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Performance and conflict

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Management in Pakistan: Performance and Conflict

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Abstract: Working with the Pakistan Bureau of Statistics we collect data on management practices in Pakistan covering 2015 and 2010 in about 4,500 manufacturing firms. We find very large variations within and between the provinces in our survey. Average management scores are well behind those of the global frontier (such as in the US) although there has been some improvement over the last decade. Higher management scores are associated with superior firm performance as measured by productivity, profitability and jobs growth. Firms which have more skilled employees, who are larger, older and/or more export oriented have more structured management practices. We find that areas (tehsils) in Pakistan that had the largest increases in terrorist activity over the 2005-2015 period also had the biggest deterioration in management practices. This suggests another (hitherto unexplored) channel through which conflict depresses economic performance.

JEL No: L2, M2, O32, O33

Keywords: management practices, productivity, competition

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1. INTRODUCTION

The vast inequality in performance between firms and establishments within countries as well as differences across countries have been thoroughly documented in the past decades (Syverson 2004; Foster, Syverson and Haltiwanger 2008; Hsieh and Klenow 2009). An emerging literature finds that large variations in management practices are strongly associated with differences in performance across firms and countries (Ichniowski, Shaw, and Prennushi 1997; Bertrand and Schoar 2003; Black and Lynch 2001; Bloom and Van Reenen 2007, Bloom et al 2014, McKenzie and Woodruff 2015) and suggests that this relationship may be causal (Bloom et al 2013).

The key purpose of this project is to measure management practices, undertake a rigorous empirical analysis of the management-performance relationship, and investigate the unique determinants of management practices in manufacturing firms in Pakistan. In partnership with the State Bank of Pakistan (SBP) and the Pakistan Bureau of Statistics (PBS) and thanks to funding from PEDL and the IGC, we extended the US Census Management and Organizational Practices Survey (MOPS) methodology (Bloom et al 2013) for the first time to nearly 2,000 firms in Punjab and Islamabad, Pakistan in 2014-2015 (see Lemos et al 2016). For the second time we extended the survey to firms in Sindh, Baluchistan and KPK provinces of Pakistan, which have been previously inaccessible to applied-micro researchers due to the lack of administrative data and difficulties in collecting data on the field, as well as a larger sample from Punjab and Islamabad through a nation-wide census survey in 2017-2018.

This paper focuses on a large-scale survey of management in Pakistan. The existing MOPS surveys have been on OECD countries, so a key motivation is to examine the role of management in a developing country. Pakistan – a lower-middle income country – is also an interesting place to focus on as it faces a huge challenge of internal conflict reflected in a large number of terrorist events. As we will show, over the last decade the number of terrorist events in Pakistan has been higher than every other country in the world except Iraq. There is a large emerging literature on the economic costs of terrorism (see for example, Abadie and Gardeazabal 2003, 2008, Blomberg et al. 2004, Crain and Crain 2006, Becker and Rubinstein 2011, Meierrieks and Gries 2013, and Brodeur 2018). However, to our knowledge there has been no work examining the impact of terrorism on the management of firms. We would expect that the risk of terrorism would cause a

deterioration in management quality (and therefore firm performance) for a number of reasons. First, it will be difficult to attract high quality managers to work in areas subject to the risk of terrorism when they have many outside opportunities. Second, there are low incentives to invest in improving management when there is a high risk of terrorism as the firm, its employees and/or or its market may be destroyed by the conflict. Third, terrorism makes it hard to enforce the rule of law and contracts that help provide long-run managerial incentives.

The analysis in this report focuses primarily on a subsample of approximately 4,500 firms of the second wave of data collection. We aim to address the following questions:

- What is the relationship between management practices and productivity, employment and growth in other remaining three provinces of Pakistan which have been so far been inaccessible to many researchers?
- How much the challenging law and order situation in the country does determines variation in management practices across firms and provinces?

This exercise has revealed the following findings. First, there is considerable variation in firm-level management practices across Pakistan both within and between provinces. Second, Pakistani management practices are well below those prevalent in more developed countries like the US, but they do seem to be improving over the 2010 to 2015 time-period. Third, the factors correlated with management practices are similar to those in other countries. Firms that are larger, more skilled, more export-oriented, listed on the stock market and older appear to have higher management practice scores. Fourth, there is a strong positive relationship between management scores and measures of firm performance such as productivity, profitability and growth. Finally (and most novel), we find that areas in Pakistan that have suffered increased terrorist activity have had the fastest deterioration in management practices.

The remainder of this report is organized as follows: Section 2 describes the survey data and methodology used to measure management practices across firms. Section 3 explores the firm-level factors linked to the variation of management practices and investigates the relationship between management practices and firm performance in Pakistan. Section 4 explores the link

between terrorist events and management practices. Section 5 concludes and highlights areas for future work.

2. DATA

2.1. Management and Organizational Practices Survey

The Management and Organizational Practices Survey in Pakistan (henceforth, PK-MOPS) is a project jointly funded by the International Growth Centre (IGC), the Private Enterprise Development in Low-Income Countries (PEDL) initiative, and the State Bank Pakistan. The PK-MOPS questionnaire is nearly identical to the US Management and Organizational Practices Survey (henceforth, US-MOPS).[1]

To administer PK-MOPS, we partnered with the Pakistan Bureau of Statistics (PBS). In 2017-2018, the Bureau of Statistic conducted a Census of Manufacturing Industries (CMI) in all provinces and added the MOPS as a supplement to the CMI. In the 4,581 sub-sample used in this report -- 1,718 in the KPK province, 934 in the Sindh province, 1,817 in the Punjab province, and 112 in the Capital Territory of Islamabad. The Census was managed centrally from PBS headquarters in Islamabad where the initial business registers were prepared from various sources such as the tax collection agency (the Federal Bureau of Revenue), the pension agency (the Employment and Old-Age Benefit Institution), the stock market regulator (Security Exchange Commission of Pakistan). The PBS worked with enumerators from: the Labor Department in Baluchistan, the provincial Bureau of Statistics in Sindh, the provincial Bureau of Statistics in KPK, and the Urban Unit in Punjab. The responses from the manufacturing firms were obtained through a door-to-door search, delivery and subsequent in-person retrieval of the questionnaires.[2]

[1] US MOPs now have two waves in 2015 and 2010 (see Bloom et al, 2018). We have maintained a consistent bank of the same questions and kept them in the same order to the US-MOPS questionnaire. The questionnaire was translated into Urdu and piloted with 82 firms in Punjab to confirm its applicability to firms in Pakistan prior to the first wave of data collection.

[2] The business registers compiled from various sources initially revealed the existence of a population of 35,463 registered firms in the manufacturing sector in Pakistan. Using this list, PBS started a door-to-door verification of the addresses using trained enumerators from various agencies. Enumerators visited the firms on multiple occasions to confirm their status and to distribute the questionnaire, and also searched for potential firms not in their initial list. This process led to the discovery of a large number of new firms enhancing the total population size to 78,687- an

This method of conducting the CMI 2017/18 breaks away from the CMI 2010/11 practice of sending and retrieving the questionnaires by mail and also devolving the administration of CMI 2010/11 to the provincial bureaus. This is because: (i) CMI 2010/11 returned low response rates across all provinces, and (ii) MOPS 2014- 2015 highlighted that directly approaching firms was a better way to improve the response rates.

From the subsample of 4,581 firms, 48% (2,198) of respondents reported to be the CEO or Executive Officer, 11% (503) were managers of multiple establishments, 20% (944) were managers from a single establishment, 4% (178) were non-managers, and 16% (758) did not report their level of seniority. We surveyed respondents about their firms' practices in 2010-2011 (henceforth, "2010") and 2015-2016 (henceforth, 2015) in order to match the data collected to CMI establishment accounts data (detailed below). An obvious concern is that the recall period of 5 years might be too long to prompt accurate answers. We tried to address this concern in the first wave by comparing differences in employment – collected both in the MOPS and in the CMI surveys – increase over time. The correlation between MOPS and CMI log of employment numbers is 0.85 and highly significant, suggesting that although there is some bias in recall, it still appears to be largely accurate (see Lemos et al, 2016).[3]

2.1.1. Survey Questions

The survey includes 36 multiple choice questions about the establishment. The questions are split into three sections: management practices (16 questions), organization (13 questions) and background characteristics (7 questions). The full set of questions (and their English translation) can be found in Lemos et al (2016).

Management: The management practices covered three main sections: monitoring, targets and incentives, based on Bloom and Van Reenen (2007), which itself was based in part on the

expansion mainly driven by Punjab and KPK. In Sindh and Baluchistan, however, the population of firms has contracted.

[3] Following the US MOPS work we also consider conditioning the recall questions on the plant manager having at least 7 years of tenure. The correlation between recall and "actual" management scores stabilizes for the tenure of such managers, presumably because they were in post for the years when they are trying to recall.

principles continuous monitoring, evaluation and improvement from Lean manufacturing (e.g. Womack, Jones and Roos, 1990). The monitoring section asked establishments about their collection and use of information to monitor and improve the production process. For example, how frequently were performance indicators tracked at the establishment, with options ranging from “never" to “hourly or more frequently”. The targets section asked about the design, integration and realism of production targets. For example, what was the time-frame of production targets, ranging from “no production targets” to “combination of short-term and long-term production targets”. Finally, the incentives asked about non-managerial and managerial bonus, promotion and reassignment/dismissal practices. For example, how were managers promoted at the establishment, with answers ranging from “mainly on factors other than performance and ability, for example tenure or family connection" to “solely on performance and ability”? As mentioned earlier, for all questions, interviewees were asked about the structure of management practices in both 2010-2011 and in 2015-2016.

In our analysis, we aggregate the results from these 16 check box questions into a single measure of structured management. The structured management score is the unweighted average of the score for each of the 16 questions, where each question is first normalized to be on a 0-1 scale. Thus, the summary measure is scaled from 0 to 1, with 0 representing an establishment that selected the bottom category (little structure around performance monitoring, targets and incentives) on all 16 management questions and a 1 representing an establishment that selected the top category (an explicit focus on performance monitoring, detailed targets and strong performance incentives) on all 16 questions. Normalization of responses can be found in Lemos et al (2016).

Organization: The organization section of the survey covered questions on the decentralization of power from the headquarters to the establishment manager based on Bresnahan, Brynjolfsson and Hitt (2002) and Bloom, Sadun and Van Reenen (2012). The one question used in this report asks about how managers learn about management practices with answers concerning a variety of sources (“Consultants”, “Competitors”, etc.).

Background characteristics: This section includes a range of questions about establishment ownership, the number of managers and non-managers at the establishment, the share of levels of

education of both groups, the share of employees in a union, and the seniority and tenure of the respondent.

Interview and interviewee characteristics: We also collected a large amount of information on the interviewee (seniority and company tenure) and interview process itself in order to control for interview measurement error.

2.2. Additional Data

2.2.1. Establishment Performance from the Census of Manufacturing Industries

CMI covers manufacturing establishments which are registered, or which qualify for registration under Pakistan's Factories Act (1934). Similar to the US Annual Survey of Manufacturers, the CMI survey provides a range of establishment level data such on quantities and values of inputs and outputs, census value added, contribution to GDP, fixed assets, stocks, employment and employment cost and industrial taxes. For this report, we use data reported in 2015 for the second wave and 2005 and 2010 for the first wave on sales, employment, wages, materials, fixed assets in the beginning of the period, and industrial classification. The data is described in more detail in Lemos et al 2016.

2.2.2. Terrorist Events from the Global Terrorism Database

To construct measures of terrorism intensity that allows us to investigate the relationship between management and terrorism, we use event-level data from Pakistan from the Global Terrorism Database. This is an open-source database that includes information on date, location, and description of terrorist events around the world from 1970 through 2017. To control for geographic characteristics of tehsils in Pakistan (the lowest administrative unit we use), we rely on grid-year-level data from the PRIO-GRID dataset, which divided the world map in quadradic grid cells covering all terrestrial areas of the world. Using information on the years immediately preceding the years of interest in the PK-MOPS, matched each tehsil's centroid to its corresponding grid and associated grid-year-level data to that tehsil-year observation.

3. MANAGEMENT ACROSS ESTABLISHMENTS, REGION, AND TIME

3.1. Exploring management practices across establishments and regions

In Table 1 we start by looking at management practices and establishment characteristics from a pooled sample of 6,876 establishment-year observations in Pakistan which presented at least 11 valid answers to the 16 management questions within the PK-MOPs. Establishments are distributed in four different provinces: Khyber Pakhtunkhwa (KPK), Punjab, Sindh, and Islamabad. The average establishment-year observation has 48 employees (median = 20) and is 12.5 years old (median = 9). Exporters account for 12.9% of our sample, while close to 56% (29%) of all observations correspond to individual (non-individual) partnerships, and 14% (1%) are private (public) limited companies. On average 47.6% of managers have a college degree, 10.6% of non-managers have a college degree, and 5.8% of employees are members of a trade union.

The average of the management score is also reported in Table 1 for our whole sample and split out by province in Table 2. The average establishment in Pakistan adopts 24% (0.24 in the management score on a 0-1 scale) of structured management practices: 27% of "data-driven performance monitoring practices" and 22% of incentives/ targets. These are much lower than those in US firms (64%, 67%, and 62% on the management score, data driven performance monitoring, and incentives and targets scores, respectively – see Bloom et al, 2018).

Panel A of Figure 1 plots out both the distribution of management scores in 2010 and 2015. There is a very large variation in management scores in both years, with a spike of low management scores – a quarter of establishments adopt less than 20% of the structured management practices captured by the PK-MOPS. Note that the low scores to the adoption of structured management practices appears in both 2010 and 2015 and regardless the breakdown into data driven performance monitoring or incentives and targets (Panel B). Within the sample of establishments answering both the latest questions on management practices (regarding 2015 information) and the recall question (regarding 2010 information), there is a slight increase in the mean management score (from 0.259 to 0.264).

We also investigate differences in management practices across provinces in Table 2. Islamabad, the largest urban area and capital city of Pakistan has the highest management score (45%) and KPK the lowest (10%). Punjab and Sindh have management scores of 32% and 29%, respectively. Table A1 shows additional differences in establishment characteristics across the four provinces, showing that the average establishment in KPK is younger and smaller establishments (26 employees) than, for example, Islamabad (13 years-old and 74 employees).

3.2. Accounting for differences in management practices

In Table 3 we consider several establishment-level factors that can potentially explain these differences in management across Pakistan. We underscore that all results here should be interpreted as correlations, not causal relationships. Column (1) simply includes provinces dummies with Punjab as the reference category. The raw differences shown in Table 2 appear to be statistically significant. In column (2) switch the province dummies for ownership dummies with public limited companies as the reference category. Although the unconditional mean is not different between public and private limited companies, partnerships, especially individual partnerships have significantly lower management scores. Column (3) shows that larger establishments appear to have significantly higher management scores, something that is consistently found in the literature. This could be because of the fixed cost of management investments are more easily spread in larger enterprises or it could reflect that better management firms are able to grow larger. Column (4) shows that older establishments have higher management scores which is consistent with the idea that selection effects drive out weakly managed firms, so that higher management score plants live longer (see Bloom, Sadun and Van Reenen, 2017). Column (5) finds that exporters have higher management scores, consistent with the evidence from the US and China in Bloom, Manova, Van Reenen and Yu (2018). Column (6) shows that establishments with higher human capital have greater management scores consistent with Bender et al (2018) in Germany. Column (7) shows that there is no significant relationship between unionization and management. Column (8) includes all these correlates of management practices

together in a single specification. Although the absolute magnitude of the individual coefficients tend to be smaller, they maintain their signs and statistical significance.[4]

3.3. Exploring changes in management practice over time

This second wave of the PK MOPS asked information about the state of management practices in both 2015 and 2010, allowing us to investigate management practices at two different points in time. Figure 2 compares the management score (Panel A) and its breakdown in data driven performance monitoring and targets and incentives (panel B) in both years. There is a large positive and significant correlation of about 0.98 for both the main management score and its breakdown within the same establishments across years –establishments who were well managed in 2010 remain well managed in 2015. This suggests that managerial practices are persistent over time. Out of 2,295 with observations in both 2010 and 2015, 413 (18%) establishments report a positive change in management scores – as indicated by the blue dots – and 229 (10%) establishments report a negative change in management scores – as indicated by the red cross – with the remaining 72% of all establishments reporting the same management scores for both years. Panel B in figure 2 shows a similar picture for data driven performance monitoring and targets and incentives, though showing that firms in Pakistan are more prompt to increase data driven performance monitoring (17% of reporting establishments increased structured practices associated with performance monitoring while only 4% weakened it) than incentives and targets (12% improving versus 10% weakening the incentives and targets score). Appendix Figure A1 shows the breakdown by province, revealing that Sindh lags in the proportion of reporting firms improving their management practices (13%) versus close to or above 20% marks on KPK, Punjab, and Sindh.

We also investigate the heterogeneous sources of management improvements across provinces by asking where managers at the firms learn about management practices. Figure 3 shows that while firms in KPK largely rely on customers and competitors to learn about management practices, firms in Punjab/Islamabad adopt a greater array of sources, encompassing not only customers and

[4] Table A2 on the appendix shows that firms in different provinces have different drivers, with the main drivers positively affecting management practices throughout is the proportion of non-managers with degree. Size is positively correlated in both Punjab and Sindh, while exporting status is positive to all provinces, but not statistically significant for Punjab.

competitors, but also consulting firms, and even potentially suppliers, within their managerial knowledge chain. Establishments in Sindh, finally, have the unusual pattern of largely relying on trade associations (30%) to learn about management, while also using consultants and competitors (both close to 15%).

3.4. Management and Performance

Do firms with more structured management practices have better performance? We examine the partial correlation between management and firm performance in terms of three outcome variables: (1) log of value added (sales minus materials) over total employment; (2) log of profitability calculated as total value added minus total wages, and (3) employment growth between 2010 and 2015. To conduct these exercises, we merge the PK MOPS Wave 2 data with data from the CMI survey.

Suppose that the firm production function can be written as:

$$Y_{it} = A_{it} K_{it}^{\alpha} L_{it}^{\beta} e^{\delta M_{it}} e^{\mu X_{it}} \quad (1)$$

where Y_{it} is value added (shipments deflated by NAICS 6 digit price deflator), A_{it} is (total factor) productivity (excluding management practices), K_{it} denotes the firm's capital stock at the beginning of the period, L_{it} are labor inputs, X_{it} is a vector of additional factors such as education, and M_{it} is our management score.[5] Management is an inherently multi-dimensional concept, but for this study we focus on a single dimension: the extent to which firms adopt more structured practices.[6] Dividing by labor and taking logs we can rewrite this in a form to estimate on the data:

$$log\left(\frac{Y_{it}}{L_{it}}\right) = \alpha \log\left(\frac{K_{it}}{L_{it}}\right) + \gamma \log\left(\frac{I_{it}}{L_{it}}\right) + (\alpha + \beta + \gamma - 1)\log\left(L_{it}\right) + \delta M_{it} \quad (2)$$

[5] We put the management score and X_{it} controls to the exponential simply so that after taking logs we can include them in levels rather than logs.

[6] The individual practices are highly correlated, which may reflect a common underlying driver or complementarities among the practices (Brynjolfsson and Milgrom 2013). In this exercise, we use the mean of the share of practices adopted, but other measures like the principal factor component or z-score yield very similar results.

$$+\mu X_{it} + f_i + \tau_t + u_{it},$$

where we have substituted the productivity term (A_{it}) for a set of industry (or firm or establishment) fixed effects f_i, time dummies τ_t and a stochastic residual u_{it}. We also cluster our standard errors at the firm level to account for within-firm correlation over time.

Table 4 reports the main results of OLS regressions of the simple production function. As control variables we add the share of managers, the share of non-managers with a degree, and the share of union members. We further add industry-level (4-digit Pakistan Standard Industrial Classification Codes) fixed effects and province fixed effects. In some specifications we further add the interaction between province fixed effects and both our management score and the two main inputs. Estimates for productivity and profitability consider a production function using only a 2015 cross section. Estimates for employment growth use management in 2010 and other lagged control variables.

Column (1) of Table 4 reports the results of a simple regression of log(valued added per employee) on management. The estimated coefficient of 1.177 is highly significant and suggests that a 10 percentage point increase in the management score is associated with a 12% (=exp(0.117)-1) increase in labor productivity. In column (2) we add employment and capital stock intensity. The coefficient on management falls to 0.91 but remains significant. In column (3) we allow the management coefficient to be different across provinces. Punjab is the omitted base, so the coefficients suggest that the output elasticity with respect to management is significantly higher in KPK than Punjab. In Sindh the management coefficient is significantly lower than in Punjab (although this disappears in later columns when we add controls).[7] Interestingly, the province with the lowest level of management (KPK) has the highest coefficient on management – suggesting severe constraints on management (and therefore very high marginal returns). In column (4) of Table 4 we add industry-level fixed effects, while in column (5) we also add firm-level controls. In both cases the management coefficient remains statistically significant and large. According to

[7] The coefficient on Islamabad is very unstable between columns which probably reflects the small number of observations.

the full model in column (5), a 10% increase in the management score is associated with a 5% increase in labor productivity in Punjab.

For the remainder of Table 4, we repeat specifications of columns (1) and (5) using profitability and employment growth as dependent variables. In columns (6) and (7) we find the management-profitability relationship to be large and significant. Further, we find that management is greatly associated with profitability in all areas except Islamabad. Columns (8) and (9) find a positive relationship between lagged management and employment growth. However, column (9) indicated that this relationship is highly concentrated in Punjab (the province with the largest number of observations).

This analysis of Table 4 indicates that firms with more structured management practices outperform those with less structured management practices on a range of performance measures and the results are largely robust across provinces in Pakistan. In Figures A2, A3, and A4 we show graphically the unconditional correlation between three performance measures -- productivity, profitability, employment growth -- and management scores by province. A comparison of between the results of the first and second wave of the PK MOPS within Punjab can be found in the Appendix.

4. MANAGEMENT PRACTICES AND TERRORISM

In this next section we explore whether the challenging law and order situation – as measured by exposure to terrorist events -- explains the variation in management across firms and provinces. Pakistan is an ideal place to study this question. The lower panels of Figure 4 shows that Pakistan has been among the top 10 countries in terms of number of terrorist events for the last 20 years, and the second country – only behind Iraq – for the last decade (totaling nearly 7,000 successful terrorist attacks from 2011 to 2015). The increase in terrorist incidents over time revealed by the four panels of Figure 4 is related to the Afghanistan and Iraq Wars, but there has also been ongoing tensions near the border with India (e.g. over Kashmir).

To investigate this question, we construct a measure of terrorist incidents as a proxy for exposure to conflict at the tehsil-level. This is the most disaggregated geographical unit available in administrative data in Pakistan. We use various measures but our baseline estimates focus on the (lagged log of) the annual average number of terrorist events per 100 square kilometers for the previous five years (we also use alternative measures such as the number of deaths from terrorist attacks).

Figure 5 presents two maps of Pakistan: the top map shows the number of terrorist events in each tehsil from 2006 and 2010 and the bottom map shows the same information from 2011 to 2015. It clearly shows that over time, terrorist attacks have intensified throughout the country but are especially prevalent in areas closer to the Afghan border (the provinces of KPK, FATA, and Baluchistan). Figure 6 presents the kernel densities of the intensity of terrorist attacks by the three main provinces (KPK, Punjab and Sindh) for each of the five-year periods, showing that the density has shifted to the left over time.

We match the tehsil-level data to PK-MOPS and relate management practices in 2010 and 2011 to 2015 to management practices in 2015 for firms – we cover 179 out of the 404 tehsils in Pakistan. Descriptive statistics at the tehsil level can be found in Table A5.

Our core result is illustrated in Figure 7. This is a binscatter of the change in the management score 2015 to 2010 against the change in the change in the intensity of terrorist attacks in the area (tehsil) where the plant is located over the five preceding years (2015-2011 for 2015-2016 and 2006-2010 for 2010-2011). There is a clear and strong downward sloping relationship indicating that areas subject to more terrorism had large falls in management practices. Although highly suggestive, the relationship may obviously not indicate a causal relationship. We do not have a credible instrumental variable for terrorism at this time, but we can partially address the issue of confounders by conditioning other observable controls.

We consider the following model for management

$$M_{it} = \theta_1 T_{st} + \theta_2 X_{i,t} + \omega_i + \tau_t + \epsilon_{it}, \quad (3)$$

where M_{it} indicates the management practice score of plant *i* in year *t*, T_{st} is our measure of terror intensity in tehsil s at time t, ω_s is a firm (or in some cases just industry and province) fixed effect; $X_{i,t}$ are observable plant controls, τ_t is a time dummy and ϵ_{it} an error term.

Table 5 presents the first results of our analysis. Column (1) presents the unconditional relationship between management and terrorism and finds a significant and negative correlation. The coefficient implies that doubling the number of terrorist attacks is associated with a fall in the management index of -0.082. Given that the average management score is 0.24, this indicates a substantial decrease of over a third (34% = 0.092/.24). As Figure 4 illustrated, the number of terrorist incidents in Pakistan approximately tripled between 2015-2010 and 2010-2005, suggesting a major potential depressing effect on management quality.

In column (2) of Table 5, we add year and industry fixed effects and observe that the coefficient on terrorism drops to -0.062. In column (3), we add a number of firm controls – size, age, export status, ownership status, share of managers and non-managers with a college degree and unionization. The coefficient on terrorism remains similar in magnitude. In column (4) we add a range of geographical controls at the tehsil-level such as coordinates at the centroid, area, whether it is a provincial capital or on the border with Afghanistan and distance to national capital and the nearest major city. We also add socio-economic controls at the grid-level such as measures of child malnutrition, infant mortality, and percentage coverage of urban areas. Adding these controls actually increases the terrorism coefficient to -0.068. In column (5) we add province fixed effects and observe that the coefficient remains similar to the previous specifications.

Despite our attempts to take into account geographical and socio-economic characteristics of each tehsil to explore the relationship across firms and tehsils in Pakistan, there could still be unobserved heterogeneity specific to firm locations confounding the relationship between management and exposure to terrorist events. To address this concern, we add tehsil-fixed effect exploring variation within tehsil over time, which is our preferred specification. Column (6) of Table 5 shows that although the coefficient on terrorism falls to -0.033 it remains statistically significant. The coefficient implies that doubling the number of terrorist attacks per 100 square km is associated with 14% less adoption of structured management practices.

To validate these results, we use two other measures of exposure to terrorism in this specification: over the previous five years, the annual average (i) number of bombing, explosions and attacks on infrastructure per 100 square kilometers (the large majority of attacks in Pakistan, see Appendix Figure A5) and (ii) number of people killed on infrastructure per 100 square kilometers for the previous 5 years. These are in columns (7) and (8) of Table 5 respectively. The results are consistent with the previous columns showing a negative and significant relationship of management practices with terrorism. Appendix Table A6 presents the analysis for all three measures of exposure to terrorism by province for KPK, Punjab, and Sindh and shows that the results are largely consistent throughout.

In summary there appears to be a statistically robust and economically large negative correlation between increases in terrorist activity and a lower adoptions of best management practices.

5. CONCLUSION AND IMPLICATIONS FOR POLICY

We have described a new management survey in Pakistan – PK-MOPS. Our results are easily summarized. First, there is considerable variation in firm level management practices across Pakistan both within and between provinces. Second, Pakistani management practices are well below those prevalent in more developed countries like the US, but they do seem to be improving over the 2010 to 2015 time-period. Third, the factors correlated with management practices are similar to those in other countries. Firms that are larger, more skilled, more export-oriented, listed on the stock market and older appear to have higher management practice scores. Fourth, there is a strong positive relationship between management scores and measures of firm performance such as productivity, profitability and growth. Finally (and most novel), we find that areas in Pakistan that have suffered increased terrorist activity have had the fastest deterioration in management practices.

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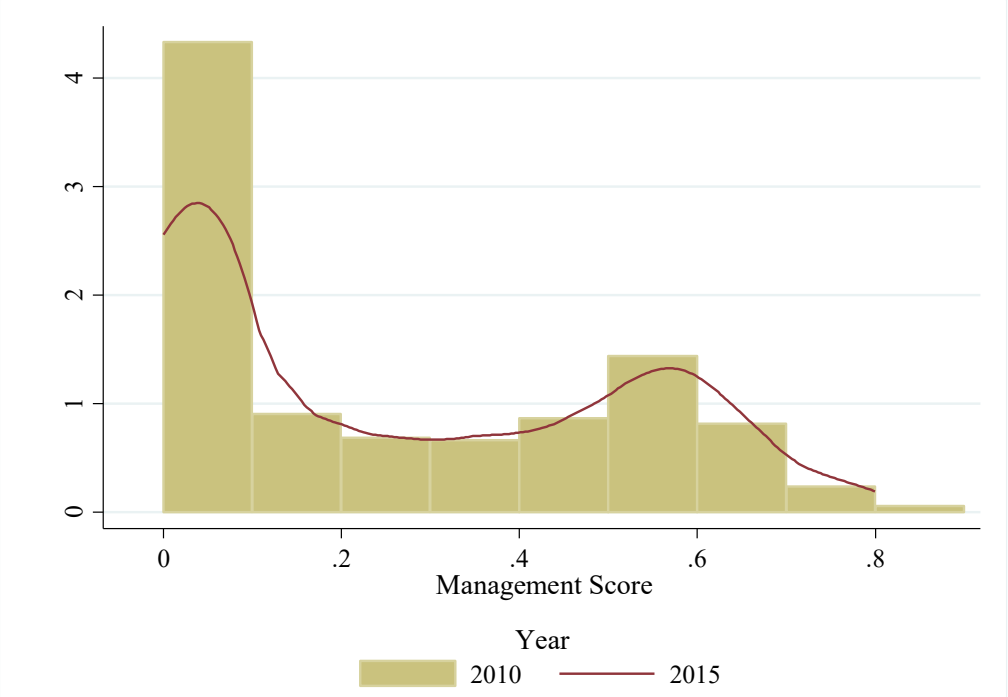
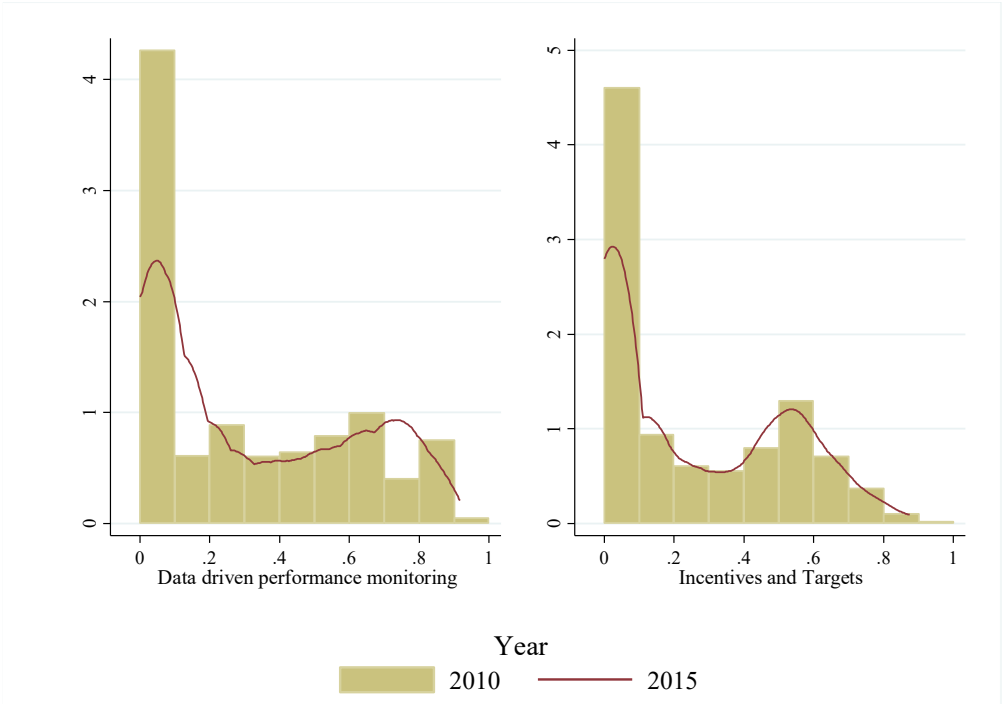
Figure 1: Management Distribution across Firms

Panel A: Management Score

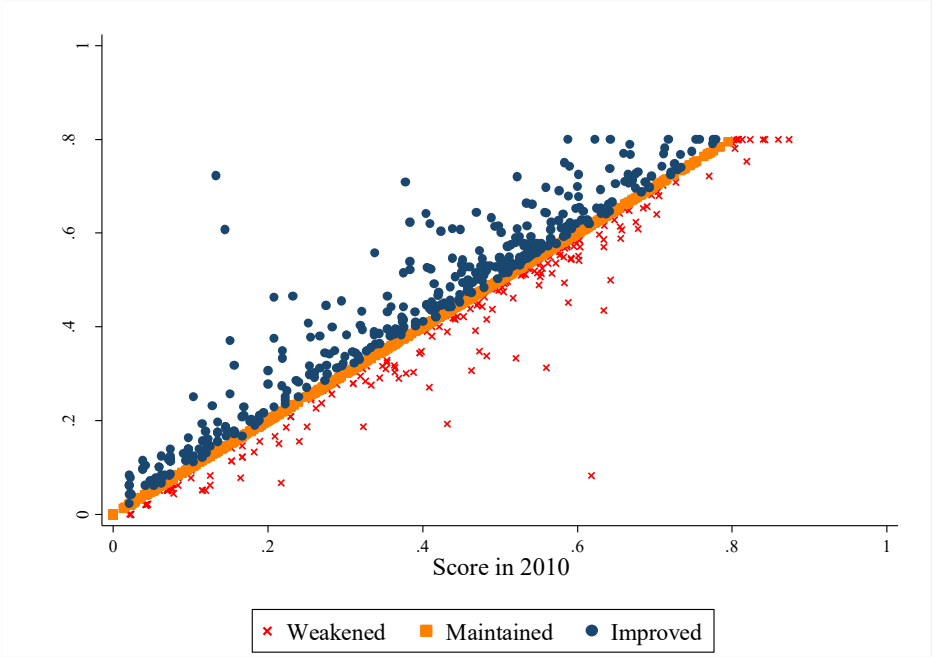


Panel B: Data-driven Performance Monitoring and Incentive and Target Setting

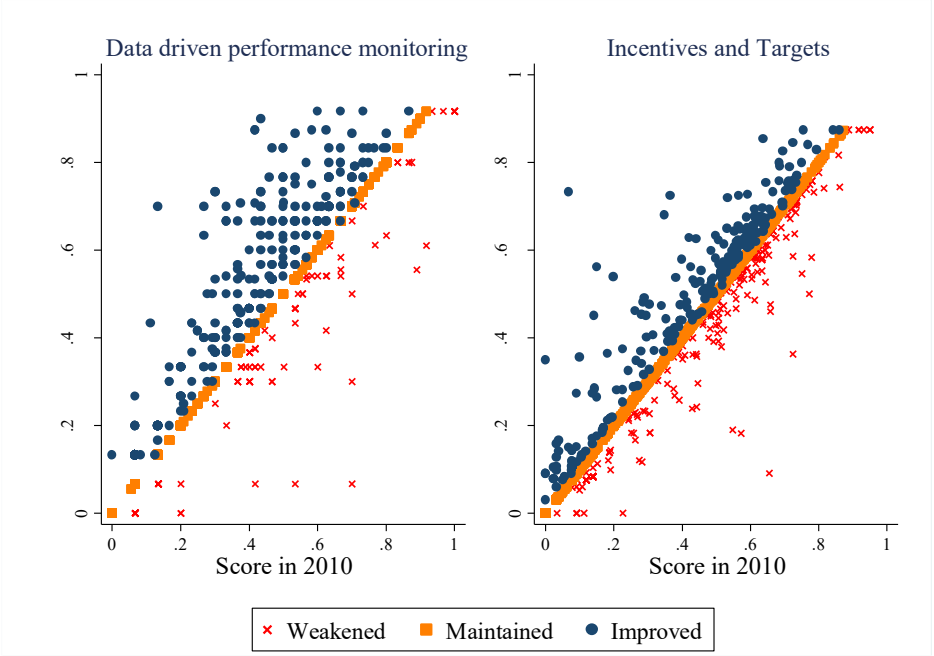


Notes: The management score is the unweighted average of the score for each of the 16 questions, where each question is first normalized to be on a 0-1 scale. The data-driven performance monitoring score is the unweighted average of the score for questions 1 to 5. The incentives and targets score is the unweighted average of the score for questions 6 to 16. The figure considers only a balanced panel of 4590 firms responding to PK-MOPS questions for both 2010 and 2015.

Figure 2: Management Practices Over Time
Panel A: Management Score

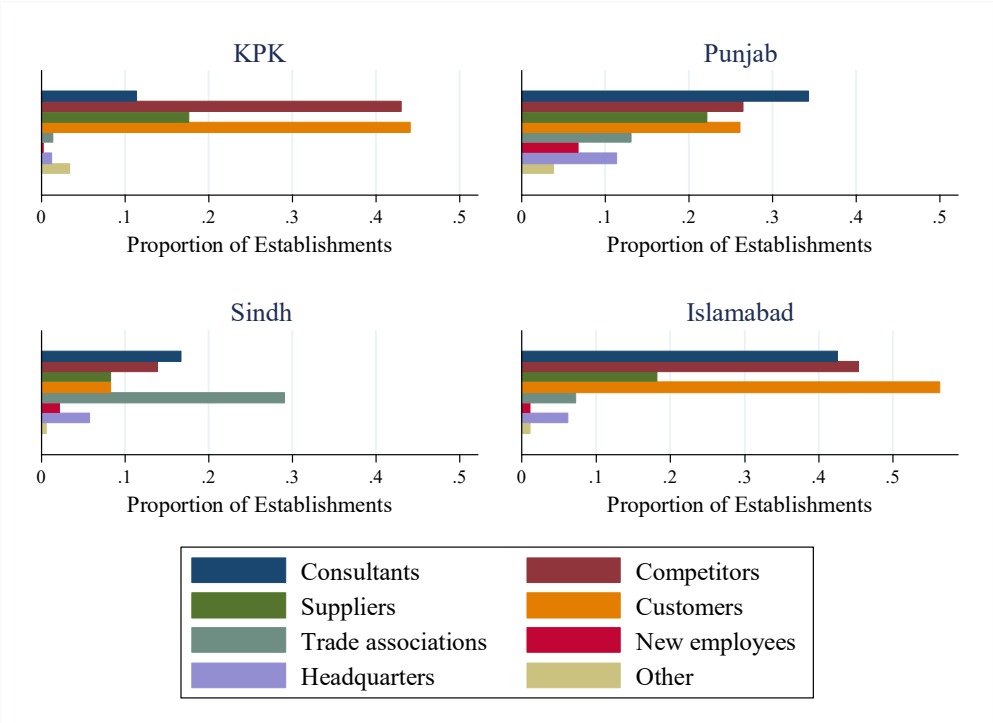


Panel B: Data-driven Performance Monitoring and Incentive and Target Setting



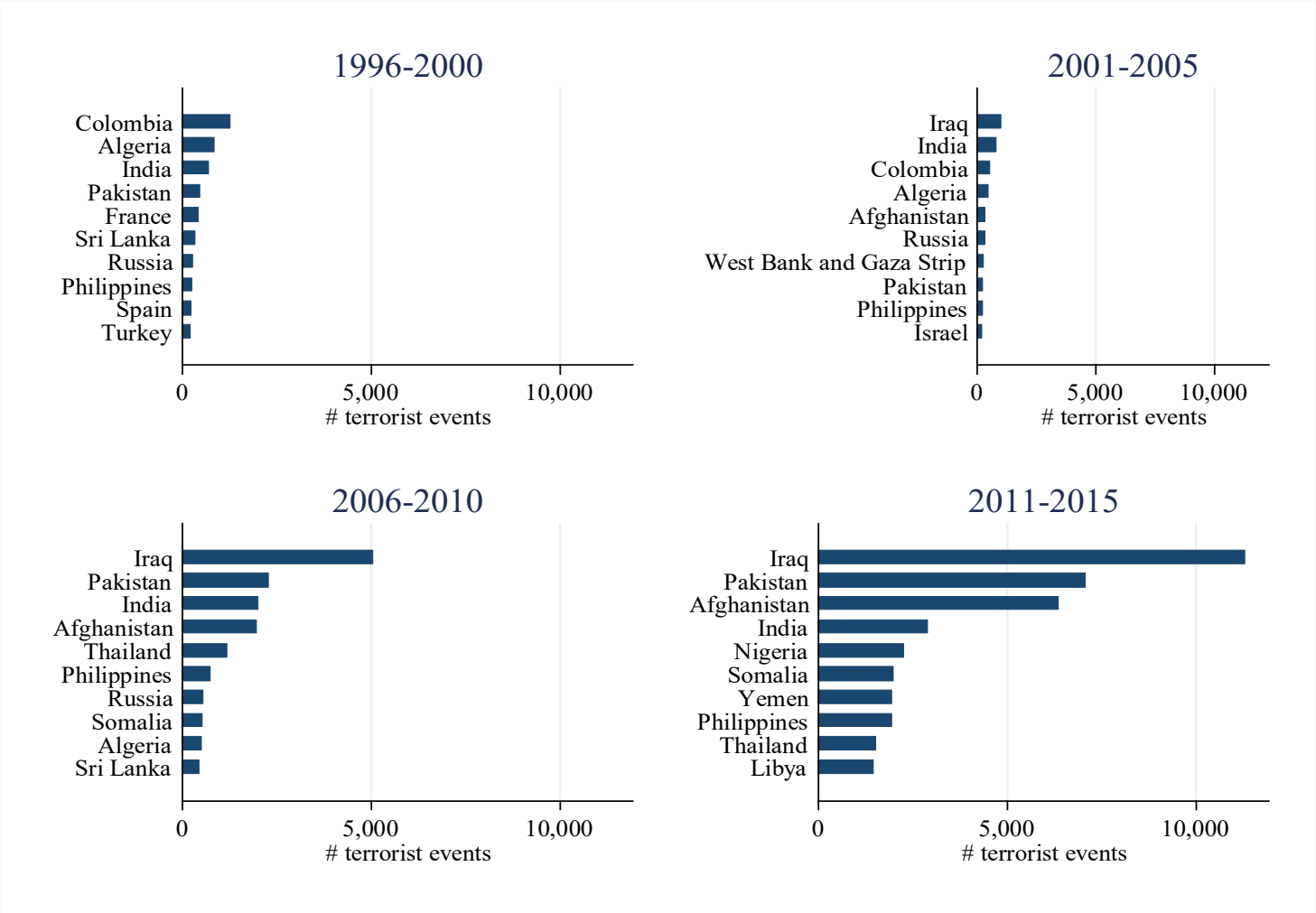
Notes: The management score is the unweighted average of the score for each of the 16 questions, where each question is first normalized to be on a 0-1 scale. The data-driven performance monitoring score is the unweighted average of the score for questions 1 to 5. The incentives and targets score is the unweighted average of the score for questions 6 to 16. The figure considers only a balanced panel of 4590 firms responding to PK-MOPS questions for both 2010 and 2015. Rounded share of firms improving(weakening) the management score in panel A: 18%(10%). Rounded share of firms improving(weakening) the performance monitoring score/incentive and target-setting score in panel B: 17%(4%)/12%(10%).

Figure 3: Sources of Learning About Management



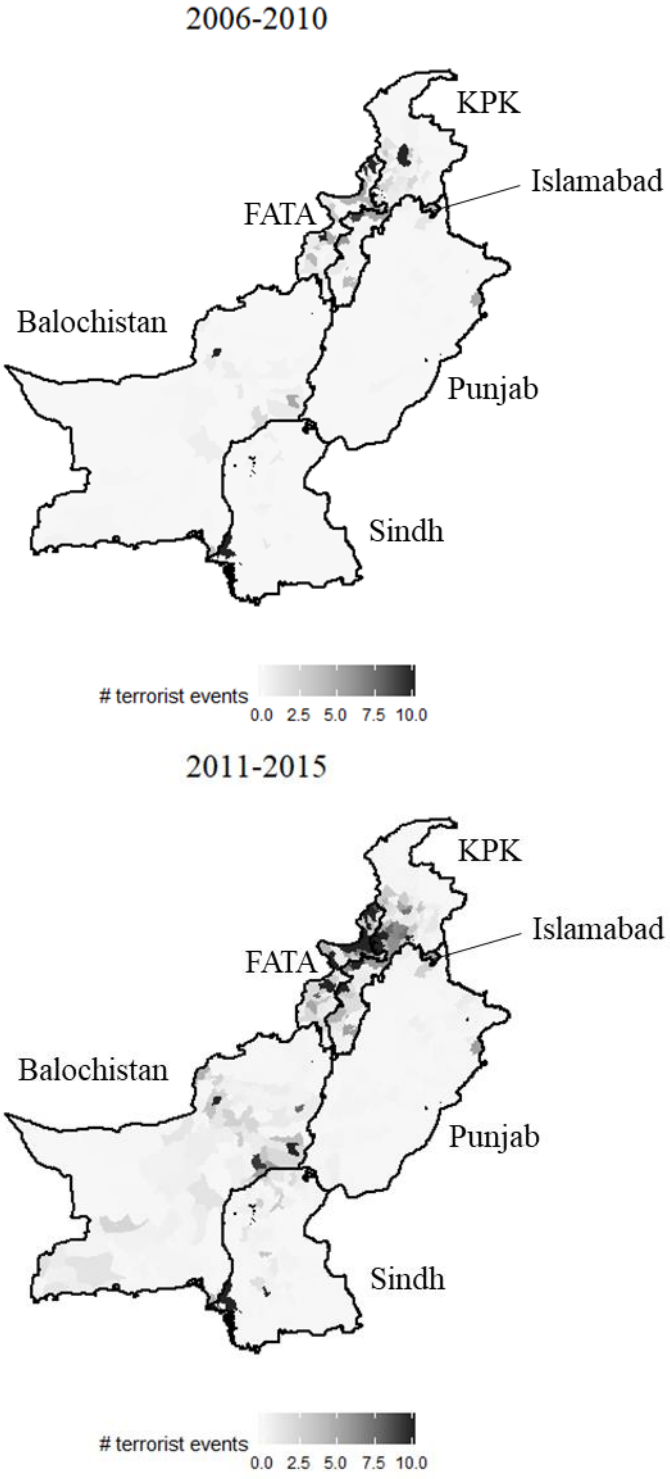
Notes: This figure considers firms' pooled responses for sources of learning about management in both years 2010 and 2015.

Figure 4: Top 10 countries in number of terrorist events (1996-2015)



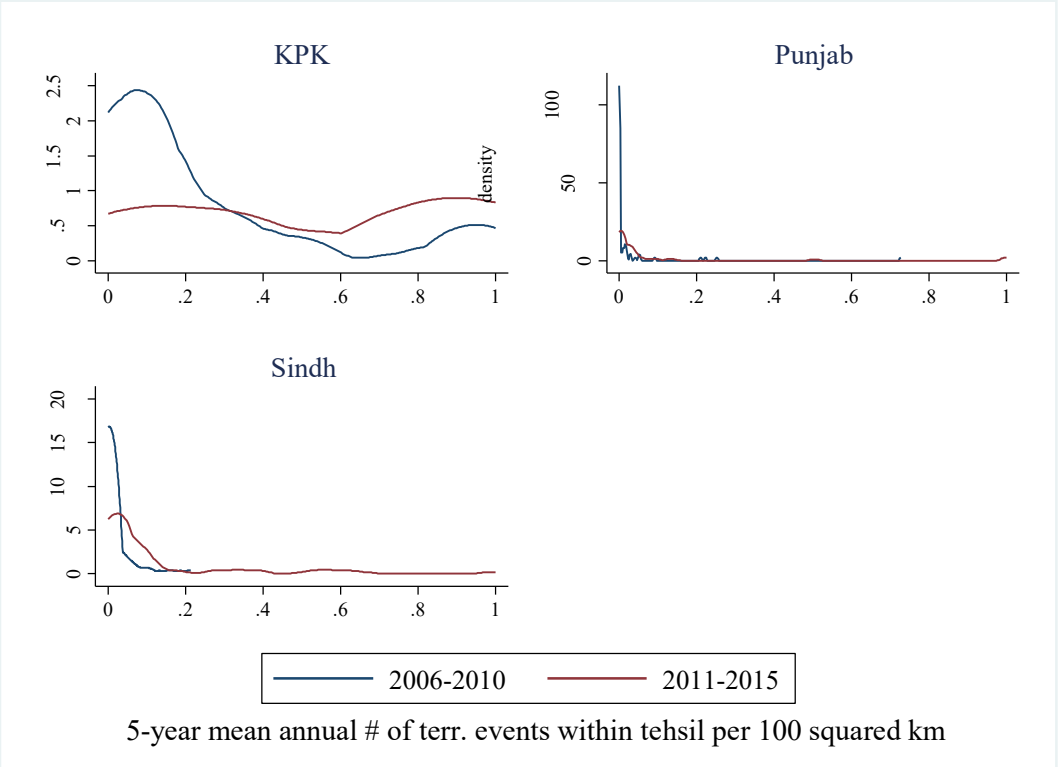
Notes: Data from the Global Terrorism Database.

Figure 5: Terrorism in Pakistan



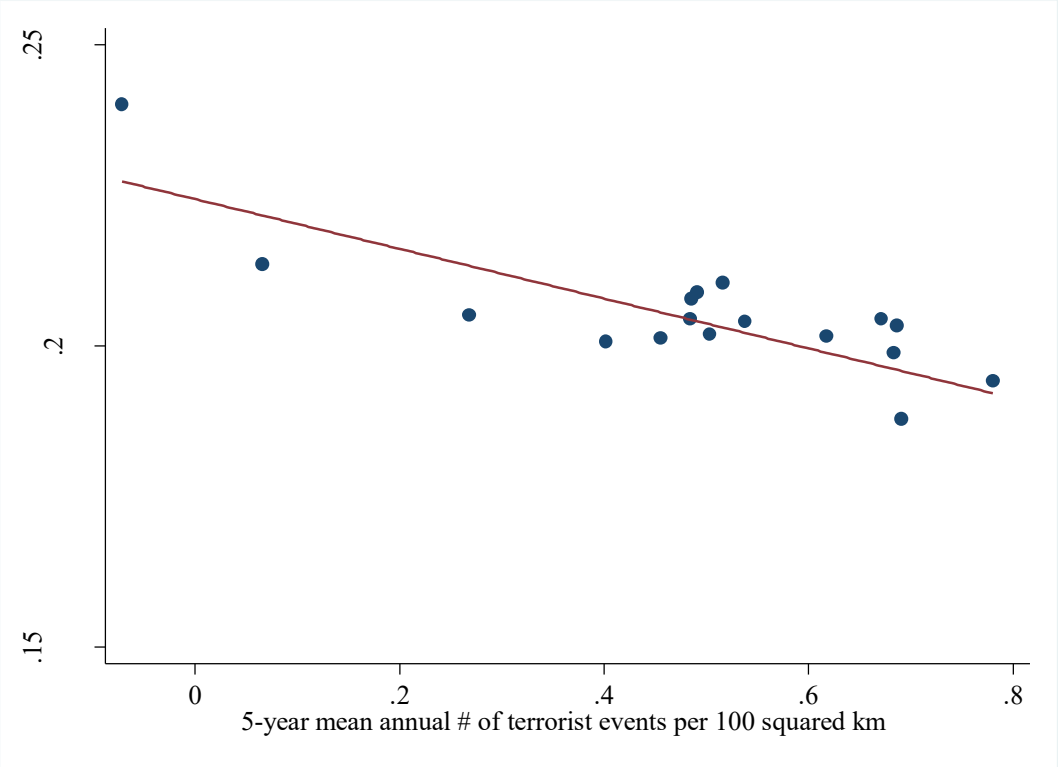
Notes: The variable being plotted is the total number of terrorist events per tehsil's area (in squared km).

Figure 6: Incidence of terrorist events in Pakistan, by province



Notes: The figure considers tehsil-window level information while incorporating Islamabad within Punjab.

Figure 7: Terrorism and Management in Pakistan (pooled 2015 and 2010 sample)



Notes: The management score is the unweighted average of the score for each of the 16 questions, where each" "question is first normalized to be on a 0-1 scale. This figure considers a “residualized” management score after filtering for tehsil-level fixed effects. The plot used a pooled sample of both 2015 and 2010 (recall) observations on management score. The 2010 measure of terrorism accounts for the mean annual number of terrorist events for the 5-year window between 2006 and 2010. The same is valid for 2015, considering a 5-year window from 2011 to 2015.

Table 1: Descriptive Statistics

Characteristic	Firm-year obs.	Mean	SD	p(10)	p(25)	p(50)	p(75)	p(90)
Management score	6876	0.24	0.24	0.00	0.02	0.13	0.47	0.60
Data driven performance monitoring	6870	0.27	0.28	0.00	0.07	0.13	0.53	0.71
Incentives and targets	6876	0.22	0.25	0.00	0.00	0.10	0.47	0.61
Size	6876	47.90	90.70	11.00	13.00	20.00	42.00	84.00
Firm age	6876	12.49	10.85	2.00	5.00	9.00	16.00	26.00
Exporter (in %)	6876	12.89%	-	-	-	-	-	-
% of managers with degree	6876	47.60%	45.13%	0.00%	0.00%	41.12%	100.00%	100.00%
% of non-managers with degree	6876	10.64%	22.24%	0.00%	0.00%	0.00%	7.89%	41.18%
% of union members	6876	5.38%	13.35%	0.00%	0.00%	0.00%	5.69%	10.00%
Ownership: public limited (in %)	6876	1.18%	-	-	-	-	-	-
Ownership: private limited (in %)	6876	14.01%	-	-	-	-	-	-
Ownership: individual partnership (in %)	6876	55.88%	-	-	-	-	-	-
Ownership: partnership (in %)	6876	28.94%	-	-	-	-	-	-

Notes: The management score is the unweighted average of the score for each of the 16 questions, where each question is first normalized to be on a 0-1 scale. The data-driven performance monitoring score is the unweighted average of the score for questions 1 to 5 and the incentives and targets score is the unweighted average of the score for questions 6 to 16. Size is a measure of the number of employees as reported in the MOPS. Firm age is defined by the date when the firm became operative. Exporter is equal to 1 if firm reported to export production. In observations with missing values for the % of manager and non-manager with a degree, the % of union members, and firm size, we replaced with the means in the sample to keep a constant sample size. P(n) is the value at the n-th percentile, e.g. p(50) is the median value. The sample in all columns is all MOPS observations with at least 11 non-missing responses to management questions.

Table 2: Management in Pakistan, by province

Province	Score	Firm-year obs.	Mean	SD	p(10)	p(25)	p(50)	p(75)	p(90)
KPK	Management score	2419	0.10	0.16	0.00	0.02	0.02	0.09	0.35
	Data driven performance monitoring	2417	0.14	0.18	0.00	0.07	0.07	0.13	0.43
	Incentives and targets	2419	0.08	0.17	0.00	0.00	0.00	0.09	0.30
Punjab	Management score	2693	0.32	0.23	0.00	0.09	0.31	0.52	0.63
	Data driven performance monitoring	2689	0.34	0.27	0.00	0.13	0.33	0.57	0.71
	Incentives and targets	2693	0.31	0.26	0.00	0.00	0.27	0.55	0.66
Sindh	Management score	1588	0.29	0.27	0.00	0.03	0.22	0.58	0.62
	Data driven performance monitoring	1588	0.33	0.35	0.00	0.00	0.13	0.70	0.80
	Incentives and targets	1588	0.28	0.25	0.00	0.00	0.21	0.52	0.61
Islamabad	Management score	176	0.45	0.19	0.19	0.29	0.45	0.59	0.70
	Data driven performance monitoring	176	0.58	0.24	0.20	0.50	0.63	0.73	0.87
	Incentives and targets	176	0.39	0.22	0.10	0.18	0.38	0.57	0.69

Notes: The management score is the unweighted average of the score for each of the 16 questions, where each question is first normalized to be on a 0-1 scale. The data-driven performance monitoring score is the unweighted average of the score for questions 1 to 5 and the incentives and targets score is the unweighted average of the score for questions 6 to 16. P(n) is the value at the n-th percentile, e.g. p(50) is the median value. The sample in all columns is all MOPS observations with at least 11 non-missing responses to management questions.

Table 3: Drivers of Management

Dependent variable	Management Score							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Province: Punjab	ref.							ref.
Province: KP	-0.219***							-0.154***
	(0.007)							(0.007)
Province: Sindh	-0.024**							-0.091***
	(0.011)							(0.010)
Province: Islamabad	0.128***							0.101***
	(0.019)							(0.017)
Ownership: public limited		ref.						ref.
Ownership: private limited		-0.017						0.001
		(0.034)						(0.032)
Ownership: individual partnership		-0.319***						-0.127***
		(0.033)						(0.033)
Ownership: partnership		-0.230***						-0.080**
		(0.034)						(0.033)
Ln(employees)			0.101***					0.031***
			(0.003)					(0.004)
Log(firm age)				0.084***				0.012***
				(0.004)				(0.004)
Exporter					0.239***			0.047***
					(0.010)			(0.012)
Proportion of managers with degree						0.112***		0.035***
						(0.008)		(0.008)
Proportion of non-managers with degree						0.344***		0.251***
						(0.016)		(0.018)
Proportion of union members							0.032	0.029
							(0.031)	(0.023)
Observations	6876	6876	6876	6876	6876	6876	6876	6876
# of firms (clusters)	4581	4581	4581	4581	4581	4581	4581	4581

Notes: * p<0.10; ** p<0.05; and *** p<0.01. All models estimated by OLS with standard errors clustered at the firm level. All models are at the firm-year level. The management score is the unweighted average of the score for each of the 16 questions, where each question is first normalized to be on a 0-1 scale. The sample in all columns is all MOPS observations with at least 11 non-missing responses to management questions and non-missing responses to the respective independent variables from the referred model. Year fixed effects are included in all regressions. Models accounting for the share of managers and non-managers with a degree, or the share of union members input missing data by the respective PK-MOPS mean while also adding dummies for missing information on these variables.

Table 4: Productivity, Profitability, Employment Growth, and Management

Dependent variable	Log(Value Added Per Employee)					Log(Profitability)		Employment Growth	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Management score	1.177***	0.909***	0.682***	0.542***	0.502***	2.879***	0.783***	0.086***	0.144***
	(0.110)	(0.116)	(0.160)	(0.158)	(0.157)	(0.160)	(0.202)	(0.024)	(0.050)
Management score # Province: KP			1.378***	0.740**	0.552*		0.874**		-0.160**
			(0.270)	(0.297)	(0.302)		(0.343)		(0.072)
Management score # Province: Sindh			-0.378	0.046	-0.682*		-0.663*		-0.182***
			(0.287)	(0.335)	(0.355)		(0.395)		(0.070)
Management score # Province: Islamabad			0.178	-0.636	-0.881		-0.954		-0.095
			(1.293)	(1.165)	(1.170)		(1.205)		(0.145)
Ln(Capital/Employee)		0.234***	0.283***	0.256***	0.235***		0.300***		
		(0.018)	(0.024)	(0.025)	(0.025)		(0.030)		
Ln(employees)		0.156***	0.204***	0.121***	0.030		1.048***		-0.044***
		(0.028)	(0.040)	(0.044)	(0.047)		(0.054)		(0.013)
Observations	3773	3534	3534	3518	3518	3430	3196	2295	2192
# of provinces (clusters)	4	4	4	4	4	4	4	4	4
Industry fixed-effects	No	No	No	Yes	Yes	No	Yes	No	Yes
Firm controls	No	No	No	No	Yes	No	Yes	No	Yes

Notes: * p<0.10; ** p<0.05; and *** p<0.01. All models estimated by OLS on a 2015 cross section of firms, with standard errors cluster at the firm-level. The management score is the unweighted average of the score for each of the 16 questions, where each question is first normalized to be on a 0-1 scale. The sample in all columns is all MOPS observations with at least 11 non-missing responses to management questions and non-missing responses to the respective independent variables from the referred model. Firm control variables are the share of managers, the share of non-managers with a degree, and the share of union members (as well as dummies indicating whether missing variables were substituted by the PK-MOPS mean for each one of such variables). For the employment growth model, all independent variables were lagged to their 2010 values. Columns (3), (4), (5), (7), and (9) also add interactions between province dummies and ln(capital/employee) and ln(employees).

Table 5: Firm Management Practices and Terrorism

Dependent variable: MOPS management score	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ln(5-year mean annual # of terr. events/100 km^2)	-0.082***	-0.062**	-0.059***	-0.068***	-0.063***	-0.033***		
	(0.021)	(0.025)	(0.021)	(0.020)	(0.019)	(0.009)		
Ln(5-year mean annual # of bomb./infra. attacks/100 km^2)							-0.033***	
							(0.011)	
Ln(5-year mean annual # of killed by terr. events/ 100 km^2)								-0.018***
								(0.006)
Observations	6122	6122	6122	6122	6122	6112	6112	6112
# of tehsils	179	179	179	179	179	169	169	169
Year and Industry FE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Geographical controls	No	No	No	Yes	Yes	No	No	No
Province FE	No	No	No	No	Yes	No	No	No
Tehsil FE	No	No	No	No	No	Yes	Yes	Yes

Notes: * p<0.10; ** p<0.05; and *** p<0.01. Standard errors clustered at the tehsil level. All regressions are at the firm-year level. Firms observed in both 2010 and 2015 are assumed to remain in the same industry in both 2010 and 2015. The management score is the unweighted average of the score for each of the 16 questions; where each question is first normalized to be on a 0-1 scale. All columns consider only MOPS-respondents with at least 11 non-missing responses to management questions. Regressions consider firms in the provinces of KPK; Punjab; and Sindh. Firms in Islamabad are assumed to be within Punjab. Firm-level controls are ; Ln(employees); Log(firms age); Exporter; % of managers with degree; % of non-managers with degree; % of union members; Ownership: individual partnership; Ownership: partnership; Ownership: private limited. Geographical controls include controls at the grid level and at the tehsil-level. Tehsil-level controls are: Tehsil's latitude and longitude at centroid; Tehsil's area (squared km); =1 if tehsil is a province capital; =1 if tehsil is on the border with Afghanistan. Grid-level controls are: Distance to national capital (grid-centroid); % Avg. prevalence of child malnutrition (grid); % SD prevalence of child malnutrition (grid); Avg. infant mortality rate - death per 10k children (grid); SD infant mortality rate - death per 10k children (grid); Avg. travel time to the nearest major city; SD travel time to the nearest major city; % coverage of urban areas (grid).

APPENDIX A

ADDITIONAL RESULTS

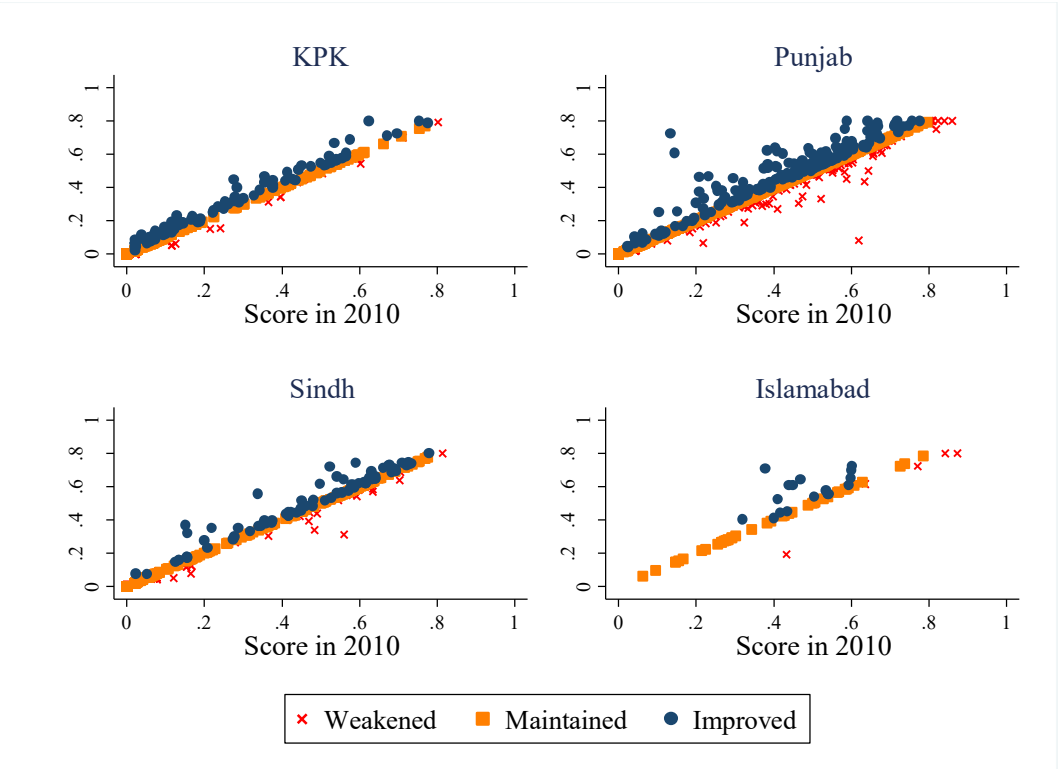
Comparison between PK-MOPS' Waves 1 and 2 results

This subsection briefly compares the results using data from the first and second waves of the PK MOPS within Punjab. Table A3 in the appendix shows that the sample of firms in the first wave is different than the sample of firms answering the second wave (Table 1) on control variables as firm size, age, exporter status, proportion of unionized employees, and proportions of non-managers and managers with degree. We attempt to create more comparable samples by estimating the probability of a firm in Punjab, who participated in either the first or second wave, to belong to the first wave as a function of all the above control variables and the squared terms of the continuous variables. Using the estimated propensity scores, we trimmed the sample of Wave 2 firms to those with an estimated propensity score lying between the 10^{th} and 90^{th} percentile of the estimated propensity score for the actual Wave 1 firms. We keep approximately 500 of our firm-year observations within Punjab for the second wave for this comparison.

Table A4 reports the results of our main specifications on management and productivity (panel A) and drivers of management for both the Wave 1 sample and the trimmed Wave 2 sample. On panel A, we estimate productivity (column 1), profitability (column 2), and employment growth (column 3) in a pooled sample across waves 1 and 2, adding an interaction term between wave 2 and our independent variables. We observe that the interaction between wave 2 and management is not significant across columns (1)-(3). On panel B, we display results on the driver of management considering only wave 1 and the trimmed sample from wave 2. The results on the drivers of management are relatively consistent. Except for firm exporter status and ownership, all firm characteristics remain the same direction and statistical significance. These results are reassuring as the direction and magnitude of the drivers of management. However, we are cautious to provide further analyses given the lack of statistical power in our reduced trimmed sample.[8]

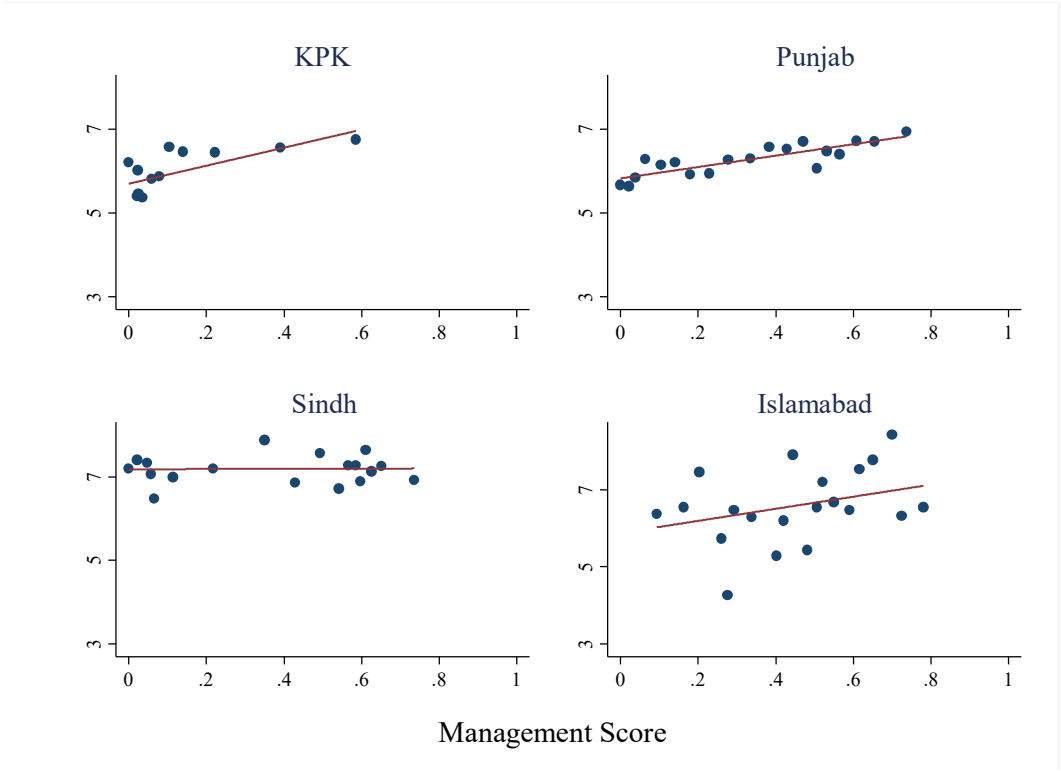
[8] Also, Table A3 still shows that even after trimming the sample, wave 1 establishments are still larger and older.

Figure A1: Management Practices Over Time, by province



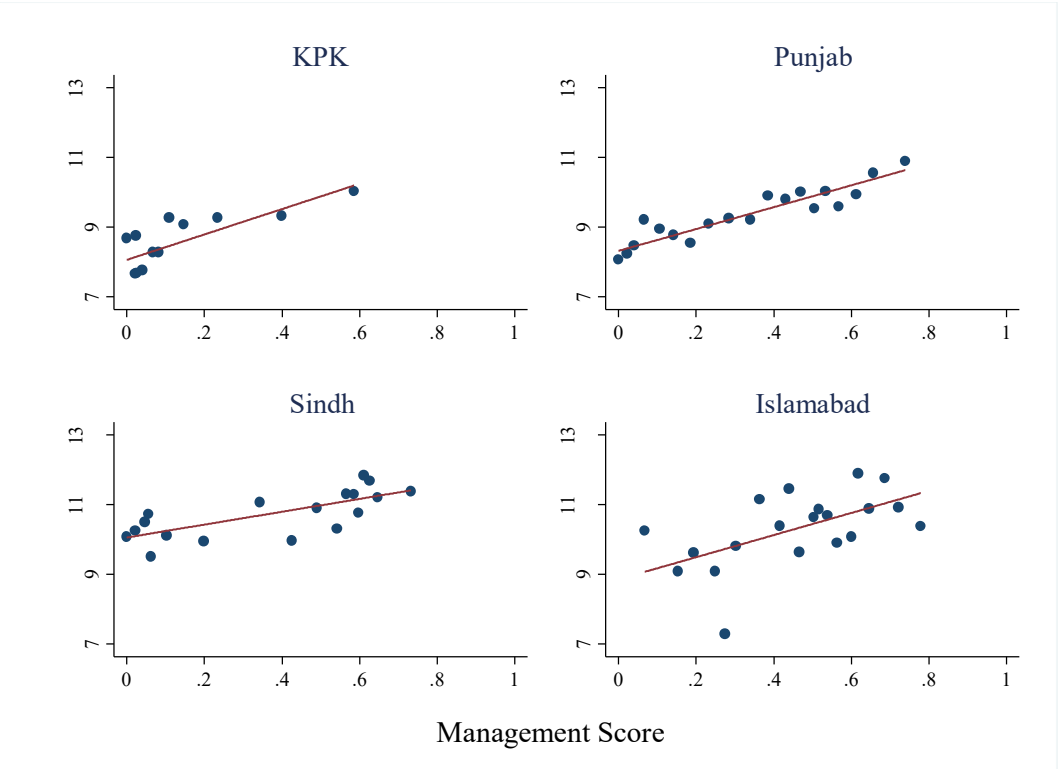
Notes: The management score is the unweighted average of the score for each of the 16 questions, where each question is first normalized to be on a 0-1 scale. The data-driven performance monitoring score is the unweighted average of the score for questions 1 to 5. The incentives and targets score is the unweighted average of the score for questions 6 to 16. The figure considers only a balanced panel of 4590 firms responding to PK-MOPS questions for both 2010 and 2015. KPK province: rounded share of firms improving(weakening) the management score: 20%(3%). Punjab province: rounded share of firms improving(weakening) the management score: 21%(14%). Sindh province: rounded share of firms improving(weakening) the management score: 12%(11%). Islamabad province: rounded share of firms improving(weakening) the management score: 27%(9%).

Figure A2: Productivity and Management, by province (2015)



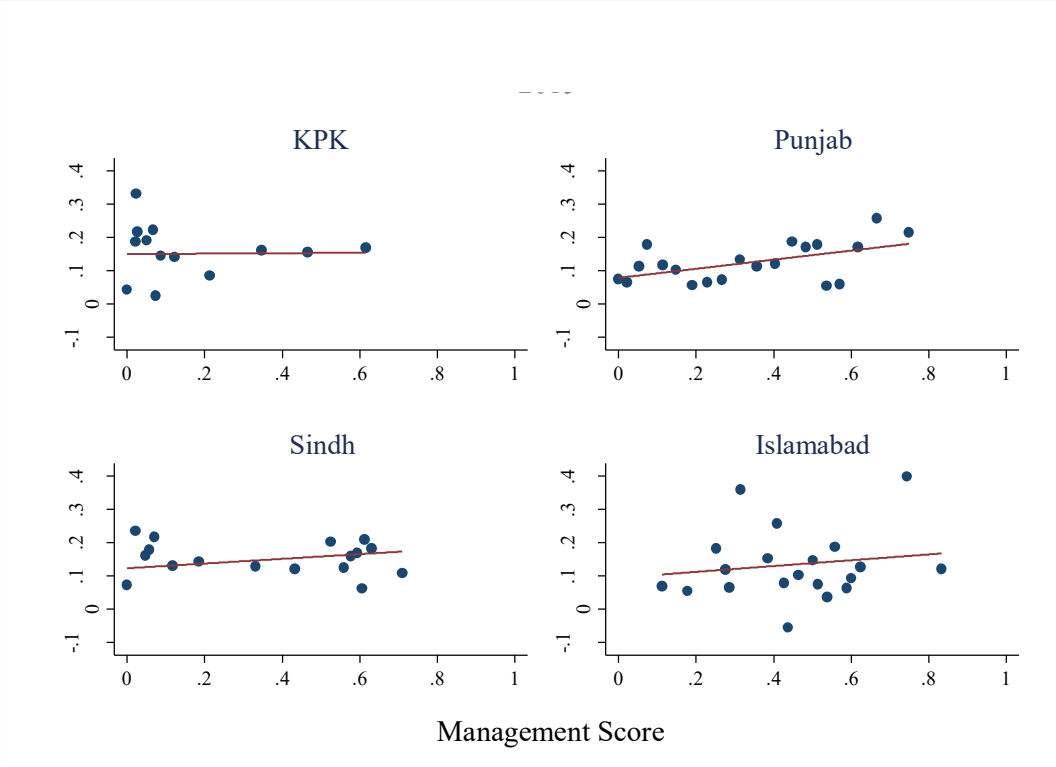
Notes: The management score is the unweighted average of the score for each of the 16 questions, where each question is first normalized to be on a 0-1 scale.

Figure A3: Profitability and Management, by province (2015)



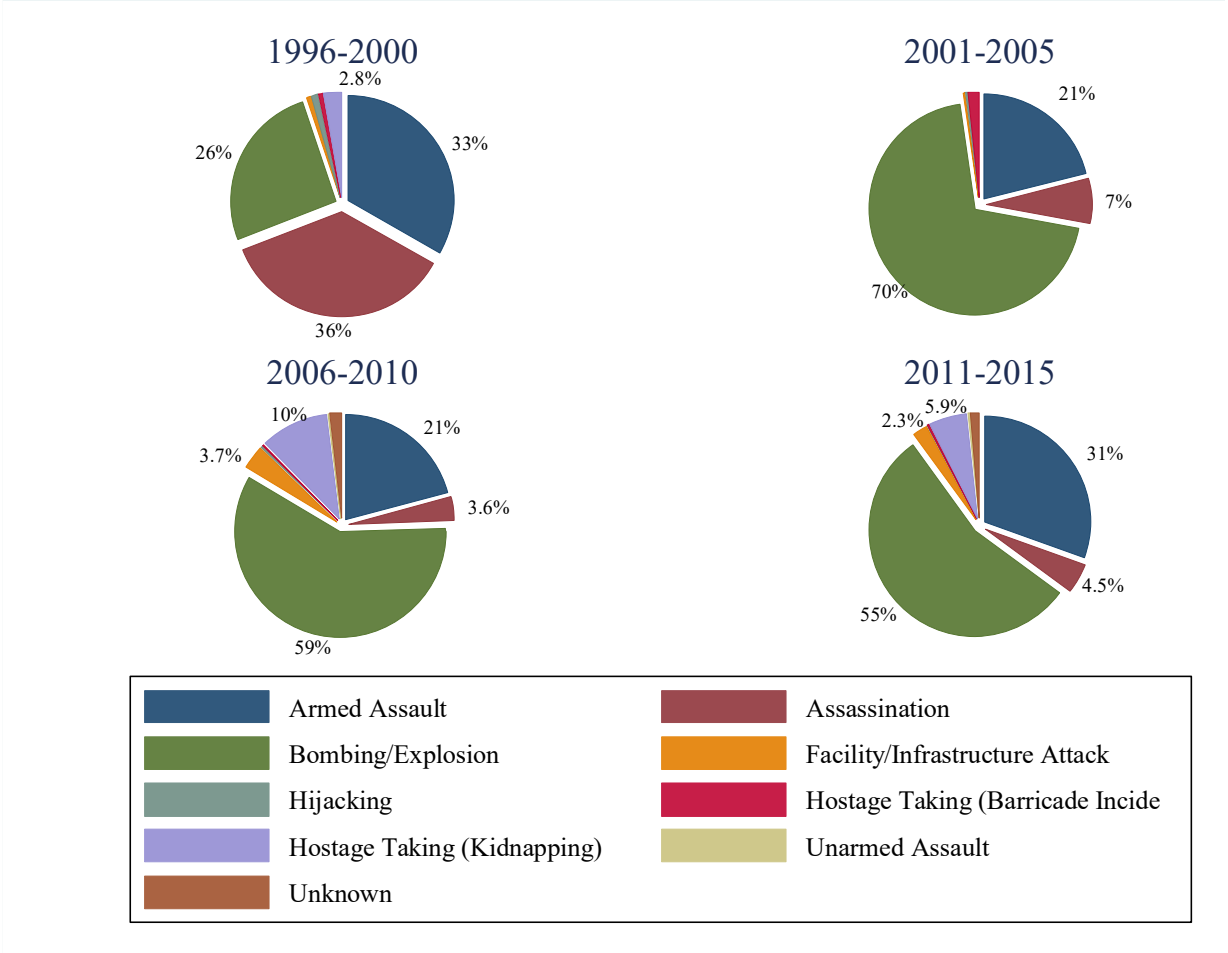
Notes: The management score is the unweighted average of the score for each of the 16 questions, where each question is first normalized to be on a 0-1 scale.

Figure A4: Employment Growth and Management, by province



Notes: The management score is the unweighted average of the score for each of the 16 questions, where each question is first normalized to be on a 0-1 scale. We used the lagged management score.

Figure A5: Terrorist events in Pakistan, by attack type (1996-2015)



Notes: Data from the Global Terrorism Database.

Table A1: Descriptive Statistics, by province

Province	Characteristic	Firm-year obs.	Mean	SD	p(10)	p(25)	p(50)	p(75)	p(90)
KPK	Size	2419	26.05	37.19	11.00	13.00	16.00	27.00	51.00
	Establishment age	2419	8.41	6.43	2.00	4.00	7.00	11.00	16.00
	Exporter	2419	3.18%	-	-	-	-	-	-
	% of managers with degree	2419	26.13%	39.43%	0.00%	0.00%	0.00%	41.12%	100.00%
	% of non-managers with degree	2419	3.08%	11.21%	0.00%	0.00%	0.00%	0.00%	7.89%
	% of union members	2419	4.77%	9.08%	0.00%	0.00%	0.00%	5.69%	10.00%
	Ownership: public limited	2419	0.29%	-	-	-	-	-	-
	Ownership: private limited	2419	3.89%	-	-	-	-	-	-
	Ownership: individual partnership	2419	68.04%	-	-	-	-	-	-
	Ownership: partnership	2419	27.78%	-	-	-	-	-	-
Punjab	Size	2693	54.57	99.00	11.00	13.00	21.00	50.00	106.00
	Establishment age	2693	13.45	11.19	2.00	6.00	11.00	18.00	28.00
	Exporter	2693	20.05%	-	-	-	-	-	-
	% of managers with degree	2693	49.61%	43.50%	0.00%	0.00%	41.12%	100.00%	100.00%
	% of non-managers with degree	2693	7.87%	19.22%	0.00%	0.00%	0.00%	7.89%	20.00%
	% of union members	2693	5.70%	15.32%	0.00%	0.00%	0.00%	5.69%	10.00%
	Ownership: public limited	2693	1.00%	-	-	-	-	-	-
	Ownership: private limited	2693	20.53%	-	-	-	-	-	-
	Ownership: individual partnership	2693	52.32%	-	-	-	-	-	-
	Ownership: partnership	2693	26.14%	-	-	-	-	-	-
Sindh	Size	1588	66.95	115.39	12.00	16.00	31.00	54.00	145.00
	Establishment age	1588	17.01	13.25	4.00	7.00	13.00	23.00	37.00
	Exporter	1588	15.24%	-	-	-	-	-	-
	% of managers with degree	1588	75.40%	39.56%	0.00%	41.12%	100.00%	100.00%	100.00%
	% of non-managers with degree	1588	26.29%	30.02%	0.00%	0.00%	10.00%	60.00%	70.00%
	% of union members	1588	6.13%	15.24%	0.00%	0.00%	0.00%	0.00%	30.00%
	Ownership: public limited	1588	2.71%	-	-	-	-	-	-
	Ownership: private limited	1588	18.45%	-	-	-	-	-	-
	Ownership: individual partnership	1588	45.03%	-	-	-	-	-	-
	Ownership: partnership	1588	33.82%	-	-	-	-	-	-

Table A1 (cont.): Descriptive Statistics, by province

Province	Characteristic	Firm-year obs.	Mean	SD	p(10)	p(25)	p(50)	p(75)	p(90)
Islamabad	Size	176	74.10	145.77	11.00	15.50	29.00	49.50	119.00
	Establishment age	176	13.03	10.48	3.00	5.00	10.00	18.50	26.00
	Exporter	176	15.34%	-	-	-	-	-	-
	% of managers with degree	176	61.23%	39.92%	0.00%	41.12%	45.56%	100.00%	100.00%
	% of non-managers with degree	176	15.76%	26.36%	0.00%	0.00%	7.89%	20.00%	50.00%
	% of union members	176	2.26%	11.22%	0.00%	0.00%	0.00%	0.00%	5.69%
	Ownership: public limited	176	2.27%	-	-	-	-	-	-
	Ownership: private limited	176	13.07%	-	-	-	-	-	-
	Ownership: individual partnership	176	40.91%	-	-	-	-	-	-
	Ownership: partnership	176	43.75%	-	-	-	-	-	-

Notes: Establishment age is defined by the date when the establishment became operative. Exporter is equal to 1 if establishment reported to export production. In observations with missing values for the % of manager and non-manager with a degree, the % of union members, and firm size, we replaced with the means in the sample to keep a constant sample size. P(n) is the value at the n-th percentile, e.g. p(50) is the median value. The sample in all columns is all MOPS observations with at least 11 non-missing responses to management questions.

Table A2: Drivers of Management, by province

Dependent variable	Management Score			
	(1)	(2)	(3)	(4)
Ownership: public limited	ref.	ref.	ref.	ref.
Ownership: private limited	-0.093	-0.012	0.007	0.225***
	(0.099)	(0.047)	(0.054)	(0.070)
Ownership: individual partnership	-0.229**	-0.108**	-0.172***	0.198***
	(0.097)	(0.048)	(0.057)	(0.073)
Ownership: partnership	-0.205**	-0.068	-0.082	0.246***
	(0.097)	(0.048)	(0.057)	(0.070)
Ln(employees)	-0.002	0.035***	0.047***	0.007
	(0.007)	(0.007)	(0.009)	(0.015)
Log(establishment age)	0.027***	0.012**	-0.002	-0.018
	(0.006)	(0.006)	(0.009)	(0.019)
Exporter	0.180***	0.015	0.053***	0.120***
	(0.033)	(0.016)	(0.020)	(0.037)
Proportion of managers with degree	0.120***	0.010	-0.003	0.031
	(0.013)	(0.014)	(0.018)	(0.046)
Proportion of non-managers with degree	0.184***	0.115***	0.348***	0.205***
	(0.055)	(0.028)	(0.027)	(0.059)
Proportion of union members	0.076	0.198***	-0.233***	-0.370***
	(0.053)	(0.035)	(0.046)	(0.060)
Observations	2419	2693	1588	176
# of firms (clusters)	1718	1817	934	112
Province	KPK	Punjab	Sindh	Islamabad

Notes: * p<0.10; ** p<0.05; and *** p<0.01. All models estimated by OLS with standard errors clustered at the establishment level. All models are at the establishment-year level. The management score is the unweighted average of the score for each of the 16 questions, where each question is first normalized to be on a 0-1 scale. The sample in all columns is all MOPS observations with at least 11 non-missing responses to management questions and non-missing responses to the respective independent variables from the referred model. Year fixed effects are included in all regressions. Models accounting for the share of managers and non-managers with a degree, or the share of union members input missing data by the respective PK-MOPS mean while also adding dummies for missing information on these variables.

Table A3: Wave 2 trimmed Sample in Punjab x Wave 1 sample comparison

Sample	Wave 1			Wave 2 (Punjab, trimmed sample)			
Characteristics	Establishment-year observations	Mean	SD	Establishment-year observations	Mean	SD	p-value (t-test)
Management score	2453	0.477	0.186	1144	0.355	0.228	0.000
Data driven performance monitoring	2453	0.597	0.213	1143	0.392	0.267	0.000
Incentives and targets	2453	0.421	0.222	1144	0.340	0.260	0.000
Size	2453	96.287	134.489	1144	77.065	114.637	0.000
Establishment age	2453	18.127	12.255	1144	17.933	12.083	0.657
Exporter	2453	0.353	-	1144	0.322	-	-
% of managers with degree	2453	0.786	0.365	1144	0.718	0.410	0.000
% of non-managers with degree	2453	0.112	0.248	1144	0.104	0.230	0.376
% of union members	2453	0.039	0.154	1144	0.045	0.164	0.310
Ownership: public limited	2453	0.038	-	1144	0.016	-	-
Ownership: private limited	2453	0.427	-	1144	0.359	-	-
Ownership: individual partnership	2453	0.224	-	1144	-	-	-
Ownership: partnership	2453	0.311	-	1144	0.339	-	-

Notes: The management score is the unweighted average of the score for each of the 16 questions, where each question is first normalized to be on a 0-1 scale. The data-driven performance monitoring score is the unweighted average of the score for questions 1 to 5 and the incentives and targets score is the unweighted average of the score for questions 6 to 16. Size is a measure of the number of employees as reported in the MOPS. Establishment age is defined by the date when the establishment became operative. Exporter is equal to 1 if establishment reported to export production. In observations with missing values for the % of manager and non-manager with a degree, the % of union members, and firm size, we replaced with the means in the sample to keep a constant sample size. P(n) is the value at the n-th percentile, e.g. p(50) is the median value. The sample in all columns is all MOPS observations with at least 11 non-missing responses to management questions.

Table A4: Comparing PK-MOPS waves 1 and 2 (within Punjab and trimmed sample)

Panel A - Productivity, Profitability, Employment Growth, and Management across Waves			
Dependent variable	Log(Value Added Per Employee)	Log(Profitability)	Employment Growth
	(1)	(2)	(3)
Management score	0.375*	0.662***	0.123**
	(0.212)	(0.244)	(0.062)
Ln(Capital/Employee)	0.386***	0.425***	
	(0.027)	(0.032)	
Ln(employees)	-0.185***	0.861***	-0.080***
	(0.042)	(0.049)	(0.012)
Wave 2 # Management score	0.002	-0.435	-0.011
	(0.352)	(0.411)	(0.089)
Observations	1689	1618	1449
Firm controls	Yes	Yes	Yes
Industry fixed-effects	Yes	Yes	Yes
Wave fixed-effects	Yes	Yes	Yes
Wave # firm controls/inputs	Yes	Yes	Yes
2010 dummy	Yes	Yes	No

Panel B - Drivers of Management across Waves		
Dependent variable	Management Score	
	(1)	(2)
Ownership: public limited	ref.	ref.
Ownership: private limited	0.039*	0.039
	(0.022)	(0.062)
Ownership: individual partnership	0.007	-0.078
	(0.025)	(0.065)
Ownership: partnership	0.042*	-0.024
	(0.024)	(0.064)
Ln(employees)	0.054***	0.029***
	(0.005)	(0.009)
Log(establishment age)	-0.005	0.017
	(0.006)	(0.015)
Exporter	0.056***	0.016
	(0.010)	(0.021)
% of managers with degree	0.045***	0.065***
	(0.013)	(0.022)
% of non-managers with degree	0.062***	0.128***
	(0.016)	(0.039)
% of union members	0.073***	0.086*
	(0.024)	(0.049)
Observations	2453	1144
# of provinces (clusters)	1338	577
Wave	1	2
Firm controls	Yes	Yes

Notes: * p<0.10; ** p<0.05; and *** p<0.01. Panel A models estimated by OLS in a pooled sample. Panel B models estimated by OLS in a wave 1 and wave 2 subsamples. The sample corresponding to wave 1 uses establishment-year observations based on 2005 and 2010 data. The wave 2 sample uses a 2015 cross section of firms. The management score is the unweighted average of the score for each of the 16 questions where each question is first normalized to be on a 0-1 scale. The sample in all columns is all MOPS observations with at least 11 non-missing responses to management questions and non-missing responses to the respective

independent variables from the referred model. Firm control variables are the share of managers the share of non-managers with a degree and the share of union members (as well as dummies indicating whether missing variables were substituted by the PK-MOPS mean for each one of such variables). For the employment growth model all independent variables were lagged to their 2010 values.

Table A5: Descriptive Statistics on Terrorism and Geographical Controls

Variable	# Tehsil-Window obs.	Mean	SD	p(10)	p(25)	p(50)	p(75)	p(90)
Ln(5-year mean annual # of terr. events within tehsil per 100 squared km)	338	0.13	0.32	0.00	0.00	0.01	0.08	0.47
Ln(5-year mean annual # of bomb./infra. attacks per 100 squared km)	338	0.09	0.25	0.00	0.00	0.00	0.05	0.33
Ln(5-year mean annual # of killed by terr. events per 100 squared km)	338	0.17	0.41	0.00	0.00	0.00	0.08	0.70
Tehsil's area (squared km)	338	1228.79	1651.50	354.01	487.77	860.58	1437.93	2546.21
=1 if tehsil is a province capital	338	0.02	0.13	-	-	-	-	-
=1 if tehsil is on the border with Afghanistan	338	0.01	0.08	-	-	-	-	-
Distance to national capital (grid-centroid)	338	464.36	340.82	104.39	169.80	338.34	783.40	1001.06
% Avg. prevalence of child malnutrition (grid)	338	40.81	4.82	37.20	37.20	38.00	47.60	47.60
Avg. infant mortality rate - death per 10k children (grid)	338	827.09	104.89	720.00	728.00	749.16	941.00	941.00
Avg. travel time to the nearest major city	338	151.92	98.42	74.56	89.12	119.05	181.91	260.88
% coverage of urban areas (grid)	338	1.26	2.26	0.00	0.00	0.33	1.40	4.10
% SD prevalence of child malnutrition (grid)	338	0.33	0.95	0.00	0.00	0.00	0.00	1.32
SD infant mortality rate - death per 10k children (grid)	338	11.01	34.97	0.00	0.00	0.00	0.00	41.01
SD travel time to the nearest major city	338	112.27	63.59	56.03	78.75	95.71	132.35	171.78

Table A6: Firm Management Practices and Terrorism, by province

Dependent variable	Management Score								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Ln(5-year mean annual # of terr. events within tehsil per 100 squared km)	-0.031***	-0.062***	-0.009						
	(0.009)	(0.012)	(0.023)						
Ln(5-year mean annual # of bomb./infra. attacks per 100 squared km)				-0.030***	-0.092***	-0.036*			
				(0.009)	(0.020)	(0.019)			
Ln(5-year mean annual # of killed by terr. events per 100 squared km)							-0.018**	-0.028***	0.005
							(0.009)	(0.007)	(0.032)
Observations	2387	2559	984	2387	2559	984	2387	2559	984
# of tehsils	36	79	53	36	79	53	36	79	53
Province	KPK	Punjab	Sindh	KPK	Punjab	Sindh	KPK	Punjab	Sindh

Notes: * p<0.10; ** p<0.05; and *** p<0.01. Standard errors clustered at the tehsil level. All regressions are at the establishment-year level. Establishments observed in both 2010 and 2015 are assumed to remain in the same industry in both 2010 and 2015. The management score is the unweighted average of the score for each of the 16 questions; where each question is first normalized to be on a 0-1 scale. All columns consider only MOPS-respondents with at least 11 non-missing responses to management questions. Regressions consider establishments in the provinces of KP; Punjab; and Sindh. Establishments in Islamabad are assumed to be within Punjab. All models account for year-, industry- and tehsil-level fixed effects. Establishment-level controls are ; Ln(employees); Log(establishment age); Exporter; % of managers with degree; % of non-managers with degree; % of union members; Missing/Inputed: % of managers with degree; Missing/Inputed: % of non-managers with degree; Missing/Inputed: % of union members; Ownership: individual partnership; Ownership: partnership; Ownership: private limited. Tehsil-level controls are; Tehsil's latitude; Tehsil's longitude; Tehsil's area (squared km); =1 if tehsil is a province capital; =1 if tehsil is on the border with Afghanistan. Grid-level controls are ; Distance to national capital (grid-centroid); % Avg. prevalence of child malnutrition (grid); Avg. infant mortality rate - death per 10k children (grid); Avg. travel time to the nearest major city; % coverage of urban areas (grid); % SD prevalence of child malnutrition (grid); SD infant mortality rate - death per 10k children (grid); SD travel time to the nearest major city.

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