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HEALTHY BUSINESS? MANAGERIAL EDUCATION AND MANAGEMENT IN HEALTHCARE

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ABSTRACT

We investigate the link between hospital performance and managerial education by collecting a large database of management practices and skills in hospitals across nine countries. We find that hospitals that are closer to universities offering both medical education and business education have higher management quality, more MBA trained managers and lower mortality rates. This is true compared to the distance to universities that offer only business or medical education (or neither). We argue that supplying joint MBA-healthcare courses may be a channel through which universities increase medical business skills and raise clinical performance.

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1. INTRODUCTION

Across the world, healthcare systems are under severe pressure due to aging populations, the rising costs of medical technologies, tight public budgets and increasing expectations. Given the evidence of enormous variations in efficiency levels across different hospitals and healthcare systems, these pressures could be mitigated by improving hospital productivity. For example, high-spending areas in the U.S. incur costs that are 50% higher than low-spending ones (Fisher et al., 2003, in the "Dartmouth Atlas").[1] Some commentators focus on technologies (such as Information and Communication Technologies) as a key reason for such differences, but others have focused on divergent preferences and human capital among medical professionals (Phelps and Mooney, 1993; Eisenberg, 2002; Sirovich et al., 2008). One aspect of the latter are management practices such as checklists (e.g. Gawande, 2009). In this paper we seek to measure management practices across hospitals in the US and eight other countries using a survey tool originally applied by Bloom and Van Reenen (2007) for the manufacturing sector. The underlying concepts of the survey tool are very general and provide a metric to measure the adoption of best practices over operations, monitoring, targets and people management in hospitals.

We document considerable variation in management practices both between and within countries. Hospitals with high management scores have high levels of clinical performance, as proxied by outcomes such as survival rates from emergency heart attacks (acute myocardial infarction or AMI). These hospitals also tend to have a higher proportion of managers with greater levels of business skills as measured by whether they have attained MBA-type degrees.

To further investigate the importance of the supply of managerial human capital on managerial and clinical outcomes we draw on data from the World Higher Education Database (WHED) providing the location of all universities in our chosen countries (see Valero and Van Reenen, 2016). We calculate geographical closeness measures (the driving times from a hospital to the nearest university) by geo-coding the location of all hospitals and universities in our sample. We show that hospitals that are closer to universities offering *both* medical and business courses

[1] Annual Medicare spending per capita ranges from $6,264 to $15,571 across geographic areas (Skinner et al, 2011), yet health outcomes do not positively co-vary with these spending differentials (e.g. Baicker and Chandra, 2004; Chandra, Staiger, Skinner, 2010).

within their premises have significantly better clinical outcomes and management practices than those located further away. This relationship holds even after conditioning on a wide range of location-specific characteristics such as income, population density and climate. In contrast, the distance to universities with only a business school, only a medical school, or neither—as in a pure liberal arts college offering only arts, humanities, or religious courses—has no significant relationship with management quality, suggesting that the results are not entirely driven by unobserved heterogeneity in location characteristics correlated with educational institutions.
Proximity to schools offering bundles of medical and managerial courses is positively associated with the fraction of managers with formal business education (MBA-type courses) in hospitals, consistent with the idea that the courses increase the supply of employees with these combined skills. We do not have an instrument for the location of universities, and cannot therefore demonstrate the causality links behind these correlations. Nevertheless, these results are suggestive of a strong—and so far unexplored—relationship between managerial education and hospital performance.

Our paper relates to several literatures. First, the paper is related to the literature documenting the presence of wide productivity differences across hospitals. Chandra et al (2013) estimate a large heterogeneity in hospital "Total Factor Productivity" across U.S. hospitals of an order of magnitude similar to the magnitude documented in manufacturing and retail. We contribute to this literature by suggesting that management education may be a possible factor driving the productivity dispersion via its effect on management practices. Second, our paper contributes to the literature on the importance of human capital (especially managerial human capital) for organizational performance. Examples of this work would include Bertrand and Schoar (2003) for CEOs, Moretti (2004) for ordinary workers, and Gennaioli et al (2013) at the regional and national levels. More specifically Doyle, Ewer and Wagner (2010) examine the causal importance of physician human capital on patient outcomes. Finally, this paper is related to the work on measuring management practices across firms, sectors and countries—for example, Osterman (1994), Huselid (1995), Ichniowski, Shaw and Prenushi, (1997), Black and Lynch (2001) and Bloom et al (2016).

The structure of the paper is as follows. In section 2 we provide an overview of the methodology used to collect the hospital management data, the health outcomes data, the skills data as well as other data used in the analysis. Section 3 describes the basic summary statistics emerging from the data and section 4 presents the results. Section 5 concludes. The online Appendices give much more detail on the data (A), additional results (B), sampling frame (C) and case studies of management practices in individual hospitals (D).

2. DATA

2.1. Collecting Measures of Management Practices across Countries:

To measure hospital management practices and the share of managers with a MBA-type degree, we adapt the World Management Survey (Bloom and Van Reenen 2007, Bloom et al 2014) methodology to healthcare. This is based on the work of international consultants and the healthcare management literature. The evaluation tool scores a set of 20 basic management practices on a grid from one ("worst practice") to five ("best practice") in four broad areas: operations (4 questions), monitoring, (5 questions), targets (5 questions) and human resource management (6 questions). Our management index is the average of all 20 questions. To compute our main management measure used in our regression analysis, we z-score the average of the z-scores of the 20 management questions. The full list of dimensions can be found in Appendix Table A1. To measure manager business and management skills, we asked "What percentage of managers have an MBA?", considering management-related courses that are at least 6-months long.

We used a variety of procedures to persuade hospital employees to participate in the survey. First, we encouraged our interviewers to be persistent running on average two hour-long interviews a day. Second, we never asked hospital managers about the hospital's overall performance during the interview (these were obtained from external administrative sources). Third, we sent informational letters, and, if necessary, copies of country endorsements letters (e.g. UK Health Department).

Following these procedures helped us obtain an overall high response rate in terms of interviews completed. The overall response rate was 34%, which is similar to the response rates for our manufacturing and school surveys. The country-specific response rates ranged from 66%, 53% and 49% of eligible hospitals in Sweden, Germany, and Brazil, to 21% of eligible hospitals in the US. In contrast, the overall explicit refusal rate was 11% and generally low across all countries surveyed, ranging from no refusals in hospitals in Sweden to 22% of all eligible hospitals in Germany. In terms of selection bias, we compare our sample of hospitals for which we secured an interview with the sample of eligible hospitals in each country against size, ownership and location. Looking at the overall pattern of results, we obtain few significant coefficients with marginal effects small in magnitude. In our country-specific analysis, the results show that hospitals with certain location characteristics are more likely to respond in India, public hospitals are more likely to be interviewed in the US, and larger hospitals are more likely to be interviewed in Germany and in Italy. We further construct sampling weights and observe that our main unweighted results hold even when using this alternative sample weighting scheme. We describe our selection analysis as well as the sampling frame sources and response rates in more detail in Appendix C.

To elicit candid responses, we took several steps. First, our interviewers received extensive training in advance on hospital management. Second, we also employed a double-blind technique. Interviewers are not told in advance about the hospital's performance – they only had the hospital's name and telephone number – and respondents are not told in advance their answers are scored. Third, we told respondents we were interviewing them about their hospital management, asking open-ended questions like "*Tell me how you track performance?*" and "*If I walked through your ward what performance data might I see?*". The combined responses to these types of questions are scored against a grid. For example, these two questions help to score question 6, *performance monitoring*, which goes from 1, which is defined as *"Measures tracked do not indicate directly if overall objectives are being met. Tracking is an ad-hoc process (certain processes aren't tracked at all)*", to 5 defined as "*Performance is continuously tracked and communicated, both formally and informally, to all staff using a range of visual management tools.*" Interviewers kept asking questions until they could score each dimension.

Other steps to guarantee data quality included: (i) each interviewer conducted on average 39 interviews in order to generate consistent interpretation of responses. They received one week of intensive initial training and four hours of weekly on-going training;[2] (ii) 70% of interviews had another interviewer silently listening and scoring the responses, which they discussed with the lead interviewer after the end of the interview. This provided cross-training, consistency and quality assurance. (iii) We collected a series of 'noise controls', such as interviewee and interviewer characteristics. We include these controls in the regressions to reduce potential response bias.

The data was collected for Canada, France, Italy, Germany, Sweden, U.S and U.K. (in 2009); India (2012); and Brazil (2013). For the U.K. we combine two waves of the survey (2006 and 2009).[3] The choice of countries was driven by funding availability, the availability of hospital sampling frames, and research and policy interest. In every country the sampling frame for the management survey was randomly drawn from administrative register data and included all hospitals that (i) have an Orthopedics or Cardiology Department, (ii) provide acute care, (iii) have overnight beds. Interviewers were each given a random list of hospitals from a sampling frame representative of the population of hospitals with these characteristics in the country. We interviewed the director of nursing, medical superintendent, nurse manager or administrator of the specialty, that is, the clinical service lead at the top of the specialty who is still involved in its management on a daily basis. We describe the country sampling frames, their sources, and eligibility criteria in Appendices A and C. In most countries, we find that some hospitals are part of larger networks. Therefore, in our analysis we cluster standard errors by hospital network to take into account potential similarities across these hospitals, and multiple observations across years for the UK sample.

2.2. Collecting Hospital Health Outcomes

Given the absence of publicly comparable measures of hospital-level performance across countries, we collected country-specific measures of AMI (acute myocardial infarction, commonly called heart attacks) death rates. AMI is a common emergency condition, recorded

[2] See, for example, the video of the training for our 2009 wave http://worldmanagementsurvey.org/?page_id=187

[3] The 2006 U.K. data has been used in Bloom et al (2015).

accurately and believed to be strongly influenced by the organization of hospital care (Kessler and McClellan 2000), and used as a standard measure of clinical quality. We tried to create a consistent measure across countries, although there are inevitably some differences in construction so we include country dummies in almost all of our specifications.[4] We observe substantial differences in spread of this measure across countries—the country specific coefficient of variation is 0.51 for Brazil, 0.52 for Canada, 0.21 for Sweden, 0.10 for the U.S. and 0.34 (2006) and 0.15 (2009) for the U.K.

2.3. Classifying differences across universities

In the WHED we can distinguish whether universities offer courses in Business (Management, Administration, Entrepreneurship, Marketing, Advertising courses), Medical (Clinical courses), and Humanities (Arts, Language, Religion courses) and a range of other "divisions" (see Feng, 2015; Valero and Van Reenen, 2015). We geocode the location of each school using their published addresses and compute drive-times between hospitals and universities of different types using GoogleMaps. The computation of travel times is restricted to hospitals and universities in the same county (see Appendix A for a more detailed explanation).

2.4. Collecting Location Characteristics Information

Using the geographic coordinates of hospitals in our sample, we also collected a range of other location characteristics. At the regional level, we use the variables provided in Gennaioli et al (2013).[5] For data at the grid level, we construct a dataset based on the G-Econ Project in Yale that estimates geographical measures for each grid cell which represents 1 degree in latitude by 1 degree longitude. Table B1 presents descriptive statistics for the sets of location characteristics used in this analysis.

[4] For Brazil we compute a simple risk-adjusted measure by taking the unweighted average across rates for myocardial infarction specified as acute or with a stated duration of 4 weeks or less from onset for each rage-gender-age cell for each hospital for the years of 2012 and 2013. For Canada, we use risk-adjusted rate for acute myocardial infarction mortality for the years 2004-2005, 2005-2006 and 2006-2007. For Sweden, we use 28-day case fatality rate from myocardial infarction from 2005 to 2007. For the US, we use the risk-adjusted 30-day death (mortality) rates from heart attack from July 2005 to June 2008. For the UK we use 30 day risk adjusted mortality rates purchased from the company "Dr Foster", the leading provider of NHS clinical data. (See Appendix A for more information and sources). For each hospital, we consider three years of data (the survey year plus two years preceding, or the closest years to the survey with available data) to smooth over possible large annual fluctuations.

[5] The regional data from Gennaioli et al (2013) consists of NUTS1, NUTS2, State or Provincial level, depending on the country.

3. DESCRIPTIVE STATISTICS

3.1 Basic Descriptives

Table 1 shows the management scores across hospitals (which is the simple average of the questions ranging between 1 and 5) and Figure 1 shows the differences across countries. The US has the highest management score (3.0), closely followed by the UK, Sweden, and Germany (all around 2.7) with Canada, Italy, and France slightly lower (at around 2.5). The emerging economies of Brazil (2.2) and India (1.9) have the lowest scores.[6] The rankings do not change substantially (except for Sweden) when we include controls for hospital characteristics and interview noise. Country fixed effects are significant (p-value on the F-test of joint significance is 0.00) and account for 32% of the variance in the hospital-level management scores, which is a greater fraction than for manufacturing firms, where the figure is 25% for the same set of countries.[7]

Figure 2 shows the distribution of management scores within each country compared to the smoothed (kernel) fit of the US distribution. Across OECD countries, lower average country-level management scores are associated with an increasing dispersion towards the left tail of the distribution. Hospitals with very weak management practices (score of 2 or below) have almost no monitoring, very weak targets (e.g. only an annual hospital-level target) and extremely weak incentives (e.g. tenure based promotion, no financial or non-financial incentives and no effective action taken over underperforming nurses or doctors). While the fraction of hospitals with very weak management practices in OECD countries is small (from 5% in the US to 18% in France), this fraction rises to 45% in Brazil and 68% in India. At the other end of the distribution, the fraction of hospitals scoring with some reasonable performance monitoring, a mix of targets and performance-based promotion, rewards and steps taken to address persistent underperformance (score 3 or above) ranges from 50% in the US to 3% in India.

[6] In the Appendix, we provide examples of management practices in the average hospital in the US (at the top of the ranking) and in India (at the bottom of the ranking).

[7] Table C2 presents hospital characteristics across countries. Although there are many differences in cross country means (e.g. the median French hospital has 730 beds compared to 45 in Canada). However, within all countries non-responders were not significantly different from participating hospitals. Characteristics are different because the healthcare systems differ and our sample reflects this.

3.2 AMI Mortality Rates and Management

As an external validation of our management measure across countries, we investigate whether management is related clinical outcomes. Table 2 shows that management practices are significantly negatively correlated with AMI mortality rates.[8] In column (1) the management coefficient suggests that a one standard deviation increase in a hospital's management score is associated with a fall of -0.188 standard deviations in AMI deaths rates, and this relationship holds even after controlling for a wide variety of factors. Column (2) includes a measure of size (hospital beds), ownership dummies (for-profits; non-for-profit and government owned), other hospital characteristics (local competition and skills) and statistical noise controls. Column (3) includes regional geographic controls (income per capita, education, population density, climate, ethnicity, etc.). Column (4) includes regional dummies, and column (5) uses more disaggregated geographical controls. Although the coefficient on management varies between columns (from -0.188 to -0.223), it is significant at the 1% level throughout.

Table 2 is consistent with findings from other work. For example, Bloom et al (2015) use English hospitals from 2006 and also find a positive link between management and positive performance such as survival rates from general surgery, lower staff turnover, lower waiting lists, shorter lengths of stay and lower infection rates.[9] Chandra et al (2016) look at the management scores and risk-adjusted AMI survival rates in US hospitals and also report a positive relationship.

3.3. Management and Management Education

We explore the correlation between management scores and management education in Table 3. First, column (1) shows that country dummies and basic interviewer, department and interview controls can account for about half of the overall variation in management scores. Column (2) shows that the management score is positively and significantly correlated with the share of managers in the hospital who have received managerial education. The coefficient implies that a 100% increase in the managerial skills variable (that is an average hospital that moves from

[8] Note that we can only do this for a sub-set of hospitals (478 from the total of 1960 observations), as AMI data is not available for all hospitals.

[9] These are only correlations so may not be causal. The results do indicate that hospitals like Virginia Mason, ThedaCare and Intermountain that are famous for adopting these types of management practices typically have better outcomes than others.

having 26% to 52% of managers with a MBA-type course) is associated with .88 of standard deviation increase in the management score.

To evaluate whether the correlation of management scores with managerial skills is due to basic structural differences across hospitals, we control for hospital size (number of beds) in column (4) and ownership (dummies for private-for profit and private-not for profit status) in column (5).[10] Larger hospitals tend to have higher management scores, whereas government run hospitals tend to have lower management scores. While the inclusion of these controls reduces the coefficient on the management skills variable by 29%, the variable remains positive and significant. Another possible explanation is that the correlation we observe is due to competition levels. For example, Bloom, Propper, Seiler, and Van Reenen (2015) show causal evidence of the impact of higher competition on improved managerial quality in English hospitals. To account for this, we add a measure of competition in column (5).[11] In column (6) we add the share of managers with a clinical degree to explore whether hospitals perform better when they are run by managers with a clinical background (Goodall 2011). Finally, in column (7) we add geographic controls at the regional level to test for whether the relationship found is simply being driven by differences in location. Management skills remain correlated with management across all these specifications.

3.4. Summary

Overall, the data show: a) a positive correlation between clinical outcomes and management practices; and b) a positive correlation between management practices and management education.

4. MAIN RESULTS

In this section we explore the relationship between the proximity of a university offering both management and clinical education and three hospital-level variables of interest: (i) AMI

[10] See, for example, evidence of firm basic structures as possible explanations for the variation in management quality in Bloom, Sadun, and Van Reenen (2016).

[11] Our measure of competition is collected during the survey itself by asking the interviewee 'How many other hospitals with the same specialty are within a 30-minute drive from your hospital?'

mortality rates, (ii) management practices, and (iii) the fraction of managers with an MBA-type qualification.

4.1 AMI Mortality Rates

The average driving time between hospitals and universities is 37 minutes with a median of 19 minutes. Column (1) of Table 4 regresses AMI death rates on driving hours to the nearest university and includes country dummies and general controls. Column (2) includes hospital characteristics (size, ownership and competition) and column (3) adds regional controls. Although there is a positive coefficient on distance from a university, it is statistically insignificant.

Next, we explore whether distance to universities offering both business and medical/clinical courses (henceforth, "*joint M-B school*") is correlated with clinical performance. We calculate driving distances from each hospital to the nearest *joint M-B school,* which is 67 minutes on average. While we include a range of geographic characteristics in our specification (such as income, education, population and temperature) there could still be unobserved heterogeneity specific to university locations confounding the relationship between hospital performance and the distance to universities. Therefore, in addition to including *joint M-B school* we also include driving distance to universities specializing solely on arts, humanities or religious courses ("*stand-alone HUM*") and therefore not offering clinical/medical or business-type courses (and expect to find no significant relationship between these universities and hospital performance). To validate the use of this type of school as a placebo, Figure 3 shows that the nearest *stand-alone HUM school* and *joint M-B school* are similar in proximity to the hospitals in our sample: 82% of hospitals have a driving time difference of two hours or less between these two types of universities. We also observe that the means of a range of location characteristics of the nearest *joint M-B school* and *stand-alone HUM school* are not statistically significant (in Table B2).[12] Finally, we also include universities that do not offer medical, business or humanities ("*no M, B, HUM*").

[12] The only measures that are statistically significant are latitude and longitude.

In column (4) of Table 3 we show that there is a statistically significant and positive relationship between distance only to the nearest *joint M-B school* and AMI mortality rates—an additional hour of driving to a *joint M-B school* increases AMI mortality rates by 0.393 of a standard deviation. Reassuringly, we do not observe a significant relationship between hospital performance and the other university types.

The significance of the *joint M-B school* in the AMI regressions may be due to other nearby universities that do not have medical/clinical or business courses, but offer other types of quantitative courses (such as engineering, etc.). To investigate this issue, we calculate distances to other schools such as (i) the nearest university offering business courses but no medical/clinical courses ("*B school, no M"*), (ii) the nearest university offering medical/clinical courses but not business courses ("*M school, no B"*), and (iii) the nearest university offering other courses but no business nor medical courses ("*nearest school, no M nor B"*). Figure 4 shows that the distributions are similar across all types of schools. In column (5) of Table 3, we include variables measuring driving distances to all four types of schools. The distance to *joint M-B* schools has explanatory power over and above distances to other school types, and has a coefficient similar to the previous column in terms of magnitude. Since none of these other school types are individually or jointly significant we drop them in column (6) which is our preferred specification.

Could the coefficient on our main variable of interest be due to a failure to control for finer geographical characteristics? Column (7) of Table 3 includes regional dummies, grid level geographical controls in the most general specification of column (5) and show that the coefficient on distance to a joint M-B school is if anything even larger.

Since we do not need the management survey for the results in Table 3, we can in principle estimate this on a larger sample. We focused on the US where information on AMI is available for close to the hospital population[13] and re-ran a similar specification to column (5) of Table 3. Although we only have one country, the coefficient on distance remains positive and (weakly)

[13] We use a sample of hospitals in the US for which AMI measures are reported in 2009, our year of reference for the OECD countries. We approximate the sample used in the US to the cross-country sample used in this paper by excluding sole community providers and hospitals operated by the Catholic Church.

significant. Because we have a larger number of hospitals within networks in the US-only sample we can also estimate a specification with network fixed effects in column (9). This exploits within network variation in AMI mortality rates and distance to schools, thus controlling for possible network-level confounders (the sample is smaller as we require at least two hospitals in the chain for which performance data was available).[14] These results confirm that distance to *joint M-B schools* is associated with AMI mortality rates, while the distance to other types of schools is not.[15]

4.2 Management Practices

Table 5 explores the relationship between distance to universities and management practices - the specifications are the same as the first seven columns of Table 3 with a different dependent variable. There is a negative correlation between distance to the nearest university and management quality, but it is insignificant in column (3) which controls for regional characteristics. As with Table 3 columns (4) and (5) show that it is only *joint M-B* schools that has explanatory power over and above distances to other school types. The results in our preferred specification in column (6) suggest that every additional hour of driving to a *joint M-B school* is associated with a decrease in hospital management quality of 0.145 of a standard deviation. [16]

4.3 Business education

What could be the reason for this relationship between distance and better hospital outcomes (in terms of AMI survival rates and management practices)? One obvious mechanism is that there is a greater supply of workers with managerial skills when a hospital is close to a *joint M-B school.*

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[14] This is analogous to a manufacturing context where one could use plant-specific variation within a firm (i.e. firm fixed effects with plant level data).

[15] We also repeat the specification in column (8) but add HRR fixed effects to check if our results are robust to market characteristics and find similar results. Using a larger UK sample, we explore another dimension of hospital performance: the average probability of staff intending to leave in the next year as a measure of worker job satisfaction for the U.K. reported by the NHS staff surveys and used on Bloom et al (2015). Reassuringly, we find similar patterns to those described in Table 3, indicating a significant positive correlation between distant to the nearest joint M-B school and the likelihood of the average employee wanting to leave the hospital.

[16] In Table B3 we check whether this relationship is driven by joint M-B school quality characteristics such as age and ranking. While we observe that these measures are to some extent significantly correlated to hospital management quality (but not to AMI mortality rates) when included in the analysis, our results show that adding these measures do not result in substantial changes to the magnitude and significant of our distance to joint M-B coefficient of interest.

In Figure 6 we investigate the relationship between the share of managers with an MBA type degree and the hospital's closeness to a *joint M-B school* (left hand side).[17] There is a clear downwards slope – being closer to these types of schools is associated with a higher fraction of managers with MBAs. By contrast, the right hand side panel of Figure 6, shows that there is no relationship between the share of MBAs and the distance to *stand-alone HUM* schools. We formalize Figure 6 in Table 6 which uses the same specifications as Table 5 except has the share of managers with MBA-type course as the dependent variable. Consistent with the two earlier tables, closeness to a *joint M-B school* (but not other types of school) is associated with significantly more hospital managers with business education.

We bring these ideas together by instrumenting the share of MBA with the distance to a joint M-B school embodying the idea that proximity increases the managerial skill supply which in turn benefits hospital performance. If the only way that university proximity matters is through skill supply this should identify the causal impact of managerial education on hospital performance. With the important caveats that the exclusion restriction may not be valid (as universities could in principle affect hospitals through other routes than the supply of human capital) and the instrument is not strong, we observe that results are consistent with a large causal effect. These results are detailed in Table B4 and described in the Appendix.

5. CONCLUSIONS

We have collected data on management practices in 2,000 hospitals in nine countries. We document a large variation of these management practices within each country and find that our index of "better management" is positively associated with improved clinical outcomes such as survival rates from AMI.

We show evidence that a hospital's proximity to a university which supplies joint business and clinical education is associated with a higher management practice score (and better clinical outcomes). Proximity to universities that do *not* have medical schools or do *not* have business schools does not statistically matter for hospital management scores, suggesting that the bundle

[17] All variables in Figure 6 are orthogonalized off geographical controls through a first stage regression.

of managerial and clinical skills has an impact on hospital management quality. We find that hospitals which are closer to the combined clinical and business schools also have a higher fraction of managers with MBAs which is consistent with this interpretation.

Our work suggests that management matters for hospital performance and that the supply of managerial human capital may be a way of improving hospital productivity. Given the enormous pressure health systems are under, this may be a complementary way of dealing with health demands in addition to the usual recipe of greater medical inputs.

The correlations we describe are only suggestive as we do not have panel data or experimental evidence to track out causal impacts. Such evidence from either randomized control trials or natural experiments is an obvious next step in this agenda.

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ONLINE APPENDICES (NOT INTENDED FOR PUBLICATION)

APPENDIX A: DATA

A1. Management Survey Data

Table A1 lists the 20 management practices questions asked during the survey.

A2. Hospital-Level Performance Data

We use hospital performance data for five countries surveyed, for which data was publicly available. Below is a description of our hospital performance dataset for each country.

Brazil: We used the rate for myocardial infarction specified as acute or with a stated duration of 4 weeks (28 days) or less from onset (ICD-10, I21) for years 2012 and 2013. We create a simple risk-adjusted measure by taking the unweighted average across rates for each rage-gender-age cell for each hospital. The raw data was extracted from Datasus Tabnet (http://tabnet.datasus.gov.br).

Canada: We take the average of the risk-adjusted rate for acute myocardial infarction mortality for the years 2004-2005, 2005-2006 and 2006-2007 for the provinces British Columbia and Ontario. The data was extracted from hospital reports provided by the Fraser Institute (www.fraserinstitute.org).

Sweden: We use 28-day case fatality rate from myocardial infarction for hospitalized patients for the years of 2004 to 2006 computed and published by the Swedish Association of Local Authorities and Regions (SALAR) and the Swedish National Board of Health and Welfare (NBHW) in the report "Quality and Efficiency in Swedish Health Care – Regional Comparisons 2008".

United States: We use the 30-day death (mortality) rates from heart attack from July 2005 to June 2008 (2009 for the specifications in Table 2, columns 8 and 9) computed and published by Hospital Compare.

United Kingdom: We use 30-day risk adjusted AMI mortality data purchased from “Dr Foster” relative to 2006 (matched with the 2006 survey wave) and 2009 (matched with the 2009 survey wave).

A3. University Data

The University data comes from the World Higher Education Database (WHED) which has the location, foundation date and list of “divisions” (subjects) of all research universities in our chosen countries (see Feng, 2015; Valero and Van Reenen, 2016). Divisions are classified into Business (Management, Administration, Entrepreneurship, Marketing, Advertising courses), Medical (Clinical courses), and Humanities (Arts, Language, Religion courses). Table A2 shows the number of unique schools in each country used in this analysis.

A4. Distance Information

We geo-code the location of hospitals and universities using addresses available, cross referencing four sources of coordinates (Geopostcodes datasets purchased, Google geo-coding of address, geo-coding of institution name and manual searches on search engines) and converging to a final dataset. We compute travel times using Google API (travel times are not a function of time of day, that it, running the Google distance API at 11pm on a Sunday vs 9am on a Monday yields the same result). Computation of distance is restricted to hospitals and universities in the same county.

A5. Location Information

The source data on population density comes from CIESIN and is presented as average density within population grids identified by the coordinates of the grid’s centroid. Population density is computed using ArGIS. We spatially join hospital coordinates with centroid coordinates and (1) take the population density of the closest centroid (2) compute the average population density of all centroids within 100km (3) compute the inverse distance weighted population density of all centroids within 100km. Results are robust to using any one of these three measures. Computation of distance is restricted to hospitals and universities in the same county.

APPENDIX B: ADDITIONAL RESULTS

Table B1 presents descriptive statistics on the range of regional- and grid-level location characteristics used in the analysis.

Table B2 presents the Difference in means of grid-level location characteristics of the nearest joint M-B and stand-alone HUM schools to each hospital in our dataset.

Table B3 explores whether the relationship between hospital performance (as measured by clinical or managerial quality) and distance to joint M-B school are being driven by school quality characteristics. We show our results are robust to controlling for the age of the university or the ranking of the university in global league tables.

In Table B4 we bring the results of Tables 2, 3 and 4 together. Columns (1) through (3) use AMI mortality rates as the dependent variable and regress this on the share of managers with an MBA type degree. We instrument share of MBA with the distance to a joint M-B school embodying the idea that proximity increases the managerial skill supply which in turn benefits hospital performance. If the only way that university proximity matters is through this school supply this should identify the causal impact of managerial education on hospital performance. The negative and significant effect in column (1) is consistent with a large causal effect. However, an important caveat is that the exclusion restriction may not be valid. For example, if proximity enabled a hospital to receive other beneficial inputs (executive education and consultancy that are not reflected in MBA share) this would violate the exclusion restriction. Columns (4) through (6) of Table 6 repeat the specifications of the first three columns, but use management practices as the dependent variable instead of AMI death rates. In column (7) and (8) we add distance to stand-alone HUM schools as a control and as an instrument, respectively, while maintaining distance to joint M-B as an instrument. There is a positive and significant coefficient on MBA share across all five columns. In column (9) we perform a placebo test by removing distance to joint M-B schools and using solely distance to stand-alone HUM schools as an instrument. As expected, the MBA share coefficient is no longer significant and turns negative. Another caveat to these results is that the instruments are not strong. The F-statistics shown in the lower rows are about 8 in the simplest specifications, but are much lower when we control for other covariates, especially geographical controls in columns (3) and (6). The second stage coefficients also become much more imprecise in these columns which is consistent with the weak instruments problem.

APPENDIX C: SAMPLING FRAME

C1. The Sampling Frame and Eligibility to Participate in the Management Survey
In every country the sampling frame for the management survey included all hospitals that (i) have an Orthopaedics or Cardiology Department, (ii) provide acute care, (iii) have overnight beds. The source of this sampling frame by country is shown in Table C1. Interviewers were each given a randomly selected list of hospitals from the sampling frame. This should therefore be representative of the population of hospitals in the country. At hospitals, we either interviewed the director of nursing, medical superintendent/nurse manager/administrator of specialty, that is, the clinical service lead at the top of the speciality who is still involved in its management on a daily basis. The clinical service leads also had to be in the post for at least one year at the time of the interview.

Table C2 shows the number of healthcare facilities in each country, the number of eligible hospitals randomly drawn the sampling frame, and hospital characteristics from these eligible hospitals. For the countries where information is available, the sample in Canada, France and the UK present the largest percentage of hospitals which are funded and managed by government authorities (all above 60% with Canada reaching 99%), while the samples in Brazil and the US have the lowest percentage (39% and 28%, respectively).

The median hospital size in the sample in France as measured by the number of hospital beds is by far the largest (730) while the median hospital in the sample in Italy, Germany, the UK and Sweden are of similar size (between 195 and 269 beds). The US and Canada samples present the smallest sized hospitals.

C2. The Survey Response Rates

Table C3 shows the survey response rates by country. The top table represents all hospitals in the randomly selected list of hospitals given to the interviewers as described above. The bottom table represents all hospitals eligible for the interview. The eligibility criteria were confirmed by the interviewer during the process of contacting and scheduling the interview. As the type of healthcare facilities included in the lists sourced in each country varied substantially, interviewers spent significant time on the phone screening out ineligible hospitals. For example, interviewers identified 78% of hospitals to be ineligible for the survey in Brazil while in France this number is down to 16%. This is one of the main reasons for a lower average of hospital interviews conducted per day in comparison to the average for our manufacturing interviews (2.8 per day).

In terms of interviews completed, we managed to obtain a response rate ranging from 66%, 53% and 49% of eligible hospitals in Sweden, Germany, and Brazil, to 21% of eligible hospitals in the US. In contrast, the explicit refusal rate was generally low across all countries surveyed, ranging from no refusals in hospitals in Sweden to 22% of all eligible hospitals in Germany. The high response rate in general was due to greater persistence in following up non-respondents in order to meet the target numbers we were aiming for and to the fact that most hospital managers interviewed in these countries responded with a scheduled time and date soon after the first or second contact with the interviewer.

"Scheduling in progress" indicates hospitals which have been contacted by an interviewer and which have not refused to be interviewed (for example they may schedule an interview but cancel or postpone it or simply take more time to respond). The high share of "scheduling in progress" schools was due to the need for interviewers to keep a stock of between 100 to 300 hospitals to cycle though when trying to arrange interviews. Since interviewers only ran an average of 1.1 interviews a day the majority of their time was spent trying to contact hospitals managers to schedule future interviews.

The ratio of successful interviews to rejections (ignoring "scheduling in progress") is above 1 in every country. Hence, managers typically agreed to the survey proposition when interviewers were able to connect with them.

C3. Selection Analysis

Panel A of Table C4 analyses the probability of being interviewed. Within each country, we compare the responding hospitals with those eligible hospitals in the sampling frame - including "interviews refused" and "scheduling in progress" but removing "hospital not eligible" for the survey - against three types of selection bias: location characteristics (income per capita, population size, population average years of education, share of population with a high school degree, share of population with a college degree, average temperature, inverse distance to coast, oil production per capital), size (number of hospital beds), ownership (whether the hospital is owned and managed by government authorities).

Looking at the overall pattern of results, there are very few significant coefficients. The results from the pooled sample show that only the coefficients for temperature and inverse distance to coast are significant (this is driven by a few countries as opposed to being an overall trend). One noticeable exception is India where the results show that hospitals with certain location characteristics are more likely to respond (hospitals in areas less populated, lower share of population with high school, farther away to the coast, and with a larger number of ethnic groups). Information on whether the hospital is owned and managed by government authorities and the number of hospital beds is not available for all countries, nonetheless we check for any potential selection bias in the countries for which we have this information. The results show that public hospitals are more likely to be interviewed, although this is only significant in the US, and larger hospitals are more likely to be interviewed in Germany (significant at the 1% level) and in Italy (significant at the 10% level).

To address selection concerns, we used the pooled regression in Column 1 of Table C4 (where data are available for all countries) to construct sampling weights. We then plot our cross-country ranking using the estimated weights. We found that the rankings across countries for the unweighted scores in Figure 1 were very robust when using this alternative sample weighting scheme. Figure C1 below gives the equivalent of Figure 1 using the weights from Table C4.

APPENDIX D: EXAMPLES OF HOSPITAL MANAGEMENT PRACTICE

United States

A typical US hospital has a set layout of patient flow which has been thought through and streamlined to be as efficient as possible. If the hospital is spread over a set of floors, it has a dedicated patient elevator to avoid delays in transporting patients. Diagnostic rooms, operation theatres and pharmacies are fairly close to each other by design, though there is not much discussion to improve this pathway anymore. There is a certain level of standardization of clinical processes across the hospital, with a set of "care models" or checklists which are to be followed by physicians and nurses. The compliance with these is checked infrequently and through an audit once per quarter or year.

For improvements to the hospital, suggestions are only followed up on if someone mentions it. The hospital has some informal processes to collect staff feedback via suggestion boxes or an open-door policy for managers. With respect to their staff, a hospital has fixed sets of staff, which are competent in their specific areas. Staff are not found performing duties for which they are over-qualified for. Ward nurses are flexible, but there is no cross-ward movement.

In terms of key performance indicators, a hospital mainly tracks patient satisfaction reports and some other government indicators. The directors review the reports monthly, and clinical leaders are responsible for sharing this data with lower level staff. While there is a process, there are no proactive visual cues in the wards or hallways. For reviewing this data, the managers have a monthly meeting that all staff, care technicians and administration staff are involved. Metrics regarding different aspects of the hospital management are reviewed, and while there is some follow up plans drawn up, no clear responsible person, expectations or deadlines are assigned.

For overall targets, there is broad range of targets that include several different aspects, from clinical to operational and financial. But these are seen as an overall mission rather than day-to-day goals. As a consequence, targets are not well understood and shared at the lower level of the hospital. Generally, they are set by the regional government and are not coherently shared with the various levels within the hospital. They usually have short-term and long-term components, with at least a 3-year plan that is loosely linked to the short-term targets. These targets are challenging but not pushy for most departments. Hospital meets 70-80% of its targets. Not all departments have the same difficulty of targets (for instance, surgery gets easier targets than cardiology), and while nurses are held accountable for budget targets, doctors are not held responsible.

There are yearly appraisal conversations with staff. These try to detect development necessities or possibilities for the staff, but there is no bonus system. Rewards are sometimes given in form of flowers or a voucher to a movie theatre. For poor performers, this evaluation system triggers a training system when under-performance is identified.

If the person does not get “fixed” after training, a disciplinary process starts. However, the process can last years and, if the person is eventually fired, the likelihood that he or she will be reinstated in the post is very high because of pressures from the unions and the infinite bureaucratic procedures.

India

The typical hospital in India is spread over a set of floors, with diagnostic centers and the emergency room on the ground floor, the Operation Theatres and post-op rooms on the first floor. General wards would usually be in the floors above the OT, though there are usually a set of "deluxe" rooms in the same floor of the OT for higher-paying patients. There is one elevator, which is shared, and a ramp in case the elevator fails. There is a general push for standardization and a willingness to develop protocols to seek accreditation, though this is not fully implemented yet. There is usually a basic lab certification, and an ISO certificate for very basic processes (i.e. are the basic procedures and infrastructure to carry out the operations of the hospital?). Checklists are not used. There is a patient history file, but processes are not thoroughly documented. Monitoring of these processes are done by ad-hoc peer-checking and not through a set procedure.

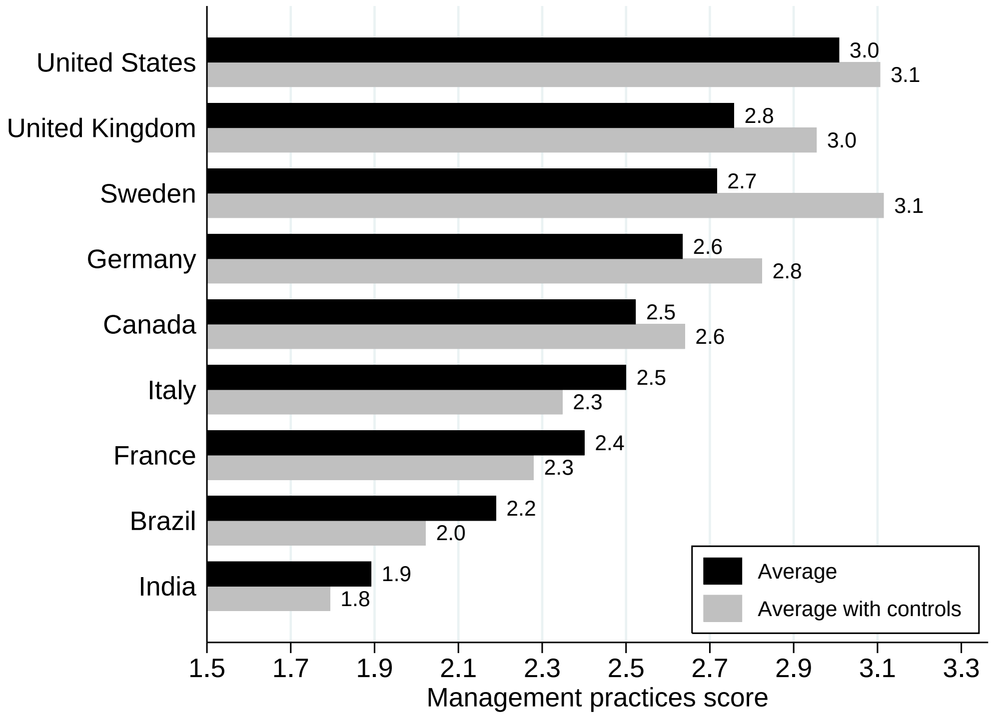
Nurses are trained in a particular department and then rotated every six months. They are cross-trained, and any staff movement is coordinated by the matron. There is no documentation of skills, and only the matron would know who could be allocated where based on her experience.

Performance is generally not tracked, apart from patient satisfaction surveys. The average hospital will sometimes track infection rates and occupancy rates, but not in a systematic manner and nothing beyond this. Whatever is tracked, is normally done on a monthly basis. Managers have monthly meetings to review the state of the hospital, but there is not much data to review. Conversations revolve around issues that happened in the month, any problems that arose, and they record the minutes of the meeting which are shared only with the attendees. The heads of department are then expected to share the information with other staff, though this is not checked or followed up on.

Overall hospital targets are very vague and not quantitative, such as "we would like to improve our specialty" or "we aim to get more equipment." There are no financial or operational targets. Since there are no targets, there is not a general concept of short-term or long-term targets, interconnection or difficulty of targets.

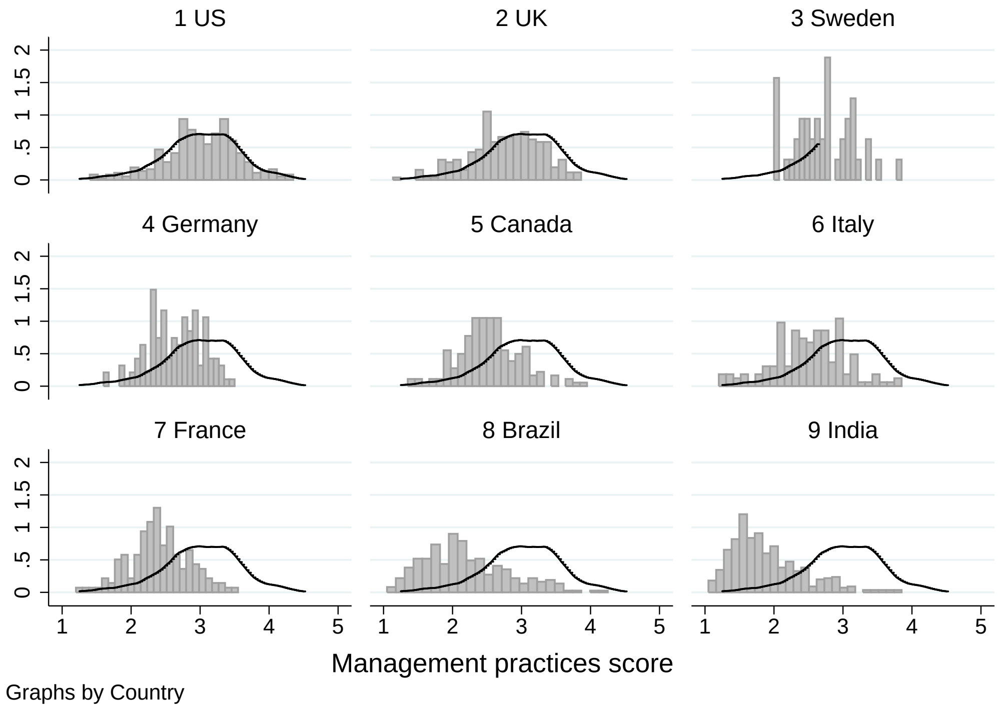
There is a yearly appraisal system, mostly done by observation of work, and it is not well defined in terms of quantifiable parameters. For instance, there is not a specific attendance rate that is expected or measured. The evaluation is based on more qualitative perceptions, such as "does the person do their job well" (without a clear measure of what "well" means). There is an increment to salary if the appraisal goes "well," but bonuses are not based on performance. Promotions are based on tenure first, and then, among the set of most senior people, performance is taken into account. There are no opportunities for professional development beyond sending people to courses and conferences, which are not frequent (once per year at most). Poor performers are dealt with through a 3-step process of verbal warning, written warning followed by termination. This usually takes at most one month, and if the problem is not fixed their employment is terminated.

Figure 1: Management practices across countries



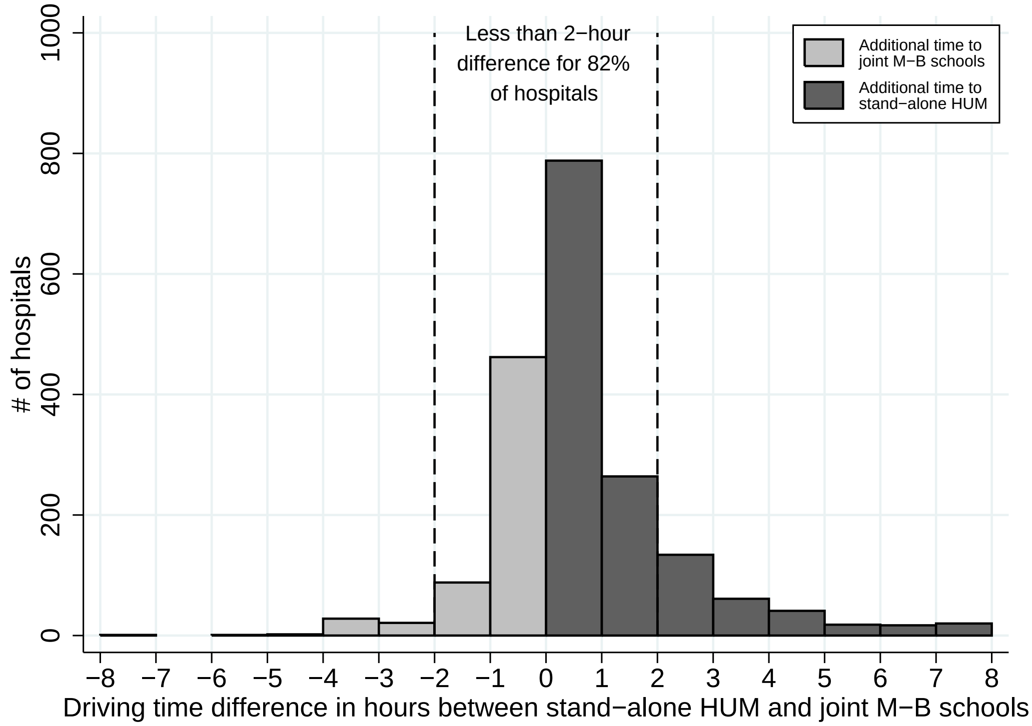
Notes: The number of observations in each country is as follows: Brazil = 286, Canada = 174, France = 147, Germany = 124, India = 490, Italy= 154, Sweden = 43, United Kingdom = 235, and United States = 307. Controls include **hospital characteristics** - log of the number of hospital beds, dummies for private for profit and non for profit - and **noise controls** -interviewee seniority, tenure, department (orthopeadics, surgery, Cardiology, or other), and type (nurse, doctor, or non-clinical manager), year and duration of the interview, an indicator of the reliability of the information as coded by the interviewer, and 55 interviewer dummies .

Figure 2: Management practices within countries



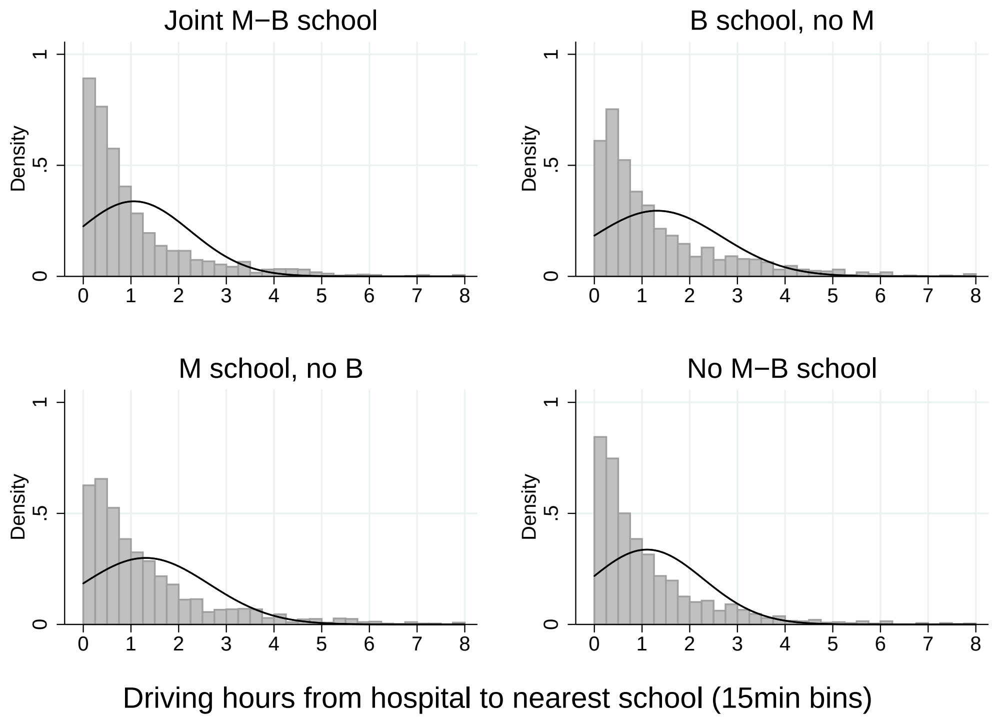
Notes: The number of observations in each country is as follows: Brazil = 286, Canada = 174, France = 147, Germany = 124, India = 490, Italy= 154, Sweden = 43, United Kingdom = 235, and United States = 307 .

Figure 3: Driving time difference between placebo and IV



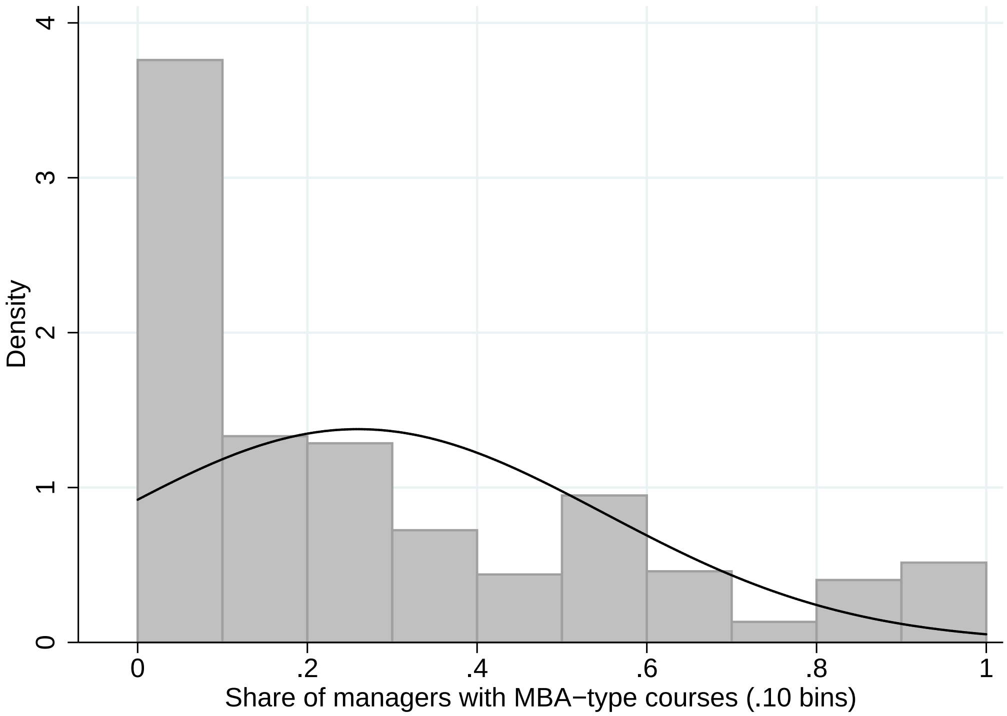
Notes: 1,960 observations. Driving time difference capped at 8 hours.

Figure 4: Driving hours between hospital location and nearest school



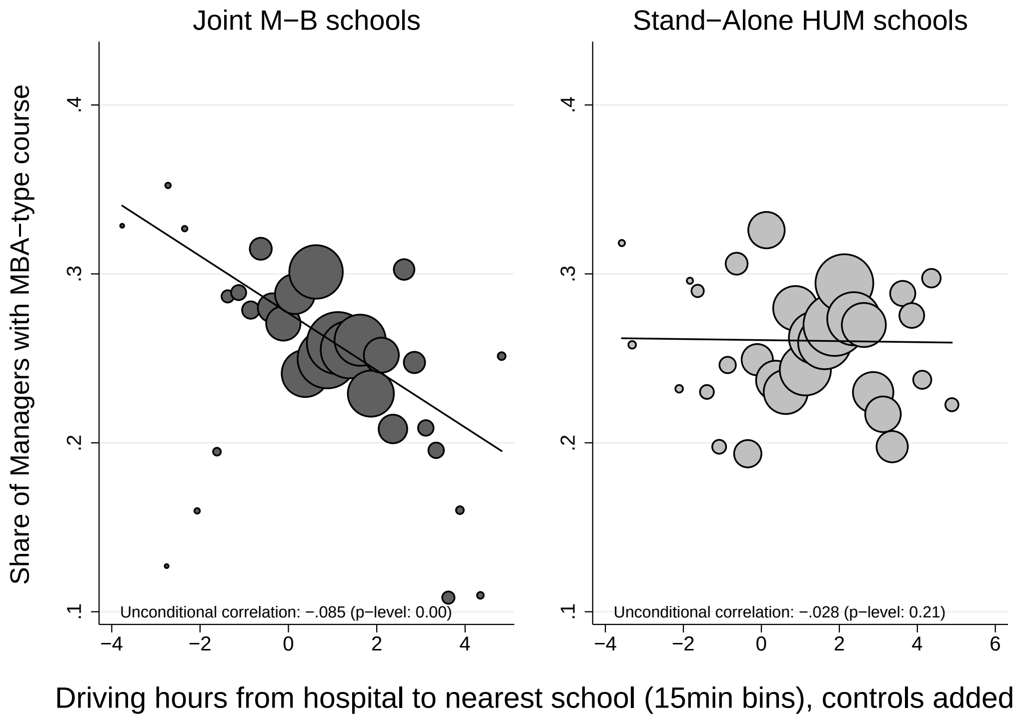
Notes: 1,960 observations. **Joint M-B school** offers both business and medical courses. **B school, no M** offers business but no medical courses. **M school, no B** offers medical but no business courses. **No M-B school** offers neither types of courses. Figure excludes hospitals with driving hours longer than 8 hours for presentation purposes (Number excluded: Top-left panel = 13, Top-right panel = 20, Bottom-left panel = 25, Bottom-right panel = 17) .

Figure 5: Share of hospital managers with a MBA-type course



Notes: 1,960 observations.

Figure 6: Share of managers with MBA-type course and driving hours to nearest school



Notes: Mean of share of managers with MBA-type courses and travel time in 15 minute bins. Controls include **general controls** - interviewee seniority, tenure, department (Orthopeadics, Surgery, Cardiology, or Other), and type (Nurse, Doctor, or non-clinical Manager), year and duration of the interview, an indicator of the reliability of the information as coded by the interviewer, and 55 interviewer dummies, and **geographic controls at the regional level** - log of income per capita, years of education, share of population with high school degree, share of population with college degree, population, temperature, inverse distance to coast, log of oil production per capita, log of number of ethnic groups. Excludes 31 hospitals with driving hours longer than 5 hours. Weighted markers represent the number of hospitals in each bin. Unconditional correlation with full-sample of 1,960 observations at the bottom or each panel.

Table 1: Descriptive statistics

	mean	p50	sd	min	max	count
Management Quality and Performance						
Management	2.42	2.40	(0.65)	1.0	4.3	1960
Measures of Managerial Skills						
Share of managers with MBA-type course	0.26	0.15	(0.29)	0.0	1.0	1960
Hospital Characteristics						
Hospital beds	270.39	133.00	(365.40)	6.0	4000.0	1959
# of competitors: 0	0.14	0.00	(0.35)	0.0	1.0	1955
# of competitors: 1 to 5	0.61	1.00	(0.49)	0.0	1.0	1955
# of competitors: more than 5	0.24	0.00	(0.43)	0.0	1.0	1955
Dummy public	0.51	1.00	(0.50)	0.0	1.0	1960
Dummy private for profit	0.30	0.00	(0.46)	0.0	1.0	1960
Dummy private not for profit	0.19	0.00	(0.39)	0.0	1.0	1960
Distances to Universities						
Driving hrs, nearest joint M-B schools	1.16	0.65	(1.84)	0.0	41.8	1960
Driving distance (km) to nearest joint M-B schools	80.28	36.59	(135.39)	0.0	2842.4	1960
Driving hrs, nearest B school, no M	1.46	0.86	(2.16)	0.0	44.4	1960
Driving hrs, nearest M school, no B	1.47	0.89	(2.19)	0.0	44.4	1960
Driving hrs, nearest school, no M or B	1.24	0.71	(2.06)	0.0	44.4	1960
Driving hrs, nearest stand-alone humanities school	1.86	1.14	(2.42)	0.0	44.4	1960
Driving hrs, nearest university in general	0.62	0.32	(1.47)	0.0	41.8	1960

Table 2: Hospital management is strongly correlated with health outcomes

Dependent variable:	(1) Z(AMI)	(2) Z(AMI)	(3) Z(AMI)	(4) Z(AMI)	(5) Z(AMI)
Z(Mgmt)	-0.188***	-0.223***	-0.203***	-0.204***	-0.203***
	(0.055)	(0.067)	(0.065)	(0.071)	(0.066)
Ln(Hospital beds)		-0.041	-0.035	-0.093	-0.047
		(0.081)	(0.084)	(0.090)	(0.082)
Dummy private for profit		-0.129	-0.089	0.000	-0.027
		(0.209)	(0.213)	(0.272)	(0.214)
Dummy private not for profit		-0.340**	-0.256*	-0.224	-0.199
		(0.147)	(0.140)	(0.145)	(0.143)
General controls		Y	Y	Y	Y
Hospital characteristics		Y	Y	Y	Y
Geographic controls - Regional level			Y	Y	
Geographic controls - Grid level					Y
Observations	478	478	478	478	478
No of clusters	397	397	397	397	397
Fixed effects	country	country	country	region	country
R-squared	0.02	0.17	0.20	0.34	0.19

Notes: * p < 0.1, ** p < 0.05, *** p < 0.01. All columns estimated by OLS. Standard errors clustered by hospital network in parentheses. Dependent variable Z(AMI) refers to a pooled measure of country-specific acute myocardial infarction mortality rates (measures are standardized by country and year of survey). **General controls** include interviewee seniority, tenure, department (orthopeadics, surgery, Cardiology, or other), and type (nurse, doctor, or non-clinical manager), year and duration of the interview, an indicator of the reliability of the information as coded by the interviewer, and 55 interviewer dummies. **Hospital characteristics** include number of competitors constructed from the response to the survey question on number of competitors, and is coded as zero for none (16% of responses), 1 for "less than 5" (59% of responses), and 2 for "5 or more" (25% of responses), and log of share of managers with a clinical degrees. **Geographic controls - Regional level** include log of income per capita, years of education, share of population with high school degree, share of population with college degree, population, temperature, inverse distance to coast, log of oil production per capita, log of number of ethnic groups. **Geographic controls - Grid level** include log of gross product per capita, 2005 USD at market exchange rates, log of gross product per capita, 2005 USD at pp exchange rates, 2005, distance to major navigable river, distance to ice-free ocean, average precipitation, average temperature, and elevation. Whenever one of these two sets of geographic controls are added, hospital latitude, hospital longitude and population density within 100km radius is also added.

Table 3: Is management education driving hospital management?

	Main Specification							Robustness	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent variable:	Z(Mgmt)	Z(Mgmt)	Z(Mgmt)	Z(Mgmt)	Z(Mgmt)	Z(Mgmt)	Z(Mgmt)	Z(Mgmt)	Z(Mgmt)
Ln(% of managers with MBA-type course)		0.878***	0.676***	0.629***	0.625***	0.630***	0.613***	0.597***	0.611***
		(0.086)	(0.085)	(0.085)	(0.085)	(0.084)	(0.084)	(0.084)	(0.089)
Ln(Hospital beds)			0.180***	0.198***	0.193***	0.192***	0.186***	0.183***	0.177***
			(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.019)
Dummy private for profit				0.283***	0.269***	0.271***	0.277***	0.258***	0.223***
				(0.056)	(0.056)	(0.056)	(0.055)	(0.056)	(0.059)
Dummy private not for profit				0.263***	0.256***	0.260***	0.233***	0.237***	0.174***
				(0.050)	(0.050)	(0.050)	(0.052)	(0.051)	(0.055)
Number of Competitors					0.049*	0.052*	0.030	0.030	0.034
					(0.026)	(0.026)	(0.028)	(0.028)	(0.030)
Ln(% of managers with clinical degree)						0.189**	0.165*	0.169*	0.220**
						(0.092)	(0.091)	(0.091)	(0.096)
Hospital latitude							0.002	-0.003	-0.010
							(0.005)	(0.004)	(0.014)
Hospital longitude							0.003	0.005***	-0.004
							(0.002)	(0.002)	(0.007)
Ln(Population density within 100km radius)							0.029*	0.032**	0.045**
							(0.018)	(0.016)	(0.023)
General controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Geographic controls - Regional level							Y		
Geographic controls - Grid level								Y	Y
Observations	1960	1960	1960	1960	1960	1960	1960	1960	1960
No of clusters	1869	1869	1869	1869	1869	1869	1869	1869	1869
Fixed effects	country	country	country	country	country	country	country	country	region
R-squared	0.55	0.58	0.60	0.61	0.61	0.62	0.63	0.63	0.67

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. All columns estimated by OLS. Standard errors clustered by hospital network in parentheses. Dependent variable Z(Mgmt) refers to the hospital's z-score of management (the z-score of the average z-scores of the 20 management questions). **General controls** include interviewee seniority, tenure, department (orthopeadics, surgery, Cardiology, or other), and type (nurse, doctor, or non-clinical manager), year and duration of the interview, an indicator of the reliability of the information as coded by the interviewer, and 55 interviewer dummies. **Geographic controls - Regional level** include log of income per capita, years of education, share of population with high school degree, share of population with college degree, population, temperature, inverse distance to coast, log of oil production per capita, log of number of ethnic groups. **Geographic controls - Grid level** include log of gross product per capita, 2005 USD at market exchange rates, log of gross product per capita, 2005 USD at pp exchange rates, 2005, distance to major navigable river, distance to ice-free ocean, average precipitation, average temperature, and elevation. Whenever one of these two sets of geographic controls are added, hospital latitude, hospital longitude and population density within 100km radius is also added.

Table 4: Hospital health outcomes and distance to nearest schools

	Main Specification					Robustness		Robustness - US	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent variable:	Z(AMI)	Z(AMI)	Z(AMI)	Z(AMI)	Z(AMI)	Z(AMI)	Z(AMI)	Z(AMI)	Z(AMI)
Ln(Driving hrs, nearest school)	0.226	0.035	0.038						
	(0.208)	(0.232)	(0.234)						
Ln(Driving hrs, nearest joint M-B schools)				0.393**	0.358**	0.344**	0.482**	0.210*	0.284*
				(0.160)	(0.163)	(0.154)	(0.214)	(0.111)	(0.164)
Ln(Driving hrs, nearest school, no M, B, HUM)				0.072					
				(0.159)					
Ln(Driving hrs, nearest stand-alone HUM)				-0.196					
				(0.173)					
Ln(Driving hrs, nearest B school, no M)					0.066		-0.026	-0.023	0.097
					(0.156)		(0.215)	(0.105)	(0.184)
Ln(Driving hrs, nearest M school, no B)					0.075		-0.035	0.090	-0.018
					(0.162)		(0.176)	(0.093)	(0.146)
Ln(Driving hrs, nearest school, no M or B)					-0.180		-0.003	-0.065	-0.088
					(0.194)		(0.219)	(0.085)	(0.159)
General controls	Y	Y	Y	Y	Y	Y	Y		
Hospital characteristics		Y	Y	Y	Y	Y	Y	Y	Y
Geographic controls - Regional level			Y	Y	Y	Y		Y	Y
Geographic controls - Grid level							Y		
Observations	478	478	478	478	478	478	478	2034	1175
No of clusters	397	397	397	397	397	397	397	1071	212
Fixed effects	country	country	country	country	country	country	region		network
Test of Equality: Joint M-B = HUM				0.03					
Test of Equality: Joint M-B = B, no M					0.20		0.12	0.14	0.47
Test of Equality: Joint M-B = M, no B					0.28		0.10	0.41	0.16
Test of Joint Sig.: HUM, no M-B-HUM				0.47					
Test of Joint Sig.: B, M, No B-M					0.72		1.00	0.72	0.90
R-squared	0.12	0.15	0.19	0.20	0.20	0.20	0.37	0.09	0.36

Notes: * p < 0.1, ** p < 0.05, *** p < 0.01. All columns estimated by OLS. Standard errors clustered by hospital network in parentheses. Dependent variable Z(AMI) refers to a pooled measure of country-specific acute myocardial infarction mortality rates (measures are standardized by country and year of survey). **General controls** include interviewee seniority, tenure, department (orthopeadics, surgery, cardiology, or other), and type (nurse, doctor, or non-clinical manager), year and duration of the interview, an indicator of the reliability of the information as coded by the interviewer, and 55 interviewer dummies. **Hospital characteristics** include log of the number of hospital beds, dummies for private for profit and non for profit, and number of competitors constructed from the response to the survey question on number of competitors, and is coded as zero for none (16% of responses), 1 for "less than 5" (59% of responses), and 2 for "5 or more" (25% of responses). **Geographic controls - Regional level** include log of income per capita, years of education, share of population with high school degree, share of population with college degree, population, temperature, inverse distance to coast, log of oil production per capita, log of number of ethnic groups. **Geographic controls - Grid level** include log of gross product per capita, 2005 USD at market exchange rates, log of gross product per capita, 2005 USD at pp exchange rates, 2005, distance to major navigable river, distance to ice-free ocean, average precipitation, average temperature, and elevation. Whenever one of these two sets of geographic controls are added, hospital latitude, hospital longitude and population density within 100km radius is also added.

Table 5: Hospital management and distance to nearest schools

	Main Specification					Robustness	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable:	Z(Mgmt)	Z(Mgmt)	Z(Mgmt)	Z(Mgmt)	Z(Mgmt)	Z(Mgmt)	Z(Mgmt)
Ln(Driving hrs, nearest school)	-0.339***	-0.139***	-0.080				
	(0.046)	(0.045)	(0.049)				
Ln(Driving hrs, nearest joint M-B schools)				-0.112**	-0.107**	-0.145***	-0.128**
				(0.044)	(0.044)	(0.038)	(0.051)
Ln(Driving hrs, nearest school, no M, B, HUM)				-0.054			
				(0.042)			
Ln(Driving hrs, nearest stand-alone HUM)				-0.019			
				(0.039)			
Ln(Driving hrs, nearest B school, no M)					0.001		-0.002
					(0.041)		(0.049)
Ln(Driving hrs, nearest M school, no B)					-0.034		-0.010
					(0.043)		(0.049)
Ln(Driving hrs, nearest school, no M or B)					-0.053		-0.072
					(0.045)		(0.052)
General controls	Y	Y	Y	Y	Y	Y	Y
Hospital characteristics		Y	Y	Y	Y	Y	Y
Geographic controls - Regional level			Y	Y	Y	Y	
Geographic controls - Grid level							Y
Observations	1960	1960	1960	1960	1960	1960	1960
No of clusters	1869	1869	1869	1869	1869	1869	1869
Fixed effects	country	country	country	country	country	country	region
Test of Equality: Joint M-B = HUM				0.16			
Test of Equality: Joint M-B = B, no M					0.09		0.09
Test of Equality: Joint M-B = M, no B					0.25		0.11
Test of Joint Sig.: HUM, no M-B-HUM				0.28			
Test of Joint Sig.: B, M, No B-M					0.39		0.52
R-squared	0.56	0.60	0.61	0.61	0.61	0.61	0.66

Notes: * p < 0.1, ** p < 0.05, *** p < 0.01. All columns estimated by OLS. Standard errors clustered by hospital network in parentheses. Dependent variable Z(Mgmt) refers to the hospital's z-score of management (the z-score of the average z-scores of the 20 management questions).**General controls** include interviewee seniority, tenure, department (orthopeadics, surgery, cardiology, or other), and type (nurse, doctor, or non-clinical manager), year and duration of the interview, an indicator of the reliability of the information as coded by the interviewer, and 55 interviewer dummies. **Hospital characteristics** include log of the number of hospital beds, dummies for private for profit and non for profit, and number of competitors constructed from the response to the survey question on number of competitors, and is coded as zero for none (16% of responses), 1 for "less than 5" (59% of responses), and 2 for "5 or more" (25% of responses). **Geographic controls - Regional level** include log of income per capita, years of education, share of population with high school degree, share of population with college degree, population, temperature, inverse distance to coast, log of oil production per capita, log of number of ethnic groups. **Geographic controls - Grid level** include log of gross product per capita, 2005 USD at market exchange rates, log of gross product per capita, 2005 USD at pp exchange rates, 2005, distance to major navigable river, distance to ice-free ocean, average precipitation, average temperature, and elevation. Whenever one of these two sets of geographic controls are added, hospital latitude, hospital longitude and population density within 100km radius is also added.

Table 6: Share of MBA-type education and distance to schools

	Main Specification					Robustness	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable:	Ln(MBA)	Ln(MBA)	Ln(MBA)	Ln(MBA)	Ln(MBA)	Ln(MBA)	Ln(MBA)
Ln(Driving hrs, nearest school)	-0.063***	-0.023	-0.004				
	(0.016)	(0.017)	(0.016)				
Ln(Driving hrs, nearest joint M-B schools)				-0.028*	-0.030**	-0.023*	-0.031*
				(0.014)	(0.015)	(0.013)	(0.017)
Ln(Driving hrs, nearest school, no M, B, HUM)				-0.002			
				(0.013)			
Ln(Driving hrs, nearest stand-alone HUM)				0.014			
				(0.011)			
Ln(Driving hrs, nearest B school, no M)					0.016		0.014
					(0.013)		(0.016)
Ln(Driving hrs, nearest M school, no B)					-0.019		-0.033**
					(0.012)		(0.015)
Ln(Driving hrs, nearest school, no M or B)					0.016		0.008
					(0.013)		(0.016)
General controls	Y	Y	Y	Y	Y	Y	Y
Hospital characteristics		Y	Y	Y	Y	Y	Y
Geographic controls - Regional level			Y	Y	Y	Y	
Geographic controls - Grid level							Y
Observations	1960	1960	1960	1960	1960	1960	1960
No of clusters	1869	1869	1869	1869	1869	1869	1869
Fixed effects	country	country	country	country	country	country	region
Test of Equality: Joint M-B = HUM				0.04			
Test of Equality: Joint M-B = B, no M					0.03		0.07
Test of Equality: Joint M-B = M, no B					0.62		0.91
Test of Joint Sig.: HUM, no M-B-HUM				0.48			
Test of Joint Sig.: B, M, No B-M					0.19		0.17
R-squared	0.23	0.27	0.28	0.29	0.29	0.28	0.37

Notes: * p < 0.1, ** p < 0.05, *** p < 0.01. All columns estimated by OLS. Standard errors clustered by hospital network in parentheses. Dependent variable Ln(MBA) refers to the log of the share of hospital managers with a MBA-type course. **General controls** include interviewee seniority, tenure, department (orthopeadics, surgery, cardiology, or other), and type (nurse, doctor, or non-clinical manager), year and duration of the interview, an indicator of the reliability of the information as coded by the interviewer, and 55 interviewer dummies. **Hospital characteristics** include log of the number of hospital beds, dummies for private for profit and non for profit, and number of competitors constructed from the response to the survey question on number of competitors, and is coded as zero for none (16% of responses), 1 for “less than 5" (59% of responses), and 2 for “5 or more" (25% of responses). **Geographic controls - Regional level** include log of income per capita, years of education, share of population with high school degree, share of population with college degree, population, temperature, inverse distance to coast, log of oil production per capita, log of number of ethnic groups. **Geographic controls - Grid level** include log of gross product per capita, 2005 USD at market exchange rates, log of gross product per capita, 2005 USD at pp exchange rates, 2005, distance to major navigable river, distance to ice-free ocean, average precipitation, average temperature, and elevation. Whenever one of these two sets of geographic controls are added, hospital latitude, hospital longitude and population density within 100km radius is also added.

Table A1: List of management practices

Operations Management

Topic	Description:
Q1. Layout of Patient Flow	Measures how well the patient pathway is configured at the infrastructure level and whether staff proactively improve their own work-place organization
Q2. Rationale for Introducing Standardisation/ Pathway Management	Measures the motivation and impetus behind changes to operations and what change story was communicated
Q3. Standardisation and Protocols	Measures whether there are standardised procedures (e.g. integrated clinical pathways) that are applied and monitored systematically
Q4. Good Use of Human Resources	Measures whether staff are deployed to do what they are best qualified for, but nevertheless help out elsewhere when needed

Performance Monitoring

Topic	Description:
Q5. Continuous Improvement	Measures how well the patient pathway is configured at the infrastructure level and whether staff proactively improve their own work-place organization
Q6. Performance Tracking	Measures whether hospital performance is tracked using meaningful metrics and with appropriate regularity
Q7. Performance Review	Measures whether hospital performance is reviewed with appropriate frequency and communicated to staff
Q8. Performance Dialogue	Measures the quality of hospital performance review conversations
Q9. Consequence Management	Measures whether differing levels of hospital performance (not personal but plan/ process based) lead to different consequence

Target Setting

Topic	Description:
Q10. Target Balance	Measures whether targets cover a sufficiently broad set of metrics
Q11. Target Interconnection	Measures whether targets are tied to hospital objectives and how well they cascade down the organisation
Q12. Time Horizon of Targets	Measures whether hospital has a '3 horizons' approach to planning and targets
Q13. Target Stretch	Measures whether targets are appropriately difficult to achieve
Q14. Clarity and Comparability of Targets	Measures how easily understandable performance measures are and whether performance is openly communicated

People Management

Topic	Description:
Q15. Rewarding High Performers	Measures whether good performance is rewarded proportionately
Q16. Fixing Poor Performers	Measures whether the hospital is able to deal with underperformers
Q17. Promoting High Performers	Measures whether promotions and career progression are based on performance
Q18. Managing Talent	Measures what emphasis is put on talent management
Q19. Retaining Talent	Measures whether the hospital will go out of its way to keep its top talent
Q20. Creating a Distinctive Employee Value Proposition	Measures how strong employee value proposition is to work in the individual hospital

Notes: Detailed survey instrument available at www.worldmanagementsurvey.org

Table A2: Number of unique universities used in each country

	(1) Joint M-B Schools	(2) M, no B Schools	(3) B, no M Schools	(4) No M nor B Schools	(5) Stand-alone HUM Schools	(6) Universities in general
Brazil	120	127	198	225	146	244
Canada	57	39	35	49	47	78
France	40	59	23	64	28	92
Germany	47	60	32	66	53	94
India	121	113	55	90	40	208
Italy	13	17	41	29	12	64
Sweden	12	6	7	8	10	20
United Kingdom	63	27	29	26	21	100
United States	235	204	165	180	156	276
Total	708	652	585	737	513	1176

Table B1: Descriptive statistics

	mean	p50	sd	min	max	count
Geographic Characteristics						
Hospital latitude	30.39	40.79	(24.40)	-32.0	68.4	1960
Hospital longitude	-8.48	-0.17	(63.16)	-157.8	94.9	1960
Population density within 100km radius	956.46	450.01	(1552.22)	0.2	12667.0	1960
Geographic Characteristics - Regional level						
Ln(Income per capita), regional	9.58	10.23	(1.13)	6.6	11.0	1960
Years of education, regional	7.51	9.53	(10.55)	-99.0	12.8	1960
Share of pop with high school degree, regional	0.31	0.29	(0.20)	0.0	0.7	1960
Share of pop with college degree, regional	0.18	0.16	(0.12)	0.0	0.5	1960
Population, regional	16.14	16.03	(1.38)	10.3	19.0	1960
Temperature, regional	14.89	12.38	(8.62)	-12.2	28.3	1960
Inverse distance to coast, regional	0.84	0.87	(0.14)	0.5	1.0	1960
Ln(Oil production per capita), regional	0.09	0.00	(0.32)	0.0	4.2	1960
Ln(# of ethnic groups), regional	1.10	1.10	(0.80)	0.0	3.0	1960
Geographic Characteristics - Grid level						
Gross prod. p.c, 2005 USD at market xrt, 2005	1.87	2.26	(1.52)	0.0	8.0	1957
Gross prod. p.c, 2005 USD at ppp xrt, 2005	2.11	2.52	(1.50)	0.0	9.4	1957
Distance to major navigable river (km)	879422.83	537973.40	(833327.76)	2821.7	4030517.0	1958
Distance to ice-free ocean (km)	314802.57	154694.60	(371156.10)	312.1	1804279.0	1958
Average precipitation	1101.90	1009.80	(422.77)	92.1	3495.1	1960
Average temperature	15.05	12.73	(8.16)	-9.2	28.9	1899
Elevation	401.15	280.70	(437.14)	1.8	4731.4	1960

Table B2: Difference in means of location characteristics of the nearest joint M-B and stand-alone HUM schools to each hospital

	Humanities Schools Mean	Medicine & Business Schools Mean	Diff in means	T Stat	Humanities Schools N	Medicine & Business Schools N
Population density within 100km radius	978.18	1105.39	127.20	1.34	534	725
Latitude	25.55	30.06	4.51**	2.95	534	726
Longitude	-41.18	-30.27	10.91**	3.25	534	726
Gross product per capita, 2005 USD at market exchange rates, 2005	2.21	2.21	-0.01	-0.08	532	724
Gross product per capita, 2005 USD at market exchange rates, 1990	1.75	1.73	-0.02	-0.32	532	724
Gross product per capita, 2005 USD at ppp exchange rates, 2005	2.46	2.40	-0.05	-0.61	532	724
Gross product per capita, 2005 USD at ppp exchange rates, 1990	1.95	1.88	-0.07	-1.01	532	724
Distance to major navigable river (km)	683143.98	756754.61	73610.62	1.92	534	724
Distance to ice-free ocean (km)	383102.62	375410.09	-7692.54	-0.34	534	724
Average precipitation	1198.19	1159.67	-38.52	-1.37	534	726
Average temperature	13.52	12.36	-1.16	-1.40	534	726
Elevation	473.68	437.22	-36.46	-1.21	534	726

Table B3: Is the performance-distance to university relationship being driven by university characteristics?

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable:	Z(Mgmt)	Z(Mgmt)	Z(Mgmt)	Z(Mgmt)	Z(AMI)	Z(AMI)	Z(AMI)	Z(AMI)
Ln(D-hrs to joint M-B)	-0.189***	-0.142***	-0.143***	-0.141***	0.376**	0.334**	0.352**	0.342**
	(0.035)	(0.038)	(0.038)	(0.038)	(0.157)	(0.155)	(0.155)	(0.157)
Log(Age of joint M-B)		0.048***		0.042**		0.068		0.045
		(0.017)		(0.020)		(0.085)		(0.090)
Global QS Rank Dummy for joint M-B			0.080*	0.033			0.160	0.131
			(0.044)	(0.051)			(0.170)	(0.180)
General controls	Y	Y	Y	Y	Y	Y	Y	Y
Hospital characteristics	Y	Y	Y	Y	Y	Y	Y	Y
Geographic controls - Regional level		Y	Y	Y		Y	Y	Y
Observations	1960	1960	1960	1960	478	478	478	478
No of clusters	1869	1869	1869	1869	397	397	397	397
R-squared	0.61	0.62	0.61	0.62	0.16	0.20	0.20	0.20

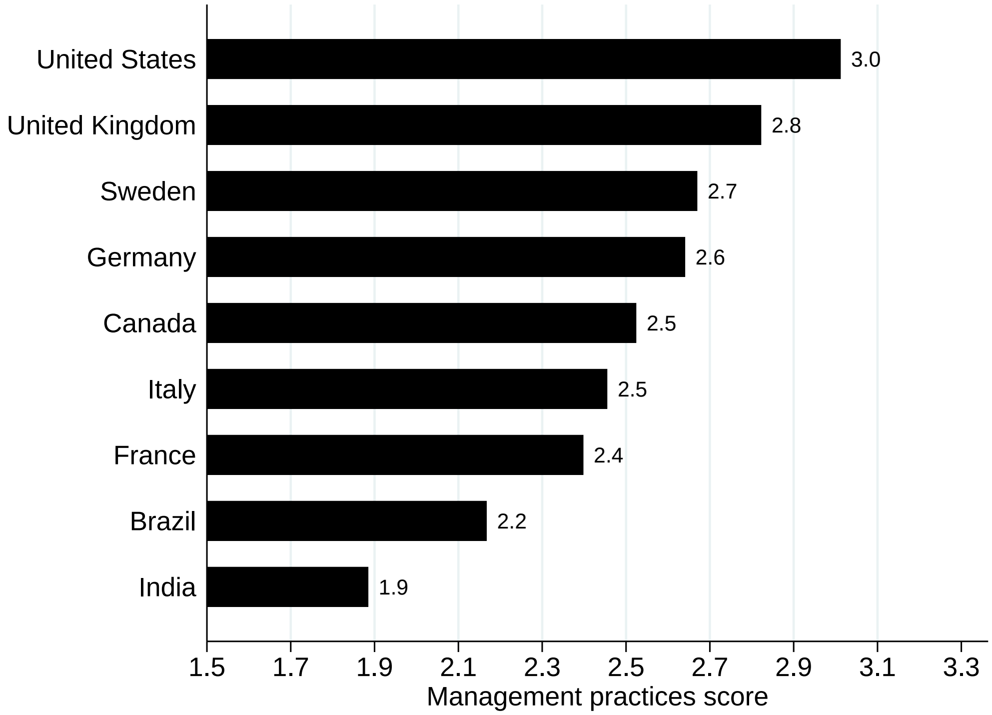
Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors clustered by hospital network in parentheses. Dependent variable Z(AMI) refers to a pooled measure of country-specific acute myocardial infarction mortality rates (measures are standardized by country and year of survey. Dependent variable Z(Mgmt) refers to the hospital's z-score of management (the z-score of the average z-scores of the 20 management questions). **Age of joint M-B** refers to the age of the university hosting both business and medical schools in the year the hospital survey was conducted in each country. **Global QS Rank Dummy** equals to 1 if the university hosting both business and medical schools was mentioned in the Quacquarelli Symonds World University Ranking in 2011. **General controls** are 55 interviewer dummies, the seniority and tenure of the manager who responded, the duration of the interview, and an indicator of the reliability of the information as coded by the interviewer, interviewee type (nurse, doctor or non clinical manager). **Hospital characteristics** refers to the log of the number of hospital beds, dummies for private for profit and non for profit, and number of competitors (hospitals within a 30-minute drive). **Geographic controls - Regional level** include log of income per capita, years of education, share of population with high school degree, share of population with college degree, population, temperature, inverse distance to coast, log of oil production per capita, log of number of ethnic groups. Hospital latitude, hospital longitude and population density within 100km radius is also added.

Table B4: The effects of MBA-trained managers on hospital management

	2nd Stage in Top Panel, 1st Stage in Bottom Panel						Placebo			Robustness
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent variable:	Z(AMI)	Z(AMI)	Z(AMI)	Z(Mgmt)	Z(Mgmt)	Z(Mgmt)	Z(Mgmt)	Z(Mgmt)	Z(Mgmt)	Z(Mgmt)
Endogenous Variable:										
Ln(% of managers with MBA-type course)	-6.082***	-8.052*	-13.833	5.050***	5.090***	6.346*	4.548**	3.775*	-17.076	4.707**
	(2.355)	(4.759)	(14.491)	(1.020)	(1.827)	(3.600)	(2.313)	(1.984)	(42.620)	(1.957)
Ln(Driving hrs, nearest joint M-B schools)	-0.074***	-0.047*	-0.025	-0.062***	-0.037***	-0.023*	-0.029**	-0.029**		-0.035**
	(0.026)	(0.028)	(0.029)	(0.012)	(0.013)	(0.013)	(0.014)	(0.014)		(0.014)
Ln(Driving hrs, nearest stand-alone HUM)							0.013	0.013	0.004	
							(0.011)	(0.011)	(0.011)	
General controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Hospital characteristics		Y	Y		Y	Y	Y	Y	Y	Y
Geographic controls - Regional level			Y			Y	Y	Y	Y	
Geographic controls - Grid level										Y
Observations	478	478	478	1960	1960	1960	1960	1960	1960	1960
No of clusters	397	397	397	1869	1869	1869	1869	1869	1869	1869
Fixed effects	country	country	country	country	country	country	country	country	country	region
First stage F-stat	7.90	2.82	0.72	24.90	8.42	3.14	4.39	2.33	0.17	6.09
Placebo added as							control	instrument	instrument	

Notes: * p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors clustered by hospital network in parentheses. Dependent variable Z(AMI) refers to a pooled measure of country-specific acute myocardial infarction mortality rates (measures are standardized by country and year of survey). Dependent variable Z(Mgmt) refers to the hospital's z-score of management (the z-score of the average z-scores of the 20 management questions). **General controls** are 55 interviewer dummies, the seniority and tenure of the manager who responded, the duration of the interview, and an indicator of the reliability of the information as coded by the interviewer, interviewee type (nurse, doctor or non clinical manager). **Geographic controls - Regional level** include log of income per capita, years of education, share of population with high school degree, share of population with college degree, population, temperature, inverse distance to coast, log of oil production per capita, log of number of ethnic groups. **Geographic controls - Grid level** include log of gross product per capita, 2005 USD at market exchange rates, log of gross product per capita, 2005 USD at pp exchange rates, 2005, distance to major navigable river, distance to ice-free ocean, average precipitation, average temperature, and elevation. Whenever one of these two sets of geographic controls are added, hospital latitude, hospital longitude and population density within 100km radius is also added. **Other hospital drivers** refers to the log of the number of hospital beds, dummies for private for profit and non for profit, and number of competitors (hospitals within a 30-minute drive).

Figure C1: Management practices across countries corrected for sampling response rates



Notes: Average management score using sample weights constructed from the sample selection model in Column 1 of Table C4. The number of observations in each country is as follows: Brazil = 286, Canada = 174, France = 147, Germany = 124, India = 490, Italy= 154, Sweden = 43, United Kingdom = 235, and United States = 307. .

Table C1: Sampling frame sources

Country	Source
Brazil	National Registry of Health Facilities (*Cadastro nacional de estabelecimentos de saúde*).
Canada	Scott's Directories (https://secure.scottsdirectories.com/)
India	The hospital sampling frame was constructed using several online sources. • National Accreditation Board for Hospitals and Healthcare Providers (NABH) (http://www.nabh.co/main/hospitals/accredited.asp) • Medicards.in (https://www.medicards.in/) • Hospital Khoj (http://www.hospitalkhoj.com/general.htm) • Cite HR (http://www.citehr.com/110771-all-india-hospitals-adresses-contact-nos.html) • Hospitals in India (http://www.hospitalsinindia.org/) The process used to construct the sampling frame was the following. First, we extracted hospital names, contact info and all other info available from these five sources. This yielded a total of 15,431 entries. Second, we appended all lists and remove duplicate entries and ineligible hospitals using (i) exact match with hospital name and (ii) exact match with state and city, (iii) and dropping hospitals containing the following words in the name (acupuncture, advanced glaucoma, plastic, ENT research foundation, neuro, mental, maternity, maternity, cosmetic, child care, ENT, communicable diseases, bone and joint, day care, clinic of integrated medicine, diabetes, integrated organ transplant, reproductive, poly clinic, polyclinic, community hospital, surgical clinic, physiotheraphy, nursing, digestive, diabetic, leprosy, scanning, laproscopic, micro surgery). This yielded a total of 7,191 entries. This number is in agreement with statistics from the Ministry of Health reporting that 7,008 rural and urban hospitals exist in India (http://cbhidghs.nic.in/hia2005/8.01.htm)
Italy	Ministry of Health (*Ministero della Sanita'*)
France	Federation Hospitaliere de France
Germany	Hospital directory acquired separately for each state
Sweden	Sveriges Kommuner och Landsting (*Swedish Association of Local Authorities and Regions*)
US	American Hospital Association
UK	National Health Service and Private Healthcare UK

Table C2: Sampling frame characteristics

	BR	CA	DE	FR	IN	IT	SE	UK	US
Healthcare facilities (N)	5861	902	1559	3926	3831	1572	153	1219	6388
Eligible hospitals in random sample (N)	591	527	553	292	1309	376	85	483	1526
Public hospitals in eligible random sample (%)	39	99		86				61	28
Beds in eligible random sample (median)		45	238	730		269	197	195	110

Notes: BR=Brazil, CA=Canada, DE=Germany, FR=France, IN=India, IT=Italy, SE=Sweden, UK=United Kingdom, US=United States. Sampling frame is the total number of hospitals eligible for the survey drawn from a random sample of hospitals from the universe of healthcare facilities in the country. Public Hospitals refers to the percentage of hospitals which are funded and managed by government authorities. This information is not available for Germany, India, Italy, and Sweden. Beds is the median number of beds in the hospital. This information is not available for Brazil and India.

Table C3: Survey response rates

	All Hospitals in Random Sample								
	BR	CA	DE	FR	IN	IT	SE	UK	US
Interviews completed (%)	10.73	24.61	19.4	44.96	12.87	30.18	41.18	20.18	16.7
Scheduling in progress (%)	9.58	45.4	44.48	31.7	14.36	34.36	21.32	30.6	57.78
Interviews refused (%)	1.63	4.53	18.66	7.49	6.94	3.82	0	2.77	4.18
Hospital not eligible (%)	78.06	25.46	17.46	15.85	65.83	31.64	37.5	46.45	21.34
Sample, all (N)	2694	707	670	347	3831	550	136	902	1940
	Eligible Hospitals in Random Sample								
	BR	CA	DE	FR	IN	IT	SE	UK	US
Interviews completed (%)	48.9	33.02	23.51	53.42	37.66	44.15	65.88	37.68	21.23
Scheduling in progress (%)	43.65	60.91	53.89	37.67	42.02	50.27	34.12	57.14	73.46
Interviews refused (%)	7.45	6.07	22.6	8.9	20.32	5.59	0	5.18	5.31
Sample, eligible (N)	591	527	553	292	1309	376	85	483	1526
Interviews completed (N)	289	174	130	156	493	166	56	182	324

Notes: BR=Brazil, CA=Canada, DE=Germany, FR=France, IN=India, IT=Italy, SE=Sweden, UK=United Kingdom, US=United States. 1) **Interviews completed** reports all the hospitals contacted for which a management interview was completed. 2) **Scheduling in progress** reports all the hospitals contacted with no interview run or manager refusing to be interviewed. 3) **Interviews refused** reports all hospitals contacted in which the manager refused to take part in the interview. 4) **No longer eligible** reports all hospitals contacted which do not have an Orthopeadics or Cardiology Department, do not provide acute care, and do not have overnight beds. It also included organizations out-of business or for which no phone number was found. **Sample, all** is the total number of hospitals that were randomly selected and contacted from the complete sampling frame. **Sample, eligible** is the total number of hospitals that were randomly selected, contacted from the complete sampling frame, and eligible for the survey.

Table C4: Selection analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent variable:	Interview	Interview	Interview	Interview	Interview	Interview	Interview	Interview	Interview	Interview
Ln(Income per capita)	-0.022	0.410	0.318	-1.000	-1.715	-0.134	0.697	1.361	2.482	-0.813*
	(0.090)	(0.589)	(0.611)	(0.714)	(1.406)	(0.197)	(0.627)	(2.589)	(1.600)	(0.448)
Population	0.035	0.066	-0.026	0.378***	0.468	-0.171**	0.170	-2.187	-0.420	0.100*
	(0.023)	(0.073)	(0.101)	(0.144)	(0.306)	(0.084)	(0.169)	(5.514)	(0.302)	(0.055)
Years of education	-0.042	-0.006	0.062	0.121	0.363	0.080	0.039	5.131	-0.391	0.185
	(0.048)	(0.365)	(0.407)	(0.232)	(0.347)	(0.119)	(1.559)	(12.106)	(0.424)	(0.212)
Share of pop with high school degree	0.239	-4.474	-3.390	-6.654	0.725	-7.106**	-5.292	102.795	20.042*	0.031
	(0.733)	(9.182)	(8.408)	(4.444)	(3.684)	(2.855)	(20.402)	(124.026)	(10.569)	(1.640)
Temperature	-0.025***	-0.050	-0.003	-0.280	0.140	-0.047	-0.166	1.274	0.074	-0.025*
	(0.008)	(0.054)	(0.041)	(0.224)	(0.108)	(0.036)	(0.104)	(2.855)	(0.178)	(0.013)
Inverse distance to coast	-0.287*	-0.396	1.315	0.849	-0.788	-1.152***	13.259**	33.055	-1.692	0.029
	(0.166)	(0.908)	(0.992)	(1.513)	(1.940)	(0.422)	(5.825)	(22.453)	(7.519)	(0.318)
Ln(# of ethnic groups)	0.012	0.008	0.106	-0.185	0.056	0.203*	0.007	2.130	0.296	0.033
	(0.033)	(0.107)	(0.237)	(0.166)	(0.240)	(0.120)	(0.227)	(4.048)	(0.377)	(0.062)
Public Hospital		0.059	-0.654		0.186				0.054	0.789***
		(0.114)	(0.473)		(0.220)				(0.208)	(0.082)
Ln(# of Hospital Beds)			0.032	0.185***			0.133*	-0.019	0.080	-0.027
			(0.052)	(0.069)			(0.070)	(0.148)	(0.068)	(0.036)
Observations	5742	591	526	553	292	1288	375	85	448	1434
Sample	ALL	BR	CA	DE	FR	IN	IT	SW	UK	US

Notes: Estimate by Probit ML (marginal effects reported with robust standard errors in parentheses). The dependent variable **Interview** equals to 1 if hospital has been interviewed. BR=Brazil, CA=Canada, DE=Germany, FR=France, IN=India, IT=Italy, SE=Sweden, UK=United Kingdom, US=United States.