ORGANIZATION MATTERS: THE CAUSES AND CONSEQUENCES OF ORGANIZATIONAL CHOICES IN THE PRIVATE AND PUBLIC SECTORS

DANIELA DILLENBURG SCUR

University of Oxford
Department of Economics
Nuffield College

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ABSTRACT

This thesis explores organizational choices of establishments in the public and private sectors. Chapter 1 introduces the topic and details the motivating stylized facts from the main dataset used in this work: the World Management Survey (WMS). Chapter 2 focuses on family firms, the most prevalent type of firm in the world, and investigates the relationship between family control and quality of management in manufacturing firms as well the link to firm performance using two new datasets: the Ownership Survey and the WMS. The results suggest that family owned-and-controlled firms are worse managed, with coefficients being over twice larger under 2SLS than OLS. The negative link seems to stem from the family vs non-family control rather than simply family or non-family ownership. Chapter 3 develops a theoretical framework to understand one possible mechanism behind the low adoption of management practices at family firms. The model suggests that industry-specific parameters such as higher cost of laying off workers (ie. unionized environments), higher cost of firm reputation for family CEOs (ie. eponymous firms) and higher shares of low ability workers all contribute to lower adoption of management. Simple stylized facts are presented and testable implications requiring more rigorous tests are suggested. Chapter 4 details the development of an expanded evaluation tool for measuring quality of management in schools mirrored in the tool used in Chapter 2, the Development WMS (D-WMS), and presents the first stylized facts with new data from Mexico, India and Colombia. One of the stylized facts is that there is a large difference in management practices between private and public schools in India. Chapter 5 explores this further and results suggest that what drives the private school management premium is the better people management. Using additional detailed student- and teacher-level panel data, I show that the combination of performance-driven teacher selection and pay practices may be behind the parallel private school student achievement premium as well.

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CONTENTS

LIST OF FIGURES

LIST OF TABLES

Part I

INTRODUCTION

1

INTRODUCTION

The majority of organizations in the world, from manufacturing firms to rural schools, share a fundamental thread that entails hiring employees to work on a task and produce some sort of output — whether the output is goods for sale or teaching children. There may or may not be a physical building where the workers work, but there is usually a manager in charge to whom workers report to. How tasks are organized and duties delegated, or, more generally, how *well managed* these organizations are has large consequences for their level of productivity. The concept of organizational best practices, or, "good management," was first established in the industrial organization and business studies literature, and also permeated through the popular press with the ascendance of lean manufacturing and the *Toyota Production System*. This thesis is about understanding the causes and consequences of good management across industries in developing countries, and also considering what might be the barriers to adoption of good management practices in different contexts.

MOTIVATION. One of the binding constraints for growth and development in emerging economies and low income countries is a lack of capital, both tangible and intangible. Investments in tangible capital such as better machines or other hard technology are relatively straightforward and often enacted by governments because of their greater visibility and ease of procurement, but there are large costs associated with such tangible capital upgrading programs. Investment in intangible capital such as organizational capital (ie. management practices) can often yield similar returns with lower levels of investment. For example, substantial improvements to organizational practices in firms can yield a return that could be comparable to increasing the workforce by 15% or

capital by 40%.[1] In education, a one standard deviation improvement in the quality of management in a school is associated with better student outcomes in year-end exams to the order of 0.2-0.4 standard deviations.[2]

The idea that *management matters* dates at least as far back as 1887, when Francis Walker wrote the following in the first volume of the Quarterly Journal of Economics:

> *"It is on account of the wide range [of management quality] among the employers of labor, in the matter of ability to meet these exacting conditions of business success, that we have the phenomenon in every community and in every trade, in whatever state of the market, of some employers realizing no profits at all, while others are making fair profits; others, again large profits; others, still, colossal profits. Side by side, in the same business, with equal command of capital, with equal opportunities, one man is gradually sinking a fortune, while another is doubling or trebling his accumulations."*
>
> Francis Walker, *The Quarterly Journal of Economics*, 1887

Since then, a large literature has developed around the idea of management and productivity, and universities have even launched a whole new set of professional schools focused on producing graduates of business administration. Empirical evidence on management practices, however, had been generally presented in the form of case studies, until Bloom and Van Reenen [29] pioneered the use of a new survey tool to systematically measure the quality of management in manufacturing firms across countries. I became involved in the World Management Survey (WMS) project in 2008 as a country leader and in 2011 joined the core research team. Since then I have pushed, along with the WMS team, for its expansion into new countries as well as new sectors. The first two chapters of this thesis use the manufacturing data collected over the years merged with a new survey on firm ownership, and the last two chapters outline the expansion of the methodology for use in developing country schools and new evidence from that data.

THE WORLD MANAGEMENT SURVEY. Although management quality has long been recognized as a key component of TFP, it is only within the past

[1] World Management Survey team [120]
[2] Bloom et al. [37]

decade that new survey and diagnostic tools for evaluating management practices have been developed and a new research agenda emerged. This new research finds that large variations in the quality of management across firms and countries are also strongly associated with differences in performance. For example, better managed firms tend to have significantly higher productivity, higher profitability, faster growth, higher market value (for quoted firms) and higher survival rates (see Bloom et al. [36] for a survey).

The WMS is a unique dataset that measures the quality of management practices of firms via over 15,000 one-hour, structured phone interviews with plant managers. The data currently spans waves between 2002 to 2014, and includes 35 countries. The management survey methodology, first described in Bloom and Van Reenen [29], uses double-blind surveys to collect data on firms' use of operations management, performance monitoring, target setting and talent management in their day-to-day runnings. The WMS focuses on medium- and large-sized firms, selecting a sample of firms with employment between 50 and 5,000 workers. The project is among a significant surge of emerging research on this subject, which has attempted to move beyond selective case studies and collect systematic and reliable data to empirically test management theories.

To measure management practices, the WMS uses an interview evaluation tool based on the questionnaire McKinsey & Co. uses in their baseline client evaluations. The tool was then adapted for research purposes and enhanced to include insights from the management literature that would be important for researchers to measure. For example, the WMS tool measures practices similar to those emphasized as relevant in earlier work in the management literature, by for example Ichniowski, Shaw, and Prennushi [78] and Black and Lynch [28]. The tool was piloted in 2002 and further refined, and since the first major wave in 2004 it has remained largely the same. The tool defines a set of 18 basic management practices and scores each practice on a scale from one ("worst practice") to five ("best practice") on a scoring grid.[3] A high score represents a best practice in the sense that firms adopting the practice will, on average, see an increase in their productivity. The combination of many of these indicators reflects "good management" as commonly understood, and

[3]The full instrument is available at www.worldmanagementsurvey.org

the main measure of management practices represents the average of these 18 scores.

Conceptually, the scores suggest a gradual increase in formalization and usage of the management practices being followed. A score of 1 indicates little to no formal processes in place, and suggests the firm deals with day to day activities in a very ad-hoc manner. A score of 2 suggests that there are some informal processes in place, though they are enacted by the acting manager and not part of the "official" day to day running of the firm. If the manager was not in the plant for any reason, the practices would not be followed. A score of 3 indicates that a firm has some formalized management processes in place, though they have some weaknesses such as the process is not regularly reviewed or it is not often used properly. If the manager was away, however, the process could be picked up by a stand-in manager as it would be known as "normal running" of the firm by most staff. A score of 4 suggests that firms have good and flexible processes in place, that are routinely reviewed and are well-known to at least all managers in the firm. A score of 5 suggests that the firm not only has "best-practice" processes in place, but that these processes are deeply embedded in the corporate culture and have substantial employee buy-in, from the shopfloor, through middle management and up to the C-suite. It is considered that firms scoring under 2 are very badly managed firms, and those scoring over 4 are well-managed firms.

The survey measures management practices in three broad areas:

1. *Operations management & performance monitoring practices*: testing how well lean (modern) manufacturing management techniques have been introduced, what the motivation and impetus behind changes were, whether processes and attitudes towards continuous improvement exist and lessons are captured and documented, whether performance is regularly tracked with useful metrics, reviewed with appropriate frequency and quality, and communicated to staff, and whether different levels of performance lead to different process-based consequences.

2. *Target setting practices*: testing whether targets cover a sufficiently broad set of metrics, including short and long-term financial and non-financial

targets, and whether these targets are based on solid rationale, are appropriately difficult to achieve, are tied to the firm's objectives, are well cascaded down the organization, are easily understandable and are openly communicated to staff.

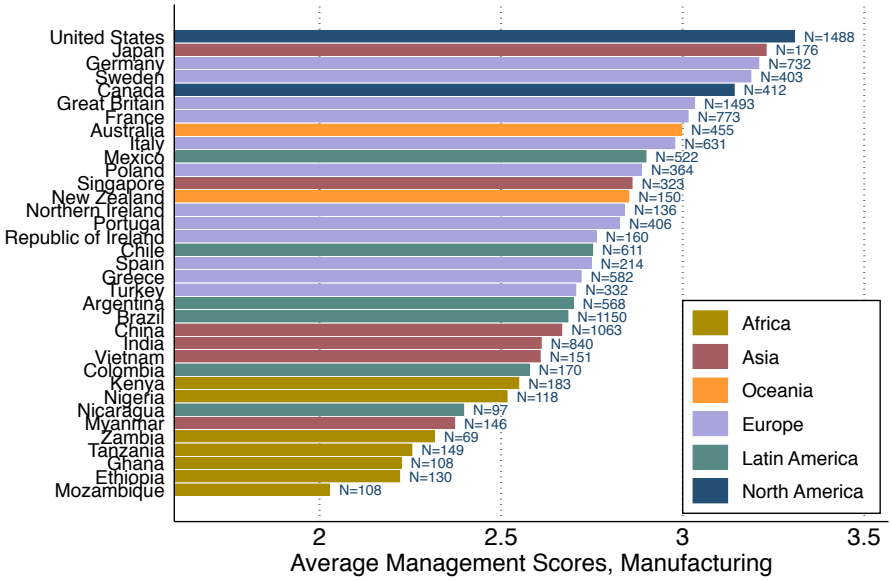
3. *Talent management practices*: testing what emphasis is put on overall talent management within the firm and what the employee value proposition is, whether there is a systematic approach to identifying good and bad performers and rewarding them proportionately or dealing with bad performers.

Crucially, this methodology is uniquely useful because the types of questions asked ensure the survey is capturing how management practices are implemented in the firm, rather than how the managers feel or what their opinions are about management. The survey questions ask managers to describe their practices including several examples, and the interviewer independently evaluates the responses systematically on a pre-set scale. Thus, the WMS captures the degree of usage rather than the superficial adoption of these practices and abstracts from possible mood influences of individual managers. Beyond the key measure of management practices at the plant level, the WMS also collects a wealth of information on the firm, including firm location, size and ownership structure.

The management data has been collected in waves over 12 years with cross-section of firms in new countries added every wave as well as panel data for selected countries. The US, UK, France, Germany, Italy and Greece were surveyed in 2004, 2006, 2010 and 2014. China, Japan, Poland, Portugal, and Sweden were surveyed in 2006 and 2010. India was surveyed in 2006, 2008 and 2010. Brazil was surveyed in 2008 and 2013. Canada and Ireland were surveyed in 2008. Australia and New Zealand were surveyed in 2009. Chile was surveyed in 2009 and 2013. Argentina and Mexico were surveyed in 2010 and 2013. Singapore was surveyed in 2012. Colombia, Ethiopia, Ghana, Kenya, Mozambique, Nicaragua, Nigeria, Spain, Tanzania, Turkey and Zambia were surveyed in 2013. Myanmar, Vietnam were surveyed in 2014.

One of the key stylized facts emerging from the WMS data is that firms in developing countries have much worse management practices than firms in developed countries. Figure 1 shows all countries in the WMS sample ranked by the average quality of management in the country. The ranking is surprisingly stable even after controlling for firm size, suggesting it is not simply a matter of rich countries having larger firms that are better managed. It is immediately clear that developing countries are at the bottom of the rank, with only the middle-income economies of Mexico and Chile placing among the top half of the country ranking.

Figure 1: Developing countries rank lowest in quality of management

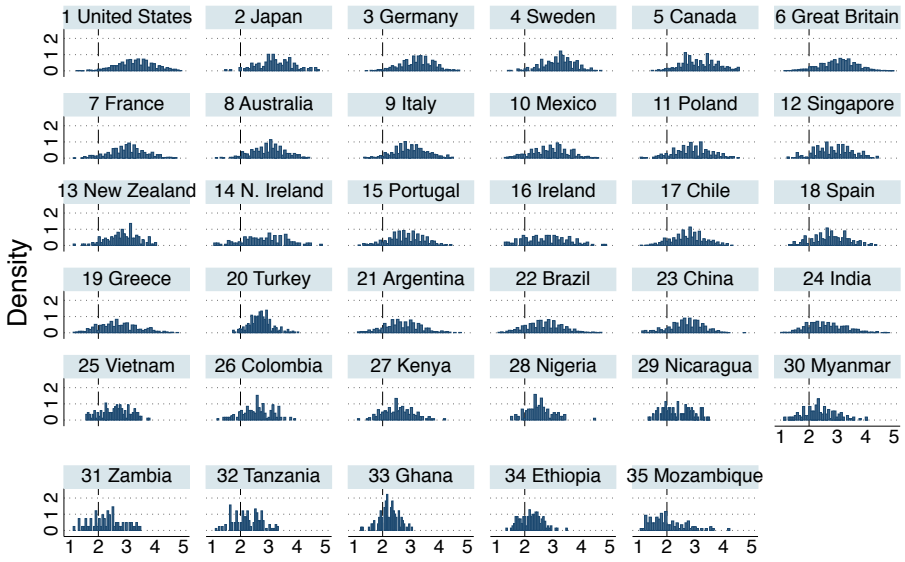


Notes: Graph created by the author using data from the World Management Survey. N indicates the number of firms in the sample. The WMS dataset is a random sample of manufacturing firms within the 50-5000 employee range.

Beyond a wide distribution of scores across countries, the data also shows that there is a substantial amount of variation within countries as well. In fact, Bloom et al. [36] suggest that the low average quality of management in developing countries appears to be attributed to a large tail of badly managed firms coexisting with firms boasting world-class management practices. Figure 2 depicts this point, showing the distribution of the management measure across countries. The vertical line marks where the score of 2 is in each sub-graph, and it is immediately clear that in the lower-ranked countries such as, for example, India or Brazil, the mass of firms with a score under 2 is much larger

than in countries higher up in the ranking such as the US, Germany or Great Britain. In Latin America and Asia, 15% of firms fall in this range while in Africa the share is just under 30%. In contrast, the share of firms scoring under 2 is only 2% in North America and 8% in Europe. Taking a closer look at the characteristics of firms populating the lower tail of the distribution yields a striking observation: 75% of the firms in Latin America and Asia in this range are family firms. The share is 60% in Africa, 35% in North America and 50% in Europe.

Figure 2: There is wide variation of management quality within countries



Notes: Graph created by the author using data from the World Management Survey. The WMS sample includes firms between 50 and 5000 workers.

OUTLINE AND CONTRIBUTION. This thesis has four core chapters. The first two chapters start to dig deeper into the long tail of badly managed firms by focusing on one of the proposed determinants: family ownership and control of the firm. In Chapter 2, I explore the importance of management practices for family firms, and propose the hypothesis that the failure of these firms to adopt good management practices is an important channel leading to their relative underperformance. With my colleague Renata Lemos I collected a new dataset on ownership and control firm characteristics as well as family characteristics of CEOs. In the chapter I show that there is evidence of a causal

relationship between a succession to a family CEO and lower adoption of good management practices.

Motivated by this evidence, Chapter 3 builds a theoretical framework to consider a possible reason behind the poor management of family firms. Previous literature is primarily concerned with firm profits and output, and to the best of my knowledge this chapter is the first piece of work considering organizational practices specifically within the context of family and non-family firms. Gibbons and Roberts [65] outline a series of reasons why organizational change is difficult, including lack of information, lack of skills, and lack of motivation and incentives. I assume that family CEOs and non-family CEOs have the same set of information and same skills, but that family CEOs face a different set of costs to organizational change as a result of implicit contracts with employees. The purpose of the chapter is to characterize the choices faced by CEOs in a bid to guide further empirical work.

Chapters 4 and 5 take the concept and methodology of the manufacturing work and apply it to the public sector in developing countries. As the WMS team started collecting data for schools and hospitals in Brazil and India, it became clear that a substantial portion of organizations in these countries were scoring exceedingly poorly in comparison to international standards of management practices and the distributions were truncated at the lowest score in the management survey grid.[4] But where exactly along the process of setting their management structures are these schools failing? Anecdotal evidence from listening to many of these interviews suggests that there is substantial heterogeneity in where the bottlenecks lie. With my colleague Renata Lemos, I developed an expanded survey tool based on the existing WMS instrument, but tailored to research in the education sector of developing countries: we call it the Development WMS (D-WMS). Chapter 4 describes the development of this expanded survey tool and provides a new set of stylized facts from the latest surveyed countries.

In Chapter 5, I use the newly collected school management data from Andhra Pradesh and merge with a detailed school-teacher-student set of surveys from the Andhra Pradesh Randomized Evaluation Studies data. I explore how differ-

[4] Bloom et al. [37]

ent management practices affect student outcomes and specifically how management is related to the effectiveness of teachers within schools. Teachers, as well as other public sector employees, are often assumed to have intrinsic motivation that could be at risk of crowding out when increased monitoring — such as those in pay per peformance schemes — is introduced. In that sense, although this chapter focuses on school management and teachers, the concepts in this chapter could be more broadly applied to other organizations with similar internal dynamics.

As a unified piece of work, this thesis contributes to the literature on management and productivity by introducing new measures and tools of measurement, as well as new identification to previously speculative relationships. Although half of the thesis speaks of the manufacturing sector and half of the education sector, there is a fundamental underlying theme of understanding how managers of organizations organize and motivate their employees — be they production workers or school teachers. The intricacies of intrinsic motivation of teachers could also apply to workers of manufacturing family firms, and the rigidities of labour contracts in public institutional settings could also apply to firms that honour implicit contracts or face more rigid industrial labour laws.

Part II

CORE CHAPTERS

2

ALL IN THE FAMILY? AN EMPIRICAL EXPLORATION OF CEO CHOICE AND FIRM ORGANISATION

with Renata Lemos

> *This excess of produce has not, speaking broadly, been generated by any greater strain upon the nervous or muscular power. Indeed, it may, as a rule, be confidently stated that, in works controlled by men who have* a high power of administration and a marked degree of executive ability, *where everything goes smoothly and swiftly forward to its end, where emergencies are long foreseen and unfavorable contingencies are carefully guarded against, where no steps have to be retraced, and where nothing ever comes out wrong end foremost, there is much less nervous and muscular wear and tear than in works under inferior management.*
>
> Francis Walker, *The Quarterly Journal of Economics*, 1887

2.1 INTRODUCTION

What drives firm productivity and growth has long been a fundamental question in economics. Although there are myriad factors that contribute to the wide dispersion of firm performance across countries, the structure of ownership and control of firms, particularly "dynastic" family control, seems to be important across both developed and developing countries. But why are family firms worse performers than non-family firms on average? We take the first look at the relationship between firm governance structures (more specifically, family CEOs in family firms) and firm management and performance in a sample of medium and large firms in the manufacturing sector in primarily emerging economies in Latin America and countries in Southern Europe. We propose that one of the mechanisms that may be behind family firms' underperformance is poor managerial practices. To consider this, we create a new survey tool to capture full firm ownership and control succession informa-

tion along with family characteristics of the family behind the family firm. We merge this data with external datasets of firm performance and management and use an instrumental variables approach exploiting exogenous variation in family structure to support a causal interpretation of our results.

We consider to be "family firms" those firms that have the founding family as the controlling shareholder block *and* a family member as the CEO: the most common type of governance structure in the world.[1] Although several studies have looked at the relationship between family ownership and firm performance, they have mainly focused on developed countries, where the share of family firms is substantial but not as ample as in developing countries, and the studies have offered only partial evidence of channels underlying this phenomenon.[2] One limiting factor in studying this type of question is lack of data availability for linked ownership and control structures and firm performance data. One notable exception is Bennedsen et al. [16], where the authors use rich census data to carry out a rigorous study of the relationship between family succession and firm productivity in Denmark. Such data is, however, notoriously scarce and generally only available from the Scandinavian nations.

In the context of this literature, a succession in ownership occurs when the controlling shareholder block changes, such as when a founding family sells shares of their firm such that another entity owns more than 25% of the voting shares. A succession in control, however, happens when the CEO changes regardless of changes in ownership.[3] Our data includes detailed information on the full history of successions of ownership *and* control. This allows us to tease out the individual effect of family control by exploiting the gender of the previous family CEO's children as a source of variation in family CEO successions that is, conditional on observables, plausibly exogenous to firm performance and management. Bennedsen et al. [16] used a similar IV strategy to explore the effect of family control on traditional firm performance measures such as sales and profits, and the authors found strong negative results. Given the lack

[1] La Porta, Silanes, and Shleifer [89] have looked at the largest firms across the richest countries in the world and found this result, though they looked only at the largest firms and across several sectors. Our focus here is medium-sized firms in the manufacturing sector.

[2] For example, see Bandiera et al. [11], Bennedsen et al. [16], Bertrand and Schoar [23], Claessens and Djankov [50], and Mueller and Philippon [99].

[3] The changes may, of course, happen at the same time as well as separately.

of such reliable traditional outputs data at the firm level for a number of the emerging economies we are studying, we primarily use a measure of the internal organizational structure of the firm as an outcome (management practices), rather than conventional measures of firm output such as sales or profits. Further, management is an interesting outcome in itself and we propose that it could be one of the channels explaining the lower performance outcomes of family firms. Our results are broadly consistent with Bennedsen et al. [16] in that we find that a family succession leads to negative firm outcomes.[4]

Our results are the following: first, we find that indeed manufacturing firms with family owners and family CEOs have significantly worse performance as well as worse management practices. This expands on the findings from Bloom and Van Reenen [29] and Bloom and Van Reenen [33] by presenting the first results suggesting a causal link. Our IV results suggest the causal relationship between a succession to family control and management practices is decidedly negative, and estimate the magnitude of the effect, in standard deviations, to be -0.808 using 2SLS compared to -0.369 from an OLS estimation. We test the strength of this result using several alternative specifications and find it to be robust. Second, contextualizing these results, we present new evidence of the relationship between management practices and firm performance for a sample of family firms in a large emerging economy: Brazil. Our results suggest that a one standard deviation increase in the quality of management practices is correlated with 15% higher sales per employee and 20% higher value added per employee in Brazilian family firms. Third, we find that within the countries we study, it is the existence of *at least one* son that matters more for family firm succession rather than simply the gender of the eldest child. Fourth, despite the relatively low relevance of the gender of the eldest child, there is a strong tendency for the first male child to be the CEO's successor, and in the absence of a son, other male family members are still chosen over daughters.

[4]The relationship between management and productivity is a parallel research agenda started by Nick Bloom and John Van Reenen. Our focus here is more specific in looking at the relationship between management and firm outcomes in emerging economies and family firms, as well as potential channels of this relationship for this subset of firms.

This study contributes to three different strands of literature. First, we contribute to the studies on the importance of family firms in the global economy in terms of the share of economic activity they command. La Porta, Silanes, and Shleifer [89] and La Porta et al. [90] look at the largest firms in the world's richest economies and show that family firms are the most common governance type across several sectors. In Europe, Faccio and Lang [61] and Iacovone, Maloney, and Tsivanidis [77] find similar results looking at public and private firms. In the US, Anderson and Reeb [2] look at firms in the S&P 500 and also find that family ownership is "both prevalent and substantial." In Asia, Claessens, Djankov, and Lang [51] find that more than two-thirds of firms have a single controlling shareholder, and that much of the corporate wealth belongs to a small number of families. Cai et al. [44] find similar trends in Chinese private firms. Among the large number of studies looking at the ubiquity of family firms, most look at OECD and large Asian economies, and generally focus on large (and often public) firms. Few studies focus on Latin America and Africa, and when they do, it is often with a focus on microenterprises.[5]

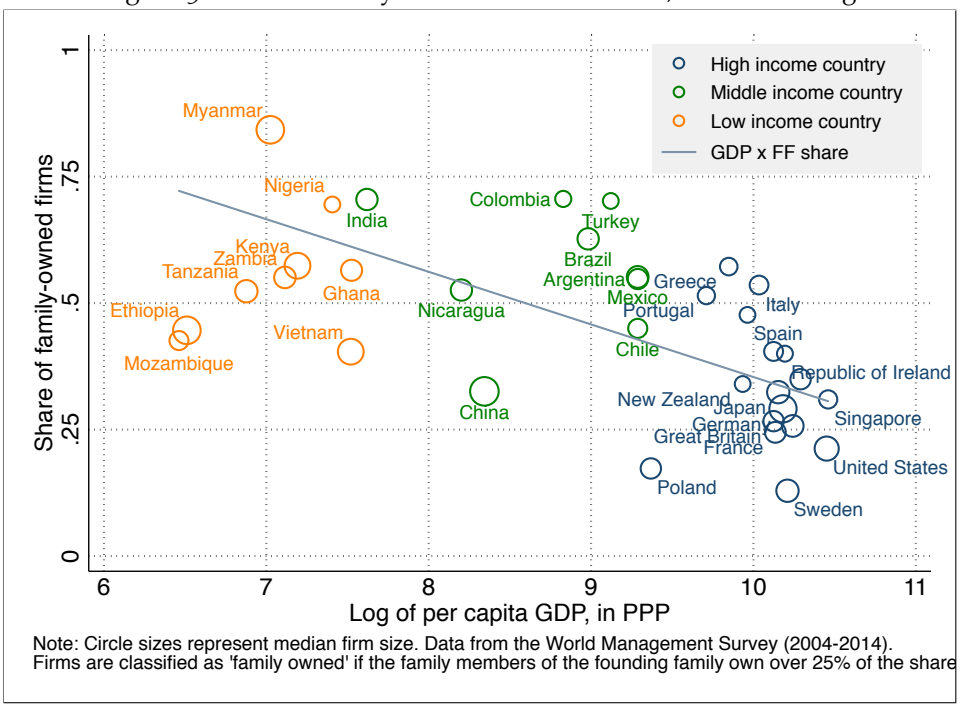
Although small firms account for the vast majority of firms in these countries, medium-sized firms account for a much larger share of employment in Latin America and Africa. Figure 3 shows the proportion of family firms in the World Management Survey, one of our primary datasets. Two key observations emerging from this graph are: (i) developing countries have a much higher share of family firms; (ii) when looking at firms with over 50 employees — or, medium and large firms — the firm size distribution is not particularly different across countries, as evidenced by the similar circle sizes representing median firm size. Thus, in this paper we add to the literature by focussing on this important group of medium-sized firms. Firms with more than 50 employees in manufacturing account for 66% of employment in Argentina, 67% of employment in Brazil and Mexico.[6] There are a series of studies considering the possible reasons behind this trend, which goes against the predictions

[5]There is a large literature looking at microfinance and microentrepreneurs, and family pressures on income sharing. As our paper focuses on medium and large firms, we do not review this literature here. For a recent study on management in small firms, see McKenzie and Woodruff [93].

[6]Authors' calculations based on 2005 firm registers for Argentina and 2010 firm registers for Brazil and Mexico.

found in the seminal work of Berle and Means [21]. Trust (Chami [46]), capital imperfections of the market (Bhattacharya and Ravikumar [26, 27]), and legal institutions (Burkart and Panunzi [42] and Mueller and Philippon [99]) are all expected to influence a founder's succession decision.

Figure 3: Share of family firms across the world, manufacturing



Note: Circle sizes represent median firm size. Data from the World Management Survey (2004-2014). Firms are classified as 'family owned' if the family members of the founding family own over 25% of the share

Another strand of the literature considers the effect of ownership concentration on firm outcomes, offering mixed evidence. For example, Morck, Shleifer, and Vishny [96] finds an inverse u-shaped relationship in the US, Claessens and Djankov [50] find a positive relationship for the Czech Republic and Demsetz and Villalonga [56] find no relationship between ownership concentration and performance. Looking at the effect of firm CEOs on firm performance, Bertrand and Schoar [23] provide evidence that CEO "style" matters. When considering specifically *family CEOs*, the evidence mostly points to a negative relationship, with few exceptions finding a positive relationship.[7] The evidence of a negative relationship at the firm-level spans North America, Asia and Europe,[8] and extends to the macro level considering the effect of large shares of family controlled firms on economic growth.[9] Although these stud-

[7] For example, Anderson and Reeb [2], Khanna and Palepu [84], and Sraer and Thesmar [113].
[8] For example, Bertrand et al. [25], Cai et al. [44], Claessens et al. [52], Morck, Strangeland, and Yeung [98], and Perez-Gonzales [105]. See Bertrand and Schoar [24] for a good review.
[9] For example, Caselli and Gennaioli [45] and Morck, Wolfenzon, and Yeung [97].

ies have taken the first step of mapping the field and describing the correlational relationship between family CEOs and firm performance across several countries, analyses with cross-sectional data are generally subject to endogeneity issues. However, studies such as Bennedsen et al. [16] have also provided causal evidence that firms led by family CEOs are, indeed, on average less productive. Our aim in this project is to add to this growing literature on mapping the degree of underperformance of family firms and eventually provide causal evidence of these effects beyond OECD countries and focus on emerging economies, where family controlled firms command a much larger share of the economy.

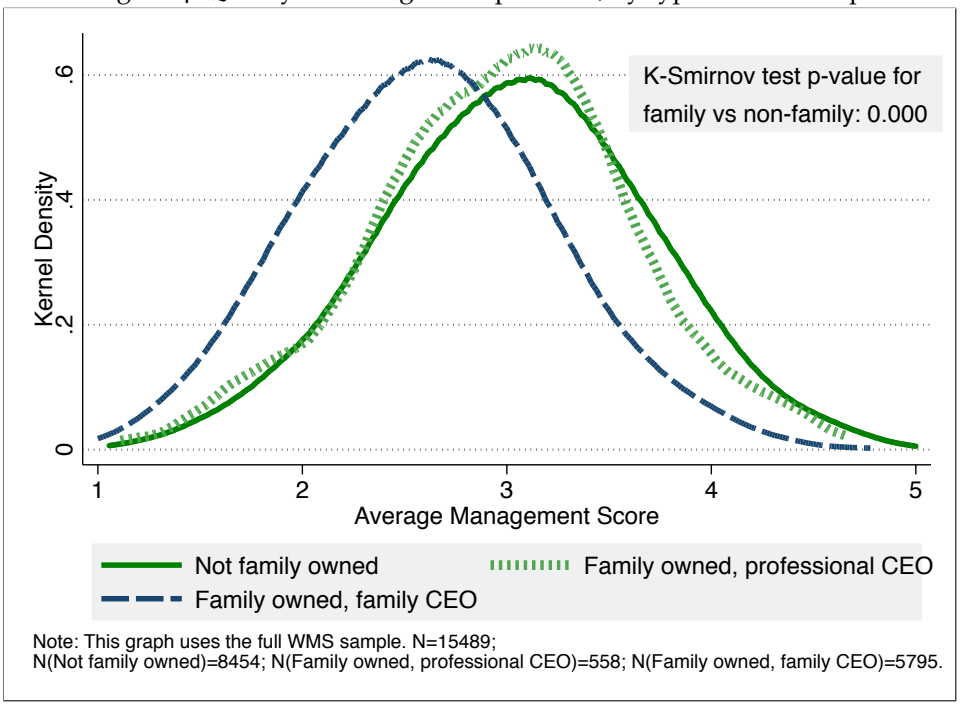
But why are family controlled firms worse performers than non-family controlled firms? We explore whether poor management practices could be one of the channels leading to poor performance. In general, the literature on management and productivity finds that large variations in quality of management practices across firms and countries are strongly associated with differences in performance and also finds that there are large systematic differences in the quality of management across ownership structures (Bandiera et al. [11], Bertrand and Schoar [23], Black and Lynch [28], Bloom and Van Reenen [29], Bloom and Van Reenen [33], Bloom et al. [34], Giorcelli [66], and Ichniowski, Shaw, and Prennushi [78]).[10] Most recently, Bloom et al. [36] show that ownership and control structures are a factor linked to the variation of management across firms and ultimately linked to firm productivity. The authors present stylized facts for over 10,000 firms in 35 countries showing that firms owned and controlled by families tend to have significantly worse management than firms under other governance structures. Using the same dataset, we show in Figure 4 the distribution of management quality for family owned-and-controlled firms, family owned but professionally controlled firms and all other firms. It is clear that the choice of CEO is an important determinant of management quality, and we return to this Figure in the empirical section.[11]

[10] Hereafter we will use management and management practices interchangeably.

[11] The Kolmogorov-Smirnov test of equality of distributions suggests that the distribution of firms that are non-family owned and controlled is not statistically different from the distribution of firms owned by families but controlled by a professional CEO. The test also suggests that both distributions are statistically different from the distribution of firms owned and controlled by family members.

If we look at management as a technology as in Alexopoulos and Tombe [1] and Bloom, Sadun, and Van Reenen [32], this work also speaks to the literature on barriers to technology adoption in manufacturing firms (see, for example, Bloom et al. [34], Atkin et al. [7] and Gibbons and Roberts [65]).

Figure 4: Quality of management practices, by type of ownership



2.2 DATA

2.2.1 *Ownership and Control History data: The Ownership Survey*

To study the questions we set out in this chapter, we designed and implemented a new survey to collect data on the full ownership and control history of successions the firm has had since its inception. For those firms that were founded by a single founder or founding family, we also collect information on their family characteristics.[12] We based the choice of basic classification of ownership and control on other firm surveys such as the World Management

[12] We are aware of existing M&A databases, such as Zephyr and SDC Platinum, but these collect data on changes in *ownership* rather than changes in control. Fons-Rosen, Bena, and Ondko [62] have created an excellent combined panel dataset using Zephyr data, and Bena, Fons-Rosen, and Hanousek [15] also developed an algorithm to create a Pyramid Ownership Structures dataset. Beyond the Scandinavian matched census datasets, however, there are no datasets that we are aware of that collect data on successions of *control* (rather than simply ownership), and include family characteristics of CEOs.

Survey and the Executive Time Use survey but expanded to include more detailed data.

In 2013, we were able to survey a sample of firms within the World Management Survey dataset and document the ownership history and family characteristics of 2,176 firms (3,027 succession data points) across 12 countries in Latin America and Africa, plus Turkey. In 2014, we added a selected set of questions to the 2014 wave of the World Management Survey to collect information on the latest succession of power in the random sample of firms interviewed across Europe and Asia. In all, we have 2,755 firms (3,606 successions) in our full sample of the Ownership Survey. The sample we use, however, is based on there being at least one *change in CEO* (or, succession of control) and also for which we have enough family history data (that is, data on our instrumental variables). Further, we can only use successions that have at least one matching data point in the World Management Survey (WMS) dataset. All considered, our final dataset has 818 successions from 810 firms. In the empirical analysis section we show the relationship between the ownership categories and management for the full sample and progressively smaller samples to show that the 810 firms included in the analysis are not likely to be a highly selected sample. We also build sampling weights to account for such issues and the results are similar.

During the survey, the interviewees are asked to describe who ultimately owns the firm, and the interviewer is instructed to probe enough to find out who the single largest shareholding is and whether they own more than 25% of the controlling shares.[13] Table 6 in the Appendix gives an overview of the ownership categories. In short, if the founder or the descendants of the founder own the firm and a family member is the CEO, we classify the firm under "fam-

[13]Our survey is specifically concerned with *controlling shares of ownership*, similar to how Bureau van Dijk's datasets are compiled. Thus, by more than 25% of the controlling shares we mean more than 25% of the "voting shares" or equivalent terminology. We exclude government firms from our analysis. The interviewees for the Ownership Survey are one of the following: firm CEO or executive assistant to the CEO, head of administration, or if the firm was recently sold, the longest tenured employee at the managerial level. For the WMS, the interviewees are usually the plant manager. In 2011 the WMS team conducted a follow-up project that looked to cross-check the survey information with external data sources, such as Bureau van Dijk's data, online research through company documents and websites and call-backs. The share of correct information was very high. More specifically, the countries included in this paper had the correct ownership structure data from the survey over 75% of the time.

ily control".[14] If the shares of the firm are owned by one or many individuals and the CEO is not related to them, we call the CEO a professional CEO and classify the firm under "non-family control." If a firm is owned by a family but has a professional CEO, so we also classify them under the "non-family control." For ease of exposition, we will henceforth refer to firms with combined family ownership and control as *family firms* and all other firms as *non-family firms*.

The variables we are collecting include a full history of ownership and control from the time of foundation and dates of these changes. For firms that at the time of inception were family firms, we ask whether the founder had children. If yes, then we ask for the gender of the first child, how many children the founder-CEO had in total and the gender of all the children. For each succession we also ask who the control was transferred to, in terms of family relationship. With this information we can ascertain whether the founder had children at all, whether the first child was male, the ratio of male to female children, and who control of the firm was passed on to within the family.[15] We give further details and an example of the dataset created in the Appendix of this chapter (Section 2.5).

2.2.2 *Organizational data: the World Management Survey*

In 2013, under the umbrella of the World Management Survey (WMS) and with our WMS colleagues Nicholas Bloom, Raffaella Sadun and John Van Reenen, we collected internal organizational data for over 3,000 firms in Africa and Latin America. As described in the introduction, the WMS is a unique dataset that includes levels of structured management practices and current governance data from over 15,000 interviews with manufacturing firm managers collected from 2004 to 2014 across 35 countries. To date, nearly 40% of these firms are owned by a founder or family member.

[14] Likewise, if a firm was sold to another entity (person or another family), and that entity (the new owner or a family member of the new owner) holds the CEO position, the firm would also be classified under "family control", though there were barely any instances of this case.

[15] In the current and future waves of the Ownership Survey we are also collecting data on the order of gender of the children.

2.2.3 *Does management matter for family firms?*

Our main aim in this chapter is to explore whether the appointment of family versus non-family CEOs affects the quality of management in manufacturing firms, and why that might be the case. Establishing a causal relationship between quality of management and *productivity* is the subject of a parallel research agenda and is outside the scope of this paper. However, it is important for us to be able to put our results into context — namely considering how much "management matters" for firm productivity in emerging economies.

One hypothesis is that family firms might be different from other firms and not need management practices in the same way to be optimally productive. If this were the case, we would expect to find no significant relationship between management and firm outcomes in the sample of family firms. The best evidence to date on the topic is the Bloom et al. [34] management experiment with family owned and controlled firms in India. They find that adopting a better set of management practices (in many ways parallel to those used in this paper) improved the treated firms' productivity by 17% in the first year. To supplement the experimental findings, we present evidence on the correlational relationship between management and firm performance in the context of the countries we are studying.

We find that management is significantly correlated with better firm outcomes for the sample of family firms. In this section we provide a brief analysis of this relationship for both the WMS Brazilian firms matched with the Brazilian industrial census and also the WMS firms that had available data in Bureau van Dijk's Orbis database, one of the most comprehensive databases of private and public firm information in the world. Although the Orbis coverage of Latin American countries is far from perfect, we hope that the results from a large Latin American economy such as Brazil will shed light on the expected relationship within the Latin American context. The reason we chose Brazil for this analysis is threefold: 1) it is one of the countries for which we have the largest number of data points for ownership and firm organization (there are only four countries with approximately 1000+ data points: US, UK, India and

Brazil); 2) it is a large and economically important country in a developing region and also has a large proportion of family firms (compared to the US/UK where only 20-30% of firms are founder or family owned); 3) the data both exists and is accessible.

To consider the relationship between family control and firm performance, we run a descriptive Cobb-Douglas specification:

$$y_{isc} = \beta_1 M_{isc} + \alpha_l l_{isc} + \alpha_k k_{isc} + \boldsymbol{\gamma'} \mathbf{Q_{isc}} + \Omega_s + \varphi_c + \varepsilon_{isc} \quad (1)$$

where y_{isc} is a measure of performance of firm i in industry s in country c (here, log of sales and log of value added).[16] The conventional factor inputs we have data for are l (log of labour) and k (log of capital). Labour is measured as number of employees and capital is the firm's capital stock in the measured year.[17] The coefficient of interest is β_1, and M_{isc} is the main management measure. To build the management index we follow the conventional approach in this literature and first create z-scores for each of the 18 ordinal management practices, then take the average across them and again take the z-score of this sum to proxy for level of management. We refer to this variable as "z-management" in the tables.

$\mathbf{Q_{isc}}$ is a vector of other controls, including firm characteristics that might be correlated with output (firm age, a dummy variable for whether firm is publicly listed in the stock market, the proportion of workers with a college degree and average hours worked) and a set of survey noise controls (interviewer dummies, the seniority and company tenure of the manager interviewed, the day of the week and time of day the interview was conducted, the duration of the interview, and an indicator of the reliability of the information as coded

[16] Sales for data for the non-Brazilian data comes from the Orbis database and is in US$, while sales and value added are in BRL$. Within each regression, the currencies are comparable. Because we use z-scores for the management index and logs for the outcome measures, however, units are less important in the interpretation of the results.

[17] The Brazilian industrial census (PIA) does not collect a direct measure of capital, but the *Instituto de Pesquisa Econômica Avançada* (IPEA), a Brazilian economic research institute, has built a widely used set of four alternative measures of capital based on the data available from PIA. They kindly made these measures available to us, and we ran the specification iterating among the four. The results are robust to all four measures of capital and although the coefficients do not change much, we present the results with the 'middle' result rather than the strongest or weakest.

by the interviewer). We also include industry and country fixed effects. We cluster the standard errors at the firm level.[18]

Table 1 reports the descriptive results. Columns (1) to (6) use the dataset of WMS Brazilian firms matched to the Brazilian annual industrial survey (*Pesquisa Industrial Anual - PIA*). PIA is an industrial census and yielded a match with the WMS firms of approximately 95%. PIA is a well-used and reliable dataset, with the only downside that all analyses must be done in their offices in Brazil to comply with microdata confidentiality restrictions. We used their measures of firm gross sales, value added and employment. Columns (7) to (9) use the best available sample from Orbis database that matches WMS firms, and primarily includes European countries where the reporting requirements are more stringent. We include it here mainly as a comparison group. We discuss each column in turn.

Columns (1) and (4) show that the raw correlation between management and value added and sales respectively is strong and substantial. Once we control for labour, capital and a series of firm, industry and noise controls, the coefficients more than halve in size but remain substantial. The coefficient of z-management in Column (2), including only controls for capital and labour, suggests that a one standard deviation increase in management practices is associated with approximately 46% higher value added.[19] For the full WMS sample, a standard deviation is 0.66 points. When we include the other series of controls in Column (3) the management coefficient is again about halved, but still significant, suggesting a conditional correlation of approximately 22% higher value added for a one-standard deviation increase in management quality. In terms of sales, we see a similar pattern. Column (6) suggests that a one standard deviation increase in management quality is associated with approximately 15% higher sales for Brazilian family firms. The relationship qualitatively holds for the Orbis sample in Columns (7), (8) and (9).

Although this is naturally only a conditional correlation, we take it along with Bloom et al. [34] experiments as evidence that improving the quality of

[18] Our unit of observation for the performance and management analysis is the establishment (plant) level, so we cluster at the firm level to take into account those companies which have multiple production sites in our dataset.

[19] Calculated as $(e^{0.379} - 1) \times 100$.

Table 1: Management on firm performance in family firms

	Dataset:						**Dataset:**		
	WMS-PIA (Brazilian Industrial census)						**WMS-Orbis (Bureau van Dijk)**		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	ln(value added)	ln(value added)	ln(value added)	ln(sales)	ln(sales)	ln(sales)	ln(sales)	ln(sales)	ln(sales)
z-management	0.997***	0.379***	0.196**	0.911***	0.260***	0.137**	0.502***	0.184***	0.071***
	(0.097)	(0.078)	(0.089)	(0.106)	(0.072)	(0.070)	(0.040)	(0.025)	(0.022)
ln(employment)		0.651***	0.694***		0.790***	0.802***		0.179***	0.332***
		(0.051)	(0.059)		(0.049)	(0.055)		(0.028)	(0.030)
ln(capital)		0.159***	0.159***		0.203***	0.202***		0.638***	0.508***
		(0.020)	(0.024)		(0.022)	(0.025)		(0.024)	(0.023)
Observations	627	601	555	624	615	567	1904	1883	1883
R^2	0.178	0.636	0.763	0.136	0.682	0.799	0.113	0.536	0.702
Noise controls			✓			✓			✓
Firm controls			✓			✓			✓
Industry controls			✓			✓			✓
Country controls									✓
Sample used:	**Family firms**	**Family firms**	**Family firms**	**Family firms**	**Family firms**	**Family firms**	**Family firms**	**Family firms**	**Family firms**

* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors in parentheses.

Note: All columns estimated by OLS with standard errors clustered by firm. Firm value added, capital measures and industry codes come from the Brazilian Industrial Survey (PIA) and Bureau van Dijk's Orbis dataset. PIA's values for sales, value added, employment and capital measures were averaged over 3 years around the year for when the management data was collected. z-management is the plant-level standardized management score. General controls include firm-level controls for average hours worked and the proportion of employees with college degrees (from the survey), plus a set of country dummies. Noise controls include a set of interviewer dummies, the seniority and tenure of the manager who responded, the day of the week the interview was conducted, the time of day the interview was conducted and the duration of the interview.

the management practices we measure here is likely to improve firm performance even in family firms. This should hopefully appease concerns that there is something happening within the organization of family firms in particular that makes such practices irrelevant, and serve as evidence against the argument that family firms "do not need" this type of management. Indeed, we suggest that poor management practices could be a channel that explains at least part of the poor performance of family firms vs. non-family firms documented elsewhere in the literature.

2.2.4 *How different are family and non-family firms?*

We find a correlation between management and firm productivity in the subsample of family firms, and Figure 4 in the introduction suggests one important factor could be the owner's choice of CEO and the CEO's family identity. The figure shows the distribution of quality of management for firms owned and run by families, firms owned by families but run by a professional CEO, and firms with non-family private ownership run by a professional CEO. It is clear that family owned firms that are *not family controlled* are just as well managed as those under other governance structures but also under professional management. The Kolmogorov-Smirnov test of equality of distributions suggests that the distribution of firms that are not family owned-and-controlled is not statistically different from the distribution of firms owned by families but controlled by a professional CEO. The test also suggests that both distributions are statistically different from the distribution of firms owned-and-controlled by a family.

But what is so different about family firms? This section will explore the observable differences between the family and non-family firms in the sample. Table 2 shows the difference in means across key characteristics of family versus non-family firms in our sample. As the literature suggests that the "family behind the family firm" drives important differences in firm governance, we turn first to the family characteristics of the CEO prior to succession.[20] We

[20] For example, Bertrand and Schoar [24] and Bertrand et al. [25].

Table 2: Difference in means: family vs. non-family succession

	Family	Non-family	Diff in	T Stat	Family	Non-family
	Mean	**Mean**	**means**	**T Stat**	**N**	**N**
Family characteristics						
Of previous CEO						
First child = male	0.80	0.65	-0.14**	-3.20	680	133
Had at least one son	0.95	0.81	-0.14***	-4.09	689	135
# children	3.10	2.45	-0.64***	-4.61	689	135
# children | first = boy	3.09	2.75	-0.35	-1.95	541	87
# boys	1.98	1.50	-0.47***	-4.48	689	135
Firm characteristics, regressors						
Employment	462.80	544.84	82.03	1.08	689	135
Firm age	50.52	46.35	-4.17	-1.48	689	135
% of employees with degrees	11.35	14.44	3.09*	2.32	689	135
MNE = 1	0.12	0.52	0.39***	8.75	688	135
Share in low tech industries	0.47	0.30	-0.16***	-3.68	689	135
Levels between CEO and shopfloor	3.25	3.57	0.33**	3.03	677	133
# direct reports to plant manager	7.17	7.75	0.59	1.16	685	134
Avg hrs/wk, manager	48.82	48.10	-0.72	-1.33	686	135
Avg hrs/wk, non-manager	43.58	42.81	-0.77*	-2.09	685	135
# production sites, total	2.24	3.54	1.31	1.61	689	134
# production sites, abroad	0.37	1.73	1.36	1.73	689	134
Management scores						
Management (overall)	2.68	2.90	0.22***	4.04	689	135
Management: ops & monitoring	2.86	3.16	0.30***	4.48	689	135
Management: targets	2.58	2.84	0.26***	4.11	689	135
Management: people	2.55	2.63	0.09	1.64	689	135

see evidence that the characteristics of the former CEO's children in family vs. non-family firms are significantly different from each other. On average, former CEOs of firms that switched to non-family control are likely to have fewer children and likely to have fewer boys. Importantly, however, conditional on the first child being male, the average family size is not statistically different between the two groups. This will be relevant in our later discussion of instrument validity. Table 7 in the Appendix reports the summary statistics for the key dependent and independent variables in our empirical model in more detail.

Turning to firm characteristics, we report the means and difference in means for the set of factors that have been shown to have a correlation with managerial structures, as in Bloom et al. [36]. Firms in the two groups are not significantly different from each other in terms of firm size, with means of 463 and 545 employees for family and non-family firms respectively, or firm age with means of 51 and 46 years respectively. In terms of the proportion of employ-

ees who have college degrees, non-family firms tend to have a slightly higher proportion, 14% for non-family firms versus 11% for family firms, though the difference in means is weakly significant. Over half of non-family firms are multinationals while only 12% of the family firms fall under the same category. Breaking down the manufacturing industries into high tech and low tech, we find that the share of family firms is higher in low tech industries than in high tech industries.

We also check the difference in means of a set of other firm organizational characteristics beyond those that are known in the literature to be correlated with management practices. The means of firms in the family and non-family groups across several variables are not statistically different from each other, including a measure of span of control (number of direct reports to the plant manager), average hours worked per week by managers and number of production sites (at home and abroad). Non-family firms seem to be more hierarchical, with on average a larger number of levels between the CEO and the shopfloor — however, this statistic is not controlling for firm size. Finally, there is a difference in the average number of hours worked by non-managers, with workers in family firms working three quarter of an hour longer on average.

Lastly, considering the average scores across the management measure indices we see that family firms have significantly lower average scores compared to non-family firms overall, and across operations and monitoring and targets areas. Interestingly, people management does not seem to be statistically different in an unconditional difference of means test. We will return to these results in the next section.

2.3 EMPIRICAL RESULTS

2.3.1 *Ownership structure and management: OLS results*

Having discussed results on the relationship between firm performance and management for family firms, we now turn to exploring the relationship of

family control and management. We first use the full WMS dataset and run the following OLS model, with results reported in Table 3:

$$M_{isc} = \alpha + \beta_1' \mathbf{Family_{isc}} + \beta_2' \mathbf{NonFamily_{isc}} + \theta' \mathbf{V_i} + \omega_s + \vartheta_c + u_{isc} \quad (2)$$

where M_{isc} is the z-scored management index for firm i in industry s in country c. $\mathbf{Family_{isc}}$ and $\mathbf{NonFamily_{isc}}$ are vectors of dummy variables indicating five ownership and control categories broken down as follows: family firms are subdivided into "family owned, family CEO" and "founder owned, founder CEO," while non-family firms are subdivided into "dispersed shareholders," "privately owned, professional CEO" and "family owned, professional CEO." The reference category is dispersed shareholders. $\mathbf{V_i}$ is a vector of controls for firm i, including the log of the number of employees, log of firm age and a dummy variable for multinational status. The survey noise controls are a set of interviewer dummies, manager's tenure, day of week, survey wave year and interview duration. We also include country and industry fixed effects.

Columns (1) through (3) use the full WMS sample, while columns (4) and (5) are restricted to only the countries that are also used in the main IV analysis in this paper, and Column (6) uses only the firms within these countries that are included in the IV specification. Column (1) shows the baseline relationship between the sub-categories and management excluding all controls, while Column (2) includes industry controls and Column (3) includes firm and noise controls. The industry controls only slightly reduce the coefficients, but firm and noise controls account for a more substantial share of the variation. The estimates in Column (3) suggest that the average family owned, family CEO firm has 0.289 standard deviations worse management than the average dispersed shareholder firm. The average founder owned, founder CEO firm has 0.320 standard deviations worse management than the average dispersed shareholder firm. We also observe that firms with professional CEOs, either family or privately owned, are also worse managed than dispersed shareholder firms (coefficients of -0.097 and -0.155, respectively) but better managed than

Table 3: Ownership and control structures on quality of management: regressions using full WMS sample and sample used in the IV analysis

	(1) z-management	(2) z-management	(3) z-management	(4) z-management	(5) z-management	(6) z-management
Family (controlled) firms						
Family owned, family CEO	-0.724***	-0.612***	-0.289***	-0.293***	-0.287***	-0.369***
	(0.025)	(0.025)	(0.024)	(0.033)	(0.034)	(0.111)
Founder owned, founder CEO	-0.961***	-0.796***	-0.320***	-0.353***		
	(0.024)	(0.025)	(0.025)	(0.037)		
Non-family (controlled) firms						
Family owned, professional CEO	-0.314***	-0.228***	-0.097**	-0.080	-0.084	-0.207
	(0.047)	(0.045)	(0.040)	(0.053)	(0.054)	(0.144)
Privately owned, professional CEO	-0.437***	-0.368***	-0.155***	-0.145***	-0.137***	-0.253
	(0.024)	(0.023)	(0.021)	(0.030)	(0.030)	(0.162)
Dispersed Shareholders (reference category)						
Observations	13842	13842	13842	6793	5468	818
R^2	0.129	0.188	0.384	0.338	0.323	0.240
Noise controls			✓	✓	✓	✓
Firm & country controls			✓	✓	✓	✓
Industry controls		✓	✓	✓	✓	✓
Sample used:	**Full WMS**	**Full WMS**	**Full WMS**	**IV countries**	**IV countries**	**IV firms only**
Tests of equality (p-values)						
Family (controlled) firms	0.000	0.000	0.185	0.055		
Non-family (controlled) firms	0.009	0.002	0.143	0.205	0.310	0.774
Family vs non-family (controlled) firms	0.000	0.000	0.000	0.000	0.000	0.131

* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors in parentheses.

Note: All columns estimated by OLS with standard errors clustered by firm. All data comes from the World Management Survey. z-management is the plant-level standardized management score. General controls include firm-level controls for average hours worked and the proportion of employees with college degrees (from the survey), plus a set of country dummies. Noise controls include a set of interviewer dummies, the seniority and tenure of the manager who responded, the day of the week the interview was conducted, the time of day the interview was conducted and the duration of the interview. The base category here is firms with dispersed shareholder ownership.

firms with family CEOs. In Column (4) we restrict the sample to only countries included in our IV analysis and observe similar results to Column (3). The exception is that the coefficient on family owned, professional CEO firms is no longer significantly different from dispersed shareholder firms though this might simply be reflecting a noisier estimate as a result of the lower number of firms with this ownership and control type in the particular subset of countries we study.

Columns (5) further restricts the sample to exclude founder firms from the samples of all firms in the "IV countries," and Column (6) shows results using only the sample of firms that are also used in the IV analysis. The purpose of this exercise is to show that the pattern of poor management practices in family owned, family CEO firms is persistent across several subsamples of the data. This negative and systematic relationship is not as clear for other types of ownership and control.[21] The coefficient in Column (6) suggests that family-controlled firms in our analysis sample have, on average, 0.37 standard deviations worse management than dispersed shareholder firms. This is equivalent to about 56% of the standard deviation in the full management dataset.

We also check for the equality of the coefficients within and between the two broader categories of firms by conducting a Hausman test of the equality of coefficients and provide results at the bottom of the table. We first test the equality of the coefficients within each category of control, that is, a comparison of (i) family owned, family CEO and founder owned, founder CEO; and of (ii) family owned, professional CEO and privately owned, professional CEO, showing that for Column (3) we cannot reject the hypothesis that the coefficients are significantly different from each other within each category.[22] We also test for the equality of coefficients between the two broader categories, that is, testing whether family firms controlled by family CEOs and professional CEOs. We find that we can reject the null hypothesis that they are equal

[21] Although our identification strategy by design excludes founder firms, the coefficients on the relationship between founder-owned, founder CEO firms and management are not statistically different from that of family owned, family CEO firms and management. The similarity of the relationship between "first generation" family firms (founder owned, founder CEO) and "second generation onwards" family firms will inform our discussion of external validity at the end of this paper.

[22] Less crucially, we do see a difference between the excluded category of founder owned, founder CEO and family owned, family CEO for the countries in our IV sample.

in specifications (1) to (5), and can nearly reject the null hypothesis in Column (6), despite the noisier data. This analysis suggests that the combination of several sub-categories into two major categories based on who *controls* the firm and not who *owns* the firm is reasonable for the purposes of this study.

2.3.2 *Ownership structure and management: Instrumental variables results*

2.3.2.1 *IV approach: exploiting conditional exogenous variation in gender composition of the outgoing CEO's children*

We have established that family control across firms and countries is significantly correlated with management quality, but we cannot infer causality from a simple OLS model. There are several reasons why the OLS results could be biased. There could be omitted variable bias where there is some factor driving both CEO choice and management quality. If the firm is able to stay alive as a family controlled firm in a competitive environment, there is likely some positive productivity shock that both drives CEO choice and their choice of management practices. There could also be reverse causality, as it is possible that different control structures, say, less concentrated control, leads firms to have better management practices, but it is also possible that better management in turn allows firms to transition to control structures with, say, less concentration of control at the top. In short, it is difficult to pin down the real effect of family control on firm performance and organization from an OLS analysis. We expect there to be a positive bias in OLS, and that the true effect is significantly more negative.

In order to establish the true effect, we need to find a source of variation in family control that is exogenous to the level of managerial structures in a firm. One instrument that is particularly useful in determining family control is the family characteristics of the outgoing owner-CEO. In particular, we explore the gender composition of the children of the former owner-CEO as identifying variation. We use three main variations of this instrument: (a) a dummy variable for whether there was at least one son among the children, conditional on the number of children (b) the number of boys, conditional on number of

children, and (c) a dummy variable for whether the first child was male. The rationale is that if the owner-CEO has a male child he is more likely to keep the firm under family control.[23] The gender of the first child instrument has been used by Bennedsen et al. [16] with Danish data of family firms CEOs, for example.

By design, this IV strategy requires that at least one succession of power has taken place. More specifically, at the point where a family owner-CEO makes the decision to pass control of the firm to the next generation of family members, hire a professional CEO or sell the firm outright, we posit that this decision is heavily influenced by the gender composition of the CEO's children. Essentially, we are comparing "stayers" with "switchers". The "stayers" are firms that stay with combined ownership and control - that is, family owned firms with family CEOs.[24] The "switchers" are firms that were founded by a founder/founding family, but have since "switched" into separate ownership and control, that is, where the CEO is not related through family ties to the majority shareholders of the firm. We use the measure of quality of management of the firm to be contemporaneous with the CEO presiding during that time, and the information on the gender of the preceding CEO's children as the identifying variation.

2.3.3 *IV-2SLS results*

The dependent variable of the first stage of our two stage least squares (2SLS) strategy is $\mathtt{FamilyCEO}_i$, a dummy variable that takes a value of 1 when the firm is owned and controlled by a family and 0 when it is not. The first instrument, $\mathtt{HADSONS}_i$ is a dummy variable that takes a value of 1 if the former owner-CEO had at least one son. The second instrument, $\mathtt{SONS}_i$ is the number of sons the former owner-CEO had, entered as a step function. The third instrument, $\mathtt{FIRSTSON}_i$, is a dummy variable that takes a value of 1 if the

[23] Here and throughout the chapter we use the masculine pronoun because the vast majority of founder/family owners and CEOs in our sample are, in fact, male.

[24] Because we need at least one "switch" to have happened, although we consider founder owned and controlled firms under the category of "combined" ownership and control they are not part of our IV strategy.

former owner-CEO had a male first child and 0 if not. $\mathbf{X_i}$ is the vector of firm controls. The first stage equations are as follows:

$$\mathrm{FamilyCEO}_i = \alpha_{fs} + \rho_h \mathrm{HADSONS}_i + \vartheta \mathrm{children}_i + \boldsymbol{\eta}'\mathbf{X_i} + \nu_i \quad (3)$$

$$\mathrm{FamilyCEO}_i = \alpha_{fs} + \sum_{j=1}^{3} \rho_j \mathrm{SONS}_j + \vartheta \mathrm{children}_i + \boldsymbol{\eta}'\mathbf{X_i} + \nu_i \quad (4)$$

$$\mathrm{FamilyCEO}_i = \alpha_{fs} + \rho_f \mathrm{FIRSTSON}_i + \boldsymbol{\eta}'\mathbf{X_i} + \nu_i \quad (5)$$

The second stage regression of the impact of family control on the quality of management is:

$$M_i = \alpha_{ss} + \beta_f \widehat{\mathrm{FamilyCEO}}_i + \vartheta \mathrm{children}_i + \boldsymbol{\phi}'\mathbf{X_i} + \epsilon_i \quad (6)$$

where M_i is a measure of managerial structures in the firm, $\widehat{\mathrm{FamilyCEO}}_i$ is the predicted value from the first stage regression and $\mathbf{X_i}$ is the set of firm-level controls. The coefficient of interest is β_f: the effect of family control on quality of management. Table 4 shows a summary of the OLS and IV results. Column (1) shows the OLS regressions using the same sample as in the main IV specification, using only the Ownership Survey data that can be matched to the World Management Survey and has full information on the instrumental variable. Column (2) shows the reduced form using the instrument from our preferred IV specification.

The bottom panel of Table 4 shows the first stage results for the three main instruments we use in Columns (3) to (5), and repeats the results for our preferred instrument in Columns (6) to (8). The first stage is essentially a linear probability model of the probability that the firm had a family control succession, conditional on the previous CEO having at least one son (Columns 3, 6-8) or the first child being male (Column 5).[25] Column (4) shows the first stage results for using the number of sons as the IV. In this specification the number

[25] As suggested by Angrist and Pischke [4]. We use Stata's `ivreg2` command, by Baum, Schaffer, and Stillman [13] to estimate these regressions.

Table 4: IV-2SLS results for the effect of family control on firm managerial structures

	OLS	**Reduced Form**	**IV Second Stage results**					
	(1) z-mgmt	(2) z-mgmt	(3) z-mgmt	(4) z-mgmt	(5) z-mgmt	(6) z-ops/monitor	(7) z-targets	(8) z-people
Family CEO = 1	-0.369***		-0.808**	-0.767**	-0.423	-0.747*	-0.686*	-0.673*
	(0.111)		(0.388)	(0.382)	(0.560)	(0.412)	(0.381)	(0.375)
Had at least 1 son		-0.298**						
		(0.123)						
# Firms			810	806	800	810	810	810
K-P Wald F-statistic			21.58	7.599	11.37	21.58	21.58	21.58
Hansen's J statistic				0.553				
Hansen's J p-value				0.758				
Stock-Yogo 10% Critical Value			*16.38*	*16.38*	*16.38*	*16.38*	*16.38*	*16.38*
Stock-Yogo 15% Critical Value			*8.96*	*8.96*	*8.96*	*8.96*	*8.96*	*8.96*
Stock-Yogo 20% Critical Value			*6.66*	*6.66*	*6.66*	*6.66*	*6.66*	*6.66*
			IV First Stage results					
Excluded instruments								
Had at least 1 son			0.308***			0.308***	0.308***	0.308***
			(0.066)			(0.066)	(0.066)	(0.066)
1 son				0.304***				
				(0.068)				
2 sons				0.302***				
				(0.069)				
3+ sons				0.348***				
				(0.074)				
First child = male					0.124***			
					(0.037)			
Control for family size: linear	✓	✓	✓	✓	✗	✓	✓	✓
# Observations	818	818	818	814	807	818	818	818
# Firms	810	810	810	806	800	810	810	810
R^2	0.311	0.259	0.059	0.064	0.019	0.059	0.059	0.059

* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors in parentheses.

Note: Columns (1) and (2) estimated by OLS with standard errors clustered by firm. Columns (3) through (6) are estimated by IV-2SLS using Stata's `ivreg2` command. Management data comes from the World Management Survey. z-management is the plant-level standardized management score. Ownership and family history data comes from the Ownership Survey. General controls include firm-level controls for average hours worked, whether the firm is listed on the stock market, plus a set of country dummies. Noise controls include a set of interviewer dummies, the seniority and tenure of the manager who responded, the day of the week the interview was conducted, the time of day the interview was conducted and the duration of the interview.

of sons enters as a step function, with dummy variables for each number of sons.

Still focusing on the bottom panel, Column (3) of Table 4 suggests that, controlling for number of children, a firm is approximately 30 percentage points more likely to have a succession to a family CEO if the previous CEO had at least one son. The Kleibergen-Paap Wald F-statistic test for weak instruments is 21.58, well above the Stock and Yogo [115] 10% maximal IV size critical value. This suggests that the largest relative bias of the 2SLS estimator relative to OLS for our preferred specification is 10%.[26]

Column (4) shows the results of using the number of sons as an IV. The coefficients and significance levels are similar to those of the "had sons" IV in Column (3), predicting an approximate 30 percentage points likelihood of a firm staying in the family if there is exactly one son in the family, and similarly for higher numbers of sons. Because we have multiple instruments here we report the Sargan-Hansen test of over-identifying restrictions resulting Hansen's J statistic (because of the clustered standard errors) and corresponding p-value. We cannot reject the joint null hypothesis that the instruments are valid. However, this specification seems to have weaker instruments than our preferred specification as suggested by the lower Kleibergen-Paap Wald F-statistic of ~ 7.6.

In Column (5) we use the gender of the first child as the instrument. The coefficient suggests that having a male first child is associated with a 12.4 percentage points higher probability of the firm remaining under the control of a family CEO. Considering the weak instruments test, the Kleibergen-Paap statistic sits between the specifications in Columns (3) and (4) with a statistic of 11.37.

The top panel of Table 4 shows the second stage results, along with the OLS results and reduced form. Column (3) is our preferred specification and suggests that a succession to a family CEO leads to 0.808 standard deviations

[26] The Kleibergen-Paap Wald statistic (Kleibergen [85] and Kleibergen and Paap [86]) is the heteroskedasticity-robust analogue to the first-stage F-statistic, and we report this value because we use clustered standard errors at the firm level. Although there are no critical values specifically for the K-P statistic, Baum, Schaffer, and Stillman [14] suggests that the Stock and Yogo [115] critical values for the Cragg-Donald Wald F-statistic could be used and thus we report them here to facilitate comparison.

worse management practices, significant at the 5% level (p-value: 0.037). The coefficients of the different iterations of the IVs are very similar to each other, and not statistically different. The coefficient in Column (5) is not significant but the sign and magnitude of the coefficient are broadly consistent with that of our preferred specification, albeit imprecisely estimated.

When comparing the family control coefficient in Column (3) of Table 4 to the one we get in the equivalent OLS regression in Column (1), we cannot reject the hypothesis that they are significantly different from each other as the standard errors around the IV coefficient are rather large. However, the IV results give us some confidence that the effect is, in fact, negative and provides new evidence that the OLS has a positive bias here.

In Columns (6) to (8) we break down the WMS management score into its three main components, including operations & monitoring, target setting and people management. We see that the coefficients are broadly consistent with the overall management measure, suggesting the negative relationship between a family succession of control and management is not likely to be driven by any one particular sub-area of management, but rather is a more general effect.

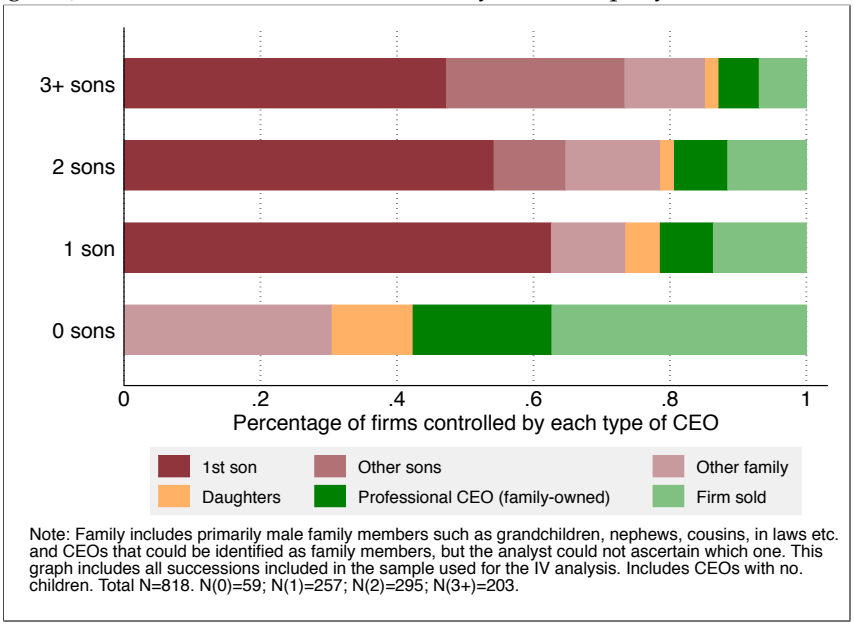
2.3.3.1 *Assessing instrument validity: instrument informativeness*

Although the results from the first stage are economically meaningful and statistically significant, in this section we present further statistics supporting the informativeness of our choice of instruments. At a glance, it is clear that the strongest instrument we have is the dummy variable for whether the outgoing CEO had at least one son or not. The results suggest that having at least one son is associated with an approximately 30 percentage points higher chance of a family control succession. In the countries that we study, the gender of the *first child* is not as strong a predictor of family succession, with a male first child predicting only a 12.4 percentage points higher chance of family control.

Figure 5 breaks down the firm control succession by the number of sons of the former CEO. We have restricted the sample used in this graph to only those used in the IV analysis. Interestingly, even when there are no sons in the family,

control tends to be passed to other male family members or to professional CEOs (either through external hires or firm sale) rather than daughters.

Figure 5: Successions from founder/family ownership, by number of sons



Note: Family includes primarily male family members such as grandchildren, nephews, cousins, in laws etc. and CEOs that could be identified as family members, but the analyst could not ascertain which one. This graph includes all successions included in the sample used for the IV analysis. Includes CEOs with no. children. Total N=818. N(0)=59; N(1)=257; N(2)=295; N(3+)=203.

2.3.3.2 *Assessing instrument validity: exclusion restriction*

The exclusion restriction would fail to hold if the gender of the CEO's children was directly related to any part of our measure of quality of management. In terms of the IV specification using the gender of the first child, this is rather "purely" random since the countries we are including in the analysis do not have histories of selective abortion or infanticide.[27] In terms of the 'number of sons' or 'at least one son', it could be argued that perhaps more devoted CEOs continue having children until they have a son to pass the firm on to. The exclusion restriction would not hold if this devotion to the family firm led to systematically better management and also to a larger family with more sons. This is generally a problem when looking at the effect of family control on sales or profits - that is, outcomes that could be affected more directly by a CEO's higher effort (ie. time spent) to leave a legacy to their children.

The fact that management is the key outcome variable of interest here partially mitigates this problem. Management is an outcome that simple CEO effort or sheer determination has a much less straightforward effect on, as

[27] Although it has been noted to us that studies have shown that there are other external factors that might affect the gender of children *in utero*, such as testosterone levels of the parents.

drivers of better management are not as simple as spending more time at work. Bloom et al. [34] note that one of the main reasons firm owners in their Indian experiment were not adopting good management practices was lack of information — they simply did not know that they were poorly managed or how to adopt these practices. Although it could be that more devoted CEOs also spend more time to increase their own levels of education — noted in Bloom et al. [36] as one of the drivers of good management — this is likely to take some investment time and it is unclear it would yield large enough changes in the short run that would upset the validity of our IV.[28] In short, even if the owner-CEO chose to have more children because they were keen to keep the firm in the family, it is less obvious that this also determines the quality of management practices they choose to adopt in the firm, thus making variations on the gender composition of children a plausible set of instruments.

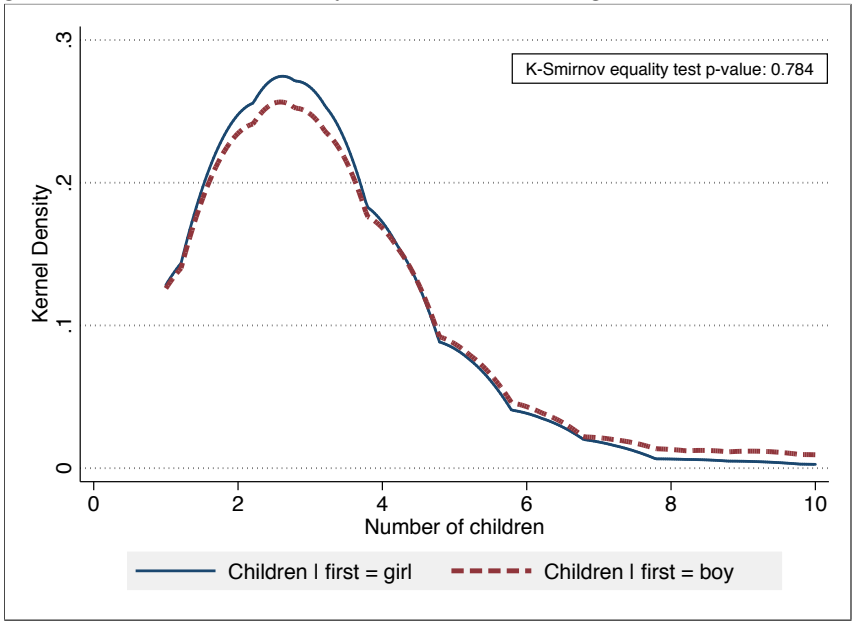
To consider this potential issue statistically, we could verify whether the probability of the last child being a boy is higher or lower across groups. As we lack the data to perform such a test at this time, we use an alternative method to check whether this is likely to be a problem. At a first instance, we have taken the data we have on the gender of the first child and number of children, and plotted the distribution of children (ie. family size) conditional on the first child being either a boy or a girl in Figure 6. The distributions are nearly identical, suggesting that selective family size is less of a concern.

2.3.4 *Robustness checks*

We have carried out a series of robustness checks of our main results. Table 5 reports the results for our specifications from Table 4 using two different sets of sampling weights in Columns (1) to (3) and (4) to (6), and the results for two different functional forms of the number of sons IV, in Columns (7) and (8). The sampling weights in the first set of columns were calculated within each country, while the second set were calculated for the full sample including

[28] See Bandiera et al. [11] for evidence on CEO time use. New evidence in *Lemos, (mimeo)* suggests that the effect of quality and quantity of tertiary education on management is significant, but small.

Figure 6: Distribution of family size conditional on gender of the first child



country fixed effects. The results are qualitatively similar to those in the main results table. The two different functional forms of the IV that we are exploring as a robustness check are:

$$FamilyCEO_i = \alpha_{fs} + \sum_{j=2}^{3} \rho_j SON_j + \vartheta_{1i} SON_1 + \vartheta_{2i} children_i \quad + \boldsymbol{\eta}' \mathbf{X_i} + \nu_i \tag{7}$$

$$FamilyCEO_i = \alpha_{fs} + \sum_{j=1}^{3} \rho_j SON_j + \sum_{j=1}^{3} \vartheta_j children_j \quad + \boldsymbol{\eta}' \mathbf{X_i} + \nu_i \tag{8}$$

In Column (7), we attempt to address the possible concern that number of sons is endogenous because families have multiple children until they "finally get a son." Here we input the dummy variable for "exactly one son" as a *control* rather than an IV. The rationale for this is to test whether the result was being driven by a family having *the first boy* - that is, we control for the "first boy effect," by pulling it out of the IV set and adding it to the set of controls. Given that the second stage results are not statistically different, this serves as evidence that the effect is not wholly driven by having exactly one boy. Column (8) shows the number of sons IV controlling for family size (number

of children) also as a step function - that is, including number of children dummies instead of the single variable. We lose efficiency by including an extra set of dummy variables, but the coefficients are not statistically different from the other two iterations of this IV.

2.3.5 *Possible mechanisms: a preliminary discussion*

Although this first step was verifying that, indeed, there is evidence of a causal effect of family CEO on quality of management, the result begs the question of "why." Here we discuss a set of key possible mechanisms that may be driving poor management in family firms inspired in the discussion in Gibbons and Roberts [65]: education, information, preferences and incentives.

In terms of *education*, Bennedsen et al. [16] show that Danish family CEOs tend to be less well educated than non-family CEOs. They suggest that if the firm is to stay under family control, the outgoing CEO inherently has a limited talent pool constrained by family size and is thus less likely to find a talented CEO when compared to the broader market. Within Latin America, however, it could also be that family CEOs invest in their children to groom them to become the future leaders of the company and thus they are just as well educated as their broader market counterparts. One possible way to consider this mechanism would be to take advantage of new "big data" datasets, such as online CV repositories like LinkedIn, and match this data with the management and ownership data from our database. As we have the name of the companies and CEOs we may be able to find information on education and past employment experience for the CEOs and perhaps even other family members working in the company.

Another possible mechanism is *information*. Bloom et al. [34] suggest that managers simply do not know that they are badly managed. The WMS collects some data that can help shed light on this mechanism: at the end of the management interview, the interviewer asks the only personal opinion question of the survey: "On a scale of 1 to 10 and excluding yourself, how well managed do you think the rest of your firm is?" The answer is then re-scaled to match

Table 5: IV-2SLS results, robustness checks

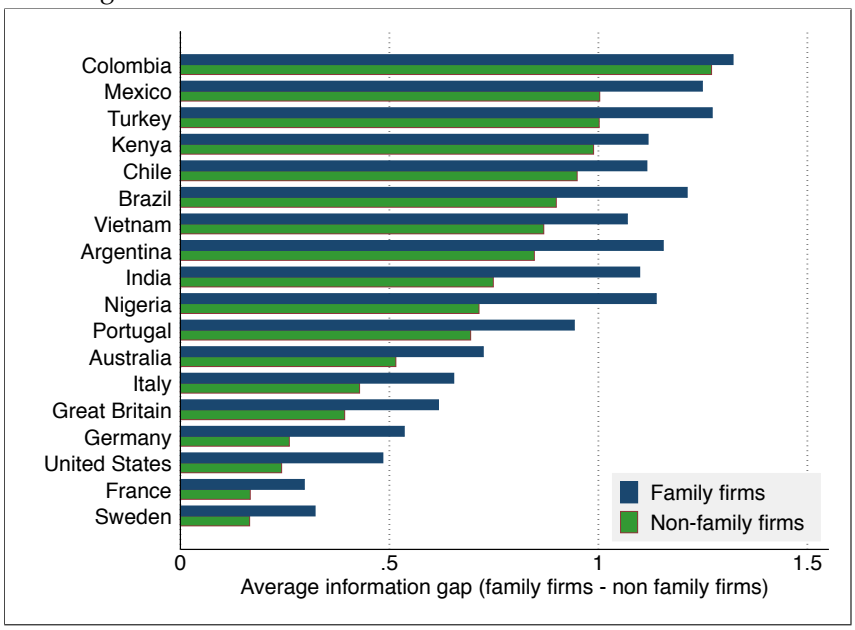
	Sampling weights: by country			Sampling weights: overall			IV functional forms unweighted	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Family CEO = 1	-1.049**	-1.014**	-0.384	-1.020**	-0.962**	-0.415	-0.718*	-0.606
	(0.509)	(0.503)	(0.529)	(0.490)	(0.476)	(0.548)	(0.390)	(0.428)
Hansen's J statistic		2.167			2.535		0.219	1.214
Hansen's J p-value		0.338			0.281		0.640	0.545
				IV First Stage results				
Excluded instruments								
Had at least 1 son	0.280***			0.280***				
	(0.075)			(0.074)				
First child = male			0.132***			0.126***		
			(0.042)			(0.041)		
1 son		0.277***			0.274***		0.304***	0.293***
		(0.078)			(0.077)		(0.068)	(0.079)
2 sons		0.275***			0.278***		0.302***	0.293***
		(0.078)			(0.077)		(0.069)	(0.081)
3+ sons		0.307***			0.312***		0.348***	0.334***
		(0.084)			(0.083)		(0.074)	(0.085)
1 child								0.080
								(0.120)
2 children								0.046
								(0.116)
3+ children								0.110
								(0.118)
Control for family size: linear	✓	✓		✓	✓		✓	
# Observations	818	814	807	818	814	807	814	814
# Firms	810	806	800	810	806	800	806	806
R^2	0.047	0.050	0.022	0.048	0.051	0.020	0.064	0.066
F-stat (first stage)	7.745	5.098	6.218	8.013	5.347	5.725	7.374	5.807

* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors in parentheses.

Note: All columns are estimated by IV-2SLS using Stata's `ivreg2` command. Management data comes from the World Management Survey. z-management is the plant-level standardized management score. Ownership and family history data comes from the Ownership Survey. General controls include firm-level controls for average hours worked, whether the firm is listed on the stock market, plus a set of country dummies. Noise controls include a set of interviewer dummies, the seniority and tenure of the manager who responded, the day of the week the interview was conducted, the time of day the interview was conducted and the duration of the interview. Columns (1) through (3) use sampling weights based on firm size by country, and Columns (4) through (6) use sampling weights based on firm size overall (across all countries). Columns (7) and (8) are unweighted.

the 1 to 5 scale of the WMS and the difference between the manager's perception and the "true" WMS score become the average information gap variable. We show in Figure 7 that managers in family firms seem to be systematically less aware of their own shortcomings than those in non-family firms. Thus, it seems plausible that family firms are perhaps less well informed about (a) their own level of quality of management, (b) what "best practice" management is, (c) whether it is profitable for them to implement new practices, and (d) how to implement such practices in their firm even if they wanted to do so.

Figure 7: Mechanisms: family firms are less well informed about how well they are managed



Finally, it could also be that *incentives*, or "influence costs," are one of the mechanisms driving lower adoption of management. This mechanism works from the "bottom up" rather than "top down," and the idea is that employees may accept new managerial structures (such as, say, increased monitoring of their work) from a new professional CEO, but would resist it from a family CEO who might be known to them. On the theoretical side, work by Meyer, Milgrom, and Roberts [95] suggests this is a plausible scenario, and there is also empirical evidence of such cases. Atkin et al. [7], in their technology adoption experiment with soccer ball factories in Pakistan, show evidence that worker pushback is indeed a possible reason for lack of technology adoption. If we consider management as technology, as in Bloom, Sadun, and Van

Reenen [32], this could be a mechanism driving the lower adoption of management practices in family firms.

It is conceivable that family firms may face a different set of costs when dealing with employees, and if there is a perception that modern management practices are inherently labour-saving, there might be resistance to adopting them. The next chapter in this thesis considers this possibility in a theoretical framework.

2.4 CONCLUSION

We set out to investigate the effect of family control on firm organization and performance. We define family firms as firms that have a combined ownership and control structure - that is, firms where the same entity (or, family) both holds the majority of voting shares and the CEO position in the firm. Adding to previous work in this area, we find that simple family *ownership* does not fully explain family firms' underperformance, but rather it is the effect of the combination of ownership and control that seems to be driving this. Given the notorious lack of data for private and family firms, particularly for emerging economies, we first collect a rich new dataset on the history of ownership and control successions for a sample of firms in Latin America and Southern Europe, and match it with a unique dataset on firm organizational structure and managerial practices. Relying on the body of work that has provided evidence on the strong relationship between managerial practices and firm performance along with our new evidence from Brazil, we suggest that poor management could be a channel driving family firms' poor performance. We consider whether the decision to appoint a family CEO had a causal effect on firm management, and provide a brief discussion on possible mechanisms.

The new dataset we collected allowed us to add to the correlational findings of Bloom and Van Reenen [29] and Bloom and Van Reenen [33] and suggest a causal relationship by using an instrumental variables approach. We explored the gender of the outgoing CEO's children as exogenous variation to identify the effect of a family CEO on the quality of management of a firm. We find con-

vincing evidence that the gender mix of the children does affect the likelihood of a succession to a family CEO: in families where there is at least one male child the likelihood of a family succession of control is 30 percentage points higher. We also present descriptive evidence that this is, indeed, a stylized fact and strengthens our claim of the informativeness of the instrument. We argue that, conditional on number of children, the *gender mix* of the children is as good as random and unrelated to the managerial structures implemented in the firm, thus satisfying the exclusion restriction.

Our OLS and IV-2SLS results suggest that there is a statistically significant negative effect of family control, and the true effect sits somewhere between -0.369 (OLS result) and -0.808 (IV result). To put this in context, a one standard deviation change in management quality is associated with approximately 20% higher value added per employee in Brazilian family firms. If we take this proportional relationship, our results suggest that keeping the firm under family control leads to between 7% and 16% lower value added per employee in the average family firm.[29] This result is strikingly within the same range as the main results from Bennedsen et al. [16] in Denmark.

We believe that better management leads to better firm productivity, and thus we believe that our results have key implications for policies in emerging economies, where family firms dominate various industries. To the best of our knowledge, this is the first piece of work to show causal evidence of this negative effect of family control on *internal organization of the firm*, and also the first such analysis to be done with emerging economies. This is also, however, only the first step in this research agenda. Future research is needed into the mechanism behind the choice of family CEOs to implement less managerial structures than non-family CEOs, and what effect this might have on other firm outcomes and characteristics, such as on employee satisfaction, wages and work-life balance.

[29] Calculated as 0.369 $\times 20\% \approx$ 7% ; 0.808 $\times 20\% \approx$ 16%

2.5 APPENDIX

OWNERSHIP CATEGORIES AND ADDITIONAL SUMMARY STATISTICS

Table 6 describes the definition of ownership and control structures used in this paper. We differentiate between *combined* ownership and control, which we refer to generally as "family firms" (for ease of exposition) and *separate* ownership and control "non-family firms." Table 7 shows the summary statistics of the dataset we use in our analysis.

Table 6: Data categories - The Ownership Survey

Ownership category	**Ownership & control**	
	Non-family	Family
Founder or family owned		
Founder owned, founder CEO		✓
Founder owned, professional CEO	✓	
Family owned, family CEO		✓
Family owned, professional CEO	✓	
Privately owned (non-founding family owners)*		
Single owner, owner CEO		✓
Single owner, professional CEO	✓	
Many owners, owner CEO		✓
Many owners, professional CEO	✓	
*Dispersed shareholders***	✓	

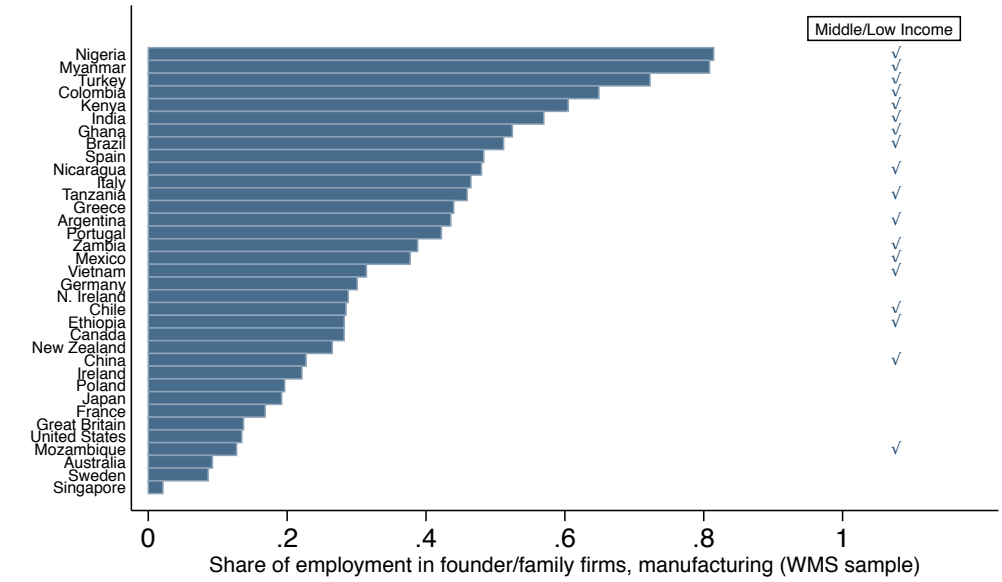
** For the category of Privately owned, at least one entity owns more than 25% of voting shares, and they are not members of the founding family.*
*** For the category of Dispersed shareholders, no one entity owns more than 25% of voting shares.*

Figure 8 shows the share of employment attributed to family firms in the WMS dataset. This graph is to quell concerns that, while there are many firms in the manufacturing sector in these countries, they account for a small share of employment.

Table 7: Summary statistics

	Family CEO				Non-family CEO			
	Mean	Median	SD	N	Mean	Median	SD	N
Family characteristics								
Of previous CEO								
First child = male	0.80	1.0	(0.40)	680	0.65	1.0	(0.48)	133
Had at least one son	0.95	1.0	(0.22)	689	0.81	1.0	(0.40)	135
# children	3.10	3.0	(1.60)	689	2.45	2.0	(1.46)	135
# children | first = boy	3.09	3.0	(1.60)	541	2.75	2.0	(1.53)	87
# boys	1.98	2.0	(1.12)	689	1.50	1.0	(1.12)	135
Of current firm								
# family members working in firm	2.04	2.0	(6.74)	689				
Son	0.09	0.0	(0.28)	689				
Brother	0.16	0.0	(0.36)	689				
Total %: male family members	0.29	0.0	(0.45)	689				
Daughter	0.04	0.0	(0.20)	689				
Sister	0.08	0.0	(0.26)	689				
Total %: female family members	0.17	0.0	(0.37)	689				
Firm characteristics								
Employment	462.80	230.0	(701.70)	689	544.84	250.0	(822.46)	135
Firm age	50.52	47.0	(28.61)	689	46.35	41.0	(30.18)	135
MNE = 1	0.12	0.0	(0.33)	688	0.52	1.0	(0.50)	135
Share in low tech industries	0.47	0.0	(0.50)	689	0.30	0.0	(0.46)	135
% of employees with degrees	11.35	7.8	(12.77)	689	14.44	10.2	(14.41)	135
Management scores								
Management (overall)	2.68	2.7	(0.57)	689	2.90	2.9	(0.57)	135
Management: ops & monitoring	2.86	2.9	(0.72)	689	3.16	3.1	(0.70)	135
Management: targets	2.58	2.6	(0.68)	689	2.84	2.8	(0.68)	135
Management: people	2.55	2.5	(0.52)	689	2.63	2.7	(0.57)	135

Figure 8: Share of employment in founder/family firms, by country (manufacturing)



Note: Firms between 50 and 5000 employees, manufacturing sector. This graph uses the full WMS dataset and represents a random sample of firms within the manufacturing sector of each country. Each bar denotes the proportion of employees in founder/family firms WITHIN the WMS sample only. To create this graph, we took the random sample of firms in the manufacturing sector from each of the countries (ie. the full WMS sample) and simply calculated the total number of workers as reported by the firms within each country, calculated the total number of workers within only family firms in each country, and took the ratio of these two numbers. This is, admittedly, a crude measure of employment share given it is only using the WMS sample of firms rather than the universe of firms. Given the data constraints in over half of the countries in the graph, however, and the fact that the WMS sample is a close approximation of a random sample of firms between 50 and 5000 employees in the manufacturing sector of these countries, we believe it is a good estimate of the pattern we are trying to show.

MANAGEMENT ACROSS REGIONS AND INDUSTRIES One important consideration is to what extent we should be treating this relationship between family control and management practices as something that is common across countries. It could be that family ownership and control matters more in countries where there is less competition, better rule of law, or a different mix of industries. To consider this, we broke the full WMS sample into the continental regions and report the results in Table 8. The coefficients across nearly all regional specifications are not statistically different from each other, with the exception of Africa. This suggests that across the world, being owned and controlled by a founder or founding family is associated with a similar negative effect on firm management.

Table 8: Management and family ownership and control across regions, WMS

	Anglo-Saxon	Sca' via & W. Europe	S & C Europe	Latin America	Asia	Africa
Family Control = 1	-0.166***	-0.149***	-0.162***	-0.211***	-0.168***	-0.122***
	(0.024)	(0.032)	(0.030)	(0.021)	(0.029)	(0.034)
Ln(employment)	0.123***	0.153***	0.178***	0.221***	0.129***	0.134***
	(0.008)	(0.012)	(0.017)	(0.010)	(0.010)	(0.016)
Observations	4299	2438	1904	3049	2453	867
Noise controls	✓	✓	✓	✓	✓	✓
Industry controls	✓	✓	✓	✓	✓	✓
Firm controls	✓	✓	✓	✓	✓	✓

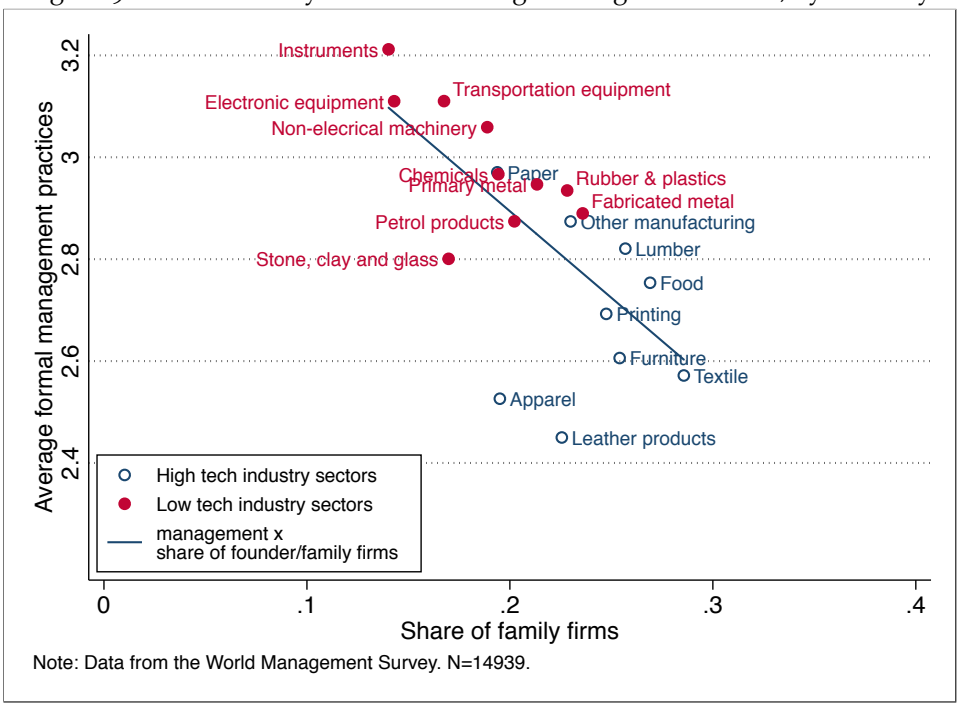
* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors in parentheses.

Note: All columns estimated by OLS with standard errors clustered by firm and reported in brackets below the estimates. Sample includes all firms with controls data. Management is the plant-level management score. Controls include a full set of country dummies, US-SIC dummies and year dummies, as well as firm-level controls including the proportion of employees with college degrees (from the survey), interviewer dummies, the seniority and tenure of the manager who responded, the day of the week the interview was conducted, the duration of the interview, and an indicator of the reliability of the information as coded by the interviewer.

Finally, another interesting feature to consider in terms of firm characteristics is the industrial mix in each group of firms. Figure 9 shows the relationship between management and the share of family firms within each 2-digit industrial sector. Each observation is an industrial sector and it is colour coded to indicate high (red) and low (hollow blue) tech industries. High tech industries are overwhelmingly both better managed and have lower shares of family firms. This result echoes one of the findings in Bennedsen et al. [16], where they suggest that the negative effect of family CEOs are worse for firms in higher tech industries. To take this into account we ensure we add industry fixed ef-

fects to all our specifications, and this is an avenue of research that could be explored in the future with more detailed administrative datasets.

Figure 9: Share of family firms and average management scores, by industry

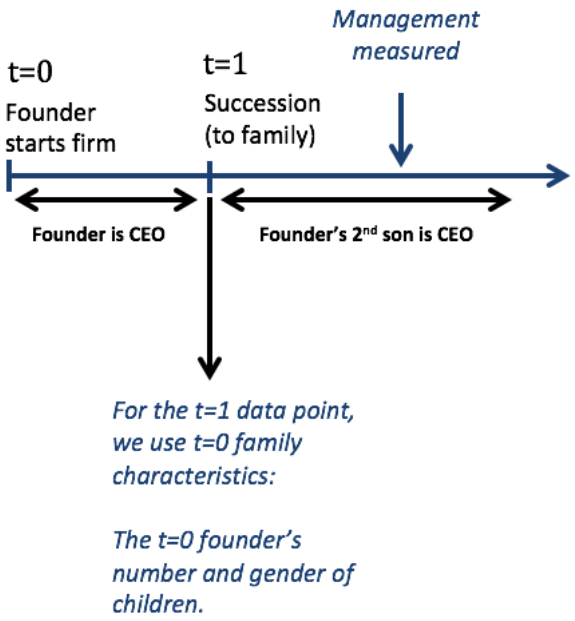


Note: Data from the World Management Survey. N=14939.

OWNERSHIP SURVEY: DATA STRUCTURE DETAILS Figure 10 shows a diagram of a hypothetical firm surveyed both by the Ownership Survey and the WMS. In this example, the WMS surveyed this hypothetical firm once between $t = 1$ and $t = 2$. The Ownership Survey collected data on: the date of foundation ($t = 0$) and each date of succession ($t = 1$); who owned the firm at each time bracket and the family characteristics of the founder and each family owner-CEO after. In terms of the merged data, the family characteristics of the founder, who owned and managed the firm between $t = 0$ and $t = 1$, will be the instrumental variables for the WMS management measurement after $t = 1$.

For example, take two hypothetical Brazilian firms: Firm A is currently a "family firm" and Firm B is currently a "non-family firm." Firm A was founded in 1980 and its founder handed down control of the firm to his son in 2005, who is still presiding over the company. Firm B was founded in 1990 by a founder who decided to sell the firm in 2000 to a set of investors ("private individuals," by our categorization). These investors chose to hire a professional

Figure 10: Hypothetical example



CEO to lead the firm. The firm today is still owned by these investors and the CEO continues to be the same professional hired in 2000. As the first WMS wave for Brazil was in 2008, we have a snapshot measure of the quality of management in both firms during the tenure of the founder's son for Firm A and during the tenure of the professional CEO in Firm B. We do not have measures for either of the founders' tenures in the earlier decades of these firms and thus cannot use panel data methods with the current dataset. The Ownership Survey collected information on the family characteristics of the founders of both firms and enables us to then use the gender composition of the founders' children as an instrument for the founders' choice of succession into another generation of a family firm or out of family control. Most of our data at the moment only has one management data point and complete data on the ownership background.

OWNERSHIP SURVEY: A BRIEF ILLUSTRATION USING THE EARLY DAYS OF THE FORD MOTOR COMPANY Beyond understanding how our data is matched to the WMS, a crucial definition worth reiterating is that when we use the term *family firm* we mean family control of the firm in terms of the same family entity owning the majority of the voting shares of the firm *as well*

as having a family member presiding over the company as CEO: *combined* ownership and control. To illustrate the data we collected and our definitions, it is useful to consider a well-known example such as the early days of the Ford Motor Company. Ford was founded in 1903 by Henry Ford, who had one son. In 1919 Henry Ford passed the position of CEO to his son, Edsel, until Edsel (unexpectedly) died in 1943. Edsel had four children: three boys and one girl. Henry Ford briefly took control for the interim two years until 1945 when Edsel's first son, Henry Ford II, returned to the US and assumed the helm of the firm. Henry Ford II had three children: two girls and one boy, Edsel Ford II.[30] In 1956, Ford went public in the largest IPO (initial public offering) of common stock shares in history at the time, but the Ford family still retained 40% of the voting shares.[31] Up to this point, the Ford Motor Co. would be considered a *family firm* in the Ownership Survey as the Ford family held over 25% of the voting shares and a family member from the original founding family held the CEO position in the firm. We would have, thus far, registered three successions of power within the family.[32]

A *non-family firm*, on the other hand, has *separate* ownership and control. Continuing with the Ford Motor Co. example, in 1980 Phillip Caldwell became the first non-Ford-family member to take the post of CEO. From 1980 onwards Ford is considered a *non-family firm* in our analysis. The data point would be recorded as "family owned, professional CEO," (ie. the green boxes in Figure 3) but as discussed earlier, we combine all categories that are not owned and controlled by families under *non-family firm*. An example of what the early Ford history would look like in our survey instrument is shown in Figure 11. If the Ford family ever chose to divest or dilute their voting shares such that the family's voting ownership stake of the firm fell to below 25% of the shares, they would then continue to be coded as a *non-family firm* category, but their ownership sub-category would change to *dispersed shareholders*.[33] Cru-

[30] Edsel Ford II ran Ford Australia between 1978 and 1980.

[31] According to Ford Motor Co.'s website. It is important to note that when they took the company public the family separated the type of stock offered into 95% Class A shares (no voting rights) and 5% Class B (voting rights) shares. The Ford family in fact owned less than 2% of the company as a whole, but crucially, they own 40% of the *Class B voting shares*, affording them majority control of the company.

[32] Henry Ford 1903-1919, Edsel Ford 1919-1943, Henry Ford 1943-1945, Henry Ford II 1945-1979.

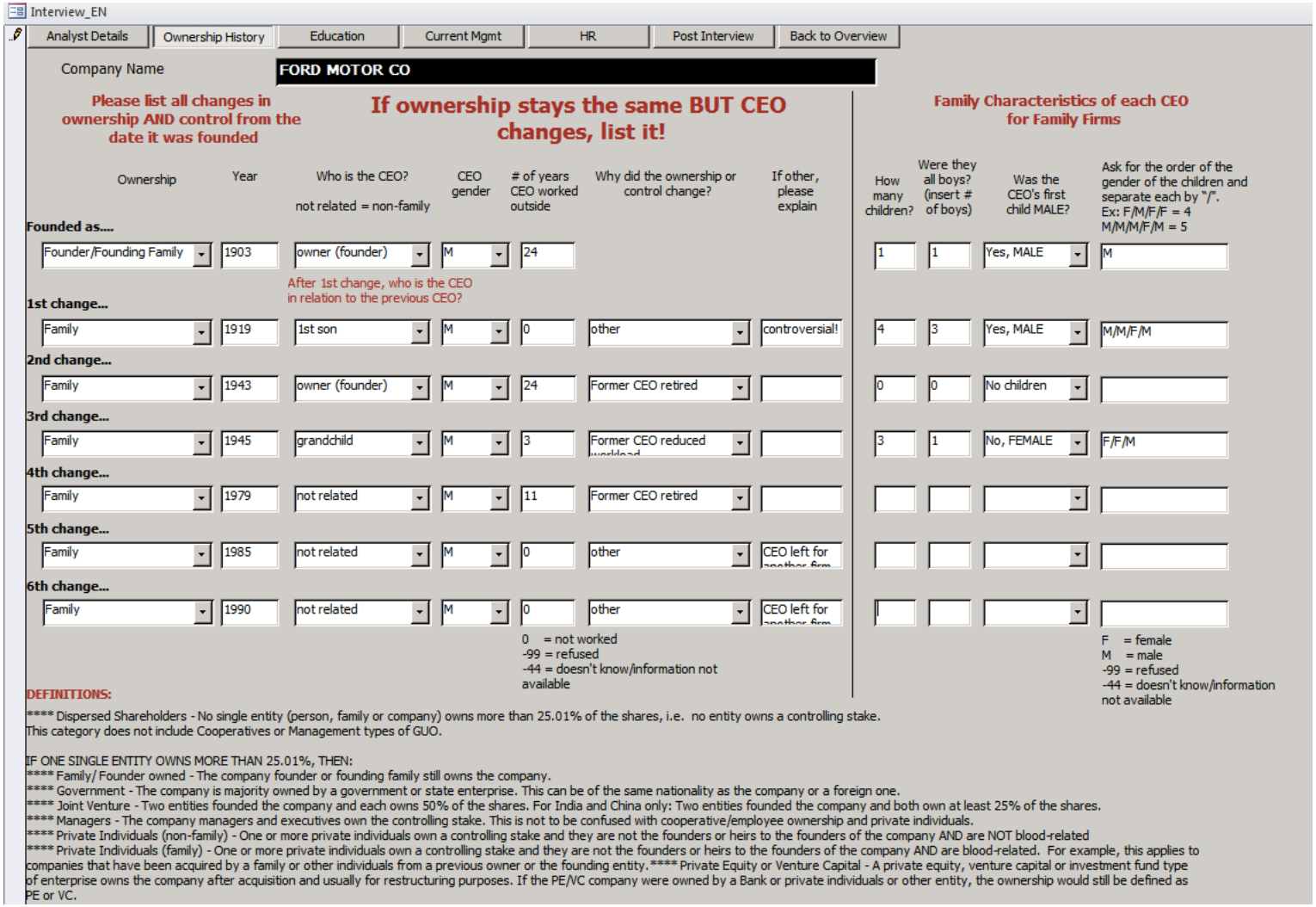
[33] History of the Ford Motor Co. primarily obtained from the Ford Motor Co.'s website: https://corporate.ford.com/company/history.html, last accessed on January 15, 2016.

cially, our identification strategy would not use ownership successions that, for example, started as "family owned, professional CEO" and switched to "dispersed shareholders, professional CEO." Our identification is coming from firms that have successions of *control*, such as a "family owned, family CEO" firm hiring a professional CEO or, alternatively, selling the firm outright/diluting their shares to under 25% voting ownership to non-family investors who then hire a professional CEO.

A concern could be that what we will capture with this strategy is the effect of the change in ownership rather than the change in control, as in our analysis we combine firms that have changed *only control* with those who change *ownership and control*. The best scenario would, indeed, be to have a large sample of firms that switched from having family ownership and control to family ownership and professional control, but that is a limitation of our dataset (indeed, of "reality") that we do not think is fatal. First, as evidenced in Figure 3, although the family ownership with professional CEO structure is relatively more common in OECD countries than in middle- and low-income countries, it still constitutes a very small share of the overall ownership and control structures that we study. Among the countries we study it is an even smaller part of the share of firms in the economy. Thus, the next best alternative is comparing family owned and controlled firms with non-family owned and professionally controlled firms.[34]

[34]Once we match the Ownership Survey data with the Brazilian industrial census we will hopefully be able to say more about the effect of changes in ownership without changes in CEO.

Figure 11: Survey instrument, hypothetical example: Ford Motor Company



Interview_EN

Analyst Details | Ownership History | Education | Current Mgmt | HR | Post Interview | Back to Overview

Company Name: FORD MOTOR CO

Please list all changes in ownership AND control from the date it was founded

If ownership stays the same BUT CEO changes, list it!

Family Characteristics of each CEO for Family Firms

	Ownership	Year	Who is the CEO? (not related = non-family)	CEO gender	# of years CEO worked outside	Why did the ownership or control change?	If other, please explain	How many children?	Were they all boys? (insert # of boys)	Was the CEO's first child MALE?	Ask for the order of the gender of the children and separate each by "/". Ex: F/M/F/F = 4 M/M/M/F/M = 5
Founded as....	Founder/Founding Family	1903	owner (founder)	M	24			1	1	Yes, MALE	M
			After 1st change, who is the CEO in relation to the previous CEO?								
1st change...	Family	1919	1st son	M	0	other	controversial!	4	3	Yes, MALE	M/M/F/M
2nd change...	Family	1943	owner (founder)	M	24	Former CEO retired		0	0	No children	
3rd change...	Family	1945	grandchild	M	3	Former CEO reduced workload		3	1	No, FEMALE	F/F/M
4th change...	Family	1979	not related	M	11	Former CEO retired					
5th change...	Family	1985	not related	M	0	other	CEO left for another firm				
6th change...	Family	1990	not related	M	0	other	CEO left for another firm				

0 = not worked
-99 = refused
-44 = doesn't know/information not available

F = female
M = male
-99 = refused
-44 = doesn't know/information not available

DEFINITIONS:

**** Dispersed Shareholders - No single entity (person, family or company) owns more than 25.01% of the shares, i.e. no entity owns a controlling stake. This category does not include Cooperatives or Management types of GUO.

IF ONE SINGLE ENTITY OWNS MORE THAN 25.01%, THEN:
**** Family/ Founder owned - The company founder or founding family still owns the company.
**** Government - The company is majority owned by a government or state enterprise. This can be of the same nationality as the company or a foreign one.
**** Joint Venture - Two entities founded the company and each owns 50% of the shares. For India and China only: Two entities founded the company and both own at least 25% of the shares.
**** Managers - The company managers and executives own the controlling stake. This is not to be confused with cooperative/employee ownership and private individuals.
**** Private Individuals (non-family) - One or more private individuals own a controlling stake and they are not the founders or heirs to the founders of the company AND are NOT blood-related
**** Private Individuals (family) - One or more private individuals own a controlling stake and they are not the founders or heirs to the founders of the company AND are blood-related. For example, this applies to companies that have been acquired by a family or other individuals from a previous owner or the founding entity.**** Private Equity or Venture Capital - A private equity, venture capital or investment fund type of enterprise owns the company after acquisition and usually for restructuring purposes. If the PE/VC company were owned by a Bank or private individuals or other entity, the ownership would still be defined as PE or VC.

WORLD MANAGEMENT SURVEY: 18 MANAGEMENT TOPICS MEASURED

The tables below describe the WMS practices measured and what they mean.[35]

Practices	What is the WMS measuring
Operations Management and Performance Monitoring	
Introducing Lean (modern) Techniques	Measures how well lean (modern) manufacturing management techniques have been introduced
Rationale for introducing Lean (modern) Techniques	Measures the motivation/impetus behind changes to the operational processes, and whether a change story was well communicated turning into company culture
Continuous Improvement	Measures attitudes towards process documentation and continuous improvement
Performance Tracking	Measures whether firm performance is measured with the right methods and frequency
Performance Review	Measures whether performance is reviewed with appropriate frequency and follow-up
Performance Dialogue	Measures the quality of review conversations
Consequence Management	Measures whether differing levels of firm performance (not personal but plan/process based) lead to different consequences

Target Setting	
Target Balance	Measures whether targets cover a sufficiently broad set of metrics and whether financial and non-financial targets are balanced
Target Interconnection	Measures whether targets are tied to the organization's objectives and how well they cascade down the organization
Time Horizon of Targets	Measures whether the firm has a '3 horizons' approach to planning and targets
Target Stretch	Measures whether targets based on a solid rationale and are appropriately difficult to achieve
Clarity and Comparability of Targets	Measures how easily understandable performance measures are and whether performance is openly communicated to staff

People Management	
Managing Talent	Measures what emphasis is out on overall talent management within the organization
Rewarding High Performers	Measures whether there is a systematic approach to identifying good and bad performers and rewarding them proportionately
Removing Poor Performers	Measures how well the organization is able to deal with underperformers
Promoting High Performers	Measures whether promotion is performance-based and whether talent is developed within the organization
Retaining Talent	Measures whether the organization will go out of its way to keep its top talent
Creating a Distinctive Employee Value Proposition	Measures the strength of the employee value proposition

[35]Note: Full survey instruments available at `www.worldmanagementsurvey.org`.

3

FAMILY FIRMS AND THE COSTS OF MONITORING: A THEORETICAL PERSPECTIVE

> *Mischief occurs when economists begin to treat a model as* the *model. Then the narrative takes on a life of its own and becomes dislodged from the setting that produced it. It turns into an all-purpose explanation that obscures alternative, and potentially more useful, story lines.*
>
> Dani Rodrik, *Economics Rules, p.174*, 2017

3.1 INTRODUCTION

As shown in the previous chapter, firms owned and controlled by families are the most common ownership type in the world. This chapter will focus on the CEO appointment decision by family firm owners, and crucially how the appointed CEO makes the decision regarding managerial structures they adopt in their firms. This is an important set of decisions to unpack: the decision of who is appointed the CEO of the firm significantly matters for management quality as well as productivity. The reasons underpinning the relationship between CEO choice and management, however, are still unclear. The previous chapter proposes that one of the reasons for family firms' underperformance is the lack of formal managerial structures relative to other firms, and provides causal evidence that a succession to family CEO leads firms to implement fewer such structures. In this chapter I will build a theoretical framework to guide the discussion of the possible mechanisms behind this result, and suggest ways to empirically test this framework in future work.

I propose a practical theoretical framework that suggests family CEOs choose different levels of managerial structures compared to professional CEOs based

on costs unique to them that arise as a result of implicit labour contracts present in family-controlled enterprises. In this model, I consider managerial structures as a type of monitoring technology that allows the CEO to identify the level of worker effort. It is only profitable to implement such a technology if the CEO makes use of the information and takes action against low effort employees. Family CEOs incur a utility cost of carrying out such actions – such as possibly dealing with a community backlash, or a "firm reputation" cost – and as such they cannot credibly commit to discipling workers. This, therefore, elicits low effort from employees and reduces the return to adopting this advanced monitoring technology for CEOs who cannot make the commitment to discipline. Professional CEOs, on the other hand, can credibly commit to take action on low effort workers (ie. layoffs), and thus elicit high effort from them.

The key aim of this theoretical framework is to characterize one aspect of the decision process of the family CEO regarding the adoption of good managerial structures (henceforth "monitoring"), and disentangle the reasons why some CEOs choose to do so and others do not. There is an extensive literature examining the decision of a firm owner to hire a professional CEO versus appointing a family member as CEO, as well as more recent work on the hiring and firing decisions of family and professional CEOs — I discuss both in the next section. The work in this area has primarily focused on profits, however, and has not directly considered how organizational choices, such as management practices, may be affected. The approach I propose in this chapter is to focus on this organizational choice, and characterize the different costs and the mechanism behind the tradeoffs faced by the family firm owners when making joint decisions on adoption of management best practices and succession of firm control.

3.2 WHY WE SHOULD CARE ABOUT FAMILY CONTROL

There are two strands of literature that relate to this chapter: the first is the literature on the relationship between firm *ownership* and productivity, and the second is the literature on firm *control* and productivity. The literature on the

performance of family vs non-family *owned* firms is relatively mixed, though evidence for the underperformance of family-*run* firms is more consistent.

Starting with ownership, the literature on ownership concentration spun from the seminal work of Berle and Means [21], *The Modern Corporation and Private Property*. The authors were concerned with the move towards ownership structures where shares were widely held and firms were controlled by a class of professional managers. They warned that separation of ownership and control would create a structure that moved agents away from maximizing profit in favour of non-value-maximizing management's desires, such as on-the-job consumption. A few decades later, their ideas started being formalized in the agency literature.[1] The main tension in this set of models is between the principal (the owner) whose objective is maximization of profits, and the agent (the manager) who maximizes his own utility and whose effort level is not perfectly observed by the principal.

The ubiquitous "dispersed shareholder" corporation of the Berle and Means [21] vision, however, has not materialized. Empirical studies have shown that, with the exception of the United States and the United Kingdom, the predominant structure in the world is not dispersed ownership but rather is one where the major group of controlling shareholders is a family. La Porta, Silanes, and Shleifer [89] look at the ownership structures of the 20 largest publicly traded firms in each of 27 richest economies and find that 36% of firms worldwide are widely held while 30% are family-controlled and 18% are state-controlled.[2]

One leading explanation for this difference put forward by the authors is that ownership structure of firms is linked with a country's shareholder protection regulation.[3] In a related paper, La Porta et al. [90] suggest that the underdevelopment of financial markets and weak legal systems in many countries make the separation of ownership and control difficult. Mueller and Philippon [99] argue for an alternative — though not mutually exclusive — explanation, where family firms are particularly effective at coping with difficult labour re-

[1] See, for example, Berhold [20] and Jensen and Meckling [81]

[2] The remaining 15% are other categories. They define a family firm as a firm where the family holds at least 20% of the shareholdings.

[3] Thus, family firms prevail in countries with poor minority shareholder protection and, by contrast, widely dispersed firms are more common in countries with strong minority shareholder protection.

lations, so they arise as a natural response in countries where labour relations are hostile. As it relates to productivity, it is unclear whether higher ownership concentration is good for productivity, and it seems to be quite context specific: ownership concentration and performance has been found to have a positive correlation (Anderson and Reeb [2], Claessens and Djankov [50], and Sraer and Thesmar [114], an inverse u-shaped relationship (Morck, Shleifer, and Vishny [96]) or even no relationship (Demsetz and Villalonga [56]) depending on the sample of firms used.

In terms of *control*, there is a larger consensus that family CEOs are associated with lower *financial* outcomes, but perhaps better *labour* outcomes. A study by Bennedsen et al. [16] was one of the first to provide rigorous evidence of the effect of family control using the incidence of male primogeniture among CEOs of firms in Denmark to infer the causal effect of family control on firm performance. They find a large negative causal impact on firm performance following family successions in the top management role. In particular, they find that the type of industry is important, and that family CEOs underperformance is worse in innovative and fast-growing industries, where there is a relatively higher incidence of larger firms and higher skilled employees. Other studies have also found that who the CEO is matters for firm performance (Bandiera et al. [11], Bennedsen, Perez-Gonzales, and Wolfenzon [17, 18], Bertrand and Schoar [23], Bertrand et al. [25], and Perez-Gonzales [105]), and Chapter 2 of this thesis presents evidence that who the CEO is matters for the quality of management in the firm.

Although there is a relative consensus that family controlled firms have poorer financial outcomes, there is some evidence that they have arguably better labour outcomes. Bassanini et al. [12] show that French family firms pay lower wages, and attribute this to both a sorting of lower-productivity workers into family firms and a compensating differential for higher job security. Bach and Serrano-Velarde [8] find similar results when interacting with an exogenous productivity shock, and suggest the level of frictions within the labour market widen the difference in job security (ie. layoff incidence) between family and non-family firms. Bennedsen, Tsoutsoura, and Wolfenzon [19], however,

find that employees at family firms in Denmark tend to exert higher effort – as measured by employee workplace absenteeism – and find that the firm-specific component accounts for 72% of the absenteeism gap. Looking at the managerial level, using a time-use survey of over 1,100 CEOs across six countries, Bandiera, Prat, and Sadun [10] family CEOs tend to work fewer "in-office" hours. Ellul, Pagano, and Schivardi [59] show for a sample of 41 countries that family firms tend to provide better job security, but provide less wage stability. They further use Italian employer-employee data to show that family firms pay lower wages and have less separations, and that adjustments occur through the hiring margin (that is, they hire less). Bach and Serrano-Velarde [8] find identical patterns using French data. Mueller and Philippon [99] suggest that family firms are "particularly effective" at dealing with labour relations and thus are more prevalent in settings where labour relations are difficult. These results suggest there is evidence that family firms, indeed, have implicit contracts with employees relating to job security, and this should feature in a model of technology adoption if the technology could be perceived as a threat to jobs. I return to this in the set up of my model.

In all, there is plenty of empirical evidence that points to the fact that the choice of CEO matters, and it is thus an important decision to understand. The model I present in this chapter starts with the owner's decision of whether to hire a professional CEO or appoint a family CEO, and I will briefly discuss the literature surrounding this decision to put the model into context.

3.2.1 *The succession decision*

A wave of research followed Berle and Means [21] and debated the results as well as formalized the ideas. Demsetz [55] argued, opposing Berle and Means, that the ownership structure of a firm is an endogenous result of a maximizing process, that is, the structure can be seen as the result of firm decisions aimed at value maximization, even if that means utility maximization by the owner-manager.[4] Later Demsetz and Lehn [57] further developed Demzetz'

[4]To illustrate this point, Demsetz uses the example of an owner-manager's consumption in terms of hiring workers. Considering this to be part of the owner-manager's on-the-job con-

initial idea and introduce the concept of "amenity potential" as a component of owner-managers' utility maximization problem, which refers to private benefits of control accruing to the family member who owns and runs the firm. These can include political and social influence associated with the family company's name or perhaps the pleasure of running the firm or having his child run it.[5]

The conceptual frameworks established by these earlier works were then further developed to consider the context of family firms, and formalized most notably by Chami [46], Bhattacharya and Ravikumar [26, 27] and Burkart and Panunzi [42]. The key question addressed in this set of works considers the principal-agent problem of the owner-manager who is choosing whether to separate the ownership and control of his firm, or stay as a concentrated ownership family firm.

Chami [46] develops a theoretical model to explain the continued existence of family firms despite evidence of their lower average levels of productivity. and concludes that trust among family members gives family firms a competitive edge because it mitigates moral hazard problems while raising the expected effort of the child (agent).[6] Bhattacharya and Ravikumar [26] look at the family business as a dynamic household model where capital market imperfections determine the evolution of the family business, though the focus of their paper is on *when* the family decides to sell its business to a private buyer, rather than *who* they sell it to.[7] Bhattacharya and Ravikumar [27] consider the evolution of firm management, but analyze the trade-off between hiring an insider with aligned interests (that is, a family member) and hiring an outsider

sumption set, he could maximize utility by hiring a set of workers based on sets of characteristics he valued more than sheer labour productivity, such as religious affiliation.

[5] They empirically analyze 511 large US firms and find no relationship between dispersion and firm performance. They also suggest that the predictability of the environment where the firm operates has an effect on the monitoring and transaction costs associated with hiring professional managers to run the firm, and that regulation reduces the cost of monitoring and disciplines managers - a point later picked up by many in explaining the incidence of family-run firms across countries.For a formal treatment of imperfect information on monitoring costs, see Holmström [75] and Holmström and Tirole [76].

[6] This trust also allows the principal to avoid reliance on monitoring schemes to elicit effort from the agent but also means the agency problem is exacerbated if this altruism is one-sided.

[7] They characterize the family business as a household operating constant-returns-to-scale production and see "business skill" as the fixed factor of production that gets passed through generations. Their main result is that family businesses tend to be larger when they cash out, and they also last longer and have lower investment rates in economies with less well developed primary capital markets.

with non-aligned interests (a professional CEO) who is more productive than the insider. The key result is that, although the external manager is unequivocally more productive, the family only chooses to hire the outsider after they reach a certain critical size, which in turn depends on the level of development of the capital markets.

Burkart and Panunzi [42], consider the same problem as Bhattacharya and Ravikumar [26] but in a static, cross-sectional framework. They focus on the fear of expropriation by the outside manager and build a theoretical model to weigh the costs and benefits of separating ownership and control in a family firm. Their static model considers the point of succession, that is, the moment the founder either chooses to pass the business on to his kin or to separate ownership and control. Their founder has three choices: (a) disperse ownership and delegate control by selling the company into this dispersed shareholder structure and hiring a professional CEO, (b) keeping ownership concentrated but delegating control by staying as a majority shareholder, hiring an professional CEO and actively monitoring him, or (c) keeping ownership and control concentrated by retaining shareholdings in the family and either staying on as CEO or passing control to a family member who is, presumably, less talented than an professional CEO. The founder's goal is to maximize his welfare, a function of his shares' value (both retained and value of sales) and "amenity potential." The professional CEO's goal is also to maximize his own welfare, a function of possible rents and wages. Monitoring by the founder - as in (b) - and a better legal institutional framework both reduce the possibility of expropriation by the outsider.

They find that, in equilibrium, good legal systems negate the need for monitoring and we end up with Berle and Means' dispersed shareholder-owned and professionally managed firm. When legal protection is so weak that it hinders the ability of the founder to monitor expropriation, the founder does not delegate management to an outsider but rather keeps it within the family despite lower levels of talent. In the intermediate range of legal protection, the founder does hire an outsider to run the firm, but stays as a majority shareholder and implements a certain level of monitoring. They thus predict an

inverse relationship between the quality of legal systems and the concentration of ownership, which is indeed what the empirical evidence points to. It also consistent with the empirical evidence on the average lower quality of top-level management of family firms vis-à-vis non-family firms.

I build on this result from the literature in the first step of the model I propose. In my model, the first decision taken by the family firm owner is whether to hire a professional CEO or to appoint a family CEO. As the value added in my framework is to understand a possible mechanism behind why CEOs – family and professional – choose to adopt a monitoring technology or not, I simplify the parameters in the model to reflect the result already discussed in the literature.

My model draws on the general findings of the literature thus far, and adds to understanding the black box of the internal workings of family firms and decisions of family CEOs. Much of the literature has suggested that family CEOs are inherently different from professional CEOs, most clearly in terms of education and perceived ability. Although it is reasonable to assume that a CEO picked from a small pool of family members (with, say, a random draw from an ability distribution) is likely to be of lower ability than a CEO picked from a larger pool of individuals self-selected into the profession, this is likely only one part of the story. Simply ascribing family firms' lower productivity to lower CEO ability ignores, for example, firm-specific knowledge that the family CEO may inherit, as well as other labour dynamics that may be at play such as the different objectives and costs faced by family CEOs. In my model, I seek to characterize the structure of the differential costs faced by family CEOs, and suggest how they relate to the decisions of CEO succession and management structures.

3.3 MODEL

3.3.1 *Setup: conceptual overview*

The overview of the model is as follows: the game has three players: the owner, the CEO and the worker. The owner decides who the CEO is. The CEO can be a professional CEO hired by the owner, or the owner himself taking on the role of CEO. The worker is hired by the CEO and is not a family member.

The game starts with the family firm owner first choosing whether he will hire a professional CEO or manage the firm himself (and be a family CEO). The CEO (family or professional) moves second and chooses to invest in monitoring (ie. good management practices) or not to invest in monitoring (ie. no management practices), and hires workers to produce output. Workers move third and choose high or low effort, based on their relative cost of effort to the cost of being laid off. The worker can be of high or low ability: high ability workers have low cost of effort and will opportunistically choose to shirk (exert low effort) depending on the chance of getting caught. Low ability workers have high cost of effort and will opportunistically always choose to shirk, regardless of the chance of getting caught. For any given industry, there is a share of workers η who will be of high ability.

Investing in monitoring allows the CEO to see whether workers are exerting effort or not. The technology has a fixed cost, and it is only worth implementing if the CEO uses the information to discipline (lay off) the low-effort workers. All CEOs incur a cost of laying off employees, but the family CEO also has a dynastic commitment to their workforce and faces an additional cost of doing so. The workers know whether the CEO invested in monitoring, and know that family CEOs tend to have higher costs of disciplining workers. They choose effort based on these facts, and only choose high effort when the monitoring technology is in place (that is, they can be caught shirking) and there is a chance they would be disciplined.

The key trade-off in this model is between the private benefit of control the owner gets from being the CEO of the family firm, the cost of firing employees

incurred by the different CEOs, and the inducement of worker effort that is afforded by investing in monitoring. If the added profit from hiring a professional CEO is substantial enough to outweigh the private benefit of control, the owner will hire a professional CEO.

Crucially, I do not assume that professional CEOs are of higher ability than family CEOs, distinguishing this model from others such as Burkart, Panunzi, and Shleifer [43]. Although there is evidence that firms run by heirs tend to be less profitable, the point of this model is to explore why *else* this might be the case if we assume family CEOs are as capable as professional CEOs. This is a worthwhile exercise because it is not clear that family firm CEOs in middle income countries are, in fact, less well educated — or less "professional" — than their non-family counterparts. Indeed there is anecdotal evidence that sons set to inherit family firms are often groomed to take on positions of power within the company from an early age and families invest substantial resources on the child for that reason.[8] Thus, in this model I choose to allow CEOs to be of similar ability and consider alternative explanations behind the observed lower levels of profitability under the assumption that they are making rational and informed choices. In this model, profits are simply a function of worker effort and are higher when CEOs invest in monitoring because it induces higher worker effort. I abstract from the possibility that workers in family firms can have intrinsic motivation at this point, but discuss this as an avenue of further research in the conclusion of this thesis. I also abstract from assuming a productivity shock that encourages firms to fire employees, as in Bach and Serrano-Velarde [8].

3.3.2 *Actions and information*

There are four action choices in the game, one action each for the owner and for the worker and two actions for the CEO.

An action set for an owner is a binary management choice $Mg \in \{PRO, FAM\}$, where $Mg = PRO$ means that the owner is hiring a professional CEO, and

[8] In a separate project, I am collecting data on education of the CEO and their siblings to find empirical evidence on this question.

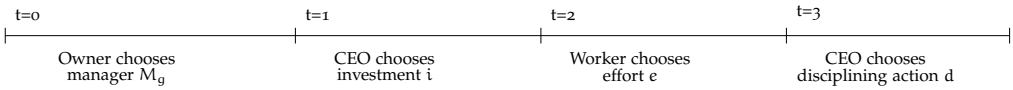
$Mg = FAM$ means that the owner is choosing to manage the firm himself and acts as a family CEO.

An action for a CEO is a pair: an investment choice, i, and a disciplining choice, d. The investment choice is a binary investment choice $i \in \{i_y, i_n\}$, where $i = i_y$ denotes investment in the monitoring technology and $i = i_n$ denotes no investment. The disciplining choice is a binary choice $d \in \{D_K, D_L\}$, where $d = D_K$ denotes keeping the worker, and $d = D_L$ denotes laying off the worker.

An action for worker is a binary effort choice, $e \in \{\overline{e}, \underline{e}\}$.

Figure 12 presents the model's timeline of the order of the actions. The game only runs once. I consider a firm owner at $t = 0$, and the owner moves first to choose a manager, family or professional. At $t = 1$, the appointed CEO chooses whether to invest in a monitoring technology or not. At $t = 2$ the workers decide whether to exert effort. At $t = 3$ production is realized and total profits generated. The CEO then decides whether to keep or lay off workers and final payoffs are realized.

Figure 12: Timing of decisions



All decisions by the owner and the CEOs are public information. The worker's effort choice is observable by the CEO only if the CEO invested in monitoring, otherwise the worker's decisions are private. Workers can be of high or low ability. Individual worker ability is private information, but within each industry the share of workers who are high ability, η, is public information.

3.3.3 *Payoffs and strategies*

3.3.3.1 *Workers*

The payoff of a worker is a function of effort, wages and the disciplining decision of the CEO. Let the utility function for the worker be:

$$u_w = \begin{cases} W & \text{if } e = \underline{e} \quad \text{and} \quad d{=}D_K \\ W - c_e & \text{if } e = \overline{e} \quad \text{and} \quad d{=}D_K \\ W - \ell_w & \text{if } e = \underline{e} \quad \text{and} \quad d{=}D_L \\ W - c_e - \ell_w & \text{if } e = \overline{e} \quad \text{and} \quad d{=}D_L \end{cases} \tag{9}$$

where W is the worker wage, c_e is the cost of effort if the worker chooses to exert effort ($e = \overline{e}$), and ℓ_w is the fixed utility cost of being laid off if the CEO chooses $d = D_L$.

3.3.3.2 *CEOs*

The payoffs for the CEO have the same structure, but individual parameter values depend on the CEO's identity. For the sake of clarity I specify the payoffs for the family CEO and the professional CEO separately below, but note how they follow the same structure. Let the cost of laying off workers that is common to all CEOs be ℓ_c and let us call it the "industry cost". This cost is exogenously set. Let the cost of investment in the monitoring technology be m. Let firm profits be only a function of worker effort: $\pi(e)$.

PROFESSIONAL CEO: Professional CEOs are paid a share of profits, $\lambda\pi(e)$, as their compensation. λ is exogenously set. The professional CEO's cost of effort in running the firm is embedded in the contract design and the "wage" he has accepted the contract at. The payoff of a professional CEO is a function

of wages $\lambda\pi(e)$, cost of adopting management m, and cost of laying off workers ℓ_c.[9]

$$u_{pro} = \begin{cases} \lambda\pi(e) & \text{if } d = D_K \text{ and } i = i_n \\ \lambda\pi(e) - \ell_c & \text{if } d = D_L \text{ and } i = i_n \\ \lambda\pi(e) - m & \text{if } d = D_K \text{ and } i = i_y \\ \lambda\pi(e) - \ell_c - m & \text{if } d = D_L \text{ and } i = i_y \end{cases} \tag{10}$$

FAMILY CEO: The family CEO incurs a cost of effort of running the firm $c_{Mg} \in [0, 1]$, but unlike the professional CEO he also accrues a private utility benefit from controlling his family firm, $B \in [0, 1]$. Let Γ be the net utility cost of control: $\Gamma = c_{Mg} - B \in [-1, 1]$.

The family CEO incurs an additional cost of laying off workers: a firm reputation cost f. The payoffs of a family CEO is a function of the profits of the firm $\pi(e)$, the cost of control Γ, the cost of the investment choice m and the total costs of laying off workers $\ell_c + f$:

$$u_{fam} = \begin{cases} \pi(e) & \text{if } d = D_K \text{ and } i = i_n \\ \pi(e) - (\ell_c + f) & \text{if } d = D_L \text{ and } i = i_n \\ \pi(e) - m - \Gamma & \text{if } d = D_K \text{ and } i = i_y \\ \pi(e) - (\ell_c + f) - m - \Gamma & \text{if } d = D_L \text{ and } i = i_y \end{cases} \tag{11}$$

In short, the two types of CEOs face the same payoff structure, but family CEOs have a set value of $\lambda = 1$, and professional CEOs have set values of $f = 0$ and $\Gamma = 0$.

[9] The cost of adopting the monitoring technology m is incurred by CEO rather the firm as he is the executive in charge of pushing changes through.

3.3.3.3 *Owner*

The family firm owner's payoffs are the same as the family CEO's if he chooses to manage the firm himself, $Mg = FAM$, and simply the share of leftover profits if he chooses $Mg = PRO$:

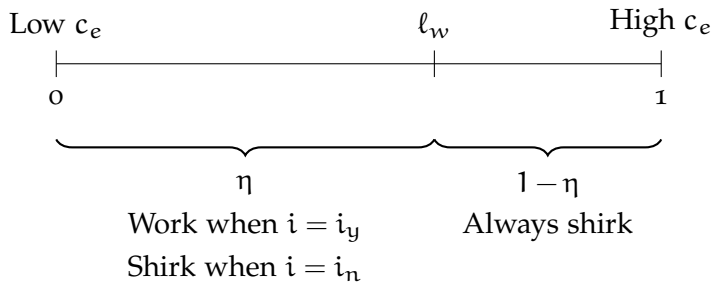
$$u_{own} = \begin{cases} \pi(e) & \text{if } Mg = FAM,\ d = D_K \text{ and } i = i_n \\ \pi(e) - (\ell_c + f) & \text{if } Mg = FAM,\ d = D_L \text{ and } i = i_n \\ \pi(e) - \Gamma - m & \text{if } Mg = FAM,\ d = D_K \text{ and } i = i_y \\ \pi(e) - (\ell_c + f) - \Gamma - m & \text{if } Mg = FAM,\ d = D_L \text{ and } i = i_y \\ (1-\lambda)\pi(e) & \text{if } Mg = PRO \end{cases} \tag{12}$$

3.4 EQUILIBRIUM

3.4.1 *Comments on modelling choices*

WORKER'S EFFORT CHOICE Let workers have a cost of effort $c_e \sim U(0,1)$. There is a share of workers, η, for which the cost of effort is below the fixed cost of getting laid off l_w, such that $c_e \leqslant \ell_w$. These workers will choose to exert effort if they have a chance of getting laid off, and will choose not to exert effort if they have no chance of getting laid off. There is a share of workers $1-\eta$ for which the cost of effort is above the cost of getting laid off, such that $c_e > \ell_w$. These workers will never exert effort, regardless of the chance of getting laid off. A way to interpret this setup is to think of employees as being of high or low ability and a share of them who have high ability (η) can choose to work as it is not too costly, whereas a share $1-\eta$ has low ability and always find it too onerous to work.

Figure 13: Distribution of the cost of worker effort, c_e



PROFESSIONAL CEO COMPENSATION $\lambda\pi(e)$ is the executive's compensation. I assume the CEO does not have enough capital to purchase the firm outright and thus has to be employed. I assume λ to be exogenous and represents the CEO net wages, taking into account the manager's cost of effort of running the firm. The λ here could also include any profit appropriation that may happen because of low legal oversight, as in Burkart, Panunzi, and Shleifer [43]. I assume this payoff will be larger than their outside option, such that there is at least one professional CEO who always agrees to manage the firm if the contract is offered.

CEO COSTS OF CONTROL Γ is the net cost of control. It is essentially representing the cost of effort that a CEO has to expend to run a firm, net of any private benefit of control he may accrue from doing so. Intuitively, the variable setup suggests that if the private benefit of control is relatively low, the family CEO would compare the cost of effort to the financial cost of hiring a professional CEO. If the family CEO gains a very high level of private benefit from control relative to how onerous it is for him to manage the firm, the utility cost would be "negative".

$\Gamma = 0$ for professional CEO is a simplification, but a reasonable one for the current purposes of the model. Conceptually, the professional CEO would also incur c_{Mg}, but this cost would be included into the $\lambda\pi(e)$ payoff bundle. I am implicitly assuming that c_{Mg} is equal for professional CEOs and family CEOs — that is, I am in a sense assuming the same level of ability for both CEO

types. This is a departure from the usual assumption in previous models, but one that can be relaxed at a later time.[10]

CEO LAYOFF COSTS All CEOs incur a common cost of laying off workers, $\ell_c \in \{\ell_c^-, \ell_c^+\}$, where ℓ_c^- denotes the lowest cost possible across all industries and ℓ_c^+ denotes the highest. In the game, this cost is exogenously set in each industry. Conceptually, we can interpret this cost as, say, an industry with higher rates of unionization than the average having an ℓ_c closer to ℓ_c^+, or a country with lax labour laws relative to the average country having ℓ_c closer to ℓ_c^-.[11] The industry for each firm and worker is determined before the game.[12]

Family CEOs incur an additional firm reputation utility cost, f if they have to discipline workers (regardless of effort). This cost reflects how emotionally important the firm's standing in the community is for the family CEO, and is consistent with the idea that family firms are held to a higher "moral standard" than faceless corporations: for example, if a family firm CEO lays off workers they can suffer a backlash from the wider community the firm is located in. For professional CEOs, it is always the case that $f = 0$.

For each CEO, there will be a threshold $\bar{L}$ at which the cost of disciplining workers is too high to be worth investing in monitoring. Because the cost is increasing in both ℓ_c and f, this implies that the total cost of laying off workers will always be higher for the family CEO, except in the case where $f = 0$ for the family CEO.

3.4.2 *Preliminary analysis*

Four actions with four binary choices lead the full game to be quite high in dimensionality. However, there are some actions that we can rule out as outcomes because they are never optimal for the actors to take. To reduce the

[10] For example, Burkart, Panunzi, and Shleifer [43] assume professional CEOs have higher ability.

[11] In a dynamic model, there would be a cost of recruitment for the next period.

[12] Of course, in reality firms can choose their industries and thus it is endogenous, but I am abstracting from this for the time being.

dimensionality of the game and simplify the problem, I replace these actions with their sub-game perfect equilibrium outcomes. The actions are as follows:

1. The CEO will never lay off a worker who he observes exerting effort, since laying off workers is a costly action. Thus, D_L is only not chosen when:
   - the CEO chooses not to invest monitoring and thus cannot observe effort ($i = i_n$)

     or

   - the CEO chooses to invest monitoring ($i = i_y$) and the worker exerts effort ($e = \bar{e}$).
2. The worker will not exert effort unless the cost of effort is lower than the cost of being laid off. Workers choose low effort ($e = \underline{e}$) when:
   - the CEO chooses not to invest monitoring and thus cannot observe effort ($i = i_n$),

     or

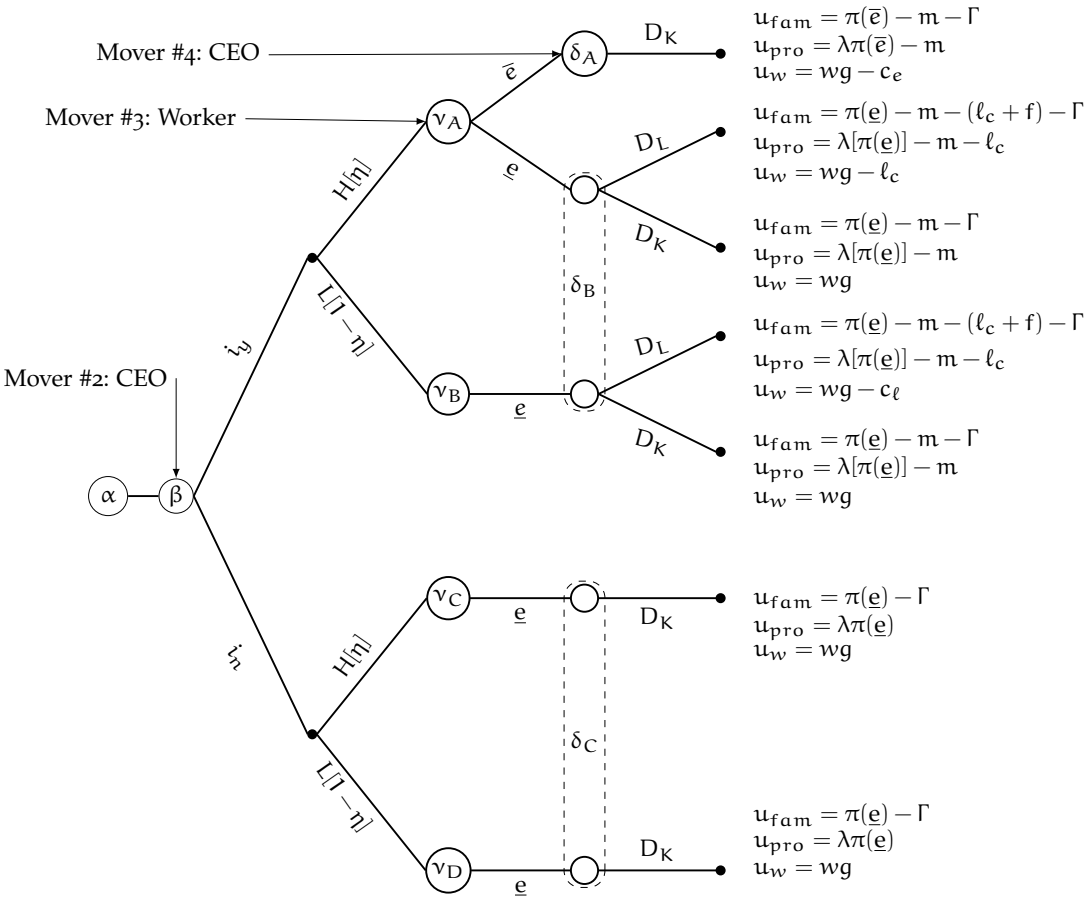
   - the worker is of low ability.

Therefore, eighteen out of thirty two outcomes can be replaced by their sub-game perfect equilibria. For example, in both the branches where the CEO opts not to invest in monitoring ($i = i_n$), no layoffs happen as they cannot tell which workers shirked. We can replace all the relevant CEO disciplining choice branches with the outcome of D_K. Similarly, when workers know that they will not be caught shirking because the CEO did not invest in monitoring, they always choose to shirk as exerting effort is too costly in this context. Thus, we can replace all the relevant worker choice branches with the outcome of $e = \underline{e}$. Imposing these results yields the game tree in the Appendix, Figure 22, which is a relatively more straightforward problem to deal with. The full game tree can be found in Figure 23.

To isolate the key insights of the model, I make further simplifications. The key choice that I seek to understand with this framework is the investment choice of each CEO. The first choice of the game determining whether the

owner will be a family CEO or choose to hire a professional CEO is a choice that has been explored in the literature before, and here is simply a function of the size of the private benefit of control. As both CEO types face the same set of choices with slightly different payoff functions, I will focus the backward induction exercise on determining the subgame equilibria for each CEO type and discuss the owner's choice last.

Figure 14: Game tree: CEO's investment decision



3.4.3 *Backwards induction*

Figure 14 shows the game tree outlining the possible decisions of the CEO, already including the results from the preliminary analysis in place of the full set of choices wherever possible. The utility functions shown as the payoffs next to each terminal node specify the utility functions for the family and professional CEOs and for the worker. Note that it only specifies the owner's payoffs as a family CEO, as I will address the owner's choice last accounting

for the payoffs under a professional CEO as well. β, ν and δ inside the nodes or dashed lines label the information sets.

FOURTH MOVER (LAST) — CEO: The last actor to make a decision is the CEO. He chooses whether he will lay off the worker ($d = D_L$) or keep the worker ($d = D_K$). This is the CEO's second action choice; the CEO's first action choice is the investment choice ($i \in \{i_y, i_n\}$).

CEO STRATEGY: The CEO has only one rational choice at the information sets δ_B and δ_C: D_K (to keep the worker). The action chosen at δ_A depends on the world and firm reputation costs of laying off workers, $\ell_c + f$. Recall there is a threshold at which layoff costs become too high — say, $\overline{L}$, and for each industry, there is a share η of workers who will work and a share $(1-\eta)$ who will shirk and could be fired.

Thus, the CEOs strategies at $\{\delta_A, \delta_B, \delta_C\}$ are:

1. $H_C = \{D_K, D_K, D_K\}$ if $\ell_c + f > \overline{L}$
2. $H_C = \{D_K, D_L, D_K\}$ if $\ell_c + f \leqslant \overline{L}$

In his disciplining choice, he will choose to lay off a worker under the following conditions:

(a) the worker shirks ($e = \underline{e}$)

and

(b) the CEO invested in monitoring ($i = i_y$)

and

(c) the costs of laying off workers is below the threshold: $(\ell_c + f) \leqslant \overline{L}$.

If any of these three conditions is violated, the CEO will keep the worker ($d = D_K$). I will discuss the layoff choice in context of the investment decision after describing the investment decision for the second mover.

THIRD MOVER — WORKER: Moving backwards, the second-last actor to make a decision is the worker. Workers naturally prefer to exert low effort and

not be fired. However, they make their effort decision conditional on what they expect the response of the CEO will be, and on their own type.

WORKER STRATEGY: The worker has only one rational choice at the information sets v_B, v_C and v_D: $e = \underline{e}$, since effort will not be observed at these nodes. The action chosen at v_A depends on worker type. For each worker, if they are of low ability type ($c_e > \ell_w$), the action at all nodes will be $\underline{e}$. If they are of high ability type ($c_e \leqslant \ell_w$), the action at information set v_A will be $\overline{e}$. In summary, the worker has two strategies:

1. $H_{W,L} = \{\underline{e}, \underline{e}, \underline{e}, \underline{e}\}$ if $c_e > \ell_w$ (low ability type)
2. $H_{W,H} = \{\overline{e}, \underline{e}, \underline{e}, \underline{e}\}$ if $c_e \leqslant \ell_w$ (high ability type)

For a given industry with share η of workers of high ability type, we expect that η share of workers will choose the second strategy and $(1-\eta)$ will choose the first strategy.

In summary, workers will exert effort ($e = \overline{e}$) under the following conditions:

(a) the worker is of high ability type ($c_e \leqslant \ell_w$)

and

(b) the CEO invests in monitoring ($i = i_y$).

SECOND MOVER — CEO: The CEO knows how workers make their choices, and also knows η and ℓ_c in his industry. This is the CEO's first action choice, before the second action choice of disciplining ($d \in \{D_K, D_L\}$). The CEO will choose to invest in monitoring iff the additional expected profits (and utility) are larger than the expected costs incurred. Formally, the expected utility for each CEO type under $i = i_y$ is:

$$\begin{array}{rlllll} \text{Family CEO:} & \eta[\pi(\overline{e})] & +(1-\eta)[& \pi(\underline{e}) & -(\ell_c + f) \quad] & -m - \Gamma \\ \text{Professional CEO:} & \eta[\lambda\pi(\overline{e})] & +(1-\eta)[& \lambda\pi(\underline{e}) & -\ell_c \qquad\quad] & -m \end{array}$$

The equivalent expected utility under $i = i_n$ is:

$$\begin{aligned} \text{Family CEO:} \quad & \pi(\underline{e}) \quad -\Gamma \\ \text{Professional CEO:} \quad & \lambda\pi(\underline{e}) \end{aligned}$$

CEO STRATEGY: Let $\Delta\pi = \pi(\overline{e}) - \pi(\underline{e})$. At information set β each type of CEO will choose $i = i_y$ and invest in the monitoring technology iff the following conditions hold:

$$\begin{aligned} \text{Family CEO:} \quad & \eta\Delta\pi \quad \geqslant \quad (1-\eta) \quad (\ell_c + f) \quad +m \\ \text{Professional CEO:} \quad & \lambda\eta\Delta\pi \quad \geqslant \quad (1-\eta) \quad (\ell_c) \quad\quad +m \end{aligned}$$

For each representative CEO type, let $\overline{L}$ generally be the threshold at which it becomes optimal for any CEO to invest in monitoring. Let the threshold be $\overline{L_f}$ for the family CEO and let the threshold be $\overline{L_p}$ for the professional CEO. Rearranging the terms in the conditions above yields the following thresholds:

$$\text{Family CEO:} \quad \overline{L_f} \leqslant \frac{\eta\Delta\pi - m}{(1-\eta)}$$

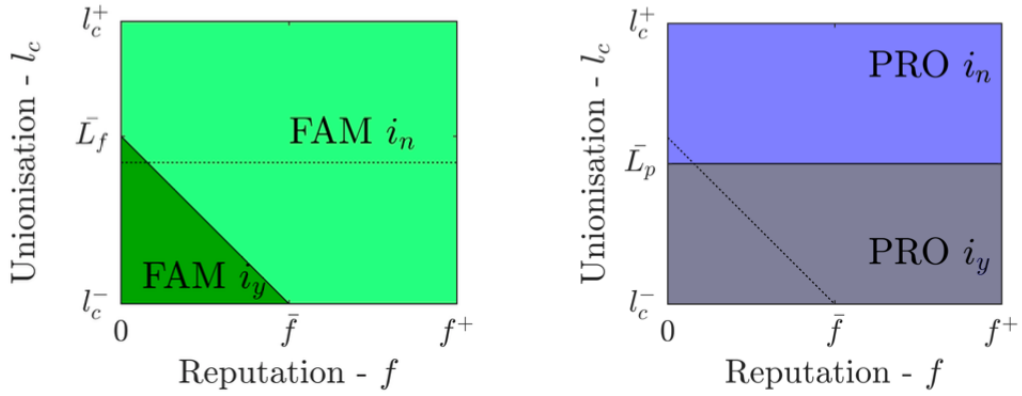
$$\text{Professional CEO:} \quad \overline{L_p} \leqslant \frac{\lambda\eta\Delta\pi - m}{(1-\eta)}$$

Conceptually, these conditions suggest that the professional CEO will only invest if the cost of layoffs is less than or equal to the added profit they can expect the firm to make minus the cost of investment, multiplied by the inverse of the share of low ability workers. Notably, this threshold is relatively lower for the professional CEO as they only get a share of the profits: the first term on the numerator of the condition is $\lambda\eta\Delta\pi$ for the professional CEO and $\eta\Delta\pi$ for the family CEO. Thus, $\overline{L_f} > \overline{L_p}$.

Figure 15 shows the two-dimensional space of ℓ_c and f for each CEO type. The darker colours indicate investment in monitoring and the lighter colours

indicate no investment and are divided along the L thresholds for each type. Each graph also includes a dotted line with the threshold of the other CEO type for ease of comparison.

Figure 15: CEO investment decision: parameter space



The CEOs full strategies at $\{\beta, \delta_A, \delta_B, \delta_C\}$ are:

1. $H_C = \{i_n, D_K, D_K, D_K\}$ if $\ell_c + f > \overline{L_f}$ (family) or if $\ell_c > \overline{L_p}$ (professional)
2. $H_C = \{i_y, D_K, D_L, D_K\}$ if $\ell_c + f \leqslant \overline{L_f}$ (family) or if $\ell_c \leqslant \overline{L_p}$ (professional)

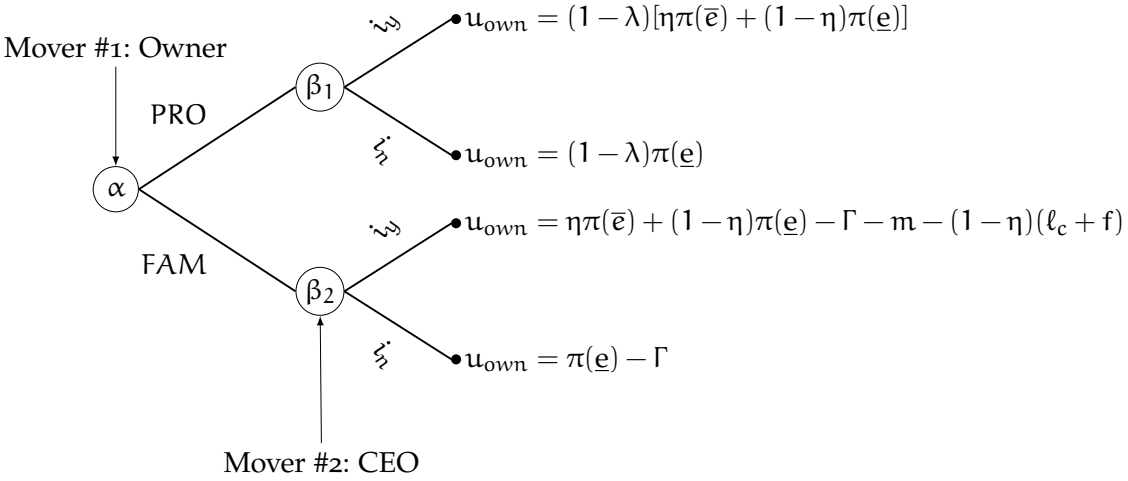
FIRST MOVER – OWNER: Finally, the owner's choice depends on the utility he would get if he acted as family CEO, versus the utility he would get from receiving the profits achieved by the professional CEO. Figure 16 shows the owner's payoffs at each terminal node if we substitute the game for the subgame perfect equilibrium at that node.

The owner's decision depends on whether he would choose investment or not given a set of parameters, as well as his opportunity cost, which depends on whether the professional CEO would have invested or not. There are four possible set of parameters that determine the space for four equilibria, as described below.

3.4.4 *Four regions of the parameter space with unique equilibria*

Ultimately there are four cases to be considered, each of which will have its unique equilibrium depending on the region of the parameter space. The CEO

Figure 16: Game tree: owner's decision



can be a professional or a family type, and each can reach an equilibrium where they invest in monitoring and one where they do not. I describe each of the cases and the possible equilibria below. There will be three threshold values that determine the parameter space based on the utility functions above, which I define here to simplify notation:

$$\overline{L_p} = \frac{\eta\lambda\Delta\pi - m}{1-\eta}$$

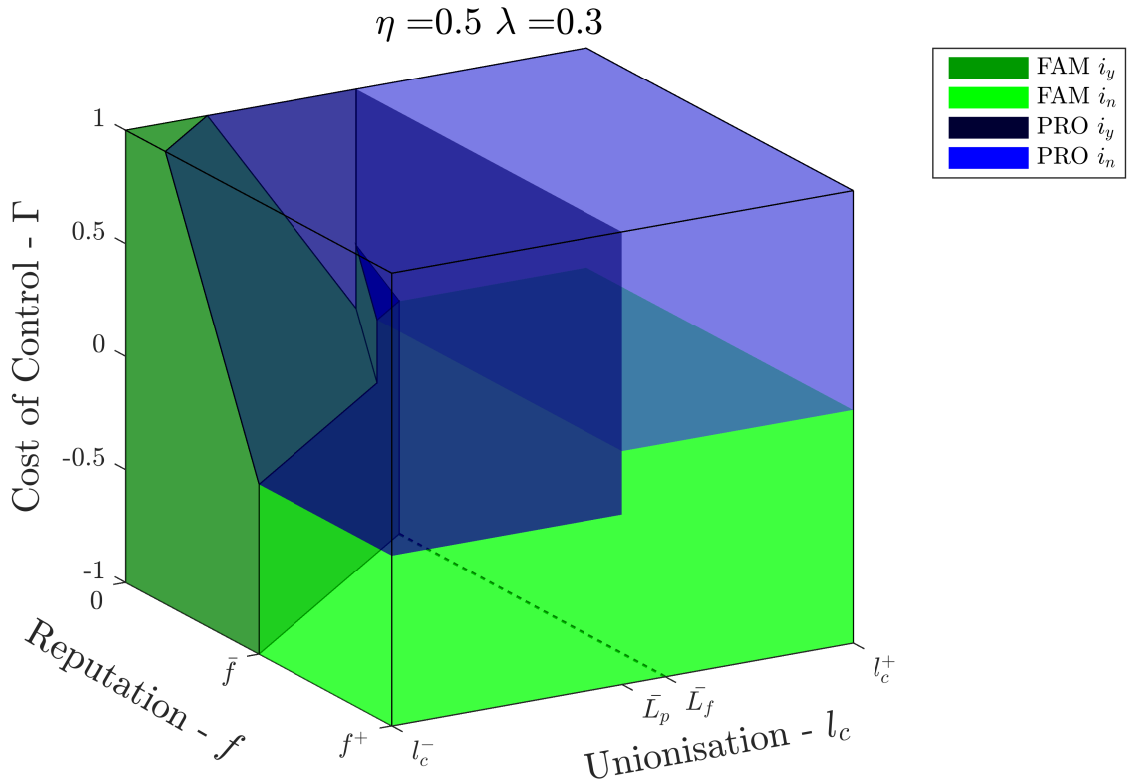
$$\overline{L_f} = \frac{\eta\Delta\pi - m}{1-\eta}$$

$$\overline{\Gamma} = \frac{\lambda\pi(\underline{e})}{1-\eta}$$

where $\Delta\pi = \pi(\bar{e}) - \pi(\underline{e})$.

Figure 17 visually depicts the four possible parameter regions for each equilibria, and are colour coded such that family CEO is shown in green shades and professional CEO is shown in blue shades; investment is shown in darker shades and no investment in lighter shades. The purpose of this first figure is simply to serve as a visual guide for the four cases described below, and I have imposed $\eta = 0.5$ and $\lambda = 0.3$ for this example. I reserve a discussion of how changing these exogenous parameters might change the sizes of the regions within the parameter space for the discussion and interpretation section.

Figure 17: Parameters determining the four equilibria space, for $\eta = .5$



CASE 1: BOTH CEOS CHOOSE TO INVEST IN MONITORING

Both CEOs would choose to invest, $i = i_y$, if $\ell_c \leqslant \overline{L_p}$ and $\ell_c + f \leqslant \overline{L_f}$. The owner's choice is based on the following utilities:

- $u_{own}(PRO, i_y) = (1-\lambda)[\eta\pi(\overline{e}) + (1-\eta)\pi(\underline{e})]$
- $u_{own}(FAM, i_y) = \eta\pi(\overline{e}) + (1-\eta)\pi(\underline{e}) - \Gamma - m - (1-\eta)(\ell_c + f)$

The owner will choose $Mg = PRO$ when both CEOs opt for $i = i_y$ iff his utility from doing so is higher than his utility from running the firm himself,[13] otherwise, he will choose $Mg = FAM$:

$$(1-\lambda)[\eta\pi(\overline{e}) + (1-\eta)\pi(\underline{e})] > \eta\pi(\overline{e}) + (1-\eta)\pi(\underline{e}) - \Gamma - m - (1-\eta)(\ell_c + f)$$

The conditions specifying where each equilibrium lies are as follows:

$$Mg = PRO, i = i_y \quad \text{if:} \quad \ell_c + f + \frac{\Gamma}{1-\eta} > \overline{\Gamma} + \overline{L_p}$$

$$Mg = FAM, i = i_y \quad \text{if:} \quad \ell_c + f + \frac{\Gamma}{1-\eta} \leqslant \overline{\Gamma} + \overline{L_p}$$

CASE 2: BOTH CEOS CHOOSE NOT TO INVEST IN MONITORING

Both CEOs would choose not to invest, $i = i_n$, if $\ell_c > \overline{L_p}$ and $\ell_c + f > \overline{L_f}$. The owner's choice is based on the following utilities:

- $u_{own}(PRO, i_n) = (1-\lambda)\pi(\underline{e})$
- $u_{own}(FAM, i_n) = \pi(\underline{e}) - \Gamma$

The owner will choose the CEO following the same logic, and the conditions for the key parameters are as follows:

[13] Rearranging the terms provides an intuitive interpretation: the wage he expects to pay the professional CEO is smaller than the costs he will face if he chooses to manage the firm himself: $\lambda[\eta\pi(\overline{e}) + (1-\eta)\pi(\underline{e})] < \Gamma + m + (1-\eta)(\ell_c + f)$

$$Mg = PRO, i = i_n \quad \text{if:} \quad \ell_c + f + \frac{\Gamma}{1-\eta} > \overline{\Gamma} + \overline{L_p}$$

$$Mg = FAM, i = i_n \quad \text{if:} \quad \ell_c + f + \frac{\Gamma}{1-\eta} \leqslant \overline{\Gamma} + \overline{L_p}$$

CASE 3: ONLY PROFESSIONAL CEO CHOOSES TO INVEST

The professional CEO would choose to invest, $i = i_y$, while the family CEO would not, $i = i_n$ if: $\ell_c \leqslant \overline{L_p}$ and $\ell_c + f > \overline{L_f}$. The owner's choice is then based on the following utilities:

- $u_{own}(PRO, i_y) = (1-\lambda)[\eta\pi(\overline{e}) + (1-\eta)\pi(\underline{e})]$
- $u_{own}(FAM, i_n) = \pi(\underline{e}) - \Gamma$

The owner will choose the CEO following the same logic, and the conditions for the key parameters are as follows:

$$Mg = PRO, i = i_y \quad \text{if:} \quad \frac{\Gamma}{1-\eta} > \overline{\Gamma} + \overline{L_p} - \overline{L_f}$$

$$Mg = FAM, i = i_n \quad \text{if:} \quad \frac{\Gamma}{1-\eta} \leqslant \overline{\Gamma} + \overline{L_p} - \overline{L_f}$$

CASE 4: ONLY FAMILY CEO CHOOSES TO INVEST

The family CEO would choose to invest, $i = i_y$, while the professional CEO would not, $i = i_n$ if: $\ell_c > \overline{L_p}$ and $\ell_c + f \leqslant \overline{L_f}$. The owner's choice is then based on the following utilities:

- $u_{own}(PRO, i_n) = (1-\lambda)\pi(\underline{e})$
- $u_{own}(FAM, i_y) = \eta\pi(\overline{e}) + (1-\eta)\pi(\underline{e}) - \Gamma - m - (1-\eta)(\ell_c + f)$

The owner will choose the CEO following the same logic, and the conditions for the key parameters are as follows:

$$Mg = PRO, i = i_n \quad \text{if:} \quad \ell_c + f + \frac{\Gamma}{1-\eta} > \overline{\Gamma} + \overline{L_f}$$

$$Mg = FAM, i = i_y \quad \text{if:} \quad \ell_c + f + \frac{\Gamma}{1-\eta} \leqslant \overline{\Gamma} + \overline{L_f}$$

3.5 DISCUSSION AND INTERPRETATION

This simple theoretical framework suggests a set of implications that can be tested in empirical work. I will discuss each key parameter in turn and suggest possible ways to empirically test the implications. In this section I will revert to using the terms "good management practices" and "bad management practices" instead of "investment in monitoring" and "no investment".

THE COST OF LAYOFFS, ℓ_c: The industry cost of laying off workers (ℓ_c) is a crucial determinant of whether it is worth it for CEOs to invest in good management. Conceptually, if management only helps with identifying who the shirkers are, it is only worth adopting it if the extra information garnered from it will be used and there can be credible commitment that it will result in layoffs for the shirkers. One interpretation of ℓ_c could be unionization rates within an industry, or labour laws within a country. For example, we could expect that CEOs in industries with high unionization rates would be less likely to adopt good management as they might encounter severe pushback in any layoff attempts, despite observing who the shirking workers are. Similarly in countries with stringent labour laws, it could be that the process of laying off employees for shirking is too costly in terms of paperwork or other barriers.

Analytically, Figure 17 shows that when $\ell_c > \overline{L}$ both family and professional CEOs opt for no investment in good management practices. Empirically, there are at least two implications that could be tested with available data:

Testable implication 1.

A. *Industries with higher labour power will have fewer firms with good management practices.*

B. *Countries with tougher labour laws will have fewer firms with good management practices.*

To consider implication 1A, one can collect data on measures of labour power — such as unionization rates — and correlate these with average quality of management across industries and countries. This would be the first step to see if such stylized facts could be observed, and if that is the case then more careful tests that would account for possible biases could also be carried out. For example, if may be possible to exploit a policy change, such as if a law is passed that curbs union activity, or if trade agreements change the market and power structure of particular industries. There is some evidence of this currently in the literature: Bloom, Draca, and Van Reenen [31] use China's entry into the World Trade Organization and subsequent increased imports from Chinese firms across a selected group of industries to identify the effect of increased competition on management quality. They find that management quality improved within surviving firms. They did not, however, consider the effect on shares of family and non-family firms given the shock.

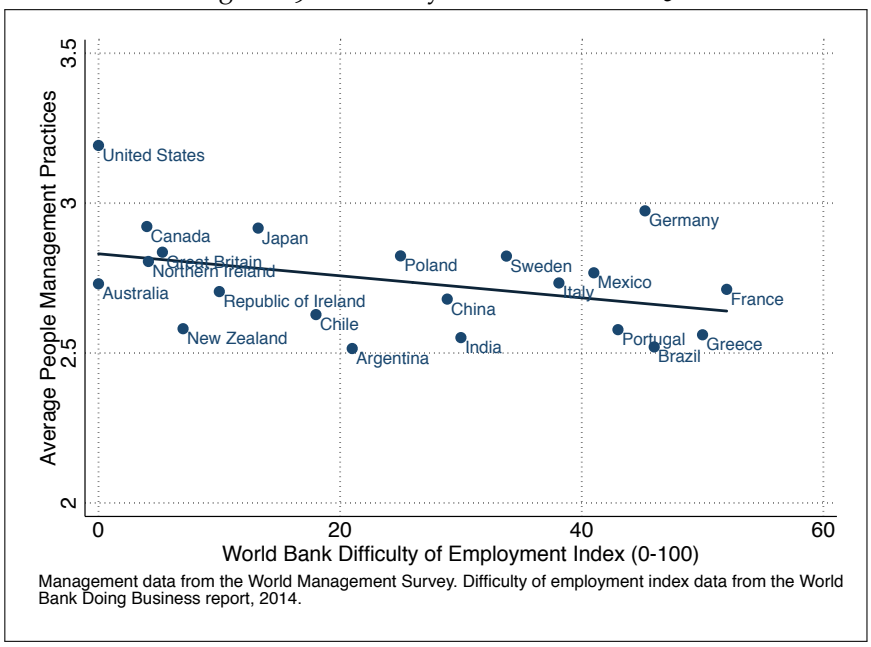
Figure 18: A firm-level measure of ℓ_c

At a firm level, the World Management Survey collects data on the share of employees who are unionized within a firm. As a simple first approximation, Figure 18 shows the lowess plot of the relationship between share of union-

ized workers and the firm's score in people management.[14] The graph shows that the lower the percentage of unionized workers within a firm, the higher the quality of people management practices in the firm. This is the case for both family and professional CEO firms, but the relationship is much more pronounced in professional CEO firms.[15]

For the testable implication 1B, one can consider the stylized fact by looking at the relationship between labour laws and management. The World Bank publishes a rank where they score countries on their "difficulty of employment" on a scale of 0 to 100, and Figure 19 plots the relationship between the country average quality of people management and the World Bank index. There is a negative relationship between the toughness of labour laws and the quality of people management at the country-level, though of course there are myriad endogeneity issues that could be considered in future work.

Figure 19: A country-level measure of ℓ_c



[14] The people management score measures the quality of monitoring, selection and reward processes within the firm.

[15] Another possible way to think about unionization rates would be that in a highly unionized environment there is a higher need for monitoring and "paperwork" in order to lay off a worker, and thus there should be an incentive to invest in monitoring. The concept of ℓ_c here is, however, that it is more expensive generally to lay off workers when there is higher union power, and even if there was a high investment in monitoring it may still be expensive to lay off workers despite having documentation — so much so that it is no longer profitable to invest in a lot of monitoring structure.

THE FIRM REPUTATION COST OF LAYOFFS, f: The model assumes by construction that family CEOs also face firm-specific costs of discipling workers. The concept has been used in previous work, such as in Bach and Serrano-Velarde [8], where the authors propose that family firms enter into an implicit contract with workers that allows them to offer lower wages in exchange for an expectation of longer tenure of employment — regardless of productivity shocks. In my framework, it could be interpreted that there are reputation costs associated with breaking this implicit contract with workers. Let "separation" refer to a worker being laid off from their job.

Testable implication 2.

A. *Family CEO firms with high reputation costs will have worse management practices.*

B. *Family CEO firms will have lower rates of separation than professional CEO firms, but better managed family CEO firms will have higher separation rates relative to worse managed family CEO firms.*

One way to measure reputation costs would be to create an indicator for eponymous firms, assuming that family CEOs of firms that bear the family name are more likely to care about the reputation of their firm. Another measure could be to use the size of the municipality (or other small regional measure) where each firm is, under the assumption that firms in smaller communities are more likely to employ a large share of the local population and suffer from a stronger community backlash if workers are laid off. These could then be used to check the relationship between separation rates and each of the firm types: family/professional CEO, well/badly managed. Building a dataset with this information is possible with access to matched employer-employee administrative datasets. I have secured access to the datasets from Brazil and Italy, and will test these implications in future work.

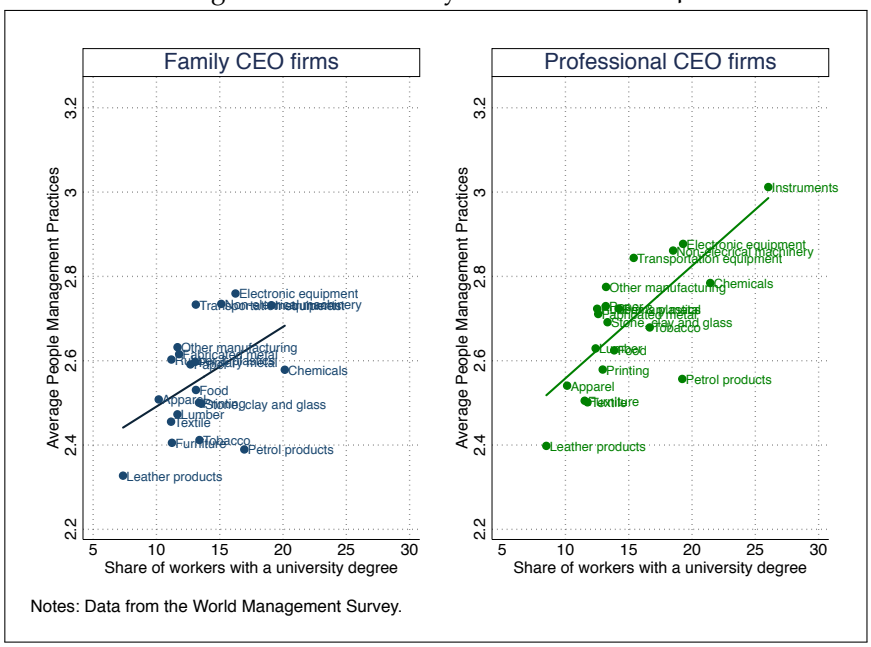
THE SHARE OF HIGH ABILITY WORKERS, η: The industry share of high ability workers, η, is important for (a) determining the size of the additional profit that could be made by the firm if the CEO opts for investment in monitor-

ing, and (b) the share of workers who would be fired. The model suggests that in industries where there is a large share of high ability workers, the return to investment in monitoring is higher and thus more CEOs will choose good management. This is the case because, in the model, only workers who are of high ability would change their behaviour in the face of monitoring — hence, the higher the share of high ability workers, the higher the share of workers who would exert higher effort. This would both lead to a larger ultimate effect on profits and a smaller possible cost of layoffs. Figure 21 shows the parameter space for $\eta = 0.2$ and $\eta = 0.8$, and it is clear that in the figure where $\eta = 0.8$ the space taken by the darker shades indicating $i = i_y$ is higher.

Testable implication 3.

A. Industries with higher shares of high ability workers will have more firms with good management practices.

Figure 20: An industry-level measure of η



Empirically, Figure 20 shows a stylized fact relating to this testable implication using data from the WMS. The graph shows a positive relationship between the average people management score for each 2-digit SIC industry and the share of workers with a university degree at the industry level — and the relationship is present both in the sample of family CEO firms as well as the professional CEO firms.

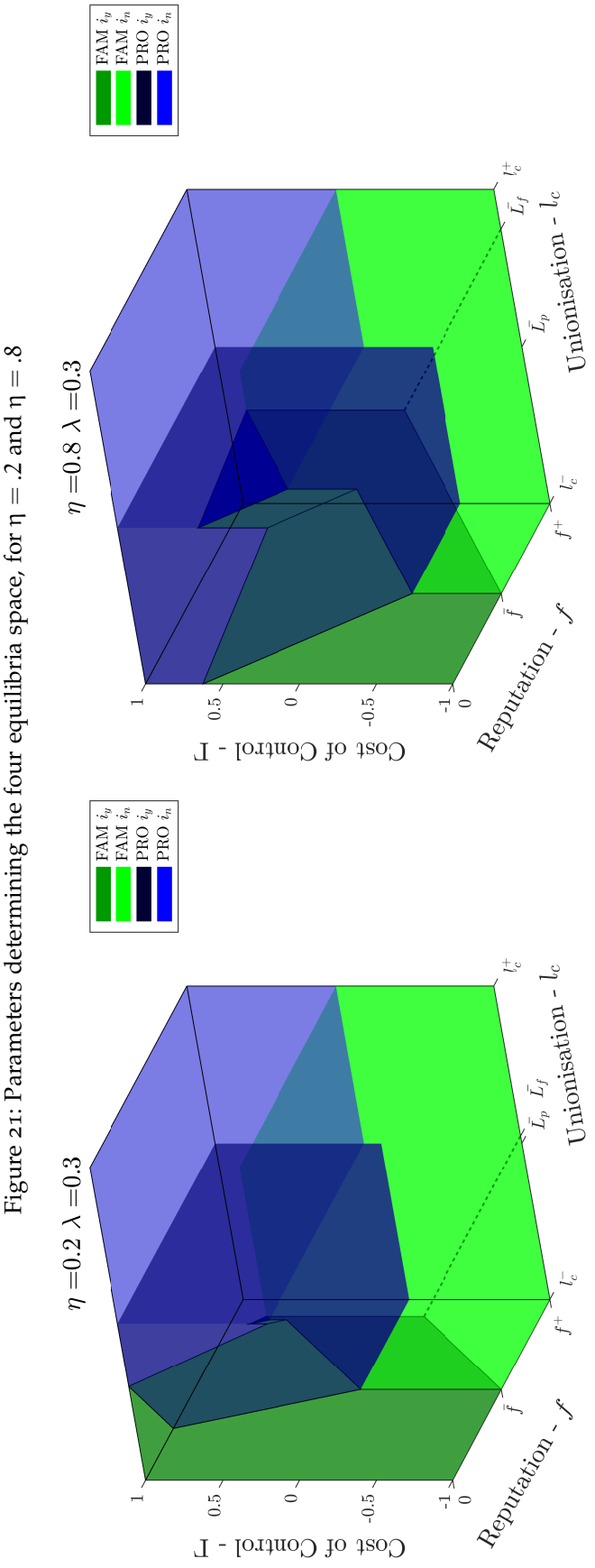


Figure 21: Parameters determining the four equilibria space, for η = .2 and η = .8

3.6 CONCLUSION

This aim of this chapter was to outline a basic framework considering a possible mechanism behind the decisions made by CEOs regarding management adoption, and by a family firm owner regarding the CEO appointment. I build the model such that there are three key parameters that affect the returns of investing in a management technology in interesting ways: the share of high-ability workers in an industry η, the industry cost of layoffs ℓ_c and the family firm's reputation cost f.[16]

The final key parameter, Γ, only influences the ultimate decision of the firm owner whether to hire a professional CEO or to appoint a family member. Conceptually, there are utility costs of being CEO as effort must be expended on the day to day running of the firm. The family CEO can also gain a "private benefit of control" from running their family's firm — that can be simply because they are proud to do so, or perhaps there are monetary or other types of influence benefits that come from owning a firm within a community.[17] If the owner chooses to run the firm himself, it must be that the benefits are larger than the costs of running the firm, and that this *net benefit* is also larger than the additional profits that would have been earned if a professional CEO had been hired.

How large the benefit or cost needs to be depends on whether the professional CEO would have adopted management or not: for example, if the industry has high union rates and the professional CEO would not have adopted the monitoring technology either, the additional revenue earned by hiring a professional CEO is very low. Thus, an owner would only hire a professional CEO if their personal net costs of running the firm are larger than the salary they would have to pay to the professional CEO. Symmetrically, in the case where a family CEO would not adopt monitoring but the professional CEO would, we would only observe an owner opting for a family CEO if they have a substantially high private benefit of control and low utility costs of running the firm —

[16] Two more parameters, the cost of investment in management m and the CEO's share of profits taken as payment λ are necessary in the model but behave in a straightforward way, and thus do not warrant discussion at this point.

[17] As in Demsetz [55], for example.

that is, the additional profit that would have been earned by the professional CEO would have been substantial, so it requires a much higher level of private benefit to compensate for the lost profit.

Considering the four equilibria, we can expect to find CEOs falling on each of the four final nodes depending on the parameters discussed above. We may generally expect that professional CEO firms have higher layoff rates when compared to family CEO firms, but that "better managed" professional CEO and family CEO firms have the higher layoff rates relative to poorly managed professional CEO and family CEO firms. This framework partly explains why we might see a distribution of management quality as seen in the second figure of the previous chapter, where both family CEO-run firms and professional CEO-run firms have good and bad management across the distribution, but the distribution of non-family firms is shifted to the right of the family firms distribution. The innovation here is that we do not need to assume that family CEOs are of lower ability, but rather that they are simply responding to differential costs of implementing personnel policy because of the unique structure of contracts — including implicit contracts — that family firms have with their employees. A more rigorous treatment of the empirical tests is left to future work.

3.7 APPENDIX

ADDITIONAL GAME TRESS The information sets are shown in nodes of the summary game tree in Figure 22, and are shown inside the nodes when they are singletons and inside the dashed lines when they are sets. Let α be the information set when the owner chooses who to manage the firm. Let β_1 and β_2 be the information sets at the time the CEOs take their investment action. Let ν_1 to ν_8 be the information sets at the time that the worker has to take their effort action. Let δ_1 to δ_6 be the information sets at the time the CEO has to take their disciplining action.

Figure 23 shows the full game tree, with all the nodes but omits the payoffs. The information sets are depicted by dashed lines and labelled above the set.

Figure 22: Game tree: summary decision set

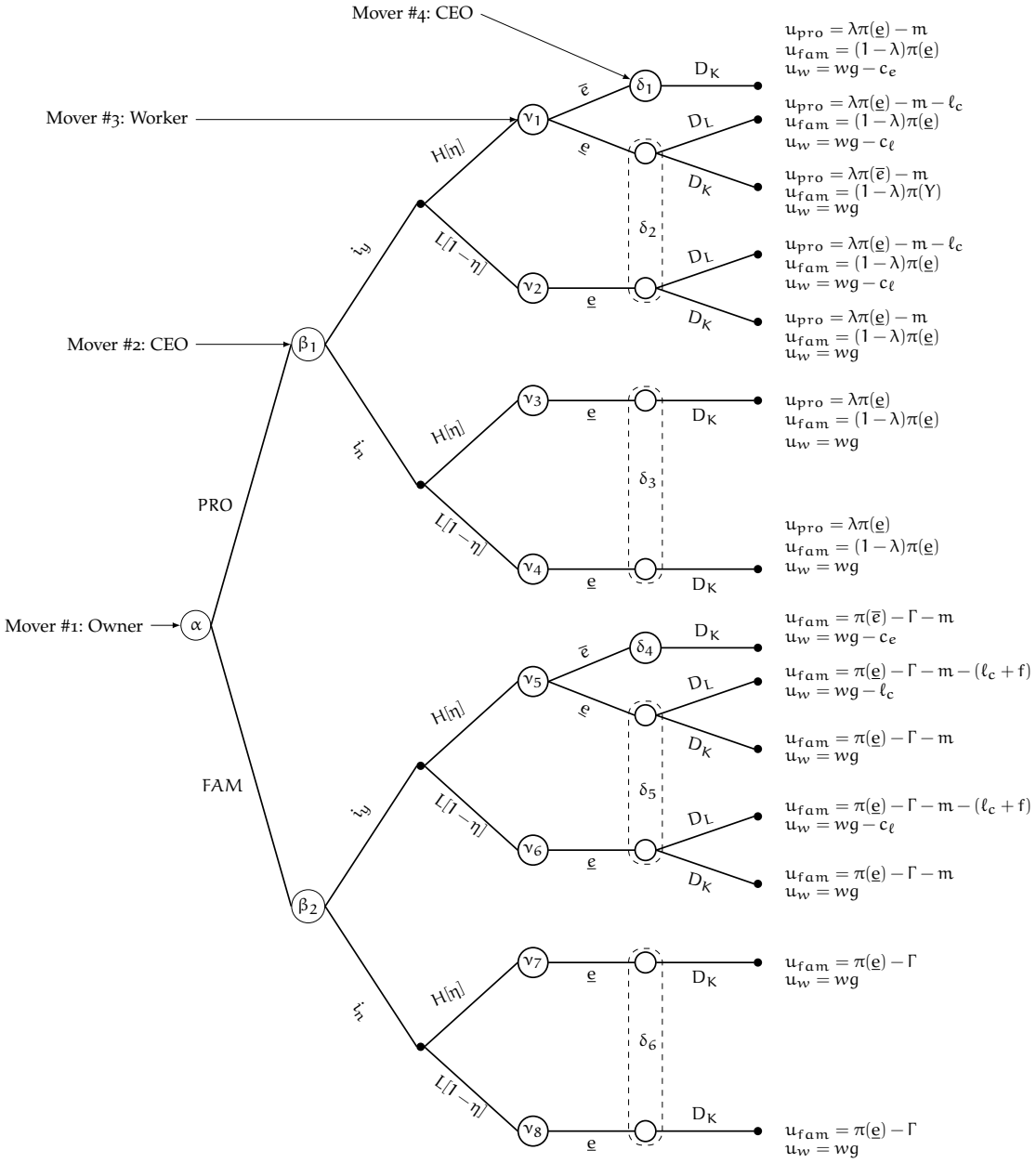
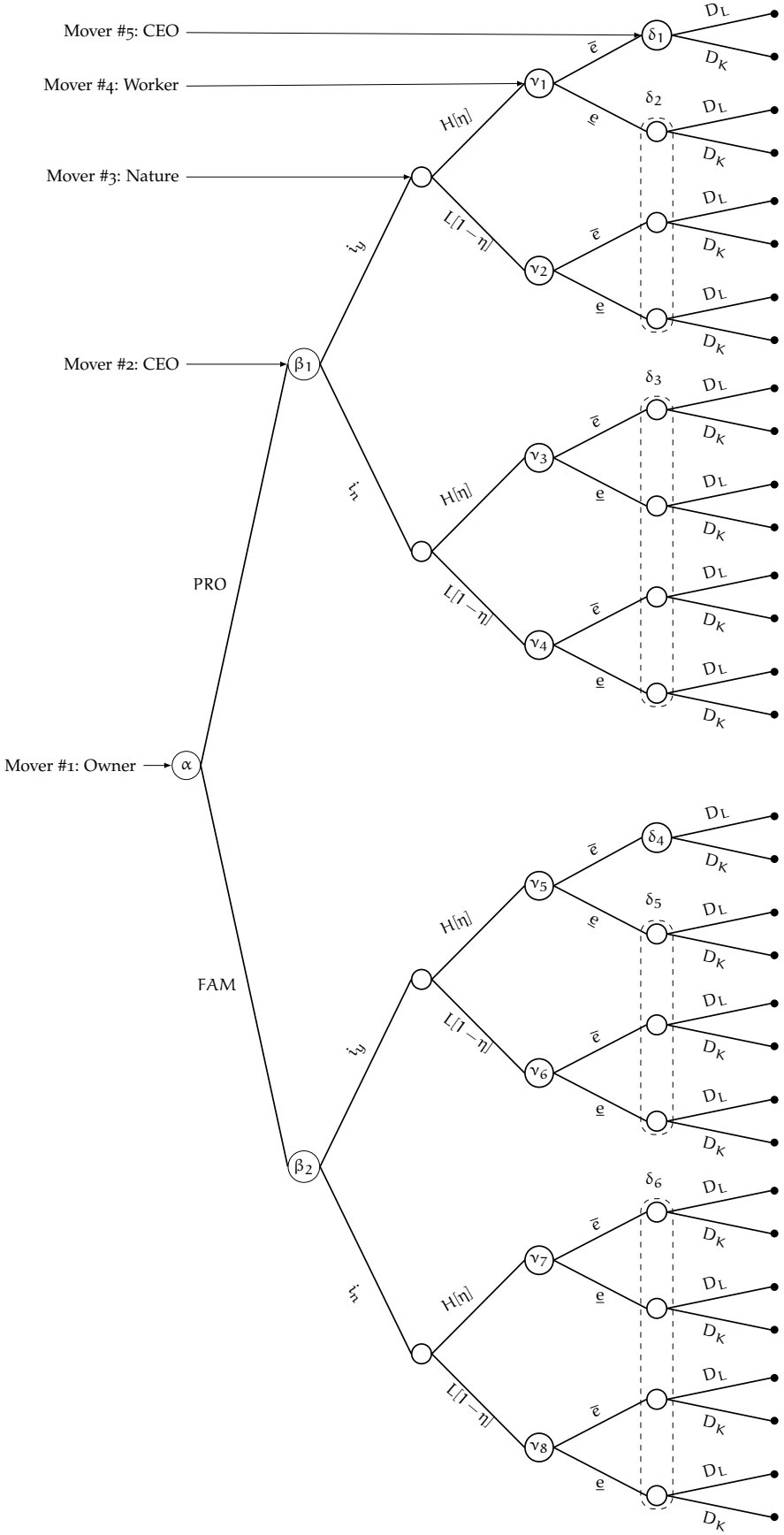


Figure 23: Game tree: full decision set



4

DEVELOPING MANAGEMENT: AN EXTENDED TOOL TO MEASURE QUALITY OF MANAGEMENT OF SCHOOLS IN DEVELOPING COUNTRIES

with Renata Lemos

> *"If the system does not add up to a functional whole, the causal impact of augmenting individual elements is completely unpredictable."*
>
> Lant Pritchett, *RISE Working Paper 15/005*, 2015

4.1 INTRODUCTION

Although there has been much progress in improving school enrolment around the world, there is still striking heterogeneity in the distribution of student learning outcomes across countries. This is particularly true for the developing world, and researchers and policy makers are paying increasing attention to addressing this "learning crisis". The traditional economics literature that considers the effect of an individual input on output has provided us with great insights into the individual effect of inputs such as teacher salaries, school infrastructure, school financing, extra teachers, different curriculums, and more textbooks, among many. However, variation in these inputs has not been able to explain a substantial share of the variation in student learning (Glewwe and Muralidharan [67]). Thus, a new research agenda is urging a more holistic view of education systems in a "systems framework" that includes a series of interconnected types of relationships between different actors and stakeholders, outlined in Pritchett [106].

This chapter makes a methodological contribution by taking lessons from private enterprise and applying to the "public sector" (broadly defined). We develop a feasible tool to measure management practices in schools in develop-

ing countries, based on the well-established World Management Survey tool.[1] Here we describe the *Development WMS*, a survey tool based on the original WMS but tailored to measuring management practices in the public sector of developing countries. We discuss each innovation in detail below, but in short:

1. We identified three management *processes* - implementation, usage, and monitoring - taken into consideration when measuring the strength of each management practice covered by the WMS but which could not be extricated ex-post from a score in the original methodology.

2. We expanded the survey "vertically" by disentangling and mapping these processes to each question of the 20 management practices, creating 60 items to score.[2] In this new survey, however, the responsibility of weighting the importance of each process does not lie with the interviewer, thereby reducing measurement error and allowing the data user to know precisely what led the score for a particular practice to be higher or lower.

3. We expanded the survey "horizontally" to allow for greater variation of scores and allow interviewers to differentiate at a finer level between the strength of processes in place at these schools and hospitals.

While we have strived to keep the essence of the WMS in terms of the questions and practices being measured and the spirit of the scoring grid, we also ensured that the adapted version was applicable in the development setting by addressing three main challenges to using the original WMS in developing countries.

First, the distribution of scores in the education sector in the two developing countries surveyed in the original WMS, India and Brazil, was tight around the scores for weak management practices. Although the global context of the WMS project allows for a useful comparison of world-class and poorly managed organizations across a number of countries, the very thick — almost

[1] Since 2008, we have worked alongside Nicholas Bloom, Raffaella Sadun and John Van Reenen to significantly expand the original WMS data collection project and systematically measure management practices within and across countries and it is using this experience that we developed this tool in a comparable way.

[2] We did this based on our seven years of training interviewers to conduct the WMS interviews, such that the questions asked related to types of processes are comparable to previous years of surveys.

truncated — left tail for developing countries makes it harder to explore the variation of managerial practices in the less well managed organizations. For example, Lemos and Scur [91] points out the thick left tail in both schools and hospitals in India and Bloom et al. [37] show that there is evidence of truncation at the lower bound score of 1, with 82% of the schools in the WMS Indian sample having an overall management score between 1 and 2 that and no schools have a score above 3 on the original WMS scale. During the data collection for these countries, we often heard interviewers wishing they could "give a 0" to those schools and hospitals that had no process whatsoever to differentiate those from schools and hospitals that had minimal processes, but not enough of an informal process to warrant a score of 2 in the scoring grid.[3]

Second, in terms of implementation, the WMS original methodology uses available sampling frames from established organizations and phone calls to carry out the interviews. Although this was less of a barrier in the manufacturing survey, it was a massive barrier in the public sector surveys in developing countries. For instance, sampling frames in India were difficult to acquire and build, and, when available, they often had names of schools and hospitals but no phone numbers. Unfortunately a common reason for the lack of phone number was that schools simply did not have a physical phone line available. We often ran interviews through managers' cell phones, and a handful of times through payphones located near these organizations as cellphones or landlines were not available. When we were able to reach them, the connection itself was sometimes problematic and several calls had to be placed to complete the interview.[4]

Finally, when thinking about policy implications, we did not have much information in the WMS to pinpoint precisely what part of the process these organizations were failing at the most. Although useful experiments such as Bloom et al. [34] and Fryer [63] have substantially helped us learn about the large effect that improvements in whole sets of management practices can afford, we do not yet have a systematic picture of what particular *types of*

[3]The reason we refrained from stretching the scoring grid to 0 and instead added half points was to preserve comparability of the ordinal scale and increase specificity equally across all score categories.

[4]The higher the number of calls that have to be made, the lower the probability of completing an interview.

processes matter the most across different settings in developing countries.[5] The 20 management practices covered by the WMS are scored based on a set of processes which are systematically triangulated by the skilled interviewer and facts are evaluated based on the survey grid to determine higher or lower scores. However, we argue that it becomes important to understand the marginal importance of each type of process when considering the type of policy interventions that are feasible, especially in the context of countries facing limited budgets and institutional constraints.

We have also developed accompanying field paper forms to facilitate the interview process as the Development WMS is meant to be run face-to-face by enumerators who visit the schools and hospitals. These forms were carefully designed to ensure that the information collected during the interviews would be sufficient for the post-interview scoring. In the phone interviews, the enumerators are able to consult the grid to ensure they have enough information, but in the face-to-face interviews they are not allowed to take the grid along as it would undermine the double-blind exercise. The importance of providing a useful field-friendly data collection tool is often underestimated. The enumerators are often not researchers by training and may fail to record important information or even record wrong information during survey interviews if not properly prompted by their field tool.[6]

With a set of individual project partners, we are in the process of collecting data using this new expanded survey tool in schools in Andhra Pradesh-India (completed), Mexican schools (ongoing, pilot completed), Colombian schools (completed), Chinese hospitals (ongoing) and Indian hospitals (pilot completed).[7] This survey tool has often been used as an additional module

[5] Focusing on charter schools in the US, Dobbie and Fryer [58] run a similar exercise where they collect a large amount of information on the inner-workings of 35 charter schools to investigate the practices that matter the most for school effectiveness.

[6] A website with instructional videos and interactive calibration tools to minimize the fixed costs of training and implementation will be made freely available to the research community in mid-2017.

[7] We have partnered with Karthik Muralidharan and the APSC project for Indian schools, Arturo Harker Roa and the Colombian Ministry of Education for Colombian schools, Rafael de Hoyos and Ciro Avitabile from the World Bank and the Mexican Ministry of Education for Mexican schools, Winnie Yip and the Ministry of Health for Chinese hospitals and Raffaella Sadun for Indian hospitals. We are immensely thankful to Raissa Ebner and Kerenssa Kay for training the Mexican school pilot teams, Raissa Ebner for training the Mexican and Colombian school teams, and Kerenssa Kay for running the Indian hospital pilot. For an initial look at the Colombian data, see Bermudez and Harker [22].

in larger projects, and sampling frames of these projects were not always necessarily representative random samples and thus are not directly comparable. While these samples were not formally designed to be representative of all schools in these countries, collectively they paint a useful picture of selected public sector organizations in low- and middle-income countries and allow us to validate our new survey tool.[8]

4.2 MEASURING PROCESSES IN DEVELOPING COUNTRIES

The original public sector WMS covers 20 questions across two main areas: operations management and people management. The original survey subdivides operations management into lean operations, monitoring and target management, as follows:

1. *Operations management*
    a) *Lean operations* in schools covers practices including whether the school has meaningful processes that allow pupils to learn over time; teaching methods that ensure all pupils can master the learning objectives; whether the school uses assessment to verify learning outcomes at critical stages and makes data easily available and adapts pupil strategies accordingly.
    b) *Monitoring management* covers practices of continuous improvement, performance tracking, review and dialogue, and consequence management. It measures whether the school has processes towards continuous improvement and lessons are captured and documented, whether school performance is regularly tracked with useful metrics, reviewed with appropriate frequency, quality, and follow-up, and communicated to staff.

[8] The samples are as follows: the Andhra Pradesh data is a random sample of public and private primary schools in 5 districts from the APREStt project; the Mexican data is a combination of samples from primary schools that are part of PEC (Programa Escuelas de Calidad) in Durango, Guanajuato, Estado de Mexico and Tabasca, marginalized primary schools in Puebla, and primary and junior high schools in Tlaxcala and Morelos; the Colombian data is a random sample from the lowest performing public schools in the country (approximately 4,000 of the 22,000 schools in Colombia); the Chinese hospital data is a random sample of hospitals and the Indian hospital data is from a pilot of 25 hospitals in Andhra Pradesh.

c) *Target management* covers practices in the balance and interconnection of targets, the time-horizon and difficulty of the targets, as well as their clarity and comparability. It measures whether the school, department, and individual targets cover a sufficiently broad set of metrics; whether these targets are aligned with each other and the overall goals.

2. *People management* covers practices in handling good and bad performance, measuring whether there is a systematic approach to identifying good and bad performance, rewarding school teachers proportionately, dealing with underperformers, and promoting and retaining good performers.

As mentioned before, we preserve the practices and areas covered in the original WMS and identify three key processes used to systematically measure these practices, and expand it both "vertically," by further dividing each of the 20 practices into the three processes we are looking to measure and "horizontally," increasing the granularity of scores by allowing half points.

4.2.1 *Identifying processes behind management practices*

In the Development WMS, we identify three key processes that are captured to measure the strength of each management practice within an organization. Each process consists of:

1. Process implementation: formulating, adopting and putting into effect management practices;
2. Process usage: carrying out and using management practices frequently and efficiently;
3. Process monitoring: monitoring the appropriateness and efficient use of management practices.

More specifically, in the original WMS, each of the overall management, operations and people management indices is made up of a set of the 20 practices, and each practice is measured through several structured questions. Each one

of the 20 management practices contains a large amount of information about how that specific practice being carried out at the establishment. For example, when measuring "data-driven planning and student transitions" at a school, the WMS interviewer evaluates the practice based on three processes: (1) what type of data is available (test scores, attendance, etc), (2) leaders understand critical points of transition for students (when to change learning levels), (3) leaders have a data-driven approach to decisions (principal and teachers use data to determine transitions). The combined responses to this practice are scored against a grid which goes from 1 - defined as "School may be aware of critical transitions for students, but little or no effort is made to match support services to students; data is often unavailable or difficult to use." up to 5 - defined as "Student transitions are managed in an integrated and proactive manner, supported by formative assessments tightly linked to learning expectations; data is widely available and easy to use."

In the original WMS instrument, the interviewer triangulates the processes herself and assigns one single score taking all the processes into account. This task requires a high cognitive ability from the interviewer as well as consistent monitoring of the interviewing process by supervisors to ensure comparability.[9] It is not possible, however, to extricate from the final data ex-post how each process weighed in the interviewer decision. In the Development WMS, each process is evaluated separately and ex-post averaged out to get the practice's score. This is useful in a practical sense because it removes the triangulation responsibility from the interviewer, which then lowers the cognitive threshold required in hired interviewers and facilitates the deployment of the survey in low-capacity contexts.

Furthermore, in an academic and policy research sense we can now disentangle precisely where the process is failing and be much more specific in targeting of interventionist policies. For example, in one of the pilot school visits we carried out in Andhra Pradesh, when asked the first question in the earlier example the principal promptly pulled out examples of report cards that they used to track student performance (Figure 24). The report cards had

[9] This is one of the reasons for the high per-interview cost of the WMS. Interviewers are generally masters students from top UK schools and experienced supervisors monitor over 80% of the interviews.

plenty of detail on student achievement and behaviour over time, and were signed by the teacher, principal and parent. This would certainly warrant a score of 3.5 or 4 on the implementation process part of the topic being measured. When we then asked the subsequent questions of how the data is used and how it relates to student transitions, we received the unsatisfying answer that the report cards were simply stacked in the corner of the principal's office and if the teachers were curious they could go and find an individual student's card whenever they wanted.

Figure 24: Report card from a rural school in Andhra Pradesh

In short, there was no process of compiling the data to be useful more generally, and there was certainly no process to use the data to help guide the transition between levels of learning. Crucially, the scores for the usage and monitoring parts would have been low, in the 1-1.5 range and the overall score might have been around a 2-2.5, and we would correctly interpret that there is not a very good formal system of data-driven student transitions, *but* we would have missed important information that it is not the data collection part of the process that is failing, but rather the usage of the data already collected. If we think in policy terms, a policy that targets giving schools best practices for report card development would be relatively useless in this context, whereas

one that builds a system that they can use the data already collected would be much more effective.

4.2.2 *Expanding the instrument vertically: higher dimensionality*

Operationally, we develop the extended grid by mapping each of the three key processes back to the questions asked for measuring each WMS practice. Process implementation is broadly related to question 1, process usage is broadly related to question 2, and process monitoring is broadly related to question 3 in each management practice. Thus, beyond looking at the average score of each practice, we can also dig deeper to understand what part of the process is driving the results. This increases the number of scores from 20 to 60.

With the increased number of variables, we can create a new set of indices to test whether they are any more informative than the original survey. We construct four sets of indices. For the first set, we follow a similar methodology to the original WMS and use the information referring to all three processes very simply. First we take an average of the three sub-questions to build a single score for each of the 20 original practices, analogous to how a WMS interviewer would assign a single score to each practice. We then take the z-score of each practice and creating indices for overall management (average of 20 practices), operations management (average of fourteen operations practices), people management (average of six people management practices). This can be interpreted in the same way as the original WMS, but with less measurement error.[10]

The main innovation in our survey is in the second, third and fourth set of indices. To build these, we skip the first step of averaging across the three processes for each practice and re-organize the dataset into three new sets of 20 practices along the lines of each process. We take the z-score of all the sub-questions and build average indices for overall management, operations management and people management using the 20 sub-practices for each of the process types. For example, we can build an implementation management in-

[10]The original WMS excludes the leadership questions from its overall management score, so we follow the same convention here.

dex by taking the average of the 20 implementation sub-practices, and again do the same to create a usage management index and a monitoring management index. Further, we could build implementation operations and implementation people management indices using only the first sub-questions within each management practice.

In short, we first produce a set of overall management, operations management and people management indices using a similar methodology to the original WMS (ie. using all the information given for a particular question), and also produce three "finer" sets of indices, broadly referring to (1) process implementation of overall, operations and people management, (2) process usage of overall, operations and people management, and (3) process monitoring of overall, operations and people management.

While we broadly follow the original WMS convention for building the comparable indices (overall management, operations and people management), we have conducted a factor analysis of our new school survey tool with the data from Andhra Pradesh, Mexico and Colombia to validate this. We find that factor analysis on the 20 management practices as well as the more granular 60 processes yields generally similar results to those found in the manufacturing sector in Bloom et al. [35], though considering the factors within each of the processes is rather telling. We present the results of the factor analysis in Table 9. The first two factors across all the four sets of variables analyzed explained all the variation across the variables, so we present only the first two factors here for each set of variables analyzed. The first two columns use the management practice scores that are comparable to the original WMS; that is, each of the 20 management scores is an average of the three respective processes in the D-WMS. The following six columns break down the use of the dataset instead of taking an average of the three processes: columns (3) and (4) use only the first process for each management practice —implementation, columns (5) and (6) use only the second process for each management practice — usage, and columns (7) and (8) use only the third process for each management practice — monitoring.

Starting with the original WMS practices, the first factor pattern suggests the largest pattern of relationships in the data, and we see that there is one principal factor that explains 87% of the variance and loads positively on all practices, and the loadings are high.[11] Similar to the result in manufacturing in [35], this suggests that there is a "common factor of good management" (Factor 1). In the context of the D-WMS data, this suggests that schools that are well managed on one practice are more generally also likely to be well managed across all practices. The second factor pattern suggests the second largest pattern of relationships that is uncorrelated with the first, and this second factor that explains about 13% of the variance and loads negatively on nearly all of the operations management practices, but positively on all the people management practices. The loadings on the second factor are, however, much smaller than those seen in the first factor — especially those in operations. In the manufacturing results, the second factor loaded positively on operations and negatively on people management. Here we see the opposite loadings but a similar pattern of specialization. In our context, it seems there is a second factor of "good people management" suggesting schools specialize in people management versus operations management.

Moving on to examining the results for each individual process, the first pattern we note is that across all three processes we find a common factor of "good management" as the first factor. The second factor, however, is not the same across processes. In the implementation process questions across the full survey, we see that the second factor loads negatively across all people management practices, while it loads positively across the same practices under the usage and monitoring processes.

In all, it is reassuring to see that the general patterns that have been found in the literature using the WMS hold with our new instrument as well. However, it is also reassuring to see that we find some different patterns across different processes within each management practice. The analysis suggests that we can, indeed, learn something new in terms of the patterns of management within schools from the new survey. In the next section we will show how each of the processes are correlated with the outcome of interest in this context — student

[11] A general rule of thumb tends to be factor loadings of 0.4 and above are relevant.

Table 9: Factor analysis of management practices and processes (unrotated)

	Original WMS		Implementation only		Usage only		Monitoring only	
	(1) Factor 1	(2) Factor 2	(3) Factor 1	(4) Factor 2	(5) Factor 1	(6) Factor 2	(7) Factor 1	(8) Factor 2
Ops 1: Standardisation of instructional processes	0.7257	**-0.1389**	0.5831	0.1985	0.5490	**-0.1507**	0.5713	**-0.0255**
Ops 2: Data driven planning and student transition	0.7064	**-0.1008**	0.6287	0.1769	0.4864	0.0132	0.6315	**-0.0934**
Ops 3: Personalization of instruction and learning	0.7524	**-0.1228**	0.5909	0.1253	0.6221	**-0.1599**	0.5671	**-0.1140**
Ops 4: Adopting educational best practices	0.7535	**-0.1421**	0.5994	0.1226	0.5608	**-0.1406**	0.6699	**-0.1680**
Ops 5: Continuous Improvement	0.7106	**-0.1761**	0.5959	0.1915	0.5717	**-0.2039**	0.6038	**-0.1100**
Ops 6: Performance Tracking	0.6791	**-0.2727**	0.5248	0.0144	0.4044	**-0.3834**	0.6354	**-0.1892**
Ops 7: Review of Performance	0.6956	**-0.3445**	0.4165	0.2374	0.5881	**-0.1080**	0.6343	**-0.2265**
Ops 8: Performance Dialogue	0.7585	**-0.2517**	0.5737	0.2257	0.5998	**-0.2800**	0.7036	**-0.1505**
Ops 9: Consequence Management	0.7165	**-0.2725**	0.6511	0.2714	0.4102	**-0.3295**	0.6065	**-0.1642**
Ops 10: Type of Targets	0.7547	**-0.0392**	0.5964	0.1142	0.6412	0.0441	0.6596	**-0.0059**
Ops 11: Interconnection of Goals	0.7479	**-0.0989**	0.5504	0.2372	0.5761	0.2020	0.5988	**-0.0543**
Ops 12: Time Horizon	0.5292	**-0.0727**	0.4730	0.0943	0.4216	**-0.1601**	0.3600	0.0766
Ops 13: Goals are Stretching	0.6800	0.0236	0.4763	0.1107	0.5682	**-0.0392**	0.4505	0.1552
Ops 14: Clarity of Goals	0.7215	0.1141	0.5911	0.0362	0.4672	0.2729	0.6181	0.0421
People 1: Instilling a talent mindset	0.6910	0.5543	0.6783	**-0.4340**	0.7096	0.4230	0.4986	0.4205
People 2: Incentives and Appraisals	0.7462	0.2712	0.7367	**-0.4433**	0.5863	0.1609	0.4146	0.2262
People 3: Making room for Talent	0.7059	0.2156	0.6778	**-0.4421**	0.6488	0.0233	0.3597	0.0895
People 4: Developing Talent	0.5544	0.2292	0.5896	**-0.3115**	0.5290	0.0854	-0.0934	0.2893
People 5: Distinctive Emp Value	0.6163	0.3884	0.5018	**-0.1004**	0.4966	0.2886	0.5143	0.3385
People 6: Retaining Talent	0.4507	0.5486	0.3737	**-0.1714**	0.1990	0.5648	0.5074	0.4272
Eigenvalue	9.513	1.3882	6.6605	1.1278	5.9000	1.2148	6.1177	0.8507
% total variance	0.8712	0.1271	0.8639	0.1463	0.8600	0.1771	0.9532	0.1326
Cumulative variance	0.8712	0.9983	0.8639	1.0102	0.8600	1.0371	0.9532	1.0858

and teacher outcomes — but for now we resume the discussion of the other survey changes.

4.2.3 *Expanding the instrument horizontally: greater score variation*

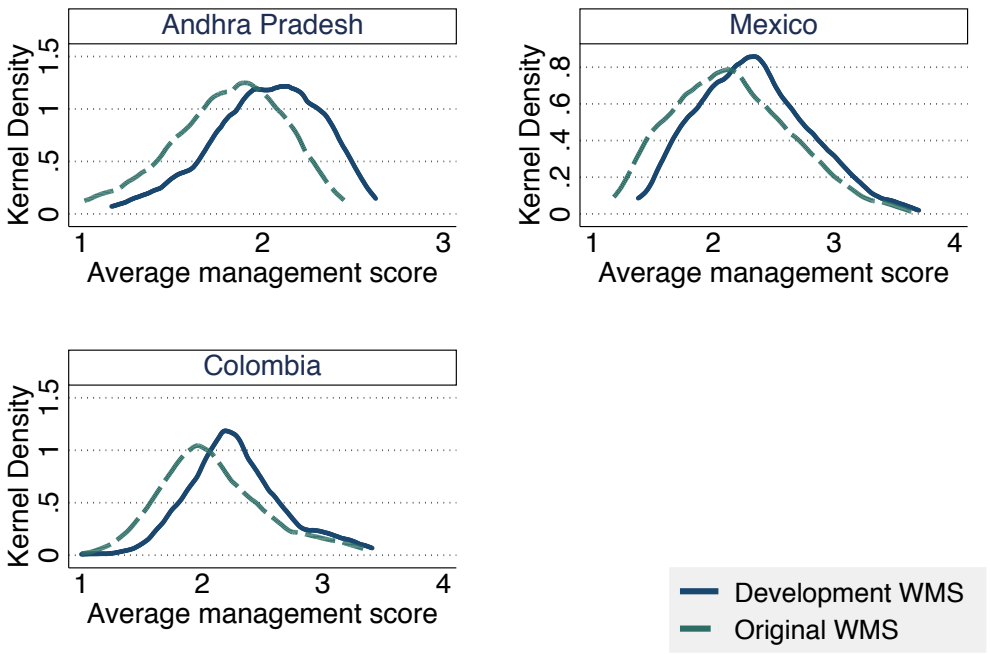
The horizontal expansion of the instrument is more straightforward. In the original WMS, interviewers are allowed to score values of 1, 2, 3, 4 or 5. No half points are allowed and no "2 or 3" values are accepted. If interviewers are unsure of whether the practice warrants a 2 or a 3, they discuss it with their colleagues and their supervisors to make a final decision. This scoring guideline worked well in developed countries as there was wide range of scores, with some schools or hospitals being very well managed and some being very badly managed, but most schools or hospitals had at least *some* practice in place, even if rudimentary. In the India and Brazil waves, however, we found several schools that had absolutely no practices in place and some that had very minimal practices in place. To score a 2 in the WMS, there must be a reasonable practice in place that is informal (if it were a formal practice it would be awarded a 3 or higher). Thus, both schools with no practices and minimal practices were awarded 1, whereas in the Development WMS the interviewer would be able to distinguish and score 1 for no practices and 1.5 for minimal practices.

Crucially, however, we follow the same gradual scoring scheme as the original WMS, which allows us to easily re-cast the scores into what they would have been in the original survey. For example, if an interviewer gave a practice in a school a score of 1.5, it is because it did not reach a high enough level to be a 2, and thus in the original WMS it would have been a score of 1. We implement these adjustments to create original WMS-comparable scores, and plot both distributions in Figure 25.

The figure shows an example of the distribution of scores using data from Andhra Pradesh, Colombia and Mexico. The main goal of the new scoring guide was to allow for a systematic distinction between schools with absolutely no structures in place — a score of 1 — and schools with very minor structures

in place that could not yet be considered informal processes, but were also not completely nonexistent — a score of 1.5. Allowing for 0.5 extra points in all scores has the expected effect of shifting the distribution to the right as analysts are allowed to score higher points, but crucially we now observe a longer tail between the score of 1 and 2 despite still seeing distributions skewed to the left.

Figure 25: Difference in distribution of scores between WMS and D-WMS



Note: Data from the Development WMS. Original WMS comparable scores were computed by recoding half points into the smaller full point.

4.2.4 *Interpreting the management index and sub-indices measures*

Before we move on to providing an overview of the data collected thus far, it is important to emphasise a few key points when interpreting the management index and sub-indices.

The D-WMS (as well as the WMS) does not measure the skills of the *manager* but rather measures the processes embedded in each managerial practice in place within the establishment. Thus, the methodology requires that interviews be conducted with managers who have been in the establishment long enough to become acquainted with the practices in place at that establishment.

If the interview is conducted with a manager who has recently taken a post in the establishment in question (that is, less than one year), the manager might refer to practices that were in place in her previous post rather than the particular establishment she is currently working in.[12] For example, a principal who has been at a school for only two months might not have gone through a review process with their teachers and cannot speak directly about the appraisal systems in place in that particular school. Although they possibly bring in new and different managerial practices into the school, it becomes difficult to discern whether these practices have truly been implemented in the new school or whether it is a current "wish list" of the new principal.

Considering that we are measuring the management practices currently in use, in general the management indices can be interpreted as follows:

- A score between 1 to 2 refers to an establishment with practically no structured management practices or very weak management practices implemented;
- A score between 2 to 3 refers to an establishment with some informal practices implemented, but these practices consist mostly of a reactive approach to managing the organization;
- A score between 3 to 4 refers to an establishment that a good, formal management process in place (though not yet often or consistent enough) and these practices consist mostly a proactive approach to managing the organization;
- A score between 4 to 5 refers to well-defined strong practices in place which are often seen as best practices in the sector.

[12] In fact, this does happen during interviews and those conducting the interviews are instructed to continuously check that the examples provided are from the current establishment rather than any previous post.

4.3 DOES D-WMS PROVIDE ANY NEW MEANINGFUL VARIATION FOR DATA ANALYSIS?

4.3.1 *Observing within-practices and between-practice variation*

As mentioned in the previous section, the expanded D-WMS instrument allows us to improve the quality of data collection in a number of practical ways, but is this new way of collecting data also helpful in terms of data analysis? That is, do we observe any *within-practice* and *between-practice* variations in the data which can be further explored?

Within-practice variation indicates whether organizations emphasize one process over the other within each management practices such as scoring highly in process implementation but poorly in process usage or process monitoring. For example, in order to track their performance, schools may formulate and put into effect a system of metrics to monitor performance but not use this system frequently and efficiently. Alternatively, some schools may define perhaps only one or two indicators to monitor performance but use this indicators appropriately and frequently. *Between-practice variation* indicates if the scores for the three types of processes vary systematically across all management practices. For example, schools may be able to formulate and put into effect systems for performance monitoring, target setting as well as people management. But while process implementation scores may be high across the board for some organizations, they might not be able to effectively use or monitor all systems in place.

We present the correlation matrix for processes within each practice in Figures 26 and 27. We observe that all correlations are positive and significant at the 1% level but of varying coefficients, ranging from 0.04 to 0.66: 14.1% of correlated pairs present a coefficient of equal or lower than 0.25, 65.0% present a coefficient between 0.25 and 0.50, while 21% present a coefficient of equal or above 0.50.

Figure 26: Management process: correlations

		Andhra Pradesh Schools			Mexico Schools			Colombia Schools		
		implementation	usage	monitoring	implementation	usage	monitoring	implementation	usage	monitoring
2. Standardization of Instructional Planning Processes	implementation	1.00			1.00			1.00		
	usage	0.52	1.00		0.37	1.00		0.44	1.00	
	monitoring	0.42	0.37	1.00	0.45	0.38	1.00	0.42	0.44	1.00
3. Personalization of Instruction and Learning	implementation	1.00			1.00			1.00		
	usage	0.11	1.00		0.36	1.00		0.26	1.00	
	monitoring	0.04	0.52	1.00	0.52	0.57	1.00	0.45	0.39	1.00
4. Data-driven Planning and Student Transitions	implementation	1.00			1.00			1.00		
	usage	0.34	1.00		0.44	1.00		0.39	1.00	
	monitoring	0.39	0.38	1.00	0.42	0.43	1.00	0.37	0.45	1.00
5. Adopting Educational Best Practices	implementation	1.00			1.00			1.00		
	usage	0.47	1.00		0.47	1.00		0.56	1.00	
	monitoring	0.43	0.32	1.00	0.48	0.55	1.00	0.48	0.53	1.00
6. Continuous Improvement	implementation	1.00			1.00			1.00		
	usage	0.41	1.00		0.42	1.00		0.44	1.00	
	monitoring	0.30	0.57	1.00	0.42	0.56	1.00	0.52	0.61	1.00
7. Performance Tracking	implementation	1.00			1.00			1.00		
	usage	0.26	1.00		0.25	1.00		0.28	1.00	
	monitoring	0.12	0.26	1.00	0.44	0.27	1.00	0.32	0.35	1.00
8. Performance Review	implementation	1.00			1.00			1.00		
	usage	0.29	1.00		0.21	1.00		0.30	1.00	
	monitoring	0.32	0.41	1.00	0.26	0.44	1.00	0.34	0.41	1.00
9. Performance Dialogue	implementation	1.00			1.00			1.00		
	usage	0.36	1.00		0.46	1.00		0.48	1.00	
	monitoring	0.33	0.31	1.00	0.43	0.52	1.00	0.57	0.56	1.00
10. Consequence Management	implementation	1.00			1.00			1.00		
	usage	0.26	1.00		0.16	1.00		0.32	1.00	
	monitoring	0.18	0.23	1.00	0.47	0.17	1.00	0.33	0.34	1.00
11. Balance of Targets/Goal Metrics	implementation	1.00			1.00			1.00		
	usage	0.35	1.00		0.60	1.00		0.54	1.00	
	monitoring	0.48	0.41	1.00	0.54	0.59	1.00	0.26	0.46	1.00

equal or below 0.25
equal or above 0.50

Note: All correlations are significant at the 1% level.

Figure 27: Management process: correlations

		Andhra Pradesh			Mexico			Colombia		
		implementation	usage	monitoring	implementation	usage	monitoring	implementation	usage	monitoring
12. Interconnection of Targets/Goals	implementation	1.00			1.00			1.00		
	usage	0.40	1.00		0.31	1.00		0.29	1.00	
	monitoring	0.31	0.47	1.00	0.31	0.54	1.00	0.34	0.52	1.00
13. Time Horizon of Targets/Goals	implementation	1.00			1.00			1.00		
	usage	0.08	1.00		0.58	1.00		0.64	1.00	
	monitoring	0.18	0.20	1.00	0.42	0.50	1.00	0.48	0.35	1.00
14. Stretch of Targets/Goals	implementation	1.00			1.00			1.00		
	usage	0.15	1.00		0.36	1.00		0.29	1.00	
	monitoring	0.11	0.14	1.00	0.28	0.34	1.00	0.14	0.32	1.00
17. Clarity and Comparability of Goals	implementation	1.00			1.00			1.00		
	usage	0.30	1.00		0.49	1.00		0.47	1.00	
	monitoring	0.40	0.30	1.00	0.47	0.41	1.00	0.39	0.38	1.00
18. Building a High Performance Culture/ Rewarding High Performers	implementation	1.00			n.a.			1.00		
	usage	0.46	1.00		n.a.	n.a		0.34	1.00	
	monitoring	0.57	0.66	1.00	n.a.	n.a	n.a	0.36	0.26	1.00
19. Making Room for Talent/ Removing Poor Performers	implementation	1.00			1.00			1.00		
	usage	0.27	1.00		0.51	1.00		0.13	1.00	
	monitoring	0.07	0.12	1.00	0.34	0.37	1.00	0.36	0.30	1.00
20. Promoting High Performers	implementation	1.00			1.00			1.00		
	usage	0.57	1.00		0.42	1.00		0.41	1.00	
	monitoring	0.42	0.57	1.00	0.24	0.38	1.00	0.10	0.20	1.00
21. Managing Talent	implementation	1.00			1.00			1.00		
	usage	0.10	1.00		0.35	1.00		0.52	1.00	
	monitoring	0.27	0.07	1.00	0.15	0.02	1.00	0.45	0.65	1.00
22. Retaining talent	implementation	1.00			1.00			1.00		
	usage	0.44	1.00		0.43	1.00		0.43	1.00	
	monitoring	0.36	0.57	1.00	0.42	0.56	1.00	0.32	0.40	1.00
23. Creating a Distinctive Employee Value Proposition	implementation	1.00			1.00			1.00		
	usage	0.55	1.00		0.44	1.00		0.39	1.00	
	monitoring	0.45	0.53	1.00	0.52	0.37	1.00	0.33	0.35	1.00

equal or below 0.25
equal or above 0.50

Note: All correlations are significant at the 1% level.

4.3.2 *Validation of the new survey*

At its core, the relevance of this research project relies on how much of the variation in the outcomes we are concerned about can be picked up by our management measure. Bloom et al. [37] show that the original WMS measure is correlated with student outcomes across a range of countries, so we can expect that our measure will also likely be correlated with school-based student outcomes. What we can explore further is whether any one of the process types explain more of the variation compared to the other processes. To explore this, we can use the data from Andhra Pradesh as it is the most detailed dataset we have available.

Table 10 shows the results of a regression between student value added and each of the management measures. As detailed analysis of the relationship between student value added and management is provided in the next chapter of this thesis, we abstract from that discussion and focus instead on the differences in the significance and magnitude differences across coefficients.[13] Each of the three first columns looks at the individual relationship between each of the management process indices and student value added, while column (4) includes all three processes in the same regression and column (5) uses the original WMS aggregate index.

Reassuringly, we see that the overall management measure that is comparable to the original WMS is correlated with student value added, in line with previous results in the literature. Considering the new set of results and turning first to Panel A, we see that each of the processes in general is correlated with student value added, but naturally we expect a high level of correlation between them. Including all three in the regression in Column (4), we see that in terms of overall management it seems it is the usage process that is driving the relationship. That is, conditional on implementation and monitoring processes, one standard deviation higher usage of general management practices is associated with a 0.123 increase in student value added. We expand on what this coefficient means in the context of Indian schools in the next

[13] Chapter 5 gives more detail on the specification used here. In short, it includes all standard controls and follows the literature on student value added.

Table 10: Correlation between management processes and student value added

	Outcome: student value added				
	(1)	(2)	(3)	(4)	(5)
	Panel A: Overall management				
z-management					0.072**
					(0.029)
z-implementation	0.048*			-0.018	
	(0.025)			(0.046)	
z-usage		0.080***		0.123**	
		(0.029)		(0.059)	
z-monitoring			0.051*	-0.031	
			(0.029)	(0.063)	
	Panel B: Operations management				
z-operations					0.047*
					(0.027)
z-implementation	0.052**			0.077	
	(0.024)			(0.050)	
z-usage		0.054**		0.062	
		(0.027)		(0.050)	
z-monitoring			0.029	-0.086	
			(0.025)	(0.055)	
	Panel C: People management				
z-people					0.117***
					(0.034)
z-implementation	0.017			-0.070*	
	(0.031)			(0.039)	
z-usage		0.135***		0.139***	
		(0.036)		(0.050)	
z-monitoring			0.106***	0.073*	
			(0.037)	(0.043)	
# Observations	9278	9278	9278	9278	9278
# Schools	264	264	264	264	264

chapter, but for the purposes of this analysis the interesting comparison is to the overall management measure in Column (5) that suggests a relationship that seems smaller on average — though the two coefficients are not statistically different. Looking at the two sub-indices of management, the operations management overall relationship with student value added is relatively small and marginally significant and it seems to be driven by implementation and usage processes. When including all three in the regression, however, we lose all significance across all coefficients. The relationship in people management is the strongest, and it looks like this is where most of the variation is being explained. Unlike operations, it is the usage and monitoring processes that have the stronger relationship with student value added, and the positive relationship remains when the three variables are included together. Strikingly, the usage process barely changes and remains highly significant. A superficial reading of this relationship could be that, given the context of Indian schools where few people management practices are in place, it is how much schools use and monitor the management practices in place that correlate with better student outcomes. In fact, conditional on levels of usage and monitoring, more implementation could even be counter-productive. Although we should approach these preliminary results with caution, it is clear that there is a promising road to be followed.

4.4 CONCLUSION

Over the past decade the research agenda on the economics of management practices has been moving forward in exciting ways. As development economists, we see and hear about the missed opportunities in our field visits and in hundreds of interviews when it comes to "good management" practices. As suggested in Pritchett [106], management practices are important facet in understanding public service delivery from a systems framework view. This new measurement tool is only the first step, and we are building a training platform that will allow individual research teams to include the full survey or individual modules in their own field work. This will be crucial for building a

large-scale *comparable dataset* and start to uncover how schools across the world are managed, and which levers are more important in which contexts.

We have two main avenues where we plan to take this work. The first is to conduct a more rigorous analysis of identifying the patterns of management processes that are correlated with student outcomes, and also expand these to other important outcomes such as teacher behaviour and value added. We plan to use new methods such as machine learning to tackle these new questions. A second avenue of work is considering theoretically what might be behind this relationship between management and student outcomes. Bloom, Sadun, and Van Reenen [32] develops a model for the manufacturing sector, but the education sector is fraught with issues of interdependent relationships of accountability and deals with different types of workers — such as intrinsically motivated teachers and principals. We hope to use the stylized facts we have learned from this new picture of management across different school systems in different countries to help guide a starting point for a theoretical framework.

4.5 APPENDIX

COLLECTING DATA USING THE DEVELOPMENT WMS In order to collect the data in developing countries, rigorous training on the Development WMS for schools was provided to 15 interviewers in India, 30 interviewers in Colombia, 70 interviewers in Mexico, and training on the Development WMS for hospitals was provided to 40 interviewers in China.

The training consists of thorough explanations of the scoring grid in an interactive environment, and multiple group scoring sessions of mock interviews to correct any inconsistent interpretation of responses and to ensure consistency across interviewers.[14] This one-week training session and subsequent routine data and calibration checks are crucial for data quality, and we have developed a process to standardize both the training and the supervisory follow up.

The Development WMS uses the same open-ended questions used in the original WMS methodology, seeking both comparability and to follow best practices in eliciting truthful responses from respondents. Continuing with the example on the management practice of "Performance Tracking," the interviewer starts by asking the open question "What kind of main indicators do you use to track school performance?", rather than a closed ended question such as "Do you use class-room level test scores indicators [yes/no]." The first question is then usually followed up by further open-ended questions such as "how frequently are these indicators measured?", "Who gets to see this data?" and "If I were to walk through your school what could I tell about how you are doing against your indicators?" Such open-ended questions avoid leading responders towards a particular answer and produce higher quality data. As mentioned above, the interviewer knows the information she is seeking and will continue to ask follow up questions if necessary.

In order to ensure the interviews are consistent within interviewer groups and non-biased, all interviews were "double-scored" and "double-blind," following the WMS methodology but adapting it to face-to-face interviews. Dou-

[14] During the training week for the school survey in India, we also piloted the Development WMS in 5 schools (a mix of private and public) to ensure the detailed questions and scoring grid appropriately captured the information provided during the interview. Travel expenses were generously covered by J-PAL.

ble scored means that the first interviewer was accompanied by a second interviewer whose main role was to monitoring the quality of the interview being conducted by taking notes and separately scoring the responses after the interviews had ended. The first and second interviewers would then discuss their individual scores to correct for any misinterpretation of responses. We mixed pairs of interviewers as much as possible throughout the survey, conditional on geographic limitations. Double-blind means that, at one end, interviewers conducted the face-to-face interview without informing school principals or hospital managers that their answers would be evaluated against a scoring grid.[15] At the other end, our interviewers did not know in advance anything about the school or hospital's performance.

As detailed in Bloom et al. [35], the original WMS is an expensive survey to run and requires highly skilled interviewers to conduct the interviews and consistently score establishment practices. The WMS has primarily employed masters and PhD students from top European and North American universities to conduct the interviews over the past 10 years of the project. With the Development WMS instrument the level of skill of the interviewers is relatively lower considering that the decision of "weighting" the quality of the processes to decide on a single score for each practice is taken away. To be sure, the interviewers still need to be skilled enough to understand the training session and the practices being measured, but in general the new tool allows for greater flexibility in recruitment of interviewers and facilitates local capacity building by hiring from local institutions.

[15] None of the forms used by both the first and the second interviewers contained the detailed scoring grid. The interviewers would score the interviews based on their notes after the interviews had been completed and, therefore, the scoring grid was not shared with the principal.

5

ORGANIZATION IN EDUCATION SYSTEMS: EVIDENCE FROM MANAGEMENT AND PERFORMANCE IN INDIAN SCHOOLS

5.1 INTRODUCTION

As we move from the Millennium Development Goals (MDGs) to the Sustainable Development Goals (SDGs), the focus of the education goals shifted from simple student enrolment in the MDGs to student *learning* in the SDGs. Teachers are pivotal to improving learning outcomes, and have long been garnering increasing attention from academic and policy research across fields. The prolific literature on teacher effectiveness has three key broad findings: first, teacher effects on student outcomes seem to depreciate quickly in the short- and mid-term,[1] but seem to matter for the long-term outcomes – such as employment and earnings.[2] Second, readily observable teacher characteristics such as formal education explain very little of differences in teacher effectiveness.[3] Third, what teachers do in the classroom through student-teacher interactions – such as extra help for struggling students and varying methods of teaching – is strongly correlated with student outcomes in developing countries.[4]

Still, what explains teacher effectiveness remains an open question. In this chapter I seek to contribute to the debate by considering how management practices within a school – particularly across institutional contexts – matter

[1] See, for example, Jackson, Rockoff, and Staiger [79], Jacob et al. [80], and Rothstein [110]

[2] See, for example, Chetty, Friedman, and Rockoff [48] and Chetty et al. [49]. Reviews in Bruns, Filmer, and Patrinos [39], Glewwe and Muralidharan [67], and Kremer, Brannen, and Glennerster [87] and Evans and Popova [60] show that research suggests traditional educational inputs have little impact on test scores but incentivizing teacher effort and supporting specific aspects of pedagogy do have an impact.

[3] See, for example, Hanushek and Rivkin [72], Hanushek and Woessmann [73], and Rivkin, Hanushek, and Kain [108]

[4] See, for example, Araujo et al. [5], Bold et al. [38], and Bruns and Luque [40].

for teacher effectiveness.[5] I look at the case of primary school teachers in the public and private school sub-systems in a large state in India: Andhra Pradesh. I use new survey data from two innovative projects, the Development World Management Survey (D-WMS) and the Andhra Pradesh School Choice (APSC) project. The D-WMS is an extension survey tool developed in Lemos and Scur [92] to fit the context of surveying schools about the quality of their day-to-day management practices in low-capacity settings.[6] The APSC project of Muralidharan and Sundararaman [104] collected five years of rich panel data on schools, students and teachers in Andhra Pradesh. The combination of these two datasets is uniquely suited to explore the relationship between school management and teacher effectiveness: the expanded nature of the D-WMS allows for finer measurement of the management practices used at schools in developing countries, and the detailed panel data afforded by the APSC allows us to observe teacher practices, teacher salaries, and teacher transfers as well estimate student and teacher value added through multiple rounds of panel data collection over 4 years.

I find three sets of results. First, I find that public schools in AP are significantly worse managed than private schools, though this deficit is primarily driven by extremely poor people management. Second, for a set of measures of teacher effort and preparedness that I find to be strongly correlated with student value added, I show that better school management is a strong predictor of these practices. I also show that management is associated with better selection and retention of high value-added teachers in private schools. I find evidence that private schools reward teachers according to outcomes, with higher value added teachers receiving higher salaries. Third, I show there is a strong positive relationship between school management practices and student value added in public schools, but not in private schools. Taken together, these results suggest that higher use of better teacher practices could be a possible channel driving the management and student outcomes relationship in pub-

[5] It is important to note that the survey is not measuring *teacher ability* but *practices*; that is, whether teachers *do certain things* or not. A teacher may well have the ability to do many things, but may choose not to.

[6] The D-WMS extends the original school and hospitals surveys, which are both adaptations of the original Bloom and Van Reenen [30] management survey. See Bloom et al. [37] for the first cross-country results from the schools survey.

lic schools where there are binding institutional constraints in selection and retention of good teachers. On the other hand, in private schools, where selection and incentives of better teachers seem to be already occurring through the labour market forces, small changes in lower-end management practices are second order.

This chapter contributes to three related literatures. First, this paper relates to the voluminous literature on teacher effectiveness in developing countries. Many studies consider the relationship between *student-teacher* interaction and learning through classroom observation data, and find that there is a set of specific practices and behaviours that are conducive to better student learning.[7] I identify the set of teacher practices that are correlated with higher student value added and explore whether I find a correlation between better management at the school level and increased use of these teacher practices.

Second, in the spirit of looking at a school as a complex organization, this chapter contributes to the well-established literature on management and productivity through the relatively younger niche on management and productivity in the public sector. Bloom et al. [37] presents stylized facts from the first project that measured management practices in over 1,800 schools across eight countries using data from the World Management Survey, finding substantial variation in school management practices across countries and a strong correlation between management practices and student outcomes within countries and Lemos and Scur [91] focuses on stylized facts in India. I can push the analysis further in this paper by taking advantage of the detailed student outcomes and teacher characteristics data as is available from the APSC dataset. There are also a series of studies in the US that support the view that "management matters" for student outcomes, for example, Fryer [64], but as the focus of this paper is the development context, I refrain from discussing US results in more detail.[8]

[7] For example, Araujo et al. [5], Bold et al. [38], Bruns and Luque [40], and Muralidharan and Sundararaman [101]. There are also a number of studies that look at types of teacher contracts and effectiveness and find mixed results. For example, Menezes-Filho and Pazello [94], Muralidharan and Sundararaman [102, 103], and Ree et al. [107].

[8] Briefly, Dobbie and Fryer [58] collected detailed data on a sample of 39 New York charter schools and found that practices such as teacher feedback, data-driven instruction and a culture of high expectations were correlated with significantly better student outcomes. Angrist, Pathak, and Walters [3] survey a sample of 36 Massachussets charter schools and find similar

Third, this chapter relates to the emerging literature on education systems. While countries have made substantial progress in achieving near-universal primary school registration, there is still a "learning crisis" across much of the developing world. Glewwe and Muralidharan [67] provide a comprehensive review of the research thus far, and the main takeaway is that there is substantial heterogeneity across contexts in what works, what does not, and why. Pritchett [106] suggests that beyond considering the relationship between individual inputs and student learning, research should move towards an understanding of how the several moving parts of a complex education system work together and lead to the different – and sometimes unexpected – effects of similar interventions across countries.

5.2 THE INDIAN PRIMARY SCHOOL INSTITUTIONAL CONTEXT

Andhra Pradesh (AP) is the fifth largest Indian state, with a population equivalent to that of South Korea (50 million). About three quarters of the population in Andhra Pradesh live in rural areas. AP is an interesting Indian state to study because it is similar to pan-Indian averages on measures of human development and per capita net state domestic product, as well as primary school enrolment, literacy, infant mortality and teacher absenteeism.[9] Public schools here mean schools that are owned and run by the government, and private schools are schools owned and run by private individuals or organizations (for profit and not for profit). In total, it is estimated that approximately 3.2 million children in AP attend public schools and approximately 2.1 million children attend private schools.[10] These private schools are not elite schools found in much of the developed world, but rather they are mostly low-cost schools targeted at children of poor families. Since their explosion in popularity across a number of developing countries, they have attracted much academic and media attention.[11] The Annual Status of Education Report (ASER)

results for urban charter schools on practices such as instructional time, classroom technique and school philosophy, though they mixed results for non-urban charter schools.

[9] Das et al. [54] and Lemos and Scur [91].

[10] 2008 data from Vennam, Komanduri, and Duggani [119].

[11] For example, media coverage: "The $1-a-week school" [116].

reports an increase of 60% in the share of children attending low-cost private schools over 7 years — an increase from about 19% in 2006 to nearly 30% in 2013.[12]

The main feature of these low-cost private schools is that they have substantially lower per-student expenditure when compared to public schools, and one of the main reasons is the striking difference in teacher pay. In our sample, the average teacher monthly salary in public schools is about 12,350 rupees, while the private school teacher salary is about 2,400 rupees.[13] This over five-fold difference is partially due to the nature of the contracts within each type of school; teachers in public schools are civil servants with relatively higher teaching qualifications and lifelong contracts, and teachers in low-cost private schools tend to be "contract teachers" with only annual renewable contracts and lower qualification requirements.[14] Incentives for teacher effort (attendance and performance) in public schools tend to be lacking, with reported teacher absence rates on average over 25% with little to no disciplinary action for offending teachers.[15]

The voluminous literature on low-cost private schools in India finds that, although these schools are targeted at the poor, the students who attend these schools tend to come from relatively less-poor households and have parents who tend to have relatively higher levels of education. [16]. Cross-sectional results have found that children in low-cost private schools tend to outperform the children in public schools, but more rigorous panel analysis accounting for time-use as well as experimental evidence from a school voucher experiment suggest that private schools do not have a value added premium per se in math and local language (Telugu), but that they are able to achieve the same level of grades with lower instructional time and use the additional time to achieve higher value added in English.[17]

[12] Children between 6 and 14 years of age. ASER data available at `http://www.asercentre.org/`. Data cited here from the time close to the APSC survey.

[13] In fact, the average salary of a regular teacher is over four times the income per capita in Andhra Pradesh. Das et al. [54] and Muralidharan and Sundararaman [101]

[14] Das et al. [54] and Muralidharan and Sundararaman [103]

[15] Kremer et al. [88] and Muralidharan and Sundararaman [101].

[16] Muralidharan and Kremer [100], Muralidharan and Sundararaman [104], *The Beautiful Tree: A Personal Journey into How the World's Poorest People are Educating Themselves* [117], and Vennam, Komanduri, and Duggani [119]

[17] Panel analysis using Young Lives data in Singh [112], and experimental evidence from Muralidharan and Sundararaman [104].

Most public schools are quite small, and the reason is that the government considers it a priority to provide children with access to primary schooling within one kilometer from their homes. Public schools in Andhra Pradesh in our sample have on average 65 students and about 3 teachers. Public schools are substantially larger with a over 200 students on average and about 14 teachers. Primary schools cover grades one through five, and classes are not usually separated by subject at the primary school level. In public schools, it is usually one teacher who teaches all subjects within a grade though that is not the case in private schools, where teachers teach their own specialty. Finally, there is a 'no detention' policy in place in the state, where grade promotion is automatic and students advance through school mostly based on age rather than learning outcomes. I describe the summary statistics for our sample of schools in the next section.

5.3 DATA

5.3.1 *Management data: the Development WMS (D-WMS)*

As the previous chapter in this thesis describes the development of this survey tool at length, I will omit a discussion here and move on. The D-WMS data was collected for a random sample of schools in the APSC project sample within five districts from January to May 2013 through face-to-face interviews with school principals. Each interview lasted approximately 1.5 hours and was carried out by two enumerators – a primary interviewer and secondary note-taker – who immediately after the interview reviewed the notes and scored the practices according to the scoring manual. The enumerators passed a one-week intensive training session with the D-WMS team and reported to the APSC project partners in AP with the data they collected.

Recall that the D-WMS measures the level of formality of different management practices within schools and, in general, more formality and procedural clarity leads to higher scores. A score of 3 suggests there are some formal processes in place though with some weaknesses, while a score of 1 suggests

there are no processes of any kind. A score of 2 suggests some processes exist, though they are all informal and heavily dependent on who the head teacher is. That is, if the head teacher was to suddenly leave the school, the incoming administration would not have anything to start from. The average management index spans questions on school operations – such as having key performance indicators and keeping track of them – as well as people management questions. For use in the analysis, the management score is standardized relative to the AP sample, such that the average is 0 and standard deviation is 1. This is the conventional use of this measure in the literature, and it facilitates interpretation. The standard deviation in the full AP sample is 0.30.[18]

In this chapter I use the conventional measure of management by using the averaged measures of the 20 management topics, taking the z-score of each topic, and subsequently building the management, operations and people indices by taking a simple average of those sets of topics. Finally, I take a z-score of each index and use this standardized measure in all the analyses in this chapter.

5.3.2 *School, teacher and student data: the APSC dataset*

The main student-teacher-school data from the APSC project is explained in detail in Muralidharan and Sundararaman [104], and spans the 4 years of the project in AP (2008/09-2011/12). I rely on the panel data characteristic of the APSC data and proxy student learning by student test scores across years. I use the subject-specific test scores from tests administered by the APSC project team for Telugu and Math, and include student characteristics as controls in our specifications, namely the student test score from the previous year as well as the student's gender, caste, religion, whether parents are labourers and whether parents are literate. This data was collected through the student questionnaires and tests. A short description of the student test scores data is replicated here in Appendix 5.6.

[18] As a comparison, the standard deviation in the cross-country WMS sample including 9 countries is 0.64, and for the pan-Indian sample in the original WMS the standard deviation is 0.53.

TEACHER VARIABLES: CONSTRUCTING TEACHER PRACTICES

For teacher characteristics and practices variables I use the data from questionnaires that were administered by enumerators to all teachers in the schools. There were over 20 practices measured by the APSC survey, each of which I correlated with student value added to identify the most effective ones. There were six practices in particular that showed a correlation with student value added in either the public or private sector. I describe each teacher practice and how it is coded below:

(i) Do you prepare a lesson plan before teaching?

(ii) Do you have a copy of the textbook? Do you have a copy of the workbook? (having both = 1)

(iii) How often are the children observed for health/hygiene related habits? (daily=1)

(iv) How much time do you spend in a typical day on each of the following activities? Teaching activity; preparing for classes; correcting homework; maintaining order and discipline; administrative/paper work; breaks during school; getting children to attend school; mid-day meals; extra classes; others. The first variable I use from this set of questions is the amount of time dedicated to teaching divided by the total time reported by the teacher.

(v) I also define a variable as "time on-task": the sum of teaching, preparing for classes, correcting homework and extra classes, and divide this sum by the total time reported.

(vi) Do you get time to provide remedial teaching to the students? The questionnaire also includes questions regarding the shape that the remedial attention takes: taking extra class; paying extra attention in the class itself; paying extra attention outside the class; help children by arranging private tuition; helping children in studies at home; other. If the teacher gives remedial attention, I calculate the average amount of extra time allocated to extra attention in class and assign a value of 1 if the teacher

dedicates *above average time* to this task. I also use information on teacher wages and a set of observable characteristics including age, experience, gender, rank (head teacher, regular teacher, volunteer teacher), education and teacher training.

But how do these practices correlate with student value added? To explore the relationship between the set of teacher practices measured in the APSC survey and student outcomes, I estimate the following relationship:

$$StuScore_{ps,t} = \alpha + \beta TPractice_{jst} + \delta_x^{'}\mathbf{X_j} + \gamma_c^{'}\mathbf{C_{st}} + \theta StuScore_{ps,t-1} + \varepsilon_{jst} \tag{13}$$

where $StuScore_{ps}$ is the student test score for student p at school s in year t and $t-1$. $TPractice_{jst}$ is one of six teacher practices for teacher j in school s in year t measured in the APSC survey. X_j is a vector of teacher characteristic controls (teacher education, teacher training, potential experience, potential experience squared and teacher rank), C_{st} is a vector of school controls in year t (log of school size, year of survey, average student population characteristics). Standard errors are clustered at the school level. The data is organized such that there is one observation per student-teacher-year in the sample.

Table 11 shows the regression results for public and private schools separately in a table of coefficients: each cell represents a separate regression.[19] Columns (1) and (4) show the raw correlation between each practice and student value added for public and private schools respectively. Columns (2) and (5) show the results including school and teacher controls, and columns (3) and (6) include district fixed effects. I classify the two first practices as "teacher preparedness": making lesson plans before classes and having a copy of the textbook and workbook. I classify the next four practices as "teacher effort": checking students' hygiene daily, the share of their workday they spend in teaching only and on teaching activities (teaching, preparing classes, correcting

[19] For the sake of brevity I have omitted all the non-significant results, but they are available upon request.

Table 11: Teacher practices and student outcomes (key coefficients only)

	Public schools			Private schools		
	(1) student test score (endline)	(2) student test score (endline)	(3) student test score (endline)	(4) student test score (endline)	(5) student test score (endline)	(6) student test score (endline)
Makes lesson plans	-0.051	-0.070	-0.060	0.106**	0.112**	0.079*
	(0.084)	(0.089)	(0.096)	(0.052)	(0.050)	(0.044)
Observations	1773	1773	1773	6922	6922	6922
# schools	81	81	81	162	162	162
Has textbook/workbook	0.145*	0.121	0.159*	0.039	0.008	-0.029
	(0.084)	(0.087)	(0.086)	(0.047)	(0.048)	(0.048)
Observations	1773	1773	1773	7012	7012	7012
# schools	81	81	81	162	162	162
Checks hygiene daily	0.198**	0.218**	0.203**	0.062	0.055	0.027
	(0.083)	(0.086)	(0.088)	(0.052)	(0.045)	(0.045)
Observations	1773	1773	1773	6969	6969	6969
# schools	81	81	81	162	162	162
% time teaching	0.729***	0.845***	0.860***	0.179	0.157	0.107
	(0.250)	(0.284)	(0.283)	(0.150)	(0.139)	(0.120)
Observations	1773	1773	1773	7002	7002	7002
# schools	81	81	81	161	161	161
% time on task	1.334***	1.612***	1.589***	0.398**	0.210	0.165
	(0.333)	(0.333)	(0.343)	(0.188)	(0.188)	(0.169)
Observations	1773	1773	1773	7002	7002	7002
# schools	81	81	81	161	161	161
Remedial: extra attention	0.268	0.296**	0.326**	0.194	0.074	0.034
	(0.177)	(0.134)	(0.147)	(0.142)	(0.144)	(0.142)
Observations	1088	1088	1088	4121	4121	4121
# schools	55	55	55	137	137	137
Baseline score	✓	✓	✓	✓	✓	✓
School controls		✓	✓		✓	✓
Teacher controls		✓	✓		✓	✓
District FE			✓			✓
Variable mean	0.049	0.049	0.049	0.497	0.497	0.497
Analysis level:	**Student**	**Student**	**Student**	**Student**	**Student**	**Student**

* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors in parentheses.

Notes: Each cell represents a regression of each individual classroom practice and the outcome variable. All regressions control for baseline test scores, so the interpretation here can be of student value added. The table presents only the coefficient of interest. School controls include: log of school size (number of students), year of survey, subject, student characteristics and class-specific average student characteristics (share female, from scheduled caste, Christian, Muslim, with illiterate parents and with labourer parents). Teacher controls include teacher education, training, and rank. Standard errors clustered by school.

homework and extra classes), and if they dedicate extra attention to remedial students in class.

An initial look at the results shows that the majority of teacher effort and preparedness practices are strongly and positively correlated to student value added in public schools while only one practice seems to have a similar relationship in private schools. Discussing each teacher practice in turn, I start with whether the teachers make lesson plans: there is no significant relationship between this practice and student value added in public schools, but there is a significant relationship in private schools. The coefficients in the private school results that if a student's teacher reports preparing lessons plans prior to class they have 0.08 higher test scores. The average test score for a private school student in our sample is 0.496, so this is an economically substantial relationship. Next, whether the teacher has a copy of the textbook and of the workbook is correlated with higher student value added in public schools but not in private schools. The magnitude of the relationship is striking: 0.187 higher endline test scores if the teacher answers positively to the questions. Similarly, students whose teachers report providing daily hygiene checks have about 0.287 higher test scores in public schools. Neither of these practices have a relationship that is significantly different from zero in private schools. In terms of share of time spent in teaching activities, I consider time only teaching and time on teaching *activities* – or, "on-task". I find a significant correlation in public schools for both variables when I account for school and teacher characteristics, but only find a significant relationship in private schools in the raw correlation for time on-task. Finally, teachers reporting to offer remedial classes does not have a significant relationship with student value added in either school type, though provision of above-average time to paying extra attention in class to remedial students has a significant relationship with student outcomes in public schools. The results are strikingly robust to the inclusion of controls and district fixed effects.

These teacher practices were the only practices out of all measured that showed a correlation with student value added, but of course they could also be correlated with each other, and the effectiveness of any one practice could

also be different to the effectiveness of a bundle of practices. To consider these issues I first check the correlation between practices and report the pairwise correlation in Table 12. The correlation between each pair of practices is not very high for the majority of the practices, with all but one pair of practices scoring about 0.20 and below. The one practice with high correlation is, naturally, the share of time spent teaching and on task since the former includes the latter. The other two sets of practices with relatively higher correlation are makes lesson plans and has a copy of the textbook/workbook, which is also intuitive — teachers who have a copy of the textbook/workbook presumably could find it easier to make lesson plans. having a copy of the textbook/-workbook is also correlated with checking hygiene daily, which in India is a common measure of attention and care for the students.

Table 12: Pairwise correlation between teacher practices - APSC data

	Makes lesson plan	Has textbook & workbook	Checks hygiene daily	share of time teaching	share of time on-task	Remedial time: extra attention
Lesson plans	1					
Textbook/workbook	0.2113	1				
Checks hygiene daily	0.023	0.1848	1			
% time teaching	0.0968	0.0697	0.1514	1		
% time on task	0.0922	0.0762	0.1375	0.7779	1	
Remedial attention	-0.0256	0.0258	0.041	0.0267	0.0062	1

* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors in parentheses.
Notes: This table includes data for 287 schools.

Although their pairwise correlation is not too high, it could be that practices matter as a bundle. To consider this, I add all practices in a multiple regression of the same form as Equation 13, but instead of entering each practice alone I include all at once. I omit share of time teaching from this regression as it is included in the % time on-task variable. Table 13 reports the results of a multiple regression including all the practices that were shown to have a positive correlation with student value added individually in either public or private schools. Column (1) starts with the pooled sample of all schools and reports the raw marginal relationship of each teacher practice with student value added, including a dummy variable control for private school. Columns (2) and (3) add school and teacher controls, though none of the coefficients move much. Columns (4) and (5) show the results for only the sample of public school and

only the sample of private schools, including all controls. Comparing with the results above, the coefficients on makes lesson plans is no longer significant in the pooled sample nor in the private sector sample, where it was significant before. The has textbook/workbook is not significant on average, but it remains significant in the public school sample as it was in the earlier results — though now the coefficient has doubled. The measure of teaching caring, checks hygiene daily, is significant throughout though it seems to be driven by a strong relationship in private schools. The variable that measures the share of time teachers spend on-task is marginally significant in the pooled sample but not in the sub-samples by sector. Finally, remedial attention in class is significant in the pooled sample and in the public school sample, but not in the private school sample.

Table 13: Student value added and teacher practices: multiple regression

	Pooled: all schools			**Public**	**Private**
	(1) student test score (endline)	(2) student test score (endline)	(3) student test score (endline)	(4) student test score (endline)	(5) student test score (endline)
Makes lesson plans	0.043	0.063	0.048	-0.025	0.096
	(0.041)	(0.043)	(0.042)	(0.101)	(0.058)
Has textbook/workbook	0.031	-0.002	-0.010	0.342***	-0.018
	(0.038)	(0.040)	(0.039)	(0.093)	(0.068)
Checks hygiene daily	0.129***	0.101**	0.105***	0.105	0.100**
	(0.043)	(0.040)	(0.040)	(0.091)	(0.043)
% time on task	0.237	0.348*	0.352*	0.718	0.303
	(0.187)	(0.192)	(0.191)	(0.456)	(0.207)
Remedial: extra attention	0.316***	0.196*	0.205*	0.331***	0.159
	(0.105)	(0.118)	(0.115)	(0.112)	(0.129)
Baseline control	✓	✓	✓	✓	✓
Private dummy	✓	✓	✓		
School controls		✓	✓	✓	✓
Teacher controls			✓	✓	✓
Observations	22762	21720	21720	2956	18764
# schools	287	263	263	85	178
R^2	0.166	0.177	0.179	0.211	0.168
Dep. variable mean	0.421	0.421	0.421	0.049	0.497
Analysis level:	**Student**	**Student**	**Student**	**Student**	**Student**

* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors in parentheses.

Notes: All regressions control for baseline test scores, so the interpretation here can be of student value added. School controls include: log of school size (number of students), year of survey, subject, student characteristics and class-specific average student characteristics (share female, from scheduled caste, Christian, Muslim, with illiterate parents and with labourer parents). Teacher controls include teacher education, training, and rank. Standard errors clustered by school.

In all, most of the practices that show a relationship on their own with student value added survive inclusion along with the other practices. To avoid

multiple hypothesis testing when looking at the relationship between management and teacher practices, I build an index of these teacher practices in the same way as the management index was built: by standardizing each measure, taking an average of the practices and standardizing the average. To avoid double-counting, I use only the value of the share of time a teacher spends "on task" and omit the share of time a teacher spends teaching, as the latter is already part of the "on task" measure. For the main analysis in Section 5.4 I use only this teacher practice index.

TEACHER VARIABLES: CONSTRUCTING TEACHER VALUE ADDED

In this chapter I primarily use the detailed student test scores data at the student level, but parts of the analysis will be at the teacher level. For these sections I will use a measure of teacher value added. Value-added models (VAMs) of student achievement have increased in popularity in the past decades, and, with great controversy, have been used by researchers, policy markers and school boards to assess and rank teacher quality. There has been a prolific discussion on how to best calculate teacher value added, a literature that started in the early 1970s with Hanushek [70], and grew substantially since then. Using such value added estimation methods as measures of "teacher quality" is highly controversial, particularly if they are used with the aim of ranking teachers solely on this metric and possibly attaching pay-per-performance schemes to these results.[20] Although this important debate is ongoing, the aim of this paper is not to contribute directly to the discussion of measurement of teacher value added and its merits as a proxy for teacher quality, but rather to understand how better school management practices are related to current available measures of teacher value added as a proxy for labour productivity in the education sector.

[20] Among many parties to this argument, Hanushek [71] advocates for "deselecting" - or, firing - the most ineffective teachers. Gordon, Kane, and Staiger [68] also support measuring teacher effectiveness using teacher value added measures as a key component, though also including subjective evaluations by principals, peers and parents. Rivkin, Hanushek, and Kain [108] suggest that "there is a strong reason to believe that a closer link between rewards and performance would improve the stock of teachers." Naturally concerns such as fairness of the measure, possible measurement error and "teaching to the test" tactics are raised; as in Baker et al. [9] and Corcoran [53].

Notwithstanding the debate on the usage of teacher value added, the recent literature on the *quality of the measure itself* in terms of producing a relatively unbiased estimator of a teacher's causal impact on student *test scores* over the period of a school year is less contentious. In a thorough test of the six most common approaches to measuring teacher value added, Guarino, Reckase, and Wooldridge [69] simulate a dataset of a hypothetical school system and with knowledge of the true parameters of their data, they test the ability of the following models to assess teacher quality: (a) Dynamic OLS (DOLS); (b) Arellano and Bond Approach; (c) Pooled OLS on the gain score; (d) Average Residual (AR) approach; (e) Fixed Effects on the gain score; (f) Empirical Bayes and related estimators. They carefully describe the assumptions implied in each method, and how they could be violated in practice. They suggest that if I consider that violations of the assumptions will invariably happen given the "real world" data generating mechanisms, which estimator performs best becomes an empirical question. They put this to the test and conclude that the DOLS method is best among the six studied methods, with AR also performing well but inferior to DOLS in some settings.[21]

The DOLS model is expected to control for a student's ability and previous inputs through the lagged test score, but teacher effects are assumed to be constant over time. It is also computationally challenging to estimate and not as efficient as methods such as the Empirical Bayes methods used by Chetty, Friedman, and Rockoff [47] and Kane and Staiger [82]. In a more recent paper, Chetty, Friedman, and Rockoff [47] expand the model by allowing teacher quality to vary across time. Using data from a large urban school district in the US, they show that "value-added models that control for a student's prior-year test scores provide unbiased forecasts of teachers' causal impacts on student achievement." This model was subsequently used in replication exercises by Rothstein [111] using data from North Carolina and Kane, Staiger, and Bacher-Hicks [83] using data from Los Angeles.[22]

[21] Singh [112] uses the DOLS method in his context using the Young Lives dataset also from Andhra Pradesh.

[22] Although Rothstein [111] argues that there are issues with the methodology, Chetty et al. post responses and further analysis to refute the claims. Raj Chetty's website for this project, http://www.rajchetty.com/chettyfiles/value$_a$dded.htm, hasalltheworkingpapersandresponses.

In this chapter, my preferred specifications will use the method by Chetty, Friedman, and Rockoff [47], but I provide comparison tables with the AR and DOLS methods as well to reassure the reader the coefficients are not substantially different, though we gain efficiency in using this method.

I rely on the panel data characteristic of the data to employ teacher value added models in building the key dependent variable. To be clear, I use teacher value added in the sense that Kane and Staiger [82] suggest: rather than looking at teacher value added with the goal of estimating the underlying education production function that requires large, detailed datasets and strong assumptions,[23] I will more simply use the measure as one that helps in assessing the "average difference" a teacher made on the test score results of the students in her class throughout the year she was teaching them.[24] In particular, I explore the how school management within public and private schools affect student test scores through their effect on teacher value added in primary schools in Andhra Pradesh.

For the sake of clarity, I reproduce here the essence of the statistical model underlying the teacher value added model from Chetty, Friedman, and Rockoff [47] in Equation 14. It shows how the authors suggest estimating teacher value added to extract the teacher effect, μ_{jt} from a panel of student-level data. $A_{i(t)}$ and $A_{i(t-1)}$ are the standardized end-of-year test score for student i in years t and $t-1$. Controlling for students' prior year test scores (or, lagged test scores) captures "most of the sorting of students to teachers that is relevant for future test achievement."[25] Further, there is some consensus in the literature that including a student's prior test scores is the best proxy available for the cumulative learning and other characteristics (such as parent's input and individual motivation) up to the point where the "new" teacher is matched with the student.[26] I describe the APSC data tests in detail in Appendix 5.6, but in short the test scores are subject-specific test scores administered by the APSC project team for English, Telugu, Science and social studies and Hindi. As only Math and Telugu tests are administered in all the primary school grades

[23] See Todd and Wolpin [118]
[24] Kane and Staiger [82]
[25] Chetty, Friedman, and Rockoff [47]
[26] For example, Guarino, Reckase, and Wooldridge [69]

(1 through 5 in Andhra Pradesh) I primarily use these two subjects but also include some results using the additional subjects. The vector X_{it} includes student and classroom characteristics as controls, namely gender, caste, religion, whether parents are labourers and whether parents are literate. Each student can be matched to a teacher, year, class and subject.

$$\begin{aligned} A_{i(t)} &= \alpha A_{i(t-1)} + \beta X_{it} + \quad \nu_{it} \\ &\text{where} \quad \nu_{it} = \mu_{jt} + \theta_c + \varepsilon_{it} \end{aligned} \tag{14}$$

where the residual term ν_{ijt} is expressed by Chetty, Friedman, and Rockoff [47] as a composite of teacher value added (μ_{jt}), exogenous class shocks (θ_c) and idiosyncratic student-level variation (ε_{it}).[27] The individual "teacher effect" is not assumed to be fixed over time but rather is allowed to fluctuate stochastically over time. They do not place restrictions on the stochastic process except that they must follow a stationary process.[28]

In short, Chetty, Friedman, and Rockoff [47] predict each teacher's value added in a school year based on the mean test scores of students she taught in other (prior and later) years. However, their innovation is that they allow teacher quality to vary over years by essentially regressing student scores in year t on the average scores in other years, "allowing the coefficients to vary across different lags." They then estimate the autocovariance of scores across classrooms taught by each teacher non-parametrically and use that information to account for "drift" in teacher quality.

[27] Chetty, Friedman, and Rockoff [47] note that their approach is similar to Kane and Staiger [82], except that it accounts for drift. In Kane and Staiger [82], the authors use "the student residuals ν to form empirical Bayes estimates of each teacher's value added." Essentially, this approach uses the noisy estimate of teacher value added multiplied by an estimate of its reliability, that is, the mean residual multiplied by ratio of (signal)-variance to (signal + noise)-variance. In a simulation exercise, however, Guarino, Reckase, and Wooldridge [69] found that empirical Bayes estimates were not the most reliable estimators among the six most common studied. Another common approach is to treat two of the components of ν_{it}, namely the teacher and classroom effects as fixed effects, for example, as in Gordon, Kane, and Staiger [68], Rockoff [109].

[28] As Chetty, Friedman, and Rockoff [47] explain, it thus requires an assumption that mean teacher quality does not vary across calendar years and that the correlation of teacher quality, class shocks and student shocks across pairs of years depends only on the time elapsed between the years. Formally: $\mathbb{E}[\mu_{jt}|t] = \mathbb{E}[\varepsilon it] = 0$, $\mathrm{Cov}(\mu_{jt}, \mu_{j(t+s)}) = \sigma_{\mu s}$, $\mathrm{Cov}(\varepsilon_{it}, \varepsilon_{i(t+s)}) = \sigma_{\varepsilon s}$ $\forall t$.

They construct the estimator in three steps: The first is to run the regression in Equation 14 to recover the residuals, ν_{ijt}. They use variation across students taught by the same teacher, which is a departure from previous techniques that used both within-teacher and between-teacher variation. The second step is to estimate mean test score residuals in classrooms in year t based on mean test score residuals in prior years. If we let the mean residual test score in the class teacher j teaches in year t be $\overline{A}_{jt} = \frac{1}{n}\Sigma_{i\in\{i:j(i,t)=j\}}\nu_{it}$, and $\mathbf{A}_j^{-t} = (\overline{A}_{j1}, ..., \overline{a}_{j(t-1)})'$ is the vector of mean residual scores prior to year t in classes taught by teacher j, then a regression of $\overline{A}_{jt}$ on $\mathbf{A}_j^{-t}$ results in a set of coefficients that are the best linear predictors of $\overline{A}_{jt}$ based on prior scores.[29] The third step is using the coefficients recovered from the "best linear predictor" to predict the teachers' value added for year t, using a leave-year-out approach.

Their results using US data suggest that a 1 standard deviation improvement in teacher quality leads to higher test scores of approximately 0.14 SD for maths and 0.1 SD in English. In their measure, they scale teacher value added such that "the average teacher has value added $\mu_{jt} = 0$ and the effect of a 1 unit increase in teacher value added on end-of-year test scores is 1."[30] It is this methodology that I use to calculate teacher value added in the context of the data available for this paper.[31]

I have opted to use Chetty, Friedman, and Rockoff [47] as the measure of teacher value added for this chapter, but have also checked the main results using Chetty, Friedman, and Rockoff [47]'s measure, the DOLS method, and the average residual (AR) method and include the results in Figure 28 and Table 14. The figure shows the raw relationship between the different value added measures and overall management, and it is clear that although there is a level difference between the DOLS method and the Chetty and AR methods, the slopes of the linear relationships seem similar. Looking at the coefficients in Table 14, the DOLS and AR methods have very similar coefficients to the

[29] I mention the OLS equivalent here for ease of exposition, but the technique used by Chetty, Friedman, and Rockoff [47] is analogous to the OLS regression method and describe it in detail in their paper.
[30] Chetty, Friedman, and Rockoff [47]
[31] To implement their method I used the accompanying Stata command `vam`.

Chetty VA method, though they are much less efficient and are estimated with larger standard errors.

Figure 28: Graphical difference between three measures teacher value added

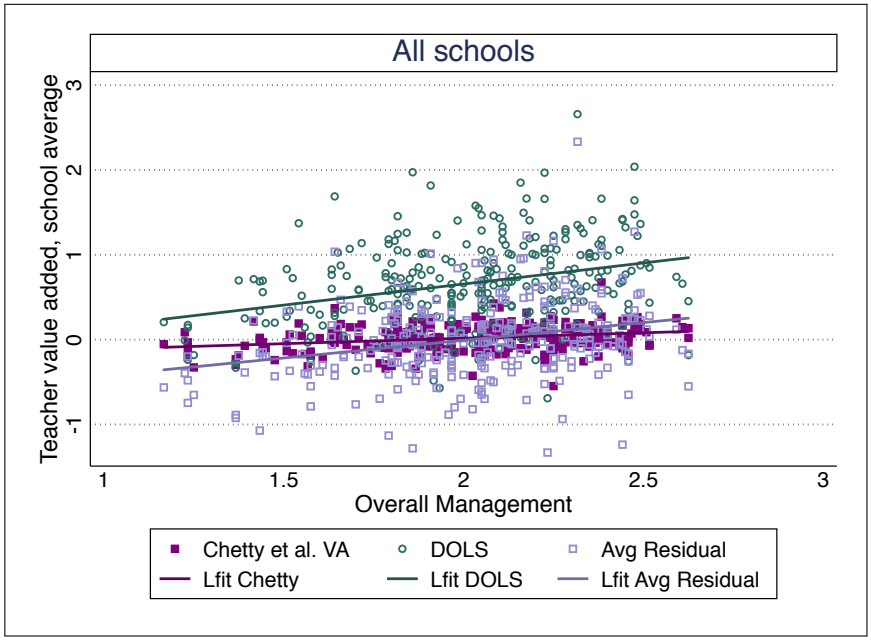


Table 14: Differences between three ways of computing teacher value added

	All schools, pooled								
Dependent variable: Teacher value added (by method)	(1) Chetty	(2) Chetty	(3) Chetty	(4) DOLS	(5) DOLS	(6) DOLS	(7) AR	(8) AR	(9) AR
z-management	0.026**			0.029			0.025		
	(0.011)			(0.025)			(0.023)		
z-operations		0.022**			0.025			0.021	
		(0.010)			(0.022)			(0.021)	
z-people			0.036**			0.038			0.040
			(0.016)			(0.038)			(0.036)
School controls	✓	✓	✓	✓	✓	✓	✓	✓	✓
Student controls	✓	✓	✓	✓	✓	✓	✓	✓	✓
# Observations	1583	1583	1583	1583	1583	1583	1583	1583	1583
# Schools	286	286	286	286	286	286	286	286	286
R^2	0.082	0.081	0.078	0.473	0.473	0.473	0.064	0.064	0.064

* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors in parentheses.

TEACHER VARIABLES: CONSTRUCTING SELECTION AND RETENTION

For exploring teacher selection and retention, I use a set of questions collected during enumerator visits that measure each teacher's transfer status:

(i) whether they were at the school in the beginning of the year and are still currently at the school;

(ii) whether they were in the school in the beginning of the year but have since left;

(iii) whether they were not in the school at the beginning of the year but were transferred in during the school year.

I use this data along with the teacher value added measures to build a "good HR outcome" indicator. In short, for each school an HR outcome is considered good when a high value added teacher is retained in the school (transfer status i), or transferred into the school (transfer status iii), or when a low value added teacher is transferred out of the school (transfer status ii).

Using the teacher value added measure also described in the Data section, I rank teachers within each school in three different ways and construct a dummy variable to identify: (a) the teachers with value added above and below *the school mean* and (b) the teachers with value added above and below *the school median*. For each ranking I then construct a measure of "good HR outcome" that takes a value of 1 when:

- a high value added teacher is retained in the school,
- a high value added teacher is transferred into the school,
- a low value added teacher is transferred out of the school.

The variable takes a value of 0 otherwise. For this analysis I use the sample from years 1 and 2 as in years 3 and 4 only a sample of schools were re-visited.

5.4 EMPIRICAL RESULTS: MANAGEMENT, STUDENT VALUE ADDED AND TEACHERS

In this chapter, I investigate whether better school management practices can improve student outcomes via better teacher preparedness, teacher effort, and high-value-added teacher retention. I go beyond the general correlation of management and student value added and use our detailed data to make a first attempt at tackling the black box of the management technology in the school setting and understand how management practices interacts with the work of teachers and the composition of teachers within the school.

5.4.1 *Key differences between public and private schools*

Public and private schools in AP are quite different from each other, so I will focus on the *within-system* variation rather than *between-system* variation. Muralidharan and Sundararaman [104] notes that the amount of instructional time used by teachers across school types in this dataset are significantly and substantially different across different subjects. Private school teachers spend on average 204 and 161 less minutes per week on Telugu and Math respectively, with more time on English, Social Studies, Science and Hindi. This has implications for our analysis, as it suggests I should not be pooling data for public and private schools to be analysed together, but rather I should conduct separate analyses for both types of schools. Otherwise I would be incorrectly comparing teacher value added across schools that spend different amounts of time in each subject. As the dataset only includes hours spent in each subject for a small sample of schools, I cannot calculate "per unit of teacher hour" measures to account for this difference. Thus, I will separate the samples of private and public schools to conduct a within-school-type analysis rather than across-school-types looking to mitigate this issue.

Table 15 shows the difference in means between public and private schools for school, teacher and principal variables. Public schools tend to be substantially smaller than private schools in terms of number of students, number of teachers, and student-teacher ratio. The medium of instruction in public schools is strictly Telugu, while only 43% of the private schools have Telugu as the medium of instruction – English is the alternative medium of instruction for private schools. The class composition across public and private schools is also mostly significantly different, with public schools having significantly higher shares of female students, students from scheduled castes, Christian students, and students whose parents are both labourers. The share of Muslim students across school types is not significantly different, and the share of students where both parents are literate is higher in private schools than public

Table 15: Public and private schools are starkly different on observables

	Private	Public	Mean Difference	SD Private	SD Public	Public N	Private N
School Characteristics							
Number of students	212.86	64.77	148.09***	135.61	39.45	107	182
Number of teachers	13.80	3.39	10.41***	8.09	4.35	107	182
Student-teacher ratio	16.24	21.61	-5.37***	6.61	7.38	107	181
Medium of instruction: telugu	0.43	1.00	-0.57***	0.48	0.00	107	182
School Infrastructure							
Average school infrastructure index	1.96	0.91	1.05***	2.96	2.02	107	182
– available water	1.00	0.97	0.03	0.03	0.15	107	182
– functional toilet	0.94	0.75	0.20***	0.22	0.39	107	182
– functional girls toilet	0.88	0.53	0.35***	0.31	0.49	107	182
– functional electricity	0.95	0.74	0.21***	0.21	0.41	107	182
– functional computers	0.62	0.02	0.60***	0.48	0.13	107	182
– functional library	0.90	1.00	-0.10***	0.28	0.00	107	182
– functional radio	0.31	0.80	-0.49***	0.46	0.34	107	182
Student Characteristics							
% Female students	0.46	0.54	-0.08**	0.20	0.25	103	165
% students from Scheduled Caste	0.17	0.40	-0.23***	0.21	0.37	103	165
% Muslim students	0.11	0.07	0.04	0.20	0.16	107	182
% Christian students	0.03	0.09	-0.06**	0.08	0.20	107	182
% students with both parents literate	0.68	0.53	0.14***	0.26	0.35	107	182
% students with both parents as laborers	0.25	0.48	-0.24***	0.24	0.34	107	182
Average Household Asset Index	3.62	3.20	0.42***	0.59	0.65	106	167
Endline score (school average)	0.39	0.03	0.36***	0.43	0.45	107	182
Teacher Wages							
Monthly wage (000 Rs)	2.47	12.35	-9.89***	3.18	6.21	255	989
Teacher Characteristics							
Male	0.24	0.44	-0.21***	0.42	0.50	284	997
Age	27.90	37.70	-9.80***	8.09	8.43	284	998
Teaching experience	5.49	12.66	-7.17***	6.23	7.27	283	995
Years of education	14.63	15.81	-1.19***	2.25	1.93	284	992
–Matriculation	0.06	0.02	0.05***	0.24	0.13	284	998
–Higher secondary	0.28	0.14	0.14***	0.44	0.34	284	998
–College or Masters degree	0.65	0.84	-0.19***	0.47	0.36	284	998
Completed teacher training	0.33	0.93	-0.61***	0.46	0.24	284	998
Teacher teaches all subjects = 1	0.12	0.79	-0.67***	0.32	0.37	284	998
Teacher practices							
Teacher prepares lesson plan = 1	0.44	0.69	-0.24***	0.48	0.45	284	996
Teacher has textbook/workbook = 1	0.38	0.37	0.02	0.47	0.47	284	998
Teacher observes hygiene daily = 1	0.51	0.76	-0.25***	0.49	0.41	284	995
Share of time used on teaching	0.55	0.57	-0.01	0.15	0.14	284	996
Share of time used on teaching activities	0.74	0.70	0.03***	0.12	0.10	284	996
Remedial action: + attention in class = 1	0.03	0.07	-0.03	0.17	0.24	171	668
Principal characteristics							
Principal age	40.62	43.46	-2.84***	7.73	7.23	284	991
Principal gender (male = 1)	0.81	0.69	0.12***	0.39	0.46	284	998
Principal tenure in school	10.05	5.08	4.97***	6.79	3.91	284	998

* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors in parentheses.

schools. In terms of school infrastructure, the average index for public schools is slightly lower – though significantly so – than for private schools.[32]

Next I consider differences between teachers. It is clear that teachers in public and private schools as quite different from each other on observable characteristics. Public school teachers are paid over five times more in the public schools, [33] tend to be about 9.5 years older and have about 1.2 years more education. Teachers in public schools thus have about 8.3 more years of potential experience (measured as age minus years in education) and nearly 7 years more teaching experience (years of reported actual teaching experience measured by the survey). Public schools teachers are about twice as likely to be male, and much more likely to teach all subjects rather than specialise.

Looking at the teacher practices measured by the APSC survey that I will study, we see that public school teachers are more likely to prepare lesson plans, and check children's hygiene daily. They also tend to spend a slightly higher share of their work day teaching, but slightly less on more general teaching *activities* (including correcting homework, preparing for class and dedicating time for extra classes). Teachers in public schools are as likely to have a copy of the textbook/workbook as their private school counterparts, and as likely to give attention to remedial students in-class.[34] Finally, the principals across the two school types are significantly difference across age, gender and tenure. Public school principals are about 3 years older, on average, are slightly less likely to be male and tend to have half as long a tenure in the school as private school principals (5 vs 10 years).

Focusing next on the new measures of management practices, Table 16 shows the difference in means across each of the 20 management topics mea-

[32] The school infrastructure index is a sum of four binary-outcome questions on whether the school has available drinking water, functioning toilets, electricity and a functioning library.

[33] For ease of exposition I have presented the monthly wage in thousands of Rupees.

[34] Muralidharan and Sundararaman [104] note that the amount of instructional time used by teachers across school types in this dataset are significantly and substantially different across different subjects. Private school teachers spend on average 204 and 161 less minutes per week on Telugu and Math respectively, with more time on English, Social Studies, Science and Hindi. This has implications for our analysis, as it suggests I should not be pooling data for public and private schools to be analysed together, but rather I should conduct separate analyses for both types of schools. Otherwise I would be incorrectly comparing teacher value added across schools that spend different amounts of time in each subject. As the dataset only includes hours spent in each subject for a small sample of schools, I cannot calculate "per unit of teacher hour" measures to account for this difference. I leave a more detailed description of the variables and distributions across school types in the Appendix.

sured in the D-WMS. It is immediately obvious that private schools are better managed than public schools across the majority of individual management practices. In terms of "operations" measures, private schools are better on average as well as in most of the components of the index. Private schools are no better at adopting education best practices – the practice that measures how well schools support the ability of teachers to discover the latest teaching methods and diffuse them across the school via teacher meetings and collaboration. Private schools are not significantly different from public schools in performance tracking and review of performance, but are mildly worse at performance dialogue. These three practices measure how well key performance indicators in the school are tracked and reviewed. Finally, although private schools tend to have a better variety of school targets, the interconnection of the targets across the organization is as well – or poorly – done as in public schools. They also have similar time horizons, and tend to be as non-binding in terms of difficulty. The targets do tend to be slightly clearer in private schools, however.

Table 16: Public and private schools have different management scores

	Private	Public	Mean Diff	SD Private	SD Public	Private N	Public N
OVERALL MANAGEMENT INDEX	2.15	1.81	0.34***	0.26	0.25	182	107
Operations average index	2.15	2.04	0.11**	0.28	0.31	182	107
Standardisation of instructional processes	2.20	1.86	0.34***	0.42	0.33	182	107
Data driven planning and student transition	2.06	1.93	0.13**	0.38	0.34	182	107
Personalization of instruction and learning	2.24	1.98	0.26***	0.39	0.34	182	107
Adopting educational best practices	2.10	2.21	-0.11	0.42	0.63	182	107
Continuous Improvement	2.15	1.89	0.26***	0.36	0.44	182	107
Performance Tracking	2.31	2.24	0.07	0.47	0.44	182	107
Review of Performance	2.38	2.45	-0.07	0.47	0.55	182	107
Performance Dialogue	2.12	2.23	-0.11*	0.36	0.38	182	107
Consequence Management	2.23	2.05	0.18**	0.48	0.42	182	107
Type of Targets	2.03	1.87	0.16***	0.43	0.34	182	107
Interconnection of Goals	2.18	2.11	0.08	0.50	0.53	182	107
Time Horizon	2.22	2.09	0.13	0.47	0.61	182	107
Goals are Stretching	1.91	1.91	0.00	0.35	0.48	182	107
Clarity of Goals	1.99	1.73	0.27***	0.37	0.39	182	107
People average index	2.13	1.26	0.87***	0.25	0.18	182	107
Instilling a talent mindset	2.47	1.14	1.33***	0.42	0.28	182	107
Incentives and Appraisals	2.00	1.51	0.48***	0.39	0.37	182	107
Making room for Talent	2.31	1.31	1.00***	0.40	0.27	182	107
Developing Talent	2.08	1.41	0.67***	0.45	0.35	182	107
Distinctive Employee Value	1.96	1.05	0.91***	0.36	0.16	182	107
Retaining Talent	1.96	1.13	0.83***	0.31	0.18	182	107

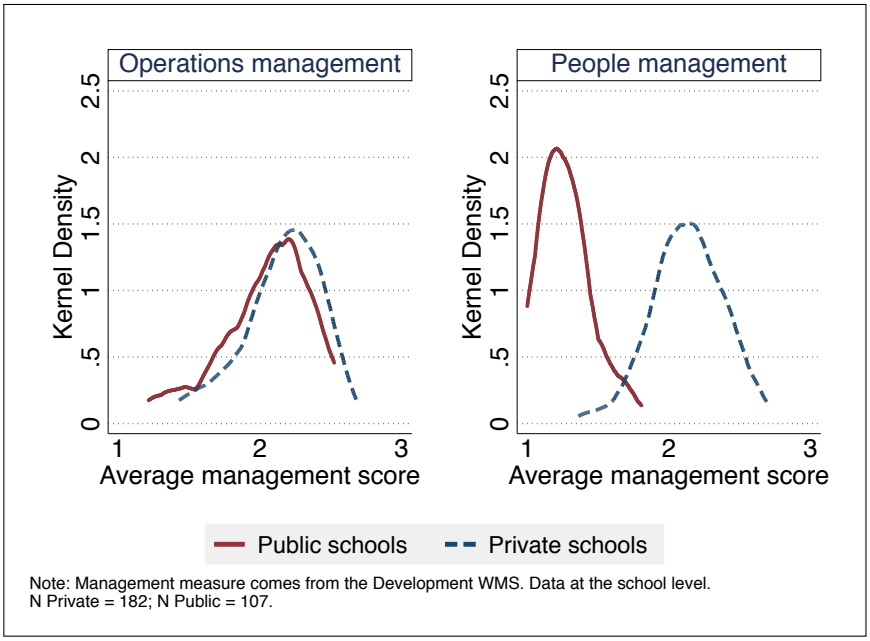
* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors in parentheses.

Finally, people management is certainly where the largest private school advantage lies, with a difference of 0.87 — well over two standard deviations above the mean. Figure 29 shows the stark difference between the distributions of public and private schools across an average of the overall operations (lean operations, monitoring and targets) and people management indices. All individual practices are significantly and substantially better in private schools, mostly notably the practice on instilling a talent mindset – measuring whether the organization values high performers and how well leaders show this, and the practice on making room for talent – measuring whether poor performers can be identified and poor performance addressed, are at an advantage by a full point or more on the management scale. Although some of the difference can be accounted for by the tighter institutional constraints faced by public schools, many of the practices measured are not *de facto* bound by such rules. For example, there may be institutional constraints in terms of hiring and firing teachers, but they do not prevent the principal from identifying the high and low performing teachers using a transparent set of criteria and putting steps in place to address poor performance and somehow reward good performance. Even if the rewards are non-financial – such as a "gold star" or certificate of achievement, it could that in settings where employees have higher levels of intrinsic motivation such rewards are also effective incentives. This is the first detailed picture of the internal workings of public and private schools in a developing country, and it is critical to understand where the improvement opportunities exist.

5.4.2 *What explains student value added?*

The best previous analysis showing the relationship between management and student outcomes across countries is in Bloom et al. [37], though the cross-sectional nature of the data for India did not allow for a value added interpretation of the results. With the more detailed data available from the APSC project this can now be done, and I take the analysis a step further by includ-

Figure 29: Distribution of operations and people management in AP



ing a battery of controls and discussing the contribution of each set of controls to explaining the differences in student value added. I estimate the following relationship:

$$SScore_{ps,t} = \alpha + \beta MM_s + \delta' \mathbf{X_p} + \gamma' \mathbf{C_{s,t}} + \theta_b SScore_{ps,t-1} + \eta_d + \varepsilon_{ps,t} \quad (15)$$

where $SScore_{ps}$ is the student test score for student p at school s at time t and $t-1$, MM_s is the z-score of each management index, X_j is a set of teacher characteristic controls (formal education, teacher-specific training and teacher rank), C_{st} is a set of school controls in year t (log of school size, year of survey, average student population characteristics). Standard errors are clustered at the school level.

Table 17 shows the detailed OLS results for the relationship between student value added and the main measures of management quality, and the summary relationship is shown in Figure 30. Column (1) shows the raw correlation between management and student value added, and each successive column adds a set of controls for student characteristics and teacher characteristics. Columns (4) and (5) report the results for the preferred specification using the sub-indices of management — operations management and people

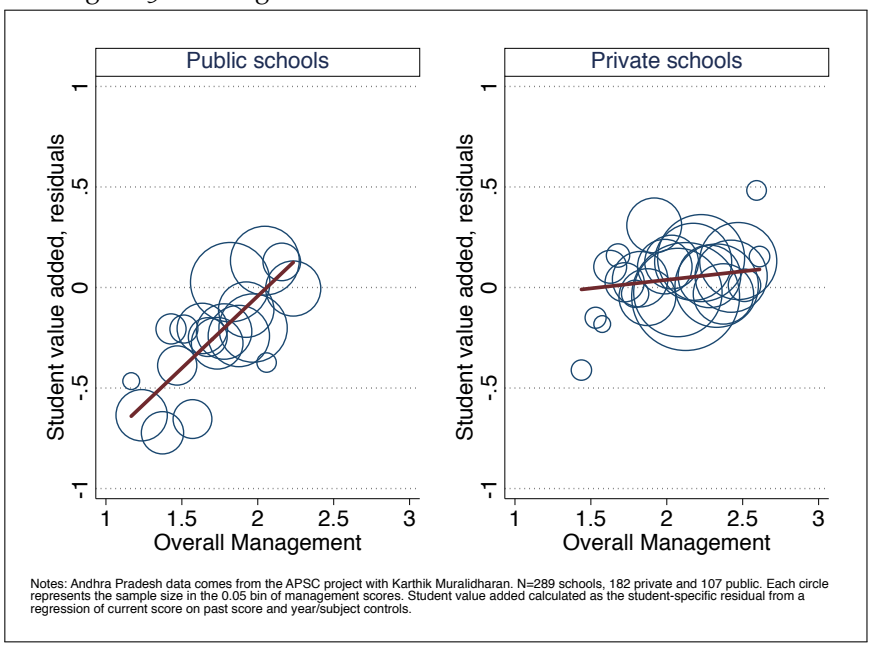
Table 17: Management is correlated with student value added

	All schools, pooled						Public	Private
	(1) endline test score	(2) endline test score	(3) endline test score	(4) endline test score	(5) endline test score	(6) endline test score	(7) endline test score	(8) endline test score
Management scores								
z-management	0.053**	0.050*	0.053*					
	(0.026)	(0.027)	(0.028)					
z-operations				0.040		0.008	0.101**	-0.055
				(0.025)		(0.033)	(0.045)	(0.040)
z-people					0.103**	0.094*	0.092	0.127*
					(0.041)	(0.056)	(0.107)	(0.066)
School characteristics								
private	0.201***	0.202***	0.146*	0.181**	0.024	0.035		
	(0.053)	(0.062)	(0.078)	(0.077)	(0.096)	(0.110)		
Ln (# students)		-0.016	-0.019	-0.017	-0.020	-0.020	0.030	-0.015
		(0.035)	(0.035)	(0.035)	(0.035)	(0.035)	(0.058)	(0.043)
Student characteristics								
Female = 1		0.025	0.024	0.024	0.026	0.025	0.020	0.031
		(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.048)	(0.028)
Scheduled caste = 1		-0.065*	-0.065*	-0.064*	-0.064*	-0.065*	-0.093	-0.044
		(0.036)	(0.035)	(0.036)	(0.035)	(0.036)	(0.074)	(0.037)
Minority religion = 1		-0.041	-0.040	-0.040	-0.039	-0.039	-0.122	-0.019
		(0.046)	(0.046)	(0.046)	(0.046)	(0.045)	(0.093)	(0.054)
Parents are literate =1		0.087***	0.087***	0.088***	0.086***	0.085***	0.065	0.084**
		(0.032)	(0.032)	(0.032)	(0.032)	(0.032)	(0.060)	(0.037)
Parents are labourers = 1		-0.063**	-0.061**	-0.063**	-0.058**	-0.058**	0.011	-0.080**
		(0.029)	(0.029)	(0.029)	(0.028)	(0.028)	(0.053)	(0.033)
Teacher characteristics								
Teacher degree = 1			-0.005	-0.004	-0.003	-0.004	0.040	-0.017
			(0.058)	(0.058)	(0.056)	(0.056)	(0.086)	(0.061)
Teacher training = 1			-0.047	-0.047	-0.044	-0.045	0.173	-0.070
			(0.054)	(0.055)	(0.053)	(0.053)	(0.145)	(0.053)
Potential experience			0.002	0.002	0.003	0.003	0.004	0.004
			(0.007)	(0.007)	(0.007)	(0.007)	(0.014)	(0.008)
Potential exp squared			-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Baseline score	✓	✓	✓	✓	✓	✓	✓	✓
Observations	9278	9278	9278	9278	9278	9278	2362	6916
# schools	264	264	264	264	264	264	103	161
R^2	0.223	0.228	0.230	0.230	0.231	0.231	0.249	0.190
Variable mean	0.42	0.42	0.42	0.42	0.42	0.42	0.05	0.50
P-value of F-test: student ch		0.00	0.00	0.00	0.00	0.00	0.43	0.00
P-value of F-test: teacher ch			0.70	0.69	0.73	0.72	0.70	0.41
Analysis level:	**Student**	**Student**	**Student**	**Student**	**Student**	**Student**	**Student**	**Student**

* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors in parentheses.

management — and column (6) includes both sub-indices together. Columns (7) and (8) reproduce the same specification for the public and private school samples separately.

Figure 30: Management is correlated with student value added



Starting with Column (1), the relationship between management and student value added is positive and significant, suggesting that one standard deviation better management is correlated with 0.053 increase in student value added (the average student endline test score is 0.42). As controls for student characteristics and teacher characteristics are added, the coefficient on management barely moves. A series of student characteristics are correlated with student value added and have the expected signs: negative correlations with being from a scheduled caste and having labourer parents, and a positive correlation with having literate parents. Student characteristics are jointly significant while teacher characteristics are not, a result that confirms what has been found elsewhere in the literature.[35]

Columns (4) and (5) show the relationship between each of the sub-indices of management and value added, and suggest that the relationship is being driven by people management. Column (6) includes both sub-indices and con-

[35]Muralidharan and Sundararaman [104] and Singh [112].

firms that the conditional correlation of management and value added is significant for people management but not operations management. Columns (7) and (8) break the sample into public and private schools only, and an interesting pattern emerges. For public schools, the conditional correlation between management and value added comes through the operations sub-index, while the opposite is true for private schools. This is intuitive as the people management channel is shut down in the public sector as schools have no control over much of their people management policy, and indeed have extremely low scores in people management. Private schools, on the other hand, would have a relative advantage in people management as they are unconstrained in what they can do. In fact, the private school premium is absorbed almost entirely by the people management variable in Columns (5) and (6). I return to this argument in the later sections and show further evidence of this pattern. Before doing so, I will turn to a discussion of why, conceptually, we might expect management to matter for student outcomes in schools.

5.4.3 *Mechanisms: looking into the black box of management*

WHY WOULD MANAGEMENT MATTER IN PUBLIC AND PRIVATE SCHOOLS?

There are myriad ways that better management could affect the student learning environment and therefore student achievement. I will focus this discussion on how better management may affect student achievement by helping teachers teach more effectively. Although the WMS (and here, the D-WMS) is the first project to systematically measure the quality of management practices in schools across countries, the concept that school management practices are important for student achievement has been explored empirically in the literature elsewhere as well. For example, Dobbie and Fryer [58] show evidence from a small sample of New York City schools that sets of practices such as frequent teacher feedback and data-driven instruction - both practices which are measured by the WMS/D-WMS - as well as increased instructional time via high dosage tutoring and a culture of high expectations account for nearly 50% of the variation in student outcome in NYC charter schools. Fryer [64],

in turn, shows experimental evidence of the impact of such practices in low-performing schools in Texas. As this is still new research territory, much of the hypotheses on "what works" have come from industry specialists, qualitative interviews with principals and observational research.[36]

Notwithstanding the lack of a formal theoretical framework, the existing empirical and qualitative evidence can help in developing a framework to guide our analysis. The WMS/D-WMS measures two broad areas of managerial practices: operations management and people management. In the presence of a well-functioning labour market and the absence of institutional constraints, the survey suggests that management can improve teacher effectiveness in several ways, including (1) gathering data on students and sharing with teachers to inform lesson plans, target students and tailor methods; (2) creating accountability between teachers and parents/students despite a lack of formal contract between them; (3) attracting, hiring, incentivizing and retaining the best teachers in the school and moving the poor performing teachers out of critical roles.

In the context of the operations management index, the first set of topics measure the extent to which the school gathers data on students and shares with teachers to inform lesson plans, to target problem students and tailor teaching methods. These practices are similar to those examined in Dobbie and Fryer [58] and Fryer [64], and it is intuitive that information about students could enhance teacher performance by helping teachers understand where students' current achievement stands and how they can best help them progress during their school year. The second set of topics within operations — monitoring management — measures the processes in place that allow principals to keep track of how students (and teachers) are doing, and in turn how the school as a whole is moving ahead towards year-end goals of the academic year. Having processes that organise standard meeting schedules and effectively-run meetings[37] should, on average, improve school performance. The third set of topics within operations — target management — measures whether the school sets effective and reasonable targets. Effectively set targets

[36] For example, the original WMS school-specific questions were developed based on advice from a large consultancy company and interviews with school principals in the UK and the US, and the experiments in Fryer [64] were developed based on evidence of charter school effectiveness in Dobbie and Fryer [58].

[37] Such as having set agendas, no time wasting or delays, finding the root cause of problems.

that are reasonable to achieve yet require hard work can motivate teachers to exert effort, particularly if the targets are linked to an incentive structure (financial or non-financial).

In the context of the people management index, the set of topics measure the quality of the processes that the school has for hiring and keeping the best teachers as well as re-allocating the poor performing teachers to less critical roles. Hoffman, Kahn, and Li [74] have shown evidence that if organisations (in their case, firms) rely on open managerial discretion rather than "hard metrics," hiring outcomes are systematically worse. Studying the healthcare sector, Ashraf, Bandiera, and Lee [6] show that career incentives affect performance of newly hired health workers in Zambia, suggesting that the largest portion of the gap in performance is not to do with selection on observables but rather 91% is due to unobservables. They conclude that their results "highlight the importance of incentive design at the recruitment stage as a tool to improve performance in organisations." Although points on recruitment apply less generally to public schools, considering the hard institutional constraints they face, they are quite salient for the private school system. In both systems, however, the existence of formal managerial structures and processes should allow for greater transparency on what is expected out of the teaching staff, how rewards and handed out, and what happens if underperformance is detected.

In all, there are several ways that better organisational structures such as the management practices described above can affect student achievement. The remainder of this section will shed some light on different aspects of the above discussion by exploiting the detailed data from APSC in three main ways. First, I will focus on teacher quality as measured by teacher value added, and consider what personnel policies — such as hiring, firing and retaining teachers — look like in public and private schools. I explore two aspects of the teacher labour market and how they relate to value added and management quality in schools: (i) selection and retention, and (ii) value-added consistent compensation. Secondly, I will use the teacher practices data to consider the relationship between management and the types of practices teachers use in the classroom.

5.4.3.1 *Teacher selection and retention: evidence from teacher transfers*

The APSC survey includes a question on the transfer status of teachers, as described in the Data section of this chapter, and I use this data to look at patterns of teacher selection and retention. I estimate the following relationship:

$$\text{HROutcome}_{js} = \alpha + \beta_j MM_s + \delta'_{j1} X_j + \delta'_{j2} size_s + \varepsilon_{jst} \quad (16)$$

where HROutcome_{jst} is defined as above, for teacher j in school s. MM_s is the z-score of management, X_j is a set of teacher characteristic controls (education, teacher training, potential experience and potential experience squared), $size_s$ is the log of school size. Standard errors are clustered at the school level.

Table 18: Management and high value added teachers: selection and retention

	Public schools		**Private schools**	
	(1) good HR outcome =1 (mean)	(2) good HR outcome =1 (median)	(3) good HR outcome =1 (mean)	(4) good HR outcome =1 (median)
z-management	-0.043	-0.043	0.054***	0.038***
	(0.029)	(0.029)	(0.010)	(0.007)
School controls	✓	✓	✓	✓
Teacher controls	✓	✓	✓	✓
# Teachers	125	125	376	376
# Schools	88	88	164	164
Analysis level:	**Teacher**	**Teacher**	**Teacher**	**Teacher**

* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors in parentheses.

Notes: z-management is the standardized measure of management. Teacher value added is estimated using the method in Chetty, Friedman, and Rockoff [47]. School controls includes school size (log of number of students). Teacher controls are: teacher education, teacher training, potential experience, potential experience squared and and rank. Standard errors clustered by school.

Table 18 shows the results of this analysis. As expected considering the tight institutional constraints, public schools show no significant results in any of the specifications. I thus focus the discussion on private schools. Column (3) suggests that one standard deviation better management practices is associated with a 5.4% higher probability of having a high value added teacher transferred in or remain in the school for private schools. Column (4) repeats the exercise but classifies a high value added teacher as a teacher whose value

added is above the median rather than the mean within a school. The coefficient is somewhat smaller at 3.8%, but qualitatively the result that better managed schools are better able to achieve "good HR outcomes" as I have defined here is robust to a different specification of good outcome.

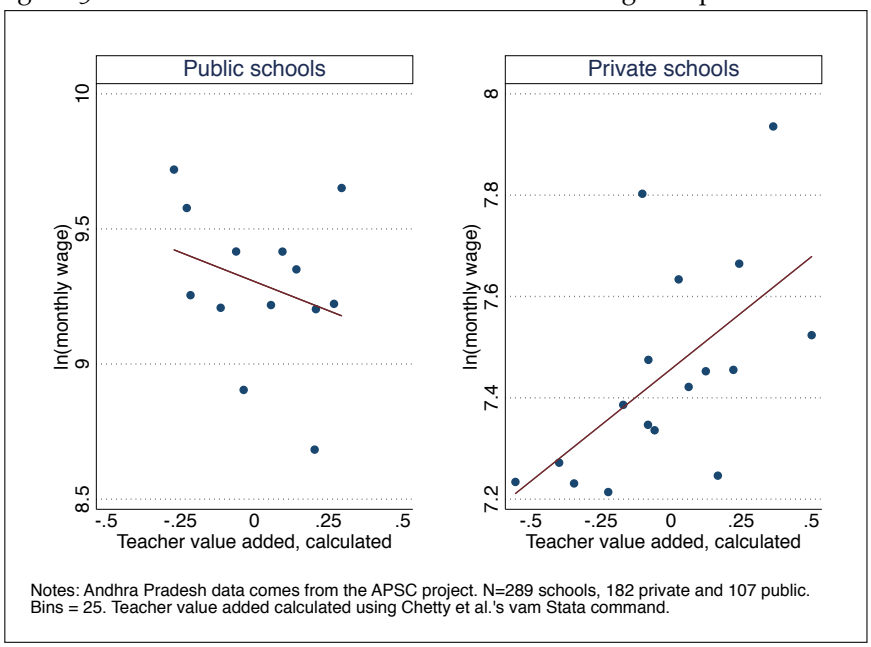
5.4.3.2 *Teacher performance related compensation: evidence from teacher wages*

To explore whether schools compensate teachers according to their quality, I used the data on teacher wages from the APSC and the constructed teacher value added measure. I run the following specification to explore the relationship between teacher wages, management and teacher value added:

$$LnWages_{jst} = \alpha + \beta TVA_j + \delta_0 MGMT_s + \delta_1' \mathbf{X_{jt}} + \delta_2' \mathbf{S_{st}} + \eta_t + \varepsilon_{jst} \quad (17)$$

where $LnWages_{jst}$ is the log of wages of each teacher j in school s at time t. X_j is a set of teacher characteristic controls (education, teacher training, potential experience and potential experience squared) and S_s is the set of school controls (school size and infrastructure). Standard errors are clustered at the school level.

Figure 31: Teacher value added is correlated with wages in private schools



Notes: Andhra Pradesh data comes from the APSC project. N=289 schools, 182 private and 107 public. Bins = 25. Teacher value added calculated using Chetty et al.'s vam Stata command.

Table 19: Teacher value added and wages

	Public					Private				
	(1) ln(wages)	(2) ln(wages)	(3) ln(wages)	(4) ln(wages)	(5) ln(wages)	(6) ln(wages)	(7) ln(wages)	(8) ln(wages)	(9) ln(wages)	(10) ln(wages)
Teacher value added	-0.077	-0.234	-0.242	-0.247	-0.216	0.293**	0.234**	0.209*	0.206*	0.226**
	(0.355)	(0.159)	(0.159)	(0.159)	(0.160)	(0.131)	(0.105)	(0.106)	(0.106)	(0.105)
z-management			0.007					0.042		
			(0.031)					(0.031)		
z-operations				0.011					0.041	
				(0.025)					(0.027)	
z-people					-0.041					0.031
					(0.080)					(0.056)
Degree = 1		0.087	0.085	0.084	0.089		0.368***	0.356***	0.355***	0.364***
		(0.090)	(0.091)	(0.091)	(0.091)		(0.038)	(0.040)	(0.040)	(0.039)
Teacher training =1		0.391***	0.390***	0.389***	0.394***		0.245***	0.240***	0.240***	0.243***
		(0.086)	(0.086)	(0.086)	(0.087)		(0.046)	(0.045)	(0.045)	(0.045)
Potential experience		0.034**	0.034**	0.034**	0.033**		0.017***	0.017***	0.017***	0.017***
		(0.014)	(0.014)	(0.014)	(0.014)		(0.006)	(0.006)	(0.006)	(0.006)
Other teacher controls		✓	✓	✓	✓		✓	✓	✓	✓
School controls		✓	✓	✓	✓		✓	✓	✓	✓
# Teachers	247	247	247	247	247	786	780	780	780	780
# Schools	103	103	103	103	103	181	180	180	180	180
R^2	0.000221	0.751	0.751	0.751	0.751	0.00699	0.314	0.316	0.317	0.314
Variable mean	9.214	9.214	9.214	9.214	9.214	7.528	7.528	7.528	7.528	7.528
Variable mean (levels, Rs)	12446	12446	12446	12446	12446	2530	2530	2530	2530	2530

* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors in parentheses.

Notes: z-management is the standardized measure of management. Controls for school size, year, subject, private status, and student controls (female dummy, scheduled caste, religion, parents literacy and labourer status, household infrastructure index). Noise controls are D-WMS survey noise controls such as analyst dummies and interview date. Standard errors clustered by school.

Table 19 and Figure 31 show the results. There is no relationship between teacher quality – as measured by value added – and wages in public schools. In private schools, the coefficient is positive and significant. Experience and training are positively and significantly correlated with wages in both public and private schools, even when we control for other teacher characteristics (such as gender), school size and district fixed effects. Management, however, is not significantly correlated with wages conditional on the other covariates. This is intuitive: if the private school premium can be mostly explained by the people management measure — which measures the ability of schools to deal with good and bad teachers — this analysis is evidence of what they *actually do* beyond reporting that they do it. That is, the survey measures the extent to which principals report that they carry out practices such as rewarding teachers based on performance, and the relationship presented here reassures us that they do indeed do so. To the extent that this regression is already considering the dynamic measured by the D-WMS survey, it is intuitive that it would not explain any more of the variation in wages than what is already picked up by teacher value added.

5.4.3.3 *Teacher practices: evidence from classroom observations*

I first explored the aspect of the labour market for teachers, looking at how management was correlated with selection, retention and rewards of teachers. It is clear that this is a channel primarily present in private schools, and conspicuously absent from public schools. This is consistent with the fact that public schools are constrained in the types of people management policies that they can enact, while private schools are free to carry them out as they see fit. Beyond possibly affecting the stock of teachers within a particular school, however, management can also affect student outcomes through the promotion of better teacher practices given the current stock of teachers in a school. I explore this next, by using the data on effective teacher practices as described in the Data section of this chapter.

To explore the relationship between each of the teacher practices I measure and school management, I run the following specification:

$$\text{TPractice}_{st} = \alpha + \beta_j MM_s + \delta'_{j1}\mathbf{X_j} + \delta'_{j2}\mathbf{C_{st}} + \varepsilon_{jst} \tag{18}$$

where TPractice_{st} is the index of teacher practices of six classroom practices I study for teachers in school s in year t measured in the APSC survey. MM_s is the z-score of each management index, X_j is a set of average teacher characteristic controls (education, teacher training, potential experience, potential experience squared and teacher rank), C_{st} is a set of school controls in year t (school size, year of survey, average student population characteristics). Standard errors are clustered at the school level.

Table 20 shows the summary table of the relationship between the teacher practices index and the management indices for public and private schools. The table only shows the coefficients of each regression. Columns (1) and (4) show the raw correlation of each management index and the teacher practice index, while columns (2) and (5) and (3) and (6) add school and teacher controls respectively. The coefficient in Column (1) suggests that one standard deviation better overall management is associated with 0.355 standard deviation better teacher practices in public schools. The relationship is 0.283 and 0.573 for operations management and people management respectively. Including school controls (such as school size) and teacher characteristics does not change the relationship.

In private schools, the relationship is existent albeit much weaker. There is a marginally significant relationship suggesting that a one standard deviation improvement in management is associated with 0.108 standard deviation improvement in teacher practices. The relationship is similar for operations and only slightly higher for people management at 0.096 and 0.141 respectively. One way to interpret these results is that, once a school has managed to attract and retain the best teachers, micromanaging the types of practices used is second order. In institutionally constrained public schools, however, the data suggests that management quality is correlated with teachers using more effec-

Table 20: Teacher practices and management (key coefficients only)

	Public schools			Private schools		
	(1) teacher practice index	(2) teacher practice index	(3) teacher practice index	(4) teacher practice index	(5) teacher practice index	(6) teacher practice index
z-management	0.355***	0.343***	0.343***	0.139**	0.108*	0.108*
	(0.081)	(0.084)	(0.084)	(0.061)	(0.058)	(0.058)
z-operations	0.283***	0.272***	0.272***	0.127**	0.096*	0.096*
	(0.067)	(0.069)	(0.069)	(0.057)	(0.054)	(0.054)
z-people	0.573***	0.581***	0.564***	0.168*	0.184**	0.141*
	(0.174)	(0.172)	(0.166)	(0.088)	(0.086)	(0.083)
School controls		✓	✓		✓	✓
Teacher controls			✓			✓
Observations	472	472	472	797	788	788
# schools	107	107	107	180	178	178
Analysis level:	**Teacher**	**Teacher**	**Teacher**	**Teacher**	**Teacher**	**Teacher**

* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors in parentheses.

Notes: Each cell represents a regression of the teacher practices index and the outcome variable. All regressions control for baseline test scores, so the interpretation here can be of student value added. The table presents only the coefficient of interest. School controls include: log of school size (number of students), year of survey, subject, student characteristics and class-specific average student characteristics (share female, from scheduled caste, Christian, Muslim, with illiterate parents and with labourer parents). Teacher controls include teacher education, training, and rank. Standard errors clustered by school.

tive practices and this is possibly one of the channels behind the relationship between management and student value added.

5.5 CONCLUSION

Teachers are one of the most important factors in the education production function, and how to attract, retain and nurture the best teachers is a crucial area of research in education policy. In economics, despite the general preference of examining problems through the production function framework, there is a push towards considering multiple factors in an education system rather than marginal effects of one input on one output. One important component of education systems is the management structures within a school and how these affect the functioning of these complex organizations, which is where this chapter places a contribution.[38]

In this chapter, I consider how management practices within a school may affect teacher selection and retention, teacher rewards and teacher practices. I look at the case of teachers in a large Indian state, using a new matched dataset including micro-data on student, teacher and school characteristics

[38] In policy, for example, new theories of reform look at teachers as actors rather than simply inputs. Bruns and Schneider [41]

and finely-measured management practices within schools. I are able to provide the first detailed look at the inner organizational structures of public and private schools in a low-capacity setting, and identify the critical points of improvement opportunities. I also provide the first evidence on the relationship between management and student value added in this setting, and more importantly, on potential channels that might be driving this relationship.

Recall that the D-WMS measures the level of formality of different management practices within schools and, in general, more formality and procedural clarity leads to higher scores (and presumably also to better outcomes). A score of 3 suggests there are some formal processes in place though with some weaknesses, while a score of 1 suggests there are no processes of any kind. A score of 2 suggests some processes exist, though they are all informal and heavily dependent on who the head teacher is. That is, if the head teacher was to suddenly leave the school, the incoming administration would not have anything to start from. The average management index spans questions on school operations – such as having key performance indicators and keeping track of them – as well as people management questions.

Consider two types of channels that may influence the aggregate level of teacher quality in a school: (a) selection and retention of the best teachers and (b) how much effort and how well prepared the currently-employed teachers are in the school. While private schools are able to act along both channels of influence, public schools face binding institutional constraints that effective shut down the second channel. The first key finding from this study is that there are stark differences across public and private schools in quality of management, and indeed the difference is primarily driven by much worse people management in public schools. The first key finding is that schools in AP generally have poor quality of management and rely primarily on informal practices with very few more formal and transparent processes. The second key finding is that in settings where schools are not able to act on the selection/retention channel – such as public schools – the first channel of good use of current teachers becomes much more important. In this context, our results suggest that even small improvements in management quality have a strong positive

relationship with student value added. An example of such changes would be to simply start using the data collected on student attendance and test performance to inform lesson plans and school targets. The third key finding is that, in contrast, in settings where schools are able to use the selection/retention channel – such as private schools, changes in management at this level supporting the first channel become second order. I find that better managed private schools are better able to select and retain better teachers, and I also find evidence of rewards systems being implemented – higher value added teachers tend to earn higher salaries in private schools.

In all, governments spend a substantial amount of public funds seeking to improve educational outcomes. In this chapter I study several ways that better management practices can influence student outcomes. When compared to other policy-actionable items, however, investment in improving managerial practices has a major advantage of being of relatively low capital intensity with potentially high returns – at least in the public sector. Improving management practices at this level is essentially a re-organization (or, often in this case, a simple organization in first place) of processes and how things are run . At higher levels it involves small capital investments such as the purchase of new computers and IT systems, but still nowhere near the amount required for overhauling funding for teachers, for example. Although the capacity building involved in implementing managerial improvements can, of course, be substantial,[39] it needn't be so for the public sector in developing countries. The type of intervention that would improve management in this setting is so basic that a concerted effort from ministries or NGOs could have a meaningful effect.

This is only the first step in a incipient but fast-growing research agenda. More thought needs to be given to the theoretical foundations of where we expect management practices and management processes to have an impact, and why. Exploring the determinants of management itself, such as size, competition and leadership characteristics of the principals, but in developing countries is also a further avenue, especially considering the interesting results from

[39] High-end consulting companies charge thousands for their expertise, and one academic experiment using managerial practices as the treatment reportedly cost around US$250,000 per firm at the "research cost."

this initial exercise. Finally, delving into wages and regional labour market characteristics would also be an interesting point of study.

5.6 APPENDIX

MEASUREMENT IN APSC DATA This section explains how the student achievement (test scores) data from the APSC project was collected. I will omit quotes for ease of exposition, but this is a collection of excerpts from a series of papers using this data including Muralidharan and Sundararaman [102–104].

Student test scores data comes from annual in-school assessments administered by the Azim Premji Foundation. Students were tested on math and language (English and Telugu) in all grades, and also tested on science and social studies in grades 3-5. Science and social studies are tested only from grade 3 onwards because they are introduced in the curriculum only in the third grade. The tests were unplanned and would not be announced until a few days prior to the test in the first year, but in the subsequent years schools knew the schedule of the tests. Tests were designed to include both "mechanical" questions resembling the types of questions one would see in a textbook, as well as "conceptual" questions testing a similar underlying idea but in different ways to test a deeper understanding of the concept.

Primary school in Andhra Pradesh covers grades 1 through 5. The school year runs from mid-June to mid-April, and the baseline test in the first year of the APSC project was conducted in June-July 2005. Five subsequent rounds of tests were conducted at the end of each academic year, starting March-April 2006 and ending in March-April 2010. Each of these rounds of testing featured two days of testing, typically two weeks apart. Math and language were tested on both days, and the first test (called the "lower end line" or LEL) covered competencies up to that of the previous school year, while the second test (called the "higher end line" or HEL) covered materials from the current school year's syllabus. Doing two rounds of testing at the end of each year allows for the inclusion of more materials across years of testing, reduces the impact of

measurement errors specific to the day of the test, and also reduces sample attrition due to student absence on the day of the test.

In the APSC dataset *Year 0* refers to the baseline tests in June-July 2005, *Year 1* refers to the tests conducted at the end of the first year of the program in March-April, 2006, and so on with *Year 5* referring to the tests conducted at the end of the fifth year of the program in March-April, 2010. Muralidharan and Sundararaman [104] normalized scores in year 0 relative to the distribution of scores across all schools for the same test (pretreatment), while scores in subsequent years are normalized with respect to the score distribution in the control schools for the same test. Student test scores on each round (LEL and HEL), which are conducted two weeks apart, are first normalized relative to the score distribution in the control schools on that test, and then averaged across the 2 rounds to create the normalized test score for each student at each point in time. Thus, a student can be absent on one testing day and still be included in the analysis without bias because the included score would have been normalized relative to the distribution of all control school students on the same test that the student took. Since cohorts 5-9 (those who enter the project in grade 1 in years 1 through 5 respectively) did not have a baseline test, Muralidharan and Sundararaman [104] set the normalized baseline score to zero for the students in these cohorts.

Tests in Telugu (native language of AP and the medium of instruction in public schools), math, and English were conducted at the end of two and four years, while additional tests in social studies (EVS) and Hindi were administered at the end of four years. All subjects except Hindi were administered as written tests, whereas the Hindi tests were administered individually to students by enumerators. The written tests were administered to the full set of students who had applied for the voucher in Muralidharan and Sundararaman [104]'s experiment, and a representative sample of students who had either not applied or who were in the private schools at the start of the project. The Hindi tests were more expensive to conduct and were administered to a representative sample of the students who applied for the voucher. Field enumerators made extensive efforts to keep track of all students who were in the frame of

the study at the beginning, but some attrition was unavoidable. The two-year attrition rate was 10% and 15% in the treatment and control groups of their experiment respectively, and the four-year attrition rate was 15% and 19% in the two groups. Most of the attrition is due to students who had migrated and could not be found, as opposed to students still attending schools but not present for testing. The initial tests at the end of two years of the project were conducted in schools, but had high attrition rates (around 40%). This was followed by an intense effort by enumerators to track down all the students who had applied for the voucher and conduct an additional round of testing in each village outside school hours. This was conducted in November 2010 (around a third of the way into the third year of the program), and so the test score results corresponding to two years as described in the text are based on tests conducted around 2.33 years into the program. A similar protocol was followed for testing after four years. Test scores are normalized relative to the distribution of the public school students in the control villages from Muralidharan and Sundararaman [104]'s experiment. The reason behind this would be to normalize relative to a group of students that would represent the "business as usual" distribution of test scores.

Part III

CONCLUSION

6

CONCLUSION AND FURTHER AVENUES OF RESEARCH

The age of big data, access to administrative datasets and measuring the "previously unmeasurable" opens several new avenues of exciting research. In this thesis I have explored one such aspect using a set of innovative datasets, particularly ones that measure the quality of management in establishments across industries and countries. I have focused on manufacturing firms and schools — two types of establishments that may be starkly different in a number of ways, but in the context of organizational economics are also quite similar.

In the first two chapters I have argued that family firms are one of the most important types of firms in the world, yet receive relatively less attention in research. That is likely to be due to the difficulty in accessing good quality data for these firms. With my colleagues, I collected a new dataset that includes ownership and control information, as well as a measure of management quality for a set of countries in Latin American and Southern Europe. In the first core chapter I show causal evidence of the negative relationship between a succession of control to a family CEO (instead of a professional CEO) and quality of management. I suggest that this poorer management could be one of the channels driving the average financial underperformance of family firms observed in the literature. This was a first step, and there are a number of potential extensions to this project. A replication of Bennedsen et al. [16] using data from the Ownership Survey merged with the Brazilian industrial survey and employer-employee matched data, for example. We can also characterize further who the CEOs of family firms are in Latin American countries, and expand this research to other developing regions such as Africa and Asia. Looking beyond firm performance, new data on work-life balance and other labour outcomes also allows us to look beyond the financial performance of firms and into possible alternative objective functions of family CEOs.

In the second core chapter I develop a theoretical framework to consider one possible reason behind the poorer management of family firms: larger firm reputation costs that arise as a result of implicit contracts with the workforce. The model suggests a set of testable implications which could be possible with further data collection. Exploring these mechanisms further is an exciting avenue of research, particularly as more details about the workforce and the CEOs themselves become available in administrative datasets and other "big data" alternatives. The model itself can be extended by, for example, making it dynamic and allowing for employee sorting between periods. Investment in monitoring could be continuous, such that CEOs can choose a particular level of management rather than simply "yes" or "no". This setting could also allow family firm workers to have different intrinsic motivation, opening the analysis to consider how different levels of monitoring might interact with this motivation. For example, perhaps there is a level of monitoring that is acceptable and promotes effort, but too much may crowd out intrinsic motivation in family firms.

In the second two chapters I detailed the expansion of the WMS into the Development WMS, aimed at schools in developing countries. The third core chapter details the new information that can be learned with the D-WMS tool, and how it may apply to policy setting. In the fourth core chapter I use it extensively to explore whether management can help explain the private school premium in Indian schools. I find that private schools are significantly better than public schools in people management, and seem to effectively use the main personnel policy tools at their disposal: matching salaries with teacher value added as well as selecting and retaining high value added teachers in schools. Public schools, constrained by institutional rigidities, are as good as private schools in operations management and gain substantially more at the margin from a focus on teacher classroom activities. This is also an exciting avenue of research, particularly focusing on labour market dynamics and management.

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