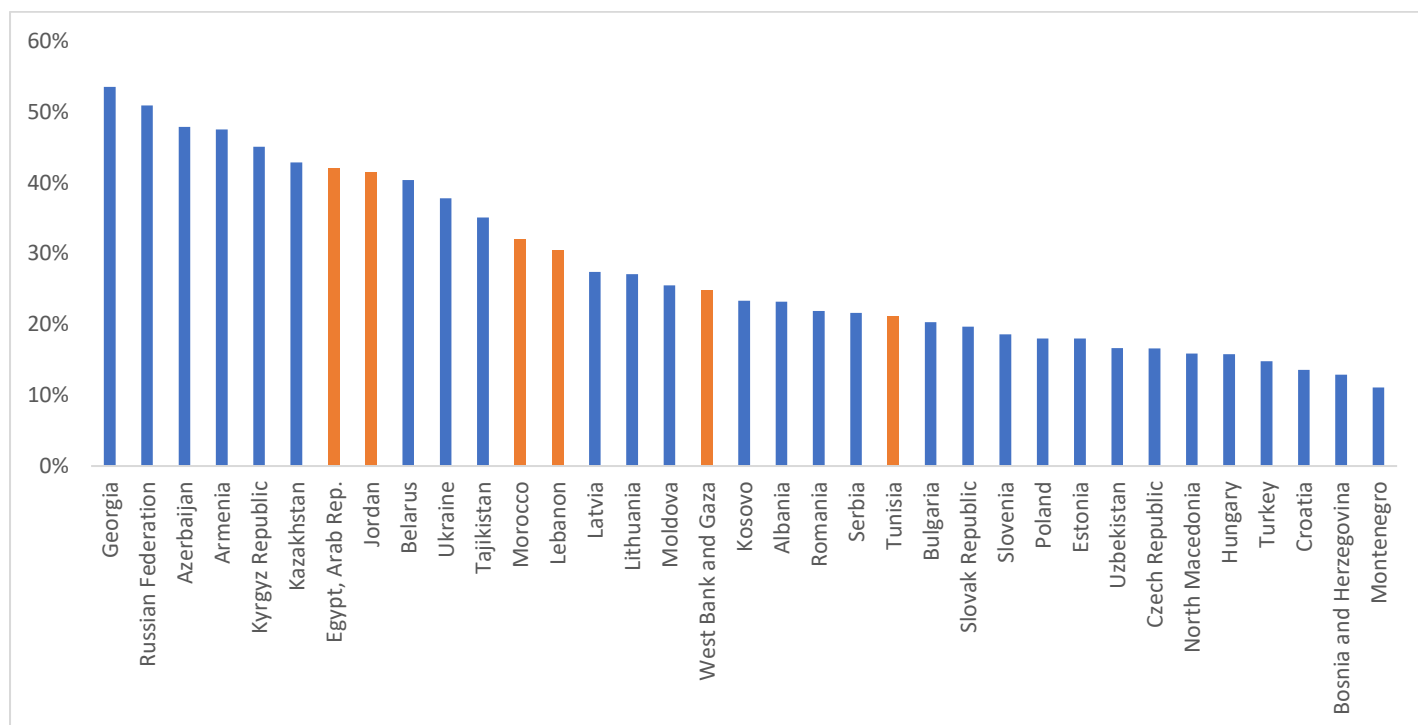**Figure 1: Firm offers formal training (% of firms)**
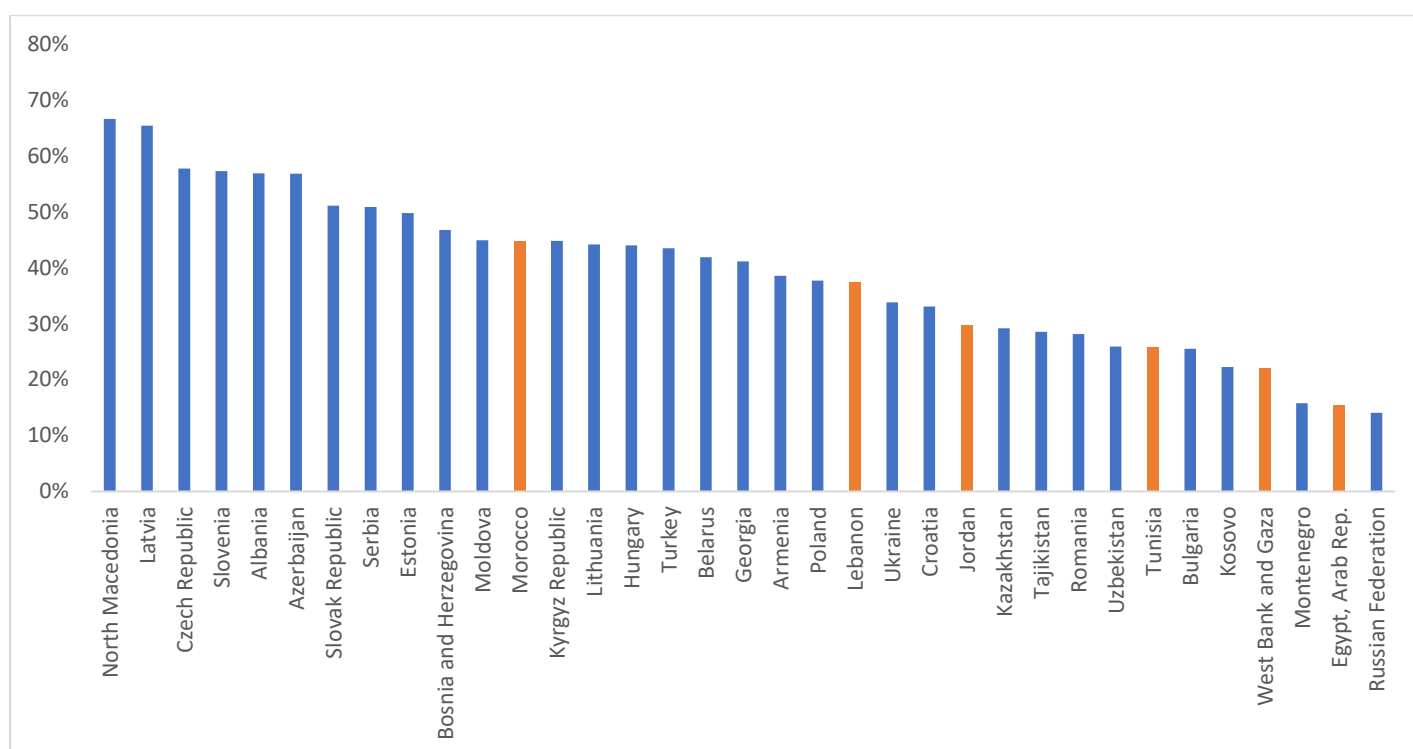
Note: Medium and large firms only. Survey weights used to calculate averages

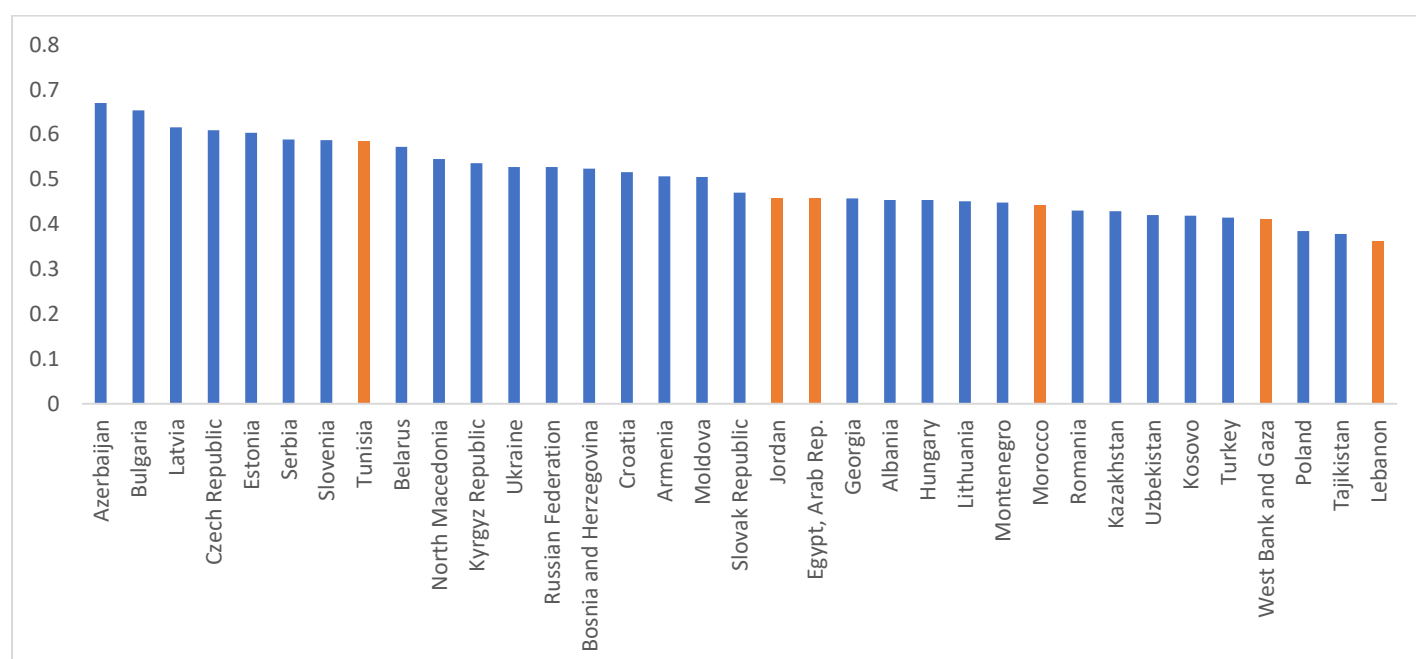**Figure 2: Percentage of workers received formal training (0 if no training)**
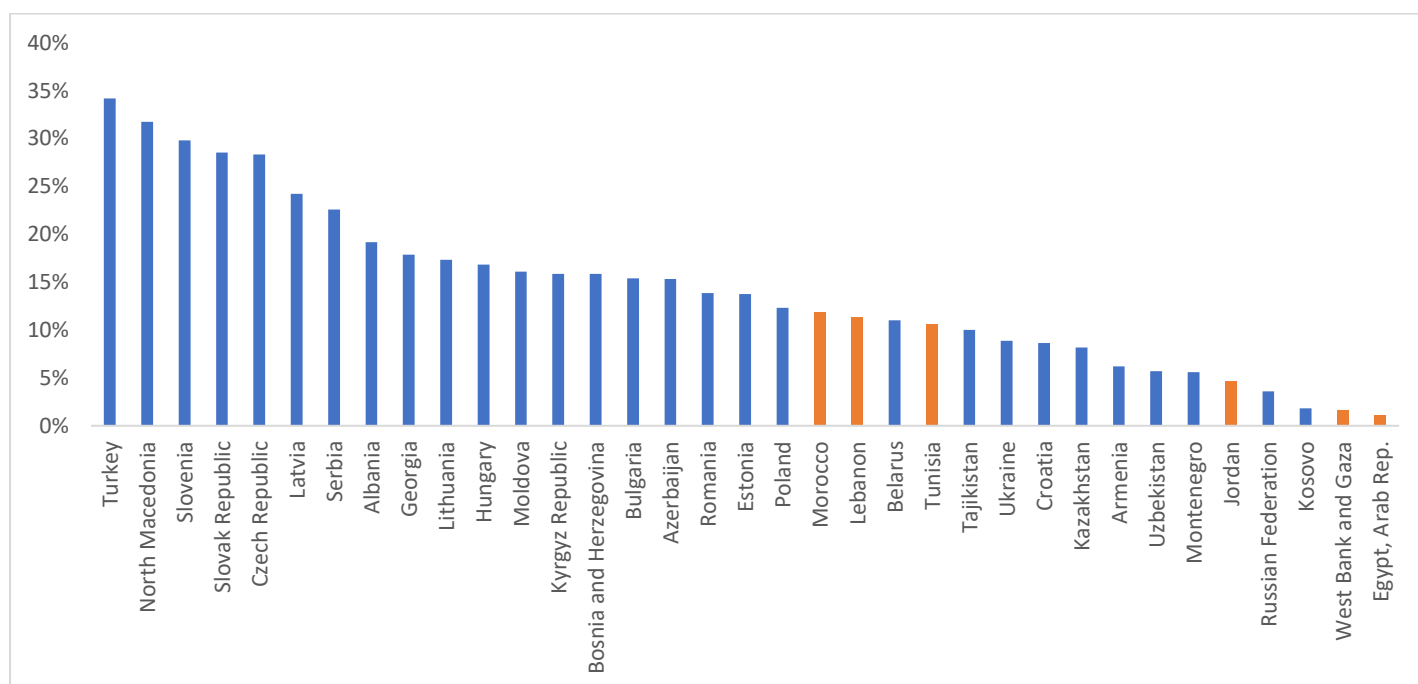
Note: Medium and large manufacturing firms only. Survey weights used to calculate averages

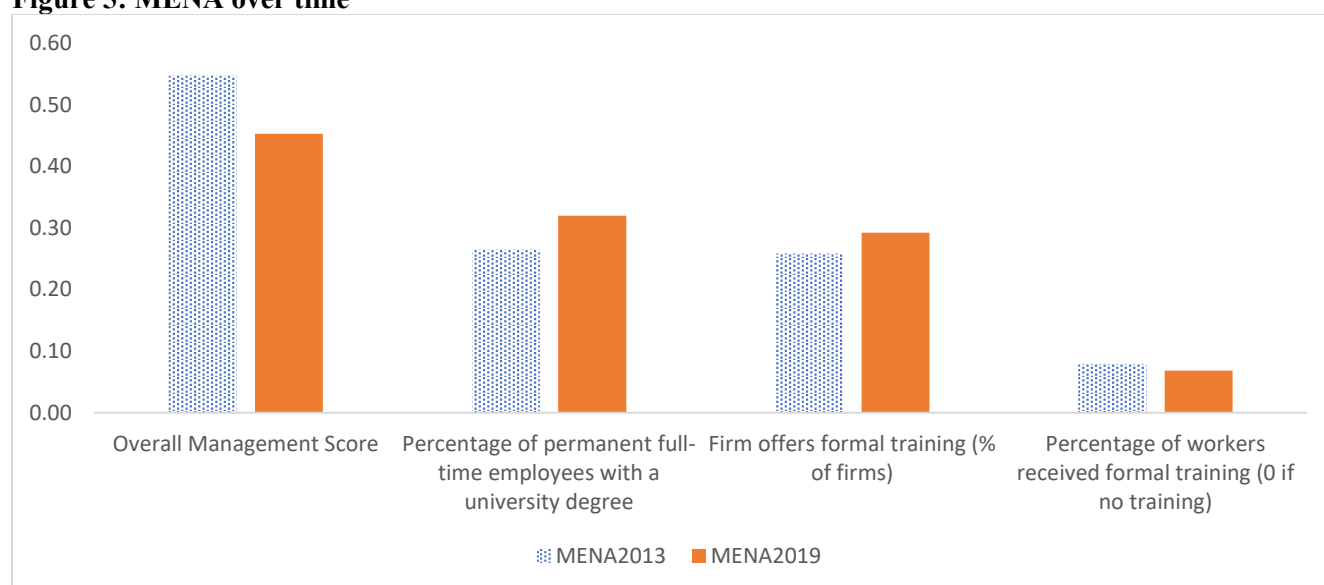**Figure 3: Percentage of permanent full-time employees with a university degree**

Note: Medium and large firms only. Survey weights used to calculate averages

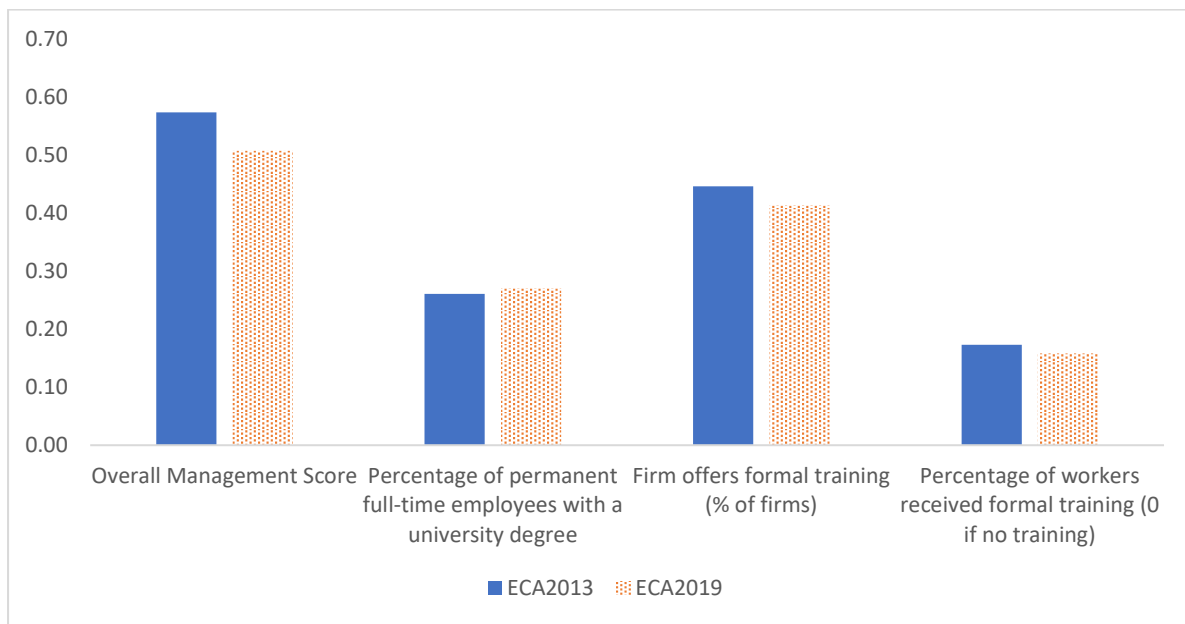**Figure 4: Overall Management Score**

Note: Medium and large firms only. Survey weights used to calculate averages

Figure 5: MENA over time

Note: Medium and large firms only. Survey weights used to calculate averages

Figure 6: ECA over time

Note: Medium and large firms only. Survey weights used to calculate averages

THE HUMAN CAPITAL OF FIRMS AND THE FORMAL TRAINING OF WORKERS

The case of firms in the Middle East and North Africa

European Investment Bank
The EU bank

European Bank
for Reconstruction and Development

WORLD BANK GROUP