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Management Practices and Firm Performance: Evidence from Portugal

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MANAGEMENT PRACTICES AND FIRM PERFORMANCE:
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Abstract

Understanding what factors determine firm performance has been a long-standing subject of interest, and management practices have been recognised as one of the key determinants. Despite evidence showing that Portugal presents lower management scores compared to other countries, research exploring this association in the Portuguese context is still lacking. This study aims to address that gap by exploring the factors that influence the adoption of structured management practices, and examining whether practices related to Monitoring, Targets, and Incentives are associated with better firm performance, particularly productivity. To achieve this, data from the *Inquérito às Práticas de Gestão* collected by the Instituto Nacional de Estatística is used to create a composite management score derived from survey questions and inspired by the *World Management Survey* methodology. The survey data is complemented with information from the administrative databases *Quadros de Pessoal*, a matched employer-employee database, and *Sistema de Contas Integrado das Empresas*. Firms in the sample have an average management score of 0.44, which is relatively low by international standards. Moreover, scores related to Incentives practices are substantially lower than those related to Monitoring and Targets. Firm characteristics such as ownership structure, firm size, and market share, as well as workforce characteristics, namely education, are associated with differences in management scores. In terms of performance, the results show a strong positive association between higher management scores and firm productivity, with a one standard deviation increase in the standardized score being associated with a 4.39% increase in productivity per employee. This positive association also holds for other performance measures, including return on capital employed and profit margin. The results are robust across different subsamples, particularly among firms in the manufacturing industry, the most common industry explored in other studies, and those with more than 100 employees.

Keywords: Management Practices; Firm Performance; Matched Employer-Employee Dataset; Portuguese Firms.

Resumo

Compreender os fatores que influenciam o desempenho das empresas tem sido uma temática de grande relevância. Entre os diversos determinantes identificados, as práticas de gestão têm-se destacado como particularmente relevantes. Apesar de Portugal apresentar pontuações mais baixas quanto à adoção de determinadas práticas face a outros países, estudos que exploram esta relação neste contexto permanecem escassos. Assim, o presente estudo visa responder a esta lacuna investigando que fatores contribuem para a adoção de práticas de gestão nas áreas de monitorização, definição de objetivos e incentivos, e explorando se estas estão associadas a um melhor desempenho das empresas portuguesas, em particular ao nível da produtividade. Para tal, são utilizados dados do Inquérito às Práticas de Gestão, recolhidos pelo *Instituto Nacional de Estatística*, para construir um indicador composto de gestão, baseado em questões do inquérito e inspirado na metodologia do *World Management Survey*. Estes dados são complementados com informação proveniente das bases de dados administrativas *Quadros de Pessoal* e *Sistema de Contas Integrado das Empresas*. As empresas da amostra apresentam uma pontuação média de 0.44, posicionando-se abaixo de outros países. Destaca-se ainda que as práticas de Incentivos registam pontuações significativamente mais baixas do que as restantes dimensões. Características como a estrutura de propriedade, dimensão da empresa, quota de mercado e o nível de educação dos trabalhadores mostram-se influentes na adoção de melhores práticas. Relativamente ao desempenho, verifica-se uma associação positiva entre maior adoção destas práticas e produtividade, verificando-se que um aumento de um desvio padrão no indicador estandardizado está associado a um aumento de 4,39% na produtividade por trabalhador. Esta associação mantém-se para outras métricas, nomeadamente o retorno sobre o capital investido e a margem de lucro. Os resultados são também robustos em diferentes subamostras, incluindo o setor da indústria transformadora e empresas com mais de 100 trabalhadores.

Palavras-chave: Práticas de Gestão; Desempenho Empresarial; Quadros de Pessoal; Empresas Portuguesas.

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1. Introduction

The question of which factors determine and influence firm performance is not new. Many have been the determinants identified, and management practices have emerged as one of them. The amount of research conducted over the past years associating management practices and firm performance has seen an increase, and a positive relationship has been identified (e.g., Bender et al., 2018; Bloom et al., 2013, 2017, 2019, 2024; Bloom & Van Reenen, 2007, 2010; Cornwell et al., 2021). Indeed, the management and organisational literature has long acknowledged the value of capable management in driving organisational success and supporting economic growth (Huselid, 1995).

The development of comprehensive structured management frameworks, as the one developed by Bloom and Van Reenen (2007), has received increased attention from academics, and many studies have been conducted using this framework to address the effects that management practices may have on firm performance (Baltrunaite et al., 2023; Bender et al., 2018; Cornwell et al., 2021; Feng & Valero, 2020; Heyman et al., 2019; Jirjahn et al., 2024; Lamorgese et al., 2024). On this note, and when comparing to other countries, Portugal has been noted for its relatively low management scores (Bloom et al., 2014, 2017, 2024; Bloom & Van Reenen, 2010), but, up to the author's knowledge, no other research that explores the relationship between management practices adoption and firm performance in the Portuguese context has been found. Nevertheless, the literature provides solid evidence to support that well-structured management practices are pivotal for attaining superior firm performance and sustaining long-term competitiveness (Gibbons & Henderson, 2013).

To bridge the gap mentioned, this dissertation aims to explore the association between management practices and firm performance within the Portuguese context. Specifically, this study sets out to achieve two objectives: (i) to identify the key drivers and factors that shape the

adoption of management practices in Portuguese firms, and (ii) to explore how the adoption of these practices affects firm performance. In particular, understanding how the adoption of better management practices can help Portuguese firms improve their performance may be pivotal in enhancing the country's efforts to improve its economic performance. Indeed, this study can provide valuable information by identifying the key drivers behind the adoption of such practices, which can guide initiatives and policies to foster a more competitive economy. This is particularly relevant given that, in recent years, Portugal has consistently recorded below-average values regarding Gross Domestic Product per capita in Purchasing Power Standards, when compared to other European Union countries, suggesting that lower living standards, less economic productivity, or fewer available resources per person may be present (Eurostat, 2025).

To do so, this study builds upon the study by Monteiro and Straume (2024), which explores the association between management practices and worker pay, using data from 2016, from the *Inquérito às Práticas de Gestão* (IPG), provided by Instituto Nacional de Estatística (INE). For the present study, the objective is to explore the relationship with firm performance, instead, and add the 2022 wave of the survey. To complement the information on management practices with labour outcomes and firm characteristics of Portuguese firms, data from the administrative databases *Quadros de Pessoal* (QP) and *Sistema de Contas Integrado das Empresas* (SCIE) will be also used.

This research follows the management practices definition provided by Bloom et al. (2019). The authors' proposed measure focuses on three main areas: Monitoring, Targets, and Incentives. These management practices are of interest as they significantly influence organisational outcomes, including productivity, profitability, and growth (e.g., Bender et al., 2018; Bloom et al., 2014, 2019; Bloom & Van Reenen, 2007, 2010; Cornwell et al., 2021; Heyman et al., 2019; Lamorgese et al., 2024). In line with the framework developed by Bloom et al. (2019) and with Monteiro and Straume (2024), the calculated average management score of the firms in the sample presents the value of 0.44, which is relatively low when compared to some other countries in other similar studies. Additionally, the Targets category presents the highest average management score, while the Incentives category presents the lowest average score.

This study contributes with some key insights. Firstly, it provides evidence on some key drivers for the adoption of these practices. In particular, foreign ownership, human capital, namely workforce education, firm size, and market share are positively associated with the adoption of structured management practices, even when controlling for other influential variables and including time, industry, and regional dummies. In its turn, family firms managed by the founder or someone from their family and public firms are associated with lower average management scores. Then, it also presents tangible evidence on the influence that management practices may have on the performance of Portuguese firms. Indeed, a higher adoption of structured management practices seems to be associated with higher productivity, measured through output per employee, with a one-standard-deviation increase in the standardized management score being associated with a 4,39% increase in Productivity per Employee. This positive evidence holds for other performance measures, including return on Capital Employed (ROCE), and Profit Margin. It is also verified that the category that is most associated with higher productivity is the Incentives category, which is interesting considering that the average management score for the firms in the sample is lower compared to the other two categories, indicating a low use of incentive-based management practices. The results are also robust, being qualitatively identical across different sub-samples, including only firms operating in the Manufacturing industry, and larger firms with more than 100 employees.

This dissertation is structured as follows: Chapter 2 consists of a literature review on firm performance, management practices, and their relationship, Chapter 3 presents the description of the data used in the study, Chapter 4 describes how management practices are measured and their relation with the interest variables, and Chapter 5 outlines the econometric approach, as well as the results and findings drawn from the research. Lastly, Chapter 6 gathers the main conclusions of the study, as well as the main limitations and suggestions for future research.

2. Literature Review

2.1. Firm Performance Determinants

The study of firm performance has been a central focus across the fields of management, economics, and organisational studies. It can be measured by a wide range of outcomes, that may be affected by both internal as well as external factors (Hansen & Wernerfelt, 1989). Some of the outcomes used to measure performance are productivity (e.g., value-added per worker, total factor productivity (TFP)), profitability (e.g., return on assets (ROA), return on capital (ROC)), sales growth, survival rates, innovation (often estimated through research and development (R&D) and patent intensity), among others (Siepel & Dejardin, 2020). Extensive research has been dedicated to understanding the factors that influence firm performance, and some key drivers have been identified by scholars, described in Figure 2.1.

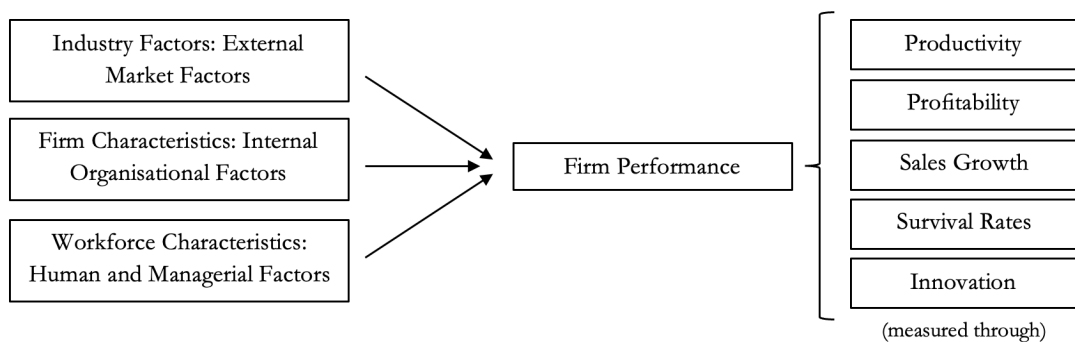


Figure 2.1.: Firm Performance Determinants and Measures

Looking through the literature, two perspectives can be identified on the factors that influence performance (Hansen & Wernerfelt, 1989). The first one is supported on the tradition that external market factors are key to influence a firm's success. The other one is related to organisational factors, building upon a more behavioural and sociological paradigm. Hansen and

Wernerfelt (1989) introduce the idea that, for understanding firm performance, a comprehensive approach that considers both external market conditions and internal organisational practices is required. The authors reach the conclusion that even if both factors are significant, the organisational one proves to have higher influence in determining performance. Indeed, many studies highlight that there are persistent productivity differences within and across firms (Gibbons & Henderson, 2013; Syverson, 2011; Van Reenen, 2011).

External factors play a crucial role by influencing the market a firm operates in, and consequently, its performance (Hansen & Wernerfelt, 1989). The characteristics of an industry, and in particular increased competition and how a company is positioned relative to its competitors, are said to drive productivity by promoting efficiency (Syverson, 2004, 2011). Moreover, market dynamics, particularly firm entry and exit, also have an influence on productivity (Bartelsman & Doms, 2000). According to Bartelsman and Doms (2000), regulations can also influence performance, by not only affecting firms' decisions, but also market structure. Therefore, markets that are badly regulated can lead firms to decrease productivity levels (Syverson, 2011). Other external factors identified by Syverson (2011) are productivity spillovers and the presence of flexible input markets.

Beyond the external factors, internal resources also play a critical role in shaping firm performance. The Resource Based-View (RBV), formalised by Barney (1991), proposed that the internal resources a firm holds are key to achieve a sustained competitive advantage. This view shifted the attention to the internal heterogeneity of firms, and how different resources and capabilities lead to differences in performance, even when looking at the same industries (Barney, 1991). Syverson (2011) also underscores how productivity improves through *learning-by-doing*, as experience allows firms to optimise their processes over time.

How a firm is structured and its relative size may also play a role in influencing performance (Syverson, 2011). Indeed, firm size has been noted as a determinant of profitability, as larger firms seem to be better able to exploit economies of scale, enhance cost efficiency, and support the initial high investment costs (Hall & Weiss, 1967). However, as Hansen and Wernerfelt (1989) highlight, some authors point out how size can indicate higher diversification, which may be related to worse performance.

The quality of capital and labour inputs also impacts productivity (Syverson, 2011). R&D

and Information Technology were some of the capital factors highlighted. Additionally, workforce's human capital, including overall experience, training, education, and tenure at a firm, has been associated with higher-quality labour that, in turn, is associated with better firm performance. In fact, the skills of the workforce have an impact on how well a firm performs (Siepel et al., 2021). Managers, in particular, are believed by some authors to “drive productivity differences” (Syverson, 2011, p. 336) and impact deeply the organisations they operate in (Bertrand & Schoar, 2003), which can arise either from their observed and unobserved characteristics (Bertrand & Schoar, 2003), or the excellence of the management practices they implement, that seem to be consequence of their characteristics (Bloom & Van Reenen, 2007).

Building on the significance of managerial characteristics, gender diversity has also been identified as a factor influencing firm performance. While the majority of studies report a positive association between female participation and firm performance across a range of dimensions, some research has found a negative relationship, and others report no statistically significant association (Gaio et al., 2024). These mixed findings underscore the complex and context-dependent nature of this relationship.

Further emphasising managers' pivotal role in shaping firm performance, Bertrand and Schoar (2003) assert that individual managers are able to influence corporate decisions regarding investment, financial policies, and organisational strategy, holding a crucial role in influencing performance, either positively or negatively. Different Chief Executive Officers' (CEOs) characteristics and abilities are beneficial to different types of firms, and managers' general talent and execution skills are positively associated with corporate success (Kaplan et al., 2012).

By using employer-employee data from Portugal, Queiró (2022) uncovers that companies with stronger growth performance were led by more highly educated managers. Furthermore, managers seem to play a fundamental role in knowledge spillovers, specifically through their mobility across firms, as managers' previous experience can significantly enhance the performance of the firm they move into (Mion et al., 2017; Mion & Opromolla, 2014). Undoubtedly, management matters, and the association between managers' quality and productivity and output quality is also translated to the public and service sector (Fenizia, 2022; Lazear et al., 2015; Rasul & Rogger, 2018).

The central role of managers in family firms has also been emphasised in a study by Bandiera et al. (2018). The authors highlight a favourable relationship between worked hours and firm performance, with family CEOs devoting fewer hours to work compared to non-family CEOs. This study shows how CEO behaviour serves as a potential explanation for a part of the performance disparity between these firms with family CEOs and non-family CEOs. In the same sense, by creating a CEO behaviour index, the study by Bandiera et al. (2020) also reinforces the notion that CEO behaviour is a driver of firm performance, challenging the traditional view that CEOs are merely a reflection of firm characteristics.

Management practices are another factor that can explain performance differences across firms, and Walker (1887) was one of the firsts to suggest this. As a matter of fact, the adoption of managerial practices has been associated with better performance by many authors (e.g., Alexopoulos & Tombe, 2012; Bloom & Van Reenen, 2007; Giorcelli, 2019; Syverson, 2011; Van Reenen, 2011).

Effective management practices and managerial innovations seem to play a critical role in driving firm performance, often yielding faster and more tangible results than traditional technological advancements, even though their effects generally produce shorter-term results (Alexopoulos & Tombe, 2012). Giorcelli (2019) also emphasises the importance of management practices in improving firm performance in the long run, by concluding that managerial quality is crucial to achieve and sustain productivity gains from technology.

However, according to Baltrunaite et al. (2023), the interaction between managers' characteristics and management practices in influencing firm performance has not been very much subject to research. By exploring a unique dataset of Italian limited liability companies, and matching firm data with managers' characteristics in order to measure managerial talent, the authors conclude that the latter does contribute to enhanced performance, and it is a reason for the variation of a firm's total productivity. Managerial talent is defined as the "portable and time-invariant" (Baltrunaite et al., 2023, p. 5) impact a manager has on the TFP of a firm, which may include all observable and unobservable manager's characteristics "such as education, early work experience, innate ability or charisma, as long as they are time-invariant (with respect to our sample period) and portable across firms" (Baltrunaite et al., 2023, p. 2). The authors also use information on management practices to investigate the way they

interact with managerial talent and affect firm performance. Although both management practices and managerial talent individually contribute to improved firm performance, they complement each other and create synergies that enhance firm-level productivity (Baltrunaite et al., 2023). As noted by the authors, the efficiency of practices, which at a first glance seems undeniably positive, is affected by the talent of the manager that promotes them. As mentioned before, this relationship has not been very explored in the literature, with studies as the ones by Bender et al. (2018) and Cornwell et al. (2021) being exceptions, by exploring the presence and interaction of the two variables in firms (Baltrunaite et al., 2023).

2.2. Management Practices

As previously noted, management practices are a key factor that enables firms with similar inputs to perform better than others, and that can significantly influence a country's wealth and productivity in addition to the traditional inputs, such as labour and capital (Scur et al., 2024). Structured management practices are characterised as being clearly defined, precise, detailed, regularly applied, and unambiguous (Bai et al., 2022; Scur et al., 2024), and involve formalised procedures for monitoring results, setting goals, and motivating employees (Lamorgese et al., 2024). According to the literature, there are some factors related to firm and workforce characteristics that promote or hinder their implementation.

2.2.1. Factors Influencing Structured Management Practices Adoption

Bloom et al. (2024) emphasise how country-specific context explains a part of the variation in management practices adoption. Yet, they also highlight how it does not explain all of it.

Ownership structure is highlighted as one of the factors that influence the implementation of management practices (Bloom et al., 2014; Bloom & Van Reenen, 2007, 2010; Lemos & Scur, 2019). Overall, family firms tend to present lower management scores when compared to other types of ownership (Bloom et al., 2024). More specifically, family firms managed by the founder or by family members tend to perform worse than those managed by external

managers (Bandiera et al., 2018), with the former being associated with less effective management practices, only above firms with public ownership, held by the state, which fill the last spot (Bloom et al., 2024). Conversely, firms with dispersed shareholders, which do not hold more than 25% of a firm, show the highest average management scores. In the same sense, with a sample of 32 countries including Portugal, Bennett et al. (2017) state that firms with founder and family CEOs generally present lower management quality, compared to firms with other types of dispersed and concentrated leadership. This study states that when the founder CEO steps down from their position and a new one comes in, management seems to improve, suggesting also that it is not merely founder ownership that hinders the adoption of management practices, but their involvement in management. Moreover, using a sample of 18 countries, Lemos and Scur (2019) show that, when a family member takes over as CEO, a lower adoption of management practices is verified, when compared to firms that were passed down to non-family CEOs. Additionally, Bloom and Van Reenen (2010) state that foreign multinationals present better management than domestic firms.

Considering the described above, the following hypotheses are developed to test how the ownership structure may impact the adoption of structured management practices:

- H1:** Family firms managed by the founder or by family members are associated with lower adoption of structured management practices;
- H2:** Firms with public ownership are associated with lower adoption of structured management practices;
- H3:** Firms with foreign ownership are associated with higher adoption of structured management practices.

Human capital, which includes the skills, knowledge, and experience of the individuals (Abraham & Mallatt, 2022), also emerges as an important determinant of management quality (Bloom et al., 2014, 2019, 2024; Bloom & Van Reenen, 2007).

A higher availability of more educated workers leads to improved management practices (Bloom et al., 2019) and firms with superior management appear to have higher numbers of workers that hold a degree (Bloom et al., 2024; Valero, 2021). Firms with better skilled workers appear to implement better human-resource management practices, focusing on

worker promotion, performance tracking, and hiring, and with human capital being one of the variables that most explains these differences (Bloom & Van Reenen, 2007). The evidence of this association involving management practices and human capital is also noted in smaller firms (McKenzie & Woodruff, 2017).

An association between the general skills of all employees, estimated based on observed wages, and management practices is identified in the study by Bender et al. (2018), with human capital being critical to sustain successful management practices. Indeed, not only managers' education influences the adoption of management practices, but also non-managers' education, which are the ones that allow for a successful implementation of these practices (Bloom et al., 2024; Feng & Valero, 2020). Nevertheless, as mentioned before, it is plausible to assume that a skilled workforce and management practices complement each other (Baltrunaite et al., 2023; Lee, 2018). Valero (2021) claims that better organisational processes are designed and implemented by better skilled managers, and a more educated workforce is more competent for executing and implementing those processes. Even so, in some cases, these two dimensions may substitute each other and, for example, when the workforce is more skilled, managers may feel less need to constantly track and monitor their performance.

However, in firms, this association between human capital and management practices is exposed to some potential issues, namely endogeneity. Indeed, the presence of structured management practices can also explain why certain firms present higher human capital and are able to attract and retain better talented managers, who seek to work in these environments (Baltrunaite et al., 2023; Bender et al., 2018; Cornwell et al., 2021).

Having the endogeneity issue in mind, some researchers have investigated how the availability of skills around firms may lead to differences in management practices and human capital (Bloom et al., 2019; Feng & Valero, 2020). Feng and Valero (2020), find that there are synergies between workforce education and management practices, with the strength of the relationship being similar for both managers and non-managers. The study also integrates data on local universities and regional skill levels, concluding that firms located near universities employ a higher share of skilled workers, resulting in the implementation of better management practices. This evidence suggests that the higher availability of skilled labour around universities is complementary with management quality, and the study moves away

the chance of reversed causality, as it does not seem reasonable to say that universities settle in places closer to firms with higher management scores (Valero, 2021).

Thus, this study argues that human capital quality, measured through workforce education and age, is related to the adoption of structured management practices, and the following hypothesis is defined:

H4: Human capital quality, measured through (a) education and (b) age, is positively associated with the adoption of structured management practices.

Additionally, Bloom et al. (2019) focus on the role that local labour market conditions and other external drivers may have in explaining variations in management practices and organisational human capital. Particularly, the authors analyse the influence of *Million Dollar Plants*, which are large investments typically made by multinational corporations, on the management practices of existent firms in the regions where these plants are established. They find a positive effect that is facilitated by the movement of skilled managers, which enables knowledge transfers. The study highlights how the local availability of skilled labour is a critical factor in shaping organisational practices, and that firms tend to adopt better management practices in regions with a greater supply of skilled labour. As such, learning spillovers are another factor linked to better management practices (Bloom et al., 2019).

In fact, smaller firms tend to adopt better management practices when near a large, multinational firm (Bloom et al., 2019). These latter firms are said to be in the forefront of the adoption of these practices, and tend to be well managed everywhere, suggesting that there are not structural factors that prevent firms to adopt certain practices in a specific country (Bloom et al., 2024). Larger firms are also more prone to have higher management practices diversity across their plants, possibly due to geographic and industry diversification, and smaller firms show less variation in management quality across plants (Bloom et al., 2019). Indeed, Bloom et al. (2017) and Scur et al. (2024) show evidence that larger firms, measured by the number of employees, are better managed than smaller firms, which could be explained by the fact that the costs of implementing these practices are lower for larger firms. Economies of scale allows them to spread these costs, making such investments more affordable compared to smaller firms. Accordingly, the following hypothesis can be formulated to explore the relationship between firm size and the adoption of structured management practices:

H5: Larger firms are positively associated with higher adoption of structured management practices.

Competition is also said to be associated with better management, as it encourages firms to perform better and promote more efficient practices in order not to lose to their competitors, and potentially leave the market (Bloom et al., 2014, 2019, 2024; Bloom & Van Reenen, 2007; Van Reenen, 2011). Likewise, the following hypothesis can be set:

H6: Firms that face higher competition are positively associated with higher adoption of structured management practices.

Other factors underlined in the literature are labour and market regulations, that when extreme may discourage firms to implement measures to manage their workforce's performance (Bloom et al., 2024), and manager perceptions, as managers sometimes have an exaggerated view of the practices implemented in the firms they manage (Bloom et al., 2014, 2024). Managers often believe that the best practices are being implemented, which prevents them from making decisions that could lead to improvements. Additionally, firm age has also been associated with better management. Bloom et al. (2017) provides evidence that, on average, older plants tend to present better management, with their management practices appearing to be more uniform and consistent.

2.2.2. Management Practices Measurement

Syverson (2011) highlights how management has been hard to measure. Notably, Bloom and Van Reenen (2007) were pioneers in quantifying management quality in medium-sized firms, and they have shown that management practices account for about the same importance as capital, labour, and technology, through the creation of the *World Management Survey* (WMS). They collected information from structured interviews with managers and initially scored their answers from one to five, with one corresponding to “worst practice” and a five to “best practice”. The first wave of the study (2004) included 18 questions that were then divided into four categories: Operations, Monitoring, Targets, and Incentives. Afterwards, the scores obtained for each category were standardised into z-scores by adjusting each practice to have a mean equal to zero and a standard deviation equal to one (*WMS methodology*). The data

was initially collected from four countries: France, Germany, United Kingdom, and United States. Several waves of the survey have been conducted then, including a higher number of countries.

More recently, Bloom et al. (2019) launched an electronic survey targeted at different managers: the *Management and Organizational Practices Survey* (MOPS). The study was conducted with two survey waves (2010 and 2015), in the United States. 16 questions based on the WMS were developed, and scored from zero to one, to obtain a management score for the categories of Monitoring, Targets, and Incentives (*MOPS methodology*).

After the development of the WMS and the MOPS, many studies have been conducted using these data to measure management practices or using similar methodologies. Nevertheless, other ways to measure management practices are also used, as described in Table 2.1.

Table 2.1.: Summary of key studies measuring Management Practices

Study	Period of Collection	Countries Studied	Categories Measured	Measurement Method
Bai et al. (2022)	2010	United States	Monitoring, Targets, and Incentives	MOPS data and methodology.
Baltrunaite et al. (2023)	2010 and 2019	Italy	Monitoring, Targets, and Incentives	Bank of Italy Survey of Industrial and Service Firms (INVIND) - MOPS methodology.
Bender et al. (2018)	2004, 2006, and 2009/10	Germany	Monitoring, Targets, and Incentives	WMS data and methodology.
Bennett et al. (2017)	not specified	32 Countries, including Portugal	Monitoring, Targets, and Incentives	MOPS data and methodology.
Bloom et al. (2014)	2013 and 2014	32 Countries, including Portugal	Monitoring, Targets, and Incentives	Expansion of WMS. WMS methodology.
Bloom et al. (2017)	2004-2014	34 Countries, including Portugal	Monitoring, Targets, and Incentives	Expansion of WMS. WMS methodology.
Bloom et al. (2024)	2004-2022	38 Countries, including Portugal	Monitoring, Targets, and Incentives	Expansion of WMS. WMS methodology.
Bloom and Van Reenen (2010)	2006 and 2009/10	17 Countries, including Portugal	Monitoring, Targets, and Incentives	Expansion of WMS. WMS methodology.

Study	Period of Collection	Countries Studied	Categories Measured	Measurement Method
Cornwell et al. (2021)	2008 and 2013	Brazil	Monitoring, Targets, and Incentives	WMS data and methodology. Additionally, if a practice scores above 3, it is defined as having “structured personnel management”, meaning that management practices are formally introduced in the firm.
Feng and Valero (2020)	2004, 2006, and 2009/10	19 Countries, including Portugal	Monitoring, Targets, and Incentives	WMS data and methodology.
Heyman et al. (2019)	2006 and 2009/10	Sweden	Monitoring, Targets, and Incentives	WMS data and methodology.
Jirjahn et al. (2024)	2008 and 2013	Germany	Monitoring, Targets, and Incentives	German Management and Organizational Practices - MOPS methodology.
Lamorgese et al. (2024)	2019	Italy	Monitoring, Targets, and Incentives	INVIND - MOPS methodology.
Lee (2018)	2002-2003	South Korea	Evaluation, Operations, and Human Resource Management	Survey carried out by the Korea Labour Institute. WMS inspired methodology.
Monteiro and Straume (2024)	2016	Portugal	Monitoring, Targets, and Incentives	Inquérito às Práticas de Gestão - MOPS methodology.
Bloom et al. (2013)	2008-2011	India	Operational: Quality control, Inventory, Sales and Order Management, Factory Operations, and Human Resources Management	Field Experiment: the practices form a set of binary indicators that reflect if the practices was or not implemented after the consulting project.
Bruhn et al. (2018)	2007 and 2009	Mexico	A wide range of categories	Randomised Control Trial. Surveys conducted to interested companies.
Huselid (1995)	1991-1992	United States	Two categories: Workforce Capabilities and Company Structures, including training and internal promotions, and Employee Motivation, including performance appraisal and compensation	Surveys targeted at Senior Human Resources workers at each firm. Respondents reported the percentage of employees in each group affected by a specific practice, which were then weighted based on the size of each group to calculate an overall value for each practice.

Study	Period of Collection	Countries Studied	Categories Measured	Measurement Method
Ichniowski et al. (1997)	not specified	United States	Recruiting and Selection, Teamwork, Skills Training, Communication, Labour Relations, Employment Security, Flexible Job Assignment, and Incentive Pay	Field interviews with managers. Information collected to answer survey questions related to practices, creating a set of dummy variables, if practices are in place or not.
McKenzie and Woodruff (2017)	2008-2014	7 Developing Countries	Financial Planning, Marketing, Purchasing and Inventory Management, and Costing and Documentation	Survey with 26 closed-ended questions that assess the implementation of business practices. Business Score from 0-1, that reflects the proportion of the practices adopted in a firm.

2.3. Management Practices and Firm Performance

The association between management practices and firm performance is very intuitive and straightforward (Bloom et al., 2024), with structured management playing a crucial role in driving economic outcomes (McKenzie & Woodruff, 2017). However, prior to the creation of the WMS, it was difficult to test that intuition, as it was very demanding to gather information on firms' management practices. Nevertheless, numerous studies have shown how management practices implementation leads to better performance within firms (Huselid, 1995), and are a primary source of persistent performance differences across firms (Gibbons & Henderson, 2013).

Structured management practices have been consistently associated with superior firm performance across multiple dimensions, including productivity, the most common measure used, profitability, growth, survival rates, and innovation (e.g., Bloom et al., 2014, 2019; Bloom & Van Reenen, 2007, 2010). Other frequently used indicators include sales per employee (as a measure of productivity) and sales growth (e.g., Bennett et al., 2017; Bloom & Van Reenen, 2007, 2010; Giorcelli, 2019; Lamorgese et al., 2024; McKenzie & Woodruff, 2017; Siepel et al., 2021). More recently, in the latest WMS wave, conducted in 2022 and including interviews with 18 000 managers from 38 different countries, a solid association between

management practices and performance measures such as productivity, sales growth, ROCE, and market share growth, was validated (Bloom et al., 2024). In particular, the report highlights how effective management enhances firms' agility, which is particularly important when facing disruptions such as the recent Covid-19 pandemic, and the ongoing geopolitical instability. Lamorgese et al. (2024) also highlight how firms with better structured management practices in place showed greater resilience in mitigating the adverse effects the Covid-19 pandemic brought. Overall, a stronger economic performance is observed in firms with more structured management practices (Scur et al., 2024). These firms are generally larger, as measured by revenues and number of employees, more profitable, more productive in terms of labour, and more prone to participate in the international trade market.

Table 2.2.: Summary of how key studies on Management Practices measure Firm Performance

Study	Prod. ^a	ROA	ROC/ ROCE	Profits/ Margin ^b	Sales Growth	Emp. Growth ^c	S. Rates ^d	Inno- vation	Tobin's Q
Alexopoulos and Tombe (2012)	x								
Bai et al. (2022)	x		x	x					
Baltrunaite et al. (2023)	x								
Bender et al. (2018)	x								
Bennett et al. (2017)	x	x	x		x				
Bloom and Van Reenen (2007)	x		x		x		x		x
Bloom and Van Reenen (2010)	x		x		x		x		x
Bloom et al. (2013)	x								x
Bloom et al. (2014)	x								
Bloom et al. (2017)	x		x		x		x		x
Bloom et al. (2019)	x			x		x	x	x	
Bruhn et al. (2018)	x	x							
Cornwell et al. (2021)	x								
Giorcelli (2019)	x				x	x	x		
Heyman et al. (2019)	x								
Huselid (1995)	x	x							x
Ichniowski et al. (1997)	x								
Jirjahn et al. (2024)	x								
Lamorgese et al. (2024)					x				
Lee (2018)		x							
McKenzie and Woodruff (2017)	x			x	x		x		
Siepel et al. (2021)					x				

^a Productivity. ^b Profit Margin. ^c Employment Growth. ^d Survival Rates.

Table 2.2 highlights the most common measures of firm performance for studies that explore the relation between management practices and firm performance. ROA, ROC and ROCE,

along with profits and profit margins, are key metrics used to assess profitability.

According to Monteiro and Straume (2024), structured management fosters higher worker productivity and promotes beneficial changes in workforce composition, both of which contribute to performance gains. In fact, management practices proved to account for about a quarter of TFP (Bloom et al., 2014), and for approximately a fifth of the disparity in productivity across firms (Bloom et al., 2019). Many studies have also focused and revealed that management practices related to incentives, recruitment, teamwork, etc., are a key determinant and contribute significantly to the variance in productivity and firm outcomes across different industries and countries (e.g., Bloom et al., 2014; Bloom & Van Reenen, 2007).

Ichniowski et al. (1997) highlight how management practices related to teamwork, training, flexible job assignments, employment security, and incentive pay result in substantial superior productivity levels, especially when adopted in a complementary way. Moreover, Bai et al. (2022) show that firms with better management scores are more likely to acquire those with worst scores in mergers and acquisitions (M&A), with the acquired firms subsequently experiencing improvements in productivity, profitability, and value added per worker.

A study on foreign-owned firms in Sweden further highlights the significance of management quality in shaping firm performance. Heyman et al. (2019) find that while foreign-owned firms generally outperform domestic ones, productivity advantages vary depending on the parent company's country of origin. The authors conclude that these differences are due to variations in home-country management practices, and highlight how the parent company's management quality can have a direct effect in the foreign affiliates' productivity.

Contextual factors also shape the effectiveness of management practices in promoting better firm performance. Jirjahn et al. (2024) investigate if works councils in German firms amplify management practices' impact on productivity. The authors confirm that there is in fact a positive correlation between management practices and productivity, for firms with and with no works councils, but this association is larger when works councils are present. This study highlights how management practices are contingent on contextual factors, unlike Bloom and Van Reenen (2007, 2010).

As mentioned before, workforce quality serves as another crucial link between management

and productivity. Bender et al. (2018) argue that the selection and retention of a high-quality workforce connects the presence of effective management practices with improved productivity in German firms. The study suggests that structured management practices are essential for enhancing both workforce talent and overall productivity, with managers' human capital playing a pivotal role in this process. Cornwell et al. (2021) reach similar conclusions in a study with Brazilian firms, but also find that firms that have structured management practices in place can attract, hire and retain higher-quality employees, especially in managerial roles. These firms recruit from the top tier of the talent pool, effectively align high-quality managers with the organisation, are more selective in dismissing employees, which leads to better performance. Nevertheless, Bender et al. (2018) suggest that management practices should not be the only factor considered, as corporate culture makes firms more than the sum of their parts, and may have great influence in driving firm performance.

Experimental studies also provide valuable evidence of the relationship between structured management and performance. Through a field experiment with airline captains, Gosnell et al. (2020) were able to establish a causal evidence between management practices and skilled labour productivity. Moreover, by also conducting a field experiment, Bruhn et al. (2018) argue that managerial capital, related to practices adopted, is able to directly impact firm performance, as it may result in improved strategic and operational choices, and also lead to an increase in productivity of both physical capital and labour. The authors argue that the absence of managerial capital hinders Mexican's small and medium enterprises growth, and they demonstrate there are improvements in TFP and ROA when management consulting services are implemented. Bloom et al. (2013) also highlighted this causal evidence with an experiment in large textile firms in India. Nevertheless, a few years after the experiment, while it was verified that this intervention had long term effects in some firms, it did not create a continuous cycle of further improvements (Bloom et al., 2020). Some of the implemented practices in the experiment were even abandoned, especially if the plant manager was replaced or did not dedicated enough time to it.

Despite the positive findings identified in the literature, the relationship between management practices and firm performance is not universally straightforward. While certain management practices directly influence firm productivity, others, such as ones related to monitoring, tar-

gets, and the use of incentives, can affect it indirectly, as they depend on how the workforce reacts to them (Bender et al., 2018). As such, practices concerning these areas can even have a negative impact in productivity (Monteiro & Straume, 2024). Indeed, excessive management can have an unintended negative effect (Gosnell et al., 2020). Monitoring, for example, when excessive, has proved to have a negative impact on productivity (Banker et al., 2010) and on corporate innovation, measured through R&D investment rate and by the quality of a firm's patents (Faleye et al., 2011). Furthermore, the use of incentives may, at times, also have the opposite effect of what was intended, harming performance (Bénabou & Tirole, 2003; Fehr & Falk, 2002; Kamenica, 2012), as well as target setting, that may be hard for employees to comprehend (Jirjahn et al., 2024).

Accordingly, the present study aims to test the following hypotheses:

- H7:** A higher management score is positively associated with better firm performance, measured by productivity (output per employee);
- H7a:** A higher management score related to Monitoring is positively associated with better firm performance, measured by productivity (output per employee);
- H7b:** A higher management score related to Targets is positively associated with better firm performance, measured by productivity (output per employee)
- H7c:** A higher management score related to Incentives is positively associated with better firm performance, measured by productivity (output per employee).

2.4. The Case of Portugal

In the study by Bloom et al. (2017), Portugal is featured as one of the countries that presents lower management scores, right above less developed economies, and considering management score as being the unweighted average of the adoption level of practices concerning the categories of monitoring, target and goal setting, and incentives and people management. Indeed, countries such as the United States, Japan, Germany, Sweden, Canada, as well as West

European countries and Australia, present higher management scores than Portugal in the referred study. This has been the case in other studies as well (Bloom et al., 2014, 2024; Bloom & Van Reenen, 2010).

Monteiro and Straume (2024) explore the role of management practices concerning the Portuguese context. However, they investigate the relation between the adoption of these practices with worker pay, using information from 2016 from the first edition of IPG, launched in 2017, and administrative databases. The present study, however, seeks to delve into the relationship between the presence of management practices in Portuguese firms and firm performance, following a similar methodology to treat the survey questions in order to create the composite management score, and including the 2022 wave of the management practices survey (IPG) conducted ever since.

3. Data Description

3.1. The Data

This study relies on data from the IPG, provided by INE. The survey was first launched in 2017, with data from 2016, with the aim of compiling relevant information that would correlate firms' management practices with their performance, measured through productivity indicators (INE, 2023). The most recent version of this compulsory survey was launched in 2023, and its information refers to the year of 2022. This version updated the results of the first edition, after being suspended during the COVID-19 pandemic, and with the objective of consolidating the thesis that higher productivity levels and more structured management practices are associated. This qualitative survey, addressed to members of the top management, preferably to top managers, aims to capture their perceptions on the management practices of the firms they manage, to provide information on the factors that condition firms' competitiveness and that do not have an explicit influence on their financial numbers.

IPG targets non-financial companies headquartered in Portugal, leaving out firms that employ less than five people (INE, 2023). For the selection of the sample, the sampling database (*Sistema Integrado de Gestão de Universos e Amostras* (SIGUA)) was stratified based on four specifications: sector of economic activity, firm size, firm age, and if it belongs to an economic group. In 2016, the number of valid responses was 3 875, while in 2022, it was only 3 254.

The survey starts by collecting information on Management and Leadership, followed by questions related to three main areas: Strategy, Monitoring and Information, Human Resources, and Management Systems and Social Responsibility (Monteiro & Straume, 2024).

Following the same selection criteria as Monteiro and Straume (2024), 29 out of the 52 questions from IPG (2022 version) are selected for the purpose of this study. Of this total, two questions are related to operational aspects, 10 questions concern performance monitoring, four questions target setting, and 13 questions are related to incentives, in line with the approach from the WMS and from the MOPS.¹ Thus, the selected questions are closely related to the ones used in previous studies (e.g., Bloom et al., 2019; Bloom & Van Reenen, 2007).

To complement the information from the IPG with firm characteristics and labour outcomes in Portuguese firms, QP and SCIE, also provided by INE, will be used. QP is a database that has been collected yearly since 1986, by the Portuguese Ministry of Labour, Solidarity and Social Security. It is a matched employee-employer database that collects information from all private firms with at least one wage earner. For each firm, information on the location, ownership, industry, and total sales, among others, is provided. Additionally, for each employee, information on schooling level, gender, age, tenure, occupation, earnings, hours worked, among others, can be accessed. SCIE, on the other hand, provides information on firms' financial situation gathering data from both their balance sheet and income statement. This database enables the assessment of a firm's financial health, including its capital structure and financial performance.

The three datasets were merged using an anonymised firm identifying number, common to all of them. As in Monteiro and Straume (2024), the final sample includes firms with non-missing values in the main interest variables across all the three datasets. The initial sample included 7129 firms from the IPG survey across the two years. However, six firms were removed from the sample due to having missing values in seven of the selected questions, in 2022. Additionally, questions 11 and 12 were excluded, as they presented a substantial number of missing values for the year of 2022. Moreover, firms with less than five employees were also excluded from the sample, as there were still some firms that fitted this category in the sample. Consequently, the final IPG survey sample included 6996 firms. After matching it with QP data, the sample was reduced to 6581 firms. When merging this dataset with SCIE, the number of firms in the sample reduced to 6577. From these 6577 firms, 2558 are only present in 2016, 2073 only in 2022, and only 973 in both years, resulting in an unbalanced

¹The interest questions of the survey can be consulted in Monteiro and Straume (2024).

panel dataset. Panel data integrates both time series and cross-sectional components, allowing for a more robust analysis (Greene, 2018). These types of datasets offer valuable economic insights, as they allow to capture differences among individuals, firms, or countries, while also highlighting dynamic trends that a cross-section cannot capture. However, as the number of firms that are present in both years is reduced, firm fixed effects estimation will not be considered.

3.2. Sample Description

This section presents a comprehensive overview of several key variables related to firm and workforce characteristics. The variables include a range of dimensions, including firm size, ownership, regional location, workforce demographics, among others. A detailed description of the variables, as well as their source, can be seen in [Annex A](#).

The number of employees is used to measure firm size. The average number of employees across the sample is 243.238, with 15.9% of the firms being classified as micro firms, 54.5% as medium-sized firms, and 29.6% as large firms, according to the criteria applied by the IPG.² The sample of 6577 firms in the sample across the two years represents a total of 1 520 866 employees.³ The summary statistics for firm size can be seen in Table 3.1.

Table 3.1.: Firm Size (Portugal 2016 & 2022)

	Mean	Median	Min	Max	SD	N
Number of Employees	243.238	50.000	5.000	26773.000	907.528	6577
Micro Firm	0.159	0.000	0.000	1.000	0.365	6577
Medium Firm	0.545	1.000	0.000	1.000	0.498	6577
Large Firms	0.296	0.000	0.000	1.000	0.457	6577

Source: IPG

The average age of the firms in the sample is 23.213 years, as seen in Table 3.2. The firm age variable ranges from 1 to 523 years, suggesting that the sample is diverse and may include

²Micro firms present a number of employees lower than 10 and turnover lower than 2 000 000€, medium firms present a number of employees lower than 250 and turnover equal or lower than 50 000 000€ (and must not be a micro firm), and large firms present a number of employees higher than 250 and turnover higher than 50 000 000€, as detailed in [Annex A](#).

³Some workers may appear more than once, either within the same firm over time or as a result of moving to another firm.

Table 3.2.: Firm Age (Portugal 2016 & 2022)

	Mean	Median	Min	Max	SD	N
Firm Age	23.213	19.000	1.000	523.000	21.169	6577

Source: QP

relatively new firms, as well as long-established ones.

Table 3.3 presents the summary for the dummy variables related to ownership structure. Approximately 44.6% of the firms are non-family firms, and family firms account for more than half of the sample. Among the family firms (55.4%), 43.5% represent family firms that are managed by the founder or by a member of the family, while the remaining 11.9% are managed by someone other than the founder or someone from the family. Moreover, 19.1% of the firms in the sample have foreign ownership, and 1.9% have public ownership.

Table 3.3.: Firm Ownership (Portugal 2016 & 2022)

	Mean	Median	N
Family Ownership			
Firm is Not Family Owned	0.446	0.000	6577
Family Firm is managed by the Founder or by the Founder's Family	0.435	0.000	6577
Family Firm is not managed by the Founder or by the Founder's Family	0.119	0.000	6577
Foreign Ownership			
Firm has Foreign Ownership	0.191	0.000	6577
Public Ownership			
Firm has Public Ownership	0.019	0.000	6577

Source: IPG

Regarding regional distribution, as presented in Table 3.4, the highest percentage of firms are located in the “Norte” region (35.5%), followed by the “Lisboa” region (30.9%), and the “Centro” region (23.3%). Smaller percentages of firms are located in other regions including “Alentejo” (6.2%), “Algarve” (2.8%), and “Açores” and “Madeira” (both 0.6%). As expected, as IPG targets Portuguese firms, there is not any firm located in the “Estrangeiro” region.

The industry distribution of firms in the sample reveals some differences in representation. In the sample, more than half of the firms operate in the service industry (52.1%), 41.6% of firms operate in the manufacturing industry, and a considerably smaller portion of firms (6.3%) are involved in the agriculture and natural resources industry⁴ (Table 3.5).

⁴For industry classification, firms were aggregated through the CAE Rev.3 classification, that represents the economic activity of a firm with a letter from A to U. Firms were grouped into three main industries, as described in Annex A.

Table 3.4.: Distribution of Firms by Region (Portugal 2016 & 2022)

	Mean	Median	N
"Norte" Region	0.355	0.000	6577
"Algarve" Region	0.028	0.000	6577
"Centro" Region	0.233	0.000	6577
"Lisboa" Region	0.309	0.000	6577
"Alentejo" Region	0.062	0.000	6577
"Açores" Region	0.006	0.000	6577
"Madeira" Region	0.006	0.000	6577

Source: QP

Table 3.5.: Distribution of Firms by Industry (Portugal 2016 & 2022)

	Mean	Median	N
Agriculture and Natural Resources Industry	0.063	0.000	6577
Manufacturing Industry	0.416	0.000	6577
Service Industry	0.521	1.000	6577

Source: QP

To capture the level of competition, market share⁵ is used as an indicator of competitive pressure, with lower market shares suggesting that firms operate in a more fragmented market with many competitors. On average, the firms in the sample present 1.0% of market share and the maximum value verified is 99.6%.

Additionally, it is relevant to mention that 7.4% of the firms in the sample have a works council, which represents a group of employees who participate in decision-making processes, often concerning labour conditions (Jirjahn et al., 2024). This is a relatively low proportion that indicates that works councils are not a common feature across the firms in the sample. In the study by Jirjahn et al. (2024), 42% of the firms in the sample of German manufacturing firms with at least 25 employees present works council.

Considering workforce composition, Table 3.6 highlights that females represent, on average, 35.8% of the workforce in firms. Moreover, around 7.6% of employees in firms are top managers, and around 25.1% of the top managers are female, as well as 31.7% of intermediate and 29.7% of operational managers.

The sample also allows to explore human capital variables for the workforce. When it comes to workforce education, the results reveal that a significant proportion of managers and non-

⁵Market share is calculated as the ratio between a firm's turnover (net sales and services revenue, excluding value-added tax (VAT)) and the total turnover of the industry (industry identified by the CAE Rev.3 2-digit classification), as seen in [Annex A](#).

Table 3.6.: Workforce Composition (Portugal 2016 & 2022)

	Mean	Median	Min	Max	SD	N
Female Employment						
Number of Female Employees	109.627	13.000	0.000	18629.000	559.324	6577
Percentage of Female Employees	0.358	0.308	0.000	1.000	0.258	6577
Top Managers						
Percentage Top Managers	0.076	0.043	0.000	1.000	0.085	6577
Female Managers						
Percentage Female Top Managers	0.251	0.000	0.000	1.000	0.335	6225
Percentage Female Intermediate Managers	0.317	0.250	0.000	1.000	0.343	5932
Percentage Female Operational Managers	0.297	0.185	0.000	1.000	0.334	5730

Source: IPG

managers have college education. Only 17.0% of firms indicate that managers employed at the firm do not hold any college degree, and 22.7% of firms report the same for non-managers. The higher percentage of firms (30.9%) indicate that over 80% of their managers hold at least a college degree. Additionally, the majority of firms (39.7%) also report that only 1-20% of non-managers are college educated. The results for the remaining categories can be observed in Table 3.7. On average (Table 3.8), the firms in the sample present 56.6% of managers and 20.9% of non-managers who hold a college degree.⁶

Table 3.7.: Workforce Education - IPG (Portugal 2016 & 2022)

	Mean	Median	N
Managers			
Percentage of College is 0%	0.170	0.000	6577
Percentage of College between 1-20%	0.227	0.000	6577
Percentage of College between 21-40%	0.082	0.000	6577
Percentage of College between 41-60%	0.098	0.000	6577
Percentage of College between 61-80%	0.089	0.000	6577
Percentage of College is > 80%	0.309	0.000	6577
Non-managers			
Percentage of College is 0%	0.227	0.000	6577
Percentage of College between 1-20%	0.397	0.000	6577
Percentage of College between 21-40%	0.126	0.000	6577
Percentage of College between 41-60%	0.076	0.000	6577
Percentage of College between 61-80%	0.056	0.000	6577
Percentage of College is > 80%	0.087	0.000	6577

Source: IPG

Regarding age, managers are generally older, with an average age of 48.513 years, compared to an average of 40.863 years for non-managers, as outlined in Table 3.10.⁷ Indeed, around

⁶Managers are identified using the “Classificação Portuguesa de Profissões (CPP)”. The lower number of observations is due to missing values, as some firms in the QP database do not have managers according to the CPP classification, as outlined in Annex A.

⁷The slightly lower number of observations for managers is verified due to missing values in the QP database for the age variable.

Table 3.8.: Workforce Education - QP (Portugal 2016 & 2022)

	Mean	Median	Min	Max	SD	N
Percentage College Managers	0.566	0.667	0.000	1.000	0.417	5449
Percentage College Non-managers	0.209	0.122	0.000	1.000	0.249	6572

Source: QP

80% of firms report that their managers are aged, on average, between 35 and 54, while only 5.5% and 14.0% having managers aged under 35 and over 54, respectively. Likewise, about 76% of firms state that non-managers average age falls into the age category between 35 and 54, but contrarily to managers, 20.5% of firms state that they are aged under 35, and only 2.7% above 54. These values, presented in Table 3.9, may indicate that the firms in the sample present a more mature workforce in managerial positions.

Table 3.9.: Workforce Age - IPG (Portugal 2016 & 2022)

	Mean	Median	N
Managers			
Average Age <35	0.055	0.000	6577
Average Age 35-54	0.799	1.000	6577
Average Age >54	0.140	0.000	6577
Non-managers			
Average Age <35	0.205	0.000	6577
Average Age 35-54	0.756	1.000	6577
Average Age >54	0.027	0.000	6577

Source: IPG

Table 3.10.: Workforce Age - QP (Portugal 2016 & 2022)

	Mean	Median	Min	Max	SD	N
Managers Average Age	48.513	48.255	18.000	68.000	7.804	5446
Non-managers Average Age	40.863	41.114	22.667	67.000	5.772	6572

Source: QP

Tenure data (Table 3.11) shows that for both managers and non-managers, a large portion of firms report an average workforce tenure between 5 and 14 years. Specifically, 43.1% of firms report that their managers have an average tenure of 5–14 years and 48.4% of firms report the same for non-managers. Interestingly, a higher share of firms reports shorter average tenure (<5 years) for non-managers (30.0%) than for managers (18.1%). The average tenure for managers is 11.924 years, compared to 7.430 years for non-managers (Table 3.12).

The summary statistics for some of the variables of interest regarding firms' financials, that can be obtained from the SCIE database, are displayed in Table 3.13. It is relevant to highlight

Table 3.11.: Workforce Tenure - IPG (Portugal 2016 & 2022)

	Mean	Median	N
Managers			
Average Tenure <5	0.181	0.000	6577
Average Tenure 5-14	0.431	0.000	6577
Average Tenure >14	0.378	0.000	6577
Non-managers			
Average Tenure <5	0.300	0.000	6577
Average Tenure 5-14	0.484	0.000	6577
Average Tenure >14	0.203	0.000	6577

Source: IPG

Table 3.12.: Workforce Tenure - QP (Portugal 2016 & 2022)

	Mean	Median	Min	Max	SD	N
Managers Average Tenure	11.924	10.667	0.000	51.500	8.575	5449
Non-managers Average Tenure	7.430	6.198	0.000	38.333	5.746	6572

Source: QP

that, in the original sample, four observations had negative values for the variable output. These were treated as accounting errors or data entry mistakes, and were not considered for the analysis. Additionally, the minimums for profits, operating profit, and capital employed are also negative. This may indicate that these firms operate at a loss, have operational costs that surpass revenues, and may present more liabilities than assets, respectively. Moreover, the high negative mean value for profit margin in the sample is likely driven by the presence of numerous outliers, particularly extreme values in firms with low or negative profits relative to sales. This effect may be due to the large proportion of firms in the sample that operate in the service industry, as these may present lower capital costs but higher relative labour costs.

Table 3.13.: Summary Statistics for Financial Variables (Portugal 2016 & 2022)

	Mean	Median	Min	Max	SD	N
Output (production)	31.89	4.05	0.00	12086.54	202.44	6573
Total Fixed Assets	12.07	0.70	0.00	5065.48	98.76	6577
Intermediate Consumption	21.89	1.90	0.00	11749.53	183.05	6577
Turnover	49.05	5.17	0.00	11861.17	270.48	6577
Total Sales	36.61	0.84	0.00	11697.79	251.87	6577
Profits	0.91	0.05	-3256.34	1235.41	64.35	6577
Operating Profit - EBIT	2.86	0.18	-160.60	457.94	17.56	6577
Capital Employed	34.54	2.45	-568.40	19417.18	346.23	6577
ROCE	-1.00	0.10	-16961.00	5244.00	223.65	6576
Profit Margin	-1333.85	0.14	-4752875.00	1.00	68657.49	4877

All values are expressed in euros and reported in real terms (discounted at Consumer Price Index, provided by INE, base year 2012 = 100). Except for ROCE and Profit Margin, all figures are in millions.

Source: SCIE and Own Calculations

4. Management Practices

4.1. Measuring the Management Score

Adopting the approach of one of the most recent works from Bloom et al. (2019) and following Monteiro and Straume (2024), the responses obtained for each of the interest questions are scaled from zero to one, having zero representing the lowest score and one representing the highest score related to how well the management practice in question is adopted.⁸ After that, an overall management score, measure of management practices, can be computed by doing the basic unweighted average of the valid answers (Monteiro & Straume, 2024).

The overall management score obtained can be decomposed into three categories: Monitoring, related to how well companies know exactly what is happening inside them and how well this information is used for improvements; Targets, related to how companies set goals, track their outcomes and take actions, if necessary; and Incentives, related to how companies reward their employees and to the efforts they make to attract and keep the best employees (Bloom & Van Reenen, 2010). Following Monteiro and Straume (2024), the 27 selected questions⁹ can be distributed across these three core categories. For the Monitoring category, the management score is computed using the average score from questions 1, 2, and 7-16, the Targets category encompasses questions 3-6, and lastly, the Incentives category includes questions 17-29. Each question for each category is related to specific topics. Regarding the Monitoring category, questions concerning *operational* aspects (op), *performance clarity and comparability* (mpcc), *performance tracking* (mpt), *performance communication* (mpc), and *performance dialogue* (mpd) are included. For the Targets category, the topics are related to *target breadth* (tb),

⁸The scale for the scores of each of the questions can be seen in Monteiro and Straume (2024).

⁹[Annex B](#), presents the description and summary statistics for each of the interest questions.

target time horizon (tth), and *target stretching* (ts). Finally, the Incentives category includes questions for practices related to *fixing poor performers* (pifpp), *rewarding high performance* (pirhp), *promoting high performers* (piphp), and *retaining human capital* (pirhc).

Figure 4.1 illustrates the distribution of the management score across the final sample of 6577 firms in the matched IPG-QP-SCIE dataset. The bars represent the number of firms that fall specifically under an interval of score, which are overlaid with a kernel density estimation curve, that shows the smoothed distribution of the management scores. The average management score in the sample is 0.44, which is relatively low compared to the scores of other countries in other studies using the same scale, for example, 0.62 for the United States concerning the manufacturing sector (Bloom et al., 2019), 0.56 for manufacturing German firms (Jirjahn et al., 2024), and 0.51 for Italy (2019 wave) (Baltrunaite et al., 2023), reinforcing that Portugal tends to show lower management scores when compared to other countries (e.g., Bloom et al., 2017). A normal distribution can be observed, indicating that most firms present a moderate score, with few firms having both very low or very high scores.



Figure 4.1.: Overall Management Score (Portugal 2016 & 2022)

Source: IPG

When comparing the two years, a slight increase in the management score is verified. In 2016, the average management score of the 3531 firms in the sample is 0.43, while in 2022, the average score of the 3046 firms is slightly higher, being 0.46 (Figure 4.2).

In Figure 4.3, the distribution of the management score by the three core categories - Monitoring, Targets, and Incentives - can be observed. As the results obtained by Monteiro and

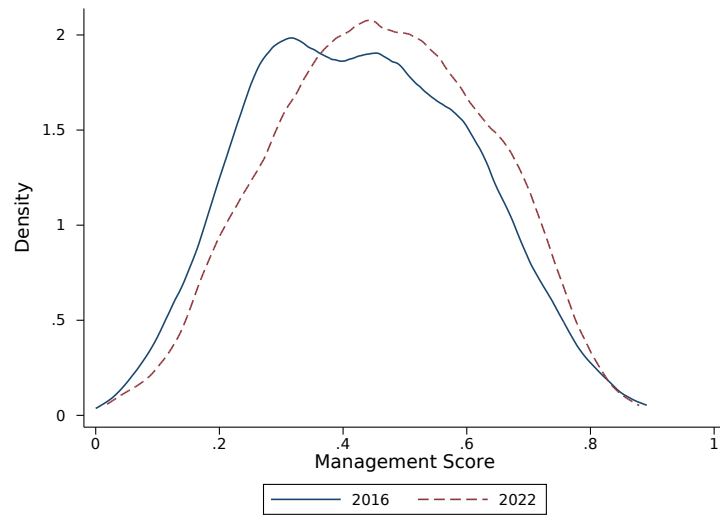


Figure 4.2.: Overall Management Score by Year (Portugal 2016 & 2022)

Source: IPG

Straume (2024), the overall score highly reflects the distribution of the score in the Monitoring category. The Targets category is more left-skewed, suggesting that the majority of firms present higher scores in this category. In contrast, the Incentives category exhibits a right-skewed distribution, indicating that most firms show low adoption of structured management practices related to incentives. As such, the majority of firms presents low incentives scores, suggesting that only a few implement incentive-related management practices, highlighting the low use of these practices in the sample, which has been noted as a key characteristic of Portuguese management (Monteiro & Straume, 2024). As displayed in [Annex B](#), practices related to *fixing poor performers* and *retaining human capital* show particularly weak results, with most average values being below 0.30. Although *rewarding high performance* and *promoting high performers* perform slightly better, these scores are still behind those in the monitoring and targets categories. Indeed, the incentive-related practices exhibit an average score of 0.31, compared to the 0.54 for the Monitoring category, and 0.64 for the Targets category, as seen in [Table 4.1](#).

Table 4.1.: Summary Statistics for Management Scores (Portugal 2016 & 2022)

	Mean	Median	Min	Max	SD	N
Management Score	0.443	0.441	0.000	0.891	0.173	6577
Monitoring	0.535	0.552	0.000	0.967	0.163	6577
Targets	0.638	0.688	0.000	1.000	0.206	6577
Incentives	0.306	0.282	0.000	1.000	0.247	6577

Source: IPG

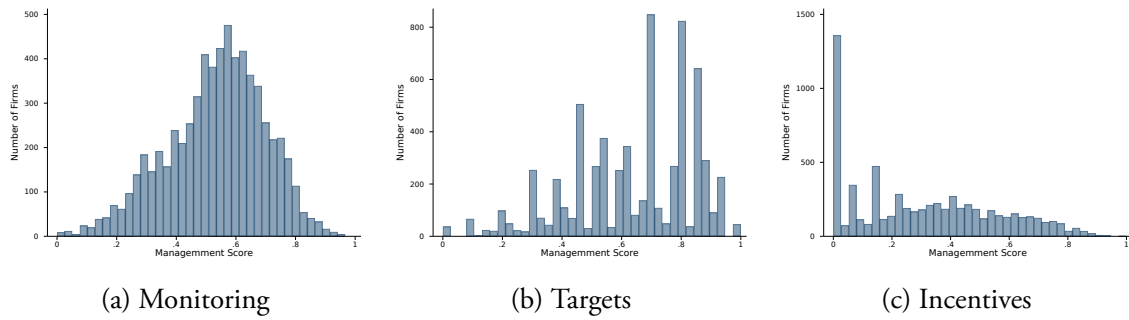


Figure 4.3.: Management Score by Category (Portugal 2016 & 2022)

Source: IPG

4.2. Management Scores and Firm Characteristics

This section illustrates the management scores across firms with different characteristics. The detailed management scores for each of the variables can be consulted in [Annex C](#).

When comparing firms by size (Figure 4.4), as defined by the IPG, larger firms generally present higher management scores, with an average of 0.56, consistent with evidence from previous studies (e.g., Bloom et al., 2017). On the other hand, the density curve for micro firms is right-skewed, suggesting that there are some micro-firms with good management scores, but most of them present weaker management practices (average score of 0.32). The density curve for medium firms overlaps significantly with both micro and large firms, implying that management quality varies more within this group (average score of 0.42).

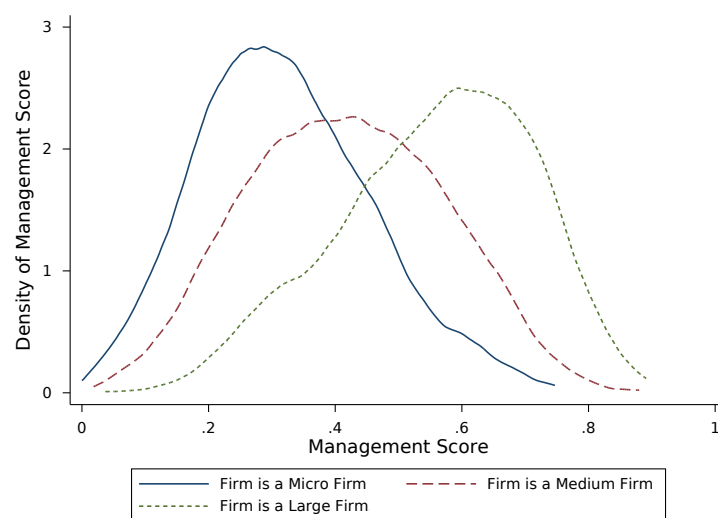


Figure 4.4.: Distribution of the Management Score by Firm Size (Portugal 2016 & 2022)

Source: IPG

When examining firms by age group (Figure 4.5), firms aged 3–9 years appear to have the highest density of management scores around 0.50. This suggests a clustering of firms in this age group with relatively high management scores. Younger firms, on the other hand, peak slightly earlier, and older firms (10+ years), show a flatter distribution across a wider range of scores, indicating more variability. Older firms are expected to present better management scores (Bloom et al., 2017), which is confirmed by the results as older firms present the higher average score (0.45). Nevertheless, the three categories present very similar average results.

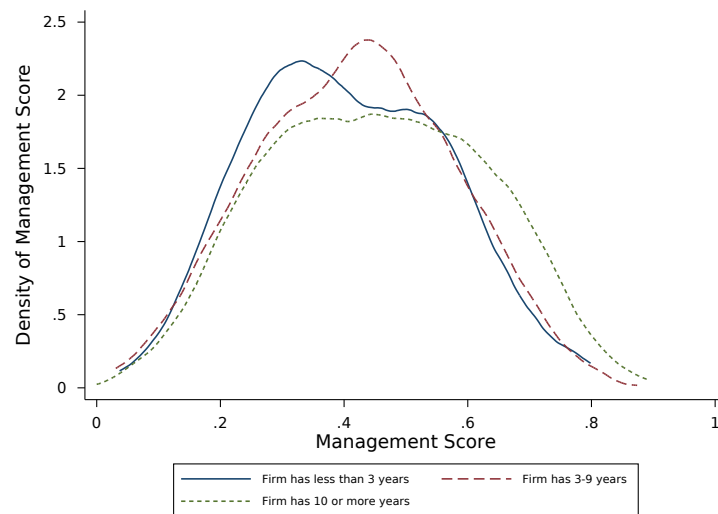


Figure 4.5.: Distribution of the Management Score by Firm Age (Portugal 2016 & 2022)

Source: IPG and QP

In Figure 4.6, box plots of the management score concerning family ownership are presented. As suggested in the literature (e.g., Bloom et al., 2024), family firms present lower average management scores (0.41) compared to non-family firms (0.48), indicating that family firms present weaker management. Family firms managed by their founder or by their family, also present lower management scores, with an average of around 0.39, compared to the average of around 0.48 when that is not the case (all others), also in line with other previous studies (Bennett et al., 2017; Lemos & Scur, 2019). Additionally, foreign-owned firms present higher average management scores on average (0.55), and firms with public ownership lower (0.41), compared to not foreign-owned and not public-owned firms, respectively.

Looking at the distribution of the overall management scores across different industries, a few disparities are noted, as shown in Figure 4.7. The service industry achieves the highest average score (0.46), followed by the manufacturing industry (0.44), the industry most com-

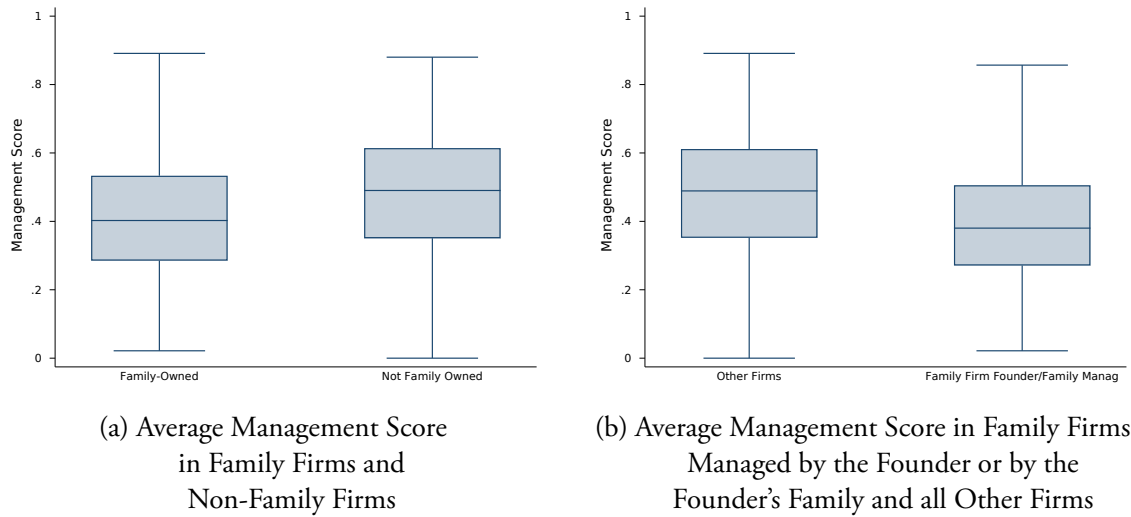


Figure 4.6.: Management Scores in Family Firms (Portugal 2016 & 2022)

Source: IPG

monly explored in similar studies (e.g., Bai et al., 2022; Bender et al., 2018; Bennett et al., 2017; Bloom et al., 2019; Cornwell et al., 2021; Feng & Valero, 2020; Jirjahn et al., 2024; Lamorgese et al., 2024). The agriculture and natural resources industry records the lowest average score at 0.36, presenting high density of scores for lower values. Indeed, agriculture and natural resources firms show a right-skewed distribution, with a strong peak at much lower management scores, suggesting that firms in this industry may be significantly less likely to implement structured management practices.

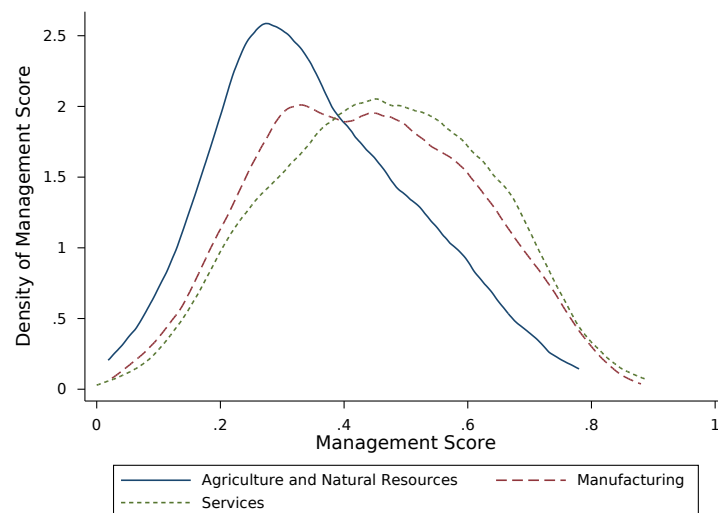


Figure 4.7.: Distribution of the Management Score by Industry (Portugal 2016 & 2022)

Source: IPG and QP

Regarding regional distribution, all regions present similar management scores, with the exception of “Madeira” that records the highest score at 0.52, and “Lisboa” that records 0.49. All other regions exhibit scores that range from 0.39 to 0.45.

Considering three groups of market share (low (<5%), medium ($\geq 5\%$ & <20%), and high ($\geq 20\%$)), as seen in Figure 4.8, the bar chart reveals that firms in the higher market share group present the highest management scores (0.64). This contrasts with prior evidence from other studies where stronger competition, which would mean lower market share, is associated with better management scores (e.g., Bloom et al., 2019, 2024; Bloom & Van Reenen, 2007).

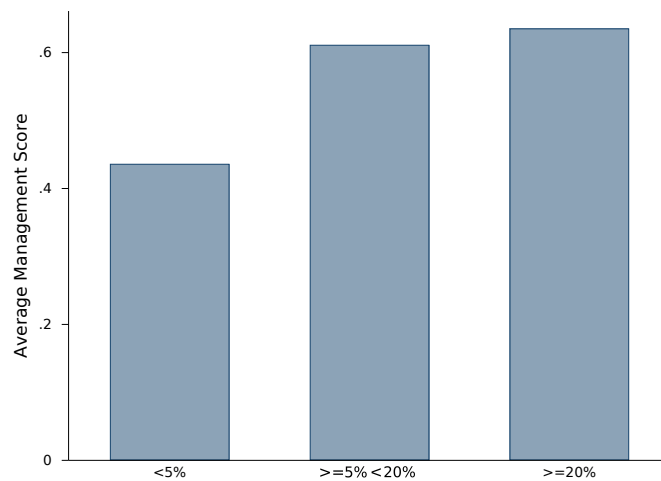


Figure 4.8.: Average Management Score by Market Share (Portugal 2016 & 2022)

Source: IPG and QP

It is also relevant to note that firms with works council present higher average management scores at 0.55, compared to 0.43 when that is not the case.

4.3. Management Scores and Workforce Characteristics

In this section, it is presented how firms with different workforce characteristics, in particular human capital variables, present different management scores. [Annex C](#) presents the management scores for each of the variables.

When considering the education levels of both managers and non-managers (Figure 4.9), it is observed that firms with higher percentages of individuals holding a college degree or higher, as collected in IPG, generally tend to present higher management scores. For example, the

average management score for firms where more than 80% of managers hold at least a college degree is around 0.50. In contrast, firms where this percentage falls in the category from 0% to 20% present an average score of 0.42. When the percentage is 0%, the average management score only reaches the value of 0.31. Similar patterns are observed for non-managers. This evidence is consistent with findings from other studies (e.g., Bender et al., 2018; Bloom et al., 2019, 2024; Cornwell et al., 2021)

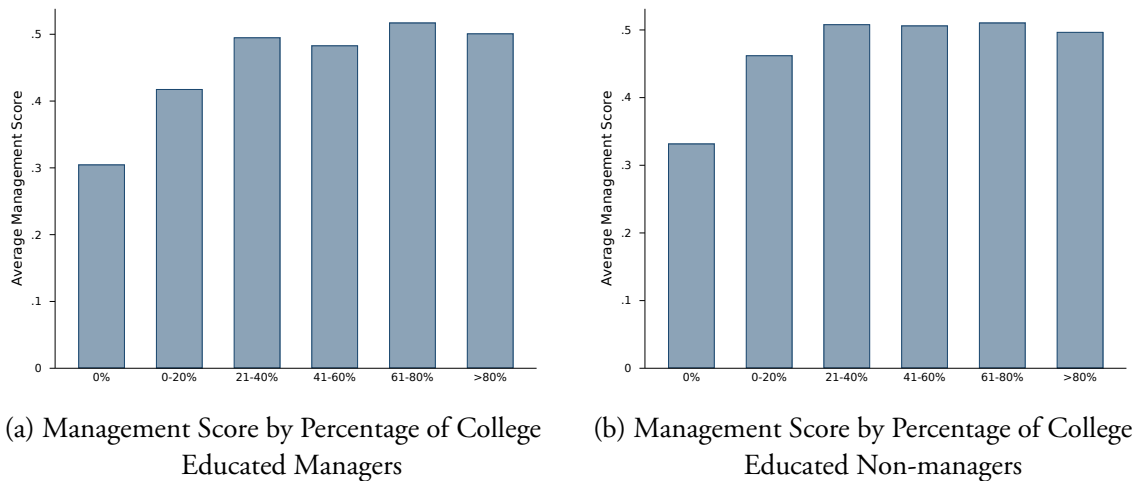


Figure 4.9.: Management Scores and Workforce Education (Portugal 2016 & 2022)

Source: IPG

For another human capital variable, age (Figure 4.10), the highest management score among managers is verified when the average age falls into the 35–54 group (0.46), with the age group below 35 presenting a slightly lower average management score (0.44), and the age group above 54 and even lower one, with an average of 0.35. In contrast, for non-managers, it is verified that an older workforce presents lower management scores (0.35), and with firms in which non-managers have an average age under 34 showing the highest value for the score (0.49). This suggests that younger non-managers may contribute more positively for the adoption of better structured management practices, but for managers there is not a linear association.

For tenure, both managers and non-managers exhibit a similar pattern, where management scores are higher when workforce tenure is 5 to 14 years (0.46 for both managers and non-managers). For the rest of the categories, both groups present very similar but marginally lower results. These results suggest that, while moderate tenure is beneficial for both groups, higher experience at firms may not always correspond to better management.

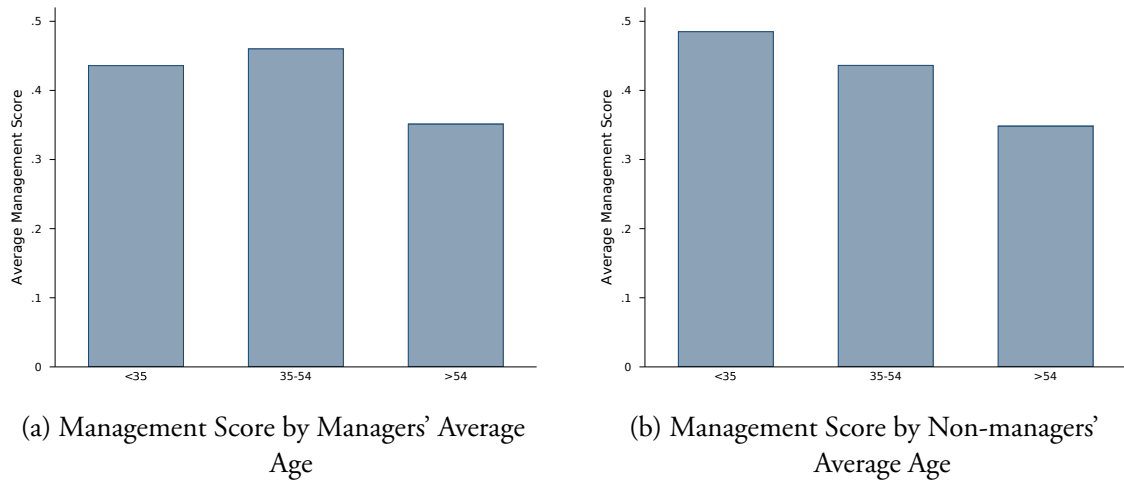


Figure 4.10.: Management Scores and Workforce Average Age (Portugal 2016 & 2022)

Source: IPG

4.4. Management Scores and Firm Performance

Figure 4.11 illustrates the relationship between some performance measures and management scores, with each bar representing a different decile of the score, ranging from zero to one. A slight upward trend in productivity (measured as output/employee) is observed as the management scores slightly rise, which suggests a positive relationship between better management practices and productivity, as previously noted in other studies (e.g Bloom et al., 2019). The same positive association is observed for both operating profits and total sales.

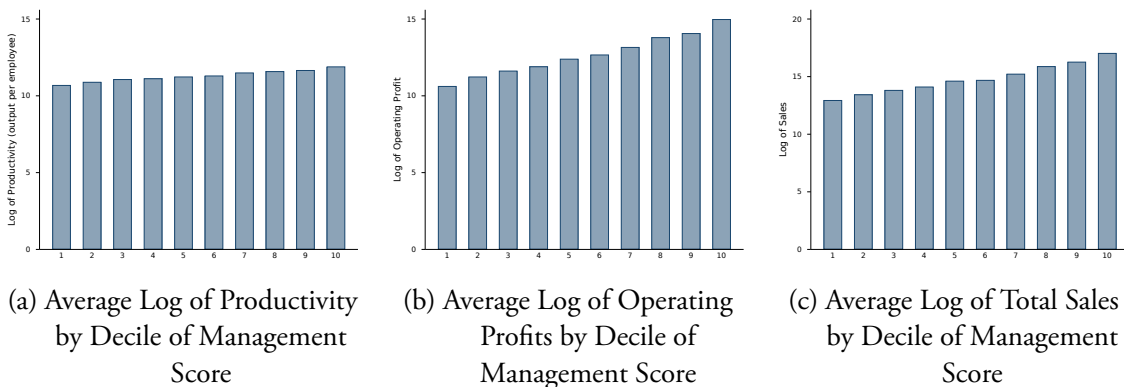


Figure 4.11.: Management Scores and Performance Measures (Portugal 2016 & 2022)

Source: IPG and SCIE

5. Econometric Approach

This section discusses the models and key findings related to the drivers of management practice adoption, as well as the association between management practices and firm performance.¹⁰

5.1. Management Practices Determinants

5.1.1. Econometric Model

After computing the management score as described previously, a model was developed to examine the factors that contribute to the adoption of better (or worse) management practices in a firm. As such, to explore the association between management practices and its explanatory variables, accounting for unobserved time-specific factors that may influence the dependent variable, the following model was estimated:

$$M_{it} = \alpha + \beta \mathbf{X}_{it} + \theta \mathbf{Z}_{it} + \tau_t + \gamma_j + \eta_k + u_{it} \quad (5.1)$$

M_{it} represents the standardized management score (z-score) for a firm i in period t , and is modelled as a function of firm characteristics $\mathbf{X}_{it}$, including firm size, ownership, and market share, and workforce characteristics $\mathbf{Z}_{it}$, including education and age, with each vector being associated with coefficients β and θ , respectively. These also include control variables. Time fixed effects, τ_t , are also included to control for time-specific shocks or trends that may affect all firms, respectively, and allow to estimate coefficients that reflect differences between firms within the same year. Industry-fixed effects (γ_j) and regional fixed-effects (η_k) are also

¹⁰The detailed description of the explanatory variables is included in [Annex A](#).

included. u_{it} is the error term, representing unobserved factors specific to each firm and time period.

5.1.2. Results

In this section, the key results from the estimation of Equation 5.1 regarding the drivers of management practices adoption will be discussed.

Table 5.1 showcases the relationship between firm and workforce characteristics and the adoption of structured management practices. For all models, the standard errors are clustered at firm level, to control for heteroscedasticity and within-firm temporal correlation.

In Column 1, a regression is run considering only firm characteristics, including firm size, ownership structure, and market share, as well as time, region, and industry dummies. Additionally, and inspired by the work of Bender et al. (2018) and Cornwell et al. (2021), this specification also controls for firm age. In Column 2, variables concerning workforce characteristics are added, including education and age. This specification retains the controls from the previous regression and further incorporates variables capturing workforce tenure, the proportion of female employees, the proportion of top managers, and a dummy variable for whether female represent more than 50% of top managers, inspired by previous studies. The results for both models are very similar, but with Model 2 presenting slightly lower coefficients.

Firm size, measured by the log of the number of employees, is positively and strongly associated with higher management scores across all model specifications, suggesting that larger firms are more likely to adopt better structured management practices. Indeed, a 1% increase in the number of employees is associated with a 0.00202 (0.202/100) standard deviation increase in the management score for the preferred model specification (Model 2).

Regarding ownership, family firms tend to be associated with lower management scores compared to non-family firms, as indicated by the negative coefficients for both variables related to family firms in the preferred model specification. However, only family firms managed by the founder or by a family member present statistically significant results. These firms present management scores that are approximately 0.154 standard deviations lower than a similar

non-family firm (omitted category). In contrast, family firms not managed by the founder or a family member show no statistically significant difference in the management scores. This suggests that the key factor driving the difference is not family ownership per se, but whether the firm is managed by the founder or by someone from the founder's family.

Moreover, foreign owned firms are positively associated with higher management scores, exhibiting scores that are approximately 0.202 standard deviations higher than firms that are not at least 50% owned by foreign entities. Contrarily, public firms seem to be associated with worse management, scoring approximately 0.668 standard deviations below firms that are not at least 50% owned by the state.

The results also show that market share is positively and significantly associated with higher management scores. Specifically, a 10 percentage point increase in market share is associated with an approximate 0.103 (0.1×1.026) standard deviation increase in the score.

Moving to the variables that reflect workforce characteristics, workforce education seems to be the most powerful predictor. All the coefficients that represent higher percentages of managers and non-managers that hold a college degree are significant and positively associated with the dependent variable, when compared to the reference category of 0%, supporting that workforce education matters. Indeed, firms in which more than 80% of managers are college-educated present scores that are 0.475 standard deviations higher than those firms which present 0% of college educated managers. A similar trend is observed among non-managers, with firms that have more than 80% of non-managers holding a college degree or higher scoring 0.374 standard deviations higher than those with no college education.

Regarding age, older managers (>54 years old) are strongly associated with lower management scores, but managers in the 35-54 age group show no significant difference compared to the reference category (<35 years old). For non-managers, the coefficients for employees aged 35-54 and above 54 are both negative and significant, suggesting that firms with an older non-manager workforce tend to present lower management scores.

Table 5.1.: Management Practices Drivers (Portugal 2016 & 2022)

	Management z-score	Management z-score
Firm Characteristics		
Log of Number of Employees	0.254*** (0.008)	0.202*** (0.011)
<i>Omitted: Firm is not Family-Owned</i>		
Family Firm is managed by the Founder or by the Founder's Family	-0.215*** (0.026)	-0.154*** (0.025)
Family Firm is not managed by the Founder or by the Founder's Family	0.004 (0.035)	-0.012 (0.033)
Firm has Foreign Ownership	0.300*** (0.031)	0.202*** (0.030)
Firm has Public Ownership	-0.696*** (0.077)	-0.668*** (0.074)
Market Share	1.108*** (0.311)	1.026*** (0.272)
Log of Firm Age	-0.017 (0.012)	-0.004 (0.015)
Workforce Characteristics		
<i>Omitted: Percentage of College Managers is 0%</i>		
Percentage of College Managers between 1-20%		0.234*** (0.033)
Percentage of College Managers between 21-40%		0.428*** (0.044)
Percentage of College Managers between 41-60%		0.389*** (0.043)
Percentage of College Managers between 61-80%		0.501*** (0.045)
Percentage of College Managers is >80%		0.475*** (0.034)
<i>Omitted: Percentage of College Non-managers is 0%</i>		
Percentage of College Non-managers between 1-20%		0.211*** (0.029)
Percentage of College Non-managers between 21-40%		0.340*** (0.038)
Percentage of College Non-managers between 41-60%		0.311*** (0.045)
Percentage of College Non-managers between 61-80%		0.394*** (0.055)
Percentage of College Non-managers is >80%		0.374*** (0.043)
<i>Omitted: Managers Average Age <35</i>		
Managers Average Age 35-54		-0.039 (0.045)
Managers Average Age >54		-0.217*** (0.053)

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	Management z-score	Management z-score
<i>Omitted: Non-managers Average Age <35</i>		
Non-managers Average Age 35-54		-0.192*** (0.027)
Non-managers Average Age >54		-0.280*** (0.065)
<i>Omitted: Managers Average Tenure <5</i>		
Managers Average Tenure 5-14		0.034 (0.033)
Managers Average Tenure >14		0.060 (0.040)
<i>Omitted: Non-managers Average Tenure <5</i>		
Non-managers Average Tenure 5-14		0.035 (0.030)
Non-managers Average Tenure >14		-0.022 (0.039)
Percentage of Female Employees		-0.090** (0.043)
Percentage Top Managers		0.271 (0.177)
50% or more Top Managers are Female		-0.010 (0.024)
Time Dummies	Yes	Yes
Industry Dummies	Yes	Yes
Region Dummies	Yes	Yes
R ²	0.304	0.382
Observations	6577	6577
F-stat	154.6	109.1
p-value	0.000	0.000
Standard errors in parentheses		
Standard errors clustered at the firm level		
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$		

The results obtained support hypotheses H1, H2, H3, H4a and H5. On the other hand, hypotheses H4b and H6 were not confirmed by the results.

Hypothesis 1, Hypothesis 2, and Hypothesis 3 sought to test the association between different types of ownership structure and management scores. As seen in Table 5.1 and as described above, the results suggest that being a family firm is not enough to drive differences in the management score. Indeed, the results confirm that a family firm being managed by the founder or by their family members is what drives the differences (H1), as a family firm managed by someone external presents no significant differences relative to non-family firms.

This result aligns with previous evidence presented by Bennett et al. (2017) and Bloom et al. (2024), that suggest that founder and family ownership by themselves is not enough to harm the adoption of management practices, but their involvement in management is. This evidence supports the view that lower adoption of such practices in family firms is not driven from structural barriers, but from the particular decisions made by the family owners themselves. Moreover, firms with public ownership are confirmed to be associated with lower adoption of structured management practices (H2), and firms with foreign ownership with higher adoption of structured management practices (H3).

Hypothesis 2 predicted a positive association between human capital variables, in particular (a) education and (b) age (proxy for experience in the labour market), and the adoption of structured management practices. The results from the preferred specification support that (a) education is positively associated with structured management practices adoption, supporting previous results from other studies (e.g. Bender et al., 2018; Bloom et al., 2019; Feng & Valero, 2020). On the other hand, the results do not support the idea that (b) age is positively associated with higher adoption of management practices, as they suggest that an older workforce is generally associated with lower management scores. One possible explanation could be that an older workforce may be less willing to change familiar processes and routines, leading to inertia in adopting better management practices.

Moreover, **Hypothesis 5** stated that larger firms were associated with higher adoption of structured management practices, and consequently higher management scores. Table 5.1 confirms this positive association, indicating that larger firms seem to be associated with higher scores, and consequently with higher adoption of more structured management practices, and supporting previous results obtained in other studies (e.g. Bloom et al., 2017).

Lastly, **Hypothesis 6** is not supported, as firms with higher market share are associated with higher management scores. This is somewhat surprising and goes against the belief that competition, which in this case would correspond to lower market shares, promotes firms to adopt better practices, in order not to lose to their competitors (e.g., Bloom et al., 2019, 2024). In a less competitive economy as Portugal, these results may suggest that scale plays a more significant role than competitive pressure in driving the adoption of management practices. Larger firms that hold larger market shares may have access to more favourable conditions that enable

them to better adopt structured management practices.

Table 5.2 shows the results for the model with the same specifications as the model in Column 2 from Table 5.1, but provides insights on how the determinants of the adoption of structured management practices relate to the overall management score (Column 1), Monitoring category (Column 2), Targets category (Column 3), and Incentives category (Column 4).

It is relevant to highlight that managers' and non-managers' educational attainment is associated with an improved management quality across all categories, suggesting that more skilled employees may contribute to the higher adoption of structured practices of all types, or vice-versa. As mentioned previously, it is important to consider the chance of reverse causality and the complementarity between a skilled workforce and management practices implementation (Baltrunaite et al., 2023; Bender et al., 2018; Cornwell et al., 2021).

Considering the included control variables, managers' tenure at a firm is significantly associated with higher management scores for the Incentives category. Nevertheless, it is also important to consider the possibility of reverse causality between employee tenure and these practices. While longer tenure might be associated with stronger incentive-related practices, suggesting that experienced managers contribute to better management, it is also plausible to infer that firms with better incentive systems may be more effective at attracting and retaining them. In this context, longer tenure may serve as a measure of the quality of the match between the manager and the firm, rather than tenure being a direct cause of improved practices.

Table 5.2.: Management Practices Drivers by Category (Portugal 2016 & 2022)

	Management	Monitoring	Targets	Incentives
	z-score	z-score	z-score	z-score
Firm Characteristics				
Log of Number of Employees	0.202*** (0.011)	0.141*** (0.012)	0.080*** (0.012)	0.198*** (0.011)
<i>Omitted: Firm is not Family-Owned</i>				
Family Firm is managed by the Founder or by the Founder's Family	-0.154*** (0.025)	-0.153*** (0.027)	-0.044 (0.029)	-0.133*** (0.025)

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	Management	Monitoring	Targets	Incentives
	z-score	z-score	z-score	z-score
Family Firm is not managed by the Founder or by the Founder's Family	-0.012 (0.033)	0.006 (0.035)	-0.020 (0.037)	-0.017 (0.036)
Firm has Foreign Ownership	0.202*** (0.030)	0.162*** (0.031)	0.062* (0.032)	0.195*** (0.032)
Firm has Public Ownership	-0.668*** (0.074)	-0.001 (0.081)	-0.268*** (0.084)	-0.897*** (0.078)
Market Share	1.026*** (0.272)	0.988*** (0.367)	0.021 (0.262)	0.974*** (0.273)
Workforce Characteristics				
<i>Omitted: Percentage of College Managers is 0%</i>				
Percentage of College Managers between 1-20%	0.234*** (0.033)	0.266*** (0.040)	0.205*** (0.043)	0.149*** (0.031)
Percentage of College Managers between 21-40%	0.428*** (0.044)	0.406*** (0.051)	0.210*** (0.053)	0.352*** (0.045)
Percentage of College Managers between 41-60%	0.389*** (0.043)	0.331*** (0.049)	0.186*** (0.053)	0.338*** (0.043)
Percentage of College Managers between 61-80%	0.501*** (0.045)	0.475*** (0.051)	0.272*** (0.054)	0.405*** (0.046)
Percentage of College Managers is >80%	0.475*** (0.034)	0.435*** (0.041)	0.252*** (0.045)	0.395*** (0.033)
<i>Omitted: Percentage of College Non-managers is 0%</i>				
Percentage of College Non-managers between 1-20%	0.211*** (0.029)	0.195*** (0.033)	0.221*** (0.037)	0.149*** (0.028)
Percentage of College Non-managers between 21-40%	0.340*** (0.038)	0.279*** (0.042)	0.322*** (0.047)	0.269*** (0.040)
Percentage of College Non-managers between 41-60%	0.311*** (0.045)	0.174*** (0.049)	0.411*** (0.053)	0.263*** (0.047)
Percentage of College Non-managers between 61-80%	0.394*** (0.055)	0.210*** (0.055)	0.335*** (0.061)	0.380*** (0.057)
Percentage of College Non-managers is >80%	0.374*** (0.043)	0.233*** (0.048)	0.370*** (0.052)	0.334*** (0.045)
<i>Omitted: Managers Average Age <35</i>				
Managers Average Age 35-54	-0.039 (0.045)	-0.098* (0.051)	-0.032 (0.056)	-0.002 (0.045)
Managers Average Age >54	-0.217*** (0.053)	-0.259*** (0.062)	-0.204*** (0.067)	-0.138*** (0.052)
<i>Omitted: Non-managers Average Age <35</i>				
Non-managers Average Age 35-54	-0.192*** (0.027)	-0.091*** (0.030)	-0.089*** (0.032)	-0.214*** (0.028)
Non-managers Average Age >54	-0.280*** (0.065)	-0.249*** (0.076)	-0.167* (0.088)	-0.238*** (0.067)
<i>Omitted: Managers Average Tenure <5</i>				
Managers Average Tenure 5-14	0.034 (0.033)	-0.073* (0.039)	-0.050 (0.040)	0.101*** (0.034)
Managers Average Tenure >14	0.060 (0.040)	-0.027 (0.047)	-0.024 (0.048)	0.110*** (0.041)

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	Management	Monitoring	Targets	Incentives
	z-score	z-score	z-score	z-score
<i>Omitted: Non-managers Average Tenure <5</i>				
Non-managers Average Tenure 5-14	0.035 (0.030)	0.112*** (0.034)	-0.007 (0.034)	-0.005 (0.031)
Non-managers Average Tenure >14	-0.022 (0.039)	0.088** (0.043)	-0.093** (0.046)	-0.056 (0.040)
Log of Firm Age	-0.004 (0.015)	-0.026 (0.017)	-0.001 (0.018)	0.007 (0.016)
Percentage of Female Employees	-0.090** (0.043)	-0.073 (0.048)	-0.047 (0.050)	-0.082* (0.043)
Percentage Top Managers	0.271 (0.177)	0.283 (0.210)	0.073 (0.205)	0.210 (0.171)
50% or more Top Managers are Female	-0.010 (0.024)	0.017 (0.027)	0.025 (0.028)	-0.026 (0.025)
Time Dummies	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
Region Dummies	Yes	Yes	Yes	Yes
R ²	0.382	0.226	0.105	0.345
Observations	6577	6577	6577	6577
F-stat	109.1	45.0	19.2	100.3
p-value	0.000	0.000	0.000	0.000
Standard errors in parentheses				
Standard errors clustered at the firm level				
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$				

5.1.3. Robustness Checks

In order to ensure the validity and reliability of the results, some robustness checks were performed, to assess if the associations obtained between management practices and its drivers hold under different specifications. Likewise, the preferred model specification was applied to the sample of only manufacturing firms, the most common industry used in similar studies as mentioned previously, and to only firms with more than 100 employees, as seen in Table D.1 in Annex D.

When including only firms that operate in the Manufacturing industry (Column 2), the results obtained were qualitatively identical, except for the public ownership dummy. Considering only firms with more than 100 employees (Column 3), the majority of the results also remain qualitatively similar, with only the category representing managers older than 54 years being

no longer statistically significant.

As such, these robustness checks support that the main findings hold across different subsamples. Even with some variables such as public ownership and manager age losing statistical significance under specific conditions, the overall pattern for the results remains identical, suggesting that the conclusions drawn previously are robust.

5.2. Management Practices and Firm Performance

5.2.1. Econometric Model

The next step is to assess how management practices relate to productivity, a measure of performance. Likewise, and taking into account the Cobb-Douglas production function and the model described by Bloom et al. (2019), the following equation is considered:

$$Y_{it} = A_{it} K_{it}^{\alpha} L_{it}^{\beta} I_{it}^{\gamma} e^{\delta M_{it}} e^{\theta \mathbf{X}_{it}} \quad (5.2)$$

In the equation, Y_{it} represents the output (measured by firm production), A_{it} represents the TFP, not including management practices, K_{it} the capital input¹¹, L_{it} the labour input, I_{it} intermediate inputs, and M_{it} represents the management score, for firm i at period t . The coefficients α , β , γ and δ represent output elasticity with respect to capital, labour, intermediate and management inputs, respectively, and indicate how changes in each input affect the output. $\mathbf{X}_{it}$ is a vector of additional factors that may also influence firms' output, but are not captured by capital, labour, or management. These include workforce education, percentage of female employees, percentage of top managers, a dummy variable for whether more than 50% of top managers are female, ownership dummies, firm age, and market share (representing competition), which have been considered in previous studies (e.g. Bender et al., 2018; Bloom et al., 2019; Cornwell et al., 2021). The presence of works councils is also accounted for, which have been previously noted to enhance firm performance, when compared to firms with no works councils (Jirjahn et al., 2024).

¹¹Capital inputs measured through total fixed assets (expressed in real terms, in euros).

The equation can be rewritten dividing both sides by labour and taking the natural logarithms, as Bloom et al. (2019) suggest:¹²

$$\log\left(\frac{Y_{it}}{L_{it}}\right) = \alpha \log\left(\frac{K_{it}}{L_{it}}\right) + \gamma \log\left(\frac{I_{it}}{L_{it}}\right) + (\alpha + \beta + \gamma - 1) \log(L_{it}) + \delta M_{it} + \theta \mathbf{X}_{it} + \tau_t + \rho_j + \eta_r + u_{it} \quad (5.3)$$

As such, $\log\left(\frac{Y_{it}}{L_{it}}\right)$ is the log of output per employee, which is labour productivity. As the TFP (A_{it}) is not directly observed, to control for whatever unmeasured productivity differences remain, the term is replaced by τ_t , which represents time fixed effects, ρ_j , which represents industry fixed effects, η_r , which represents regional fixed effects, and u_{it} , which is the error term that captures unobserved time-invariant factors.

A similar equation will be used to determine the relationship between management practices and other performance measures, such as ROCE and profit margin, measures of profitability, in order to test the robustness of the results.

5.2.2. Results

In this section, the key results from the econometric models that model the association between management practices and firm performance will be discussed.

Considering the work developed by Bloom et al. (2019) and the matched IPG-QP-SCIE sample, Table 5.3 presents the results from the regressions run to assess the association between management practices and firm performance. For all models, the standard errors are clustered at firm level to account for within-firm correlation, and all previously mentioned controls are included. Moreover, to mitigate the influence of extreme outliers in labour productivity, only observations between the 1st and 99th percentiles are kept. Some observations were also dropped due to missing values in the log-transformed variables.

¹²The terms M_{it} and X_{it} are exponentiated so that, when natural logarithms are applied, they reflect levels. Moreover, after dividing both sides by labour and taking the natural logarithms, the terms $\alpha \log(K_{it})$ and $\gamma \log(I_{it})$ become $\alpha(\log\left(\frac{K_{it}}{L_{it}}\right) + \log(L_{it}))$ and $\gamma(\log\left(\frac{I_{it}}{L_{it}}\right) + \log(L_{it}))$, respectively, in order to model output per employee as a function of capital and intermediate inputs per employee as well. Expressing $\log(K_{it})$ and $\log(I_{it})$ per employee generates extra $\log(L_{it})$ components that merge with the original $(\beta - 1) \log(L_{it})$ to form $(\alpha + \beta + \gamma - 1) \log(L_{it})$.

The first column of Table 5.3 presents the results for the regression of labour productivity (measured as $\log(\text{output}/\text{number of employees})$) on the calculated standardized management score. The z-management score presents a highly significant coefficient of 0.043, which means that a one unit standard deviation increase in the z-management score leads to 4,39% $(=(\exp(0.043)-1)*100)$ increase in productivity per employee.

Considering these results, **Hypothesis 8** is supported. As shown in previous studies, the adoption of structured management practices is associated with better firm performance, and in particular productivity (e.g. Baltrunaite et al., 2023; Bender et al., 2018; Bennett et al., 2017; Bloom & Van Reenen, 2007; Cornwell et al., 2021; Heyman et al., 2019).

The remaining columns of Table 5.3 present the results for the regression of labour productivity on the calculated standardized management scores for each of the interest categories. The results are mainly qualitatively identical, as the coefficients for the management score remain significant across the three categories, supporting **Hypothesis 8a**, **Hypothesis 8b**, and **Hypothesis 8c**. Nevertheless, the Monitoring category is only significant at a percentage level of 5%. Moreover, the Incentives category seems to present the higher impact on productivity, compared to the other categories. This is particularly interesting, as Portugal is recognised as presenting low use of incentive-based initiatives (Monteiro & Straume, 2024), scoring below average in this category in the study by Bloom and Van Reenen (2010) and being the category where the average score is significantly lower in the sample of this study.

Considering the control variables, it is worth noticing that the share of female employees in the firms in the sample is negatively associated with productivity per employee, with high statistical significance.

Table 5.3.: Management Practices and Firm Performance (Portugal 2016 & 2022)

	$\log(\text{output}/\text{employee})$	$\log(\text{output}/\text{employee})$	$\log(\text{output}/\text{employee})$	$\log(\text{output}/\text{employee})$
Management z-score	0.043*** (0.006)			
Monitoring z-score		0.012** (0.006)		
Targets z-score			0.023*** (0.005)	

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	log(output/ employee)	log(output/ employee)	log(output/ employee)	log(output/ employee)
Incentives z-score				0.041*** (0.006)
Log of Capital Inputs per Employee	0.008** (0.004)	0.009** (0.004)	0.009** (0.004)	0.009** (0.004)
Log of Intermediate Inputs per Employee	0.638*** (0.007)	0.642*** (0.007)	0.641*** (0.007)	0.639*** (0.007)
Log of Labour Inputs	0.000 (0.006)	0.009 (0.006)	0.008 (0.006)	0.001 (0.006)
<i>Omitted: Percentage of College Managers is 0%</i>				
Percentage of College Managers between 1-20%	0.045*** (0.016)	0.050*** (0.016)	0.049*** (0.016)	0.048*** (0.016)
Percentage of College Managers between 21-40%	0.032 (0.021)	0.044** (0.021)	0.044** (0.021)	0.035* (0.021)
Percentage of College Managers between 41-60%	0.078*** (0.021)	0.089*** (0.021)	0.089*** (0.020)	0.080*** (0.020)
Percentage of College Managers between 61-80%	0.083*** (0.021)	0.096*** (0.021)	0.096*** (0.021)	0.087*** (0.021)
Percentage of College Managers is >80%	0.106*** (0.017)	0.119*** (0.017)	0.119*** (0.017)	0.109*** (0.017)
<i>Omitted: Percentage of College Non-managers is 0%</i>				
Percentage of College Non-managers between 1-20%	0.031** (0.013)	0.036*** (0.013)	0.034*** (0.013)	0.034*** (0.013)
Percentage of College Non-managers between 21-40%	0.082*** (0.019)	0.091*** (0.019)	0.087*** (0.019)	0.085*** (0.019)
Percentage of College Non-managers between 41-60%	0.081*** (0.025)	0.090*** (0.025)	0.084*** (0.025)	0.083*** (0.025)
Percentage of College Non-managers between 61-80%	0.154*** (0.026)	0.168*** (0.027)	0.163*** (0.027)	0.155*** (0.026)
Percentage of College Non-managers is >80%	0.165*** (0.024)	0.179*** (0.024)	0.174*** (0.024)	0.168*** (0.024)
Percentage of Female Employees	-0.152*** (0.022)	-0.150*** (0.022)	-0.150*** (0.022)	-0.152*** (0.022)
Percentage Top Managers	0.079 (0.094)	0.090 (0.095)	0.089 (0.095)	0.083 (0.095)
50% or more Top Managers are Female	-0.002 (0.012)	-0.002 (0.012)	-0.003 (0.012)	-0.001 (0.012)
<i>Omitted: Firm is not Family-Owned</i>				
Family Firm is managed by the Founder or by the Founder's Family	-0.004 (0.011)	-0.007 (0.011)	-0.008 (0.011)	-0.004 (0.011)
Family Firm is not managed by the Founder or by the Founder's Family	-0.026 (0.017)	-0.026 (0.017)	-0.025 (0.017)	-0.026 (0.017)
Firm has Foreign Ownership	0.089*** (0.015)	0.094*** (0.015)	0.095*** (0.015)	0.089*** (0.015)
Firm has Public Ownership	-0.058	-0.092*	-0.084*	-0.049

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	log(output/ employee)	log(output/ employee)	log(output/ employee)	log(output/ employee)
	(0.047)	(0.047)	(0.047)	(0.048)
Log of Firm Age	0.006	0.004	0.005	0.005
	(0.006)	(0.006)	(0.006)	(0.006)
Market Share	1.119***	1.116***	1.138***	1.120***
	(0.239)	(0.237)	(0.240)	(0.239)
Firm has Works Council	0.013	0.016	0.018	0.013
	(0.020)	(0.020)	(0.020)	(0.020)
Time Dummies	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
Region Dummies	Yes	Yes	Yes	Yes
R ²	0.872	0.871	0.872	0.872
Observations	6267	6267	6267	6267
F-stat	527.0	526.8	523.0	529.6
p-value	0.000	0.000	0.000	0.000
Standard errors in parentheses				
Standard errors clustered at firm-level				
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$				

5.2.3. Robustness Checks

To ensure the results are robust, additional performance measures are used to assess if the association obtained between management practices and performance holds. As such, the results for profitability measures, including ROCE and profit margin ratio are presented in Table 5.4. Additionally, the model was also applied to the sample of only manufacturing firms, and to only firms with more than 100 employees, as seen in Table D.2 in Annex D.

For ROCE, considering only observations between the 1st and 99th percentiles, the coefficient for the management score remains highly significant, reinforcing previous results (e.g. Bennett et al., 2017; Bloom & Van Reenen, 2007). The same is verified for profit margin, although with less significance, as the management score is positively associated with this measure of performance at 10% level, but still in line with previous results (Bai et al., 2022; Bloom et al., 2019). For this measure of performance, only observations between the 5th and 95th percentiles are kept, due to evidence of the presence of a large number of outliers, which may be driven by the presence of a significant portion of service industry firms in the sample, as mentioned previously.

As such, the positive and significant association between the higher adoption of structured management practices and productivity is robust to alternative performance measures, particularly ROCE, as the management score remains a strong predictor of performance. Regarding profit margin, the results remain significant, even though at lower significance level, which may suggest that different profitability metrics may capture different aspects of firm performance, and not all respond in the same way to the management practices in question.

Table 5.4.: Management Practices and Firm Performance (other measures) (Portugal 2016 & 2022)

	log(output/ employee)	ROCE	Profit Margin
Management z-score	0.043*** (0.006)	0.028*** (0.005)	0.632* (0.333)
Log of Capital Inputs per Employee	0.008** (0.004)	-0.025*** (0.003)	0.935*** (0.238)
Log of Intermediate Inputs per Employee	0.638*** (0.007)	0.025*** (0.004)	1.175*** (0.258)
Log of Labour Inputs	0.000 (0.006)	-0.000 (0.004)	-1.273*** (0.321)
<i>Omitted: Percentage of College Managers is 0%</i>			
Percentage of College Managers between 1-20%	0.045*** (0.016)	0.002 (0.012)	-1.052 (0.677)
Percentage of College Managers between 21-40%	0.032 (0.021)	-0.011 (0.016)	-0.305 (0.976)
Percentage of College Managers between 41-60%	0.078*** (0.021)	-0.012 (0.016)	0.612 (0.764)
Percentage of College Managers between 61-80%	0.083*** (0.021)	-0.005 (0.015)	-1.270 (1.066)
Percentage of College Managers is >80%	0.106*** (0.017)	0.001 (0.014)	-1.857** (0.802)
<i>Omitted: Percentage of College Non-managers is 0%</i>			
Percentage of College Non-managers between 1-20%	0.031** (0.013)	-0.003 (0.011)	0.084 (0.611)
Percentage of College Non-managers between 21-40%	0.082*** (0.019)	-0.000 (0.014)	0.602 (0.794)
Percentage of College Non-managers between 41-60%	0.081*** (0.025)	-0.009 (0.016)	-0.526 (1.019)
Percentage of College Non-managers between 61-80%	0.154*** (0.026)	-0.013 (0.018)	0.620 (1.261)
Percentage of College Non-managers is >80%	0.165*** (0.024)	0.019 (0.019)	0.366 (1.048)
Percentage of Female Employees	-0.152*** (0.022)	0.005 (0.017)	2.799** (1.128)

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	log(output/ employee)	ROCE	Profit Margin
Percentage Top Managers	0.079 (0.094)	-0.137** (0.065)	-0.461 (3.832)
50% or more Top Managers are Female	-0.002 (0.012)	0.006 (0.009)	-0.276 (0.553)
<i>Omitted: Firm is not Family-Owned</i>			
Family Firm is managed by the Founder or by the Founder's Family	-0.004 (0.011)	0.018** (0.009)	0.145 (0.546)
Family Firm is not managed by the Founder or by the Founder's Family	-0.026 (0.017)	-0.014 (0.012)	0.658 (0.685)
Firm has Foreign Ownership	0.089*** (0.015)	0.014 (0.012)	2.196*** (0.685)
Firm has Public Ownership	-0.058 (0.047)	-0.049** (0.021)	1.982 (2.467)
Log of Firm Age	0.006 (0.006)	-0.029*** (0.005)	0.816*** (0.282)
Market Share	1.119*** (0.239)	0.008 (0.114)	-6.942* (4.112)
Firm has Works Council	0.013 (0.020)	0.004 (0.016)	0.088 (0.945)
Time Dummies	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes
Region Dummies	Yes	Yes	Yes
R ²	0.872	0.065	0.075
Observations	6267	6265	4341
F-stat	527.0	8.5	5.1
p-value	0.000	0.000	0.000
Standard errors in parentheses			
Standard errors clustered at firm-level			
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$			
Return on capital employed is defined as the ratio of operating profit over capital employed.			
Profit margin is defined by value added minus wages and salaries over total sales.			

When restricting the sample to firms operating in the manufacturing industry (Column 2) and those with more than 100 employees (Column 3), the results remain consistent. This robustness check also reinforces the validity of the findings and shows that the positive association between higher adoption of management practices and labour productivity is also verified in different subsets of the sample.

6. Conclusion

This study aimed to add to the increasing literature that explores management practices as a determinant of firm performance. Specifically, this study aimed to explore the Portuguese context, that has been recognized for having lower management scores, and identify which factors drive the adoption of structured management practices, and how these are associated with performance measures, in particular with productivity.

To achieve this objective, and building upon the research by Monteiro and Straume (2024) and the work by Bloom et al. (2019), this study leveraged data from IPG, a survey collected by INE with the goal of gathering firms' top managers' perceptions on the management practices of the firms they manage. To complement the information from the survey with workforce and firm characteristics, QP and SCIE were also used.

Considering the existing literature, some hypotheses were developed. The results concerning the drivers for the adoption of structured management practices were able to support hypotheses H1, H2, H3, H4a and H5, but not H4b and H6. One of the main conclusions drawn was that ownership structure plays an important role in driving the adoption of these practices, with firms with public ownership being associated with lower management scores and firms with foreign ownership with higher (H2 and H3). However, the results suggest that the lower management scores that are observed in family firms may not be due to family ownership per se. It appears to be the presence of the founder or someone from their family as the manager that is associated with lower management scores (H1), confirming previous evidence from other studies. This is particularly relevant for the Portuguese context, as family firms represent a vast part of businesses. The results also support that workforce education plays a relevant role (H4a). Nevertheless, it is important to take into account the chance of reverse causality, as firms that present higher adoption of structured management practices may

attract a more educated workforce, and not only the presence of a more educated workforce driving their adoption. H4b was not supported by the results, as an older workforce seems to be generally associated with lower management scores, which may be explained by a greater resistance to change among older employees. Additionally, a positive association between firm size and higher scores was confirmed (H5), as well as for market share (H6). This last result is not consistent with previous evidence, and in a less competitive economy as Portugal, these results may suggest that scale may play a larger role than competitive pressure in fostering the adoption of management practices, with larger firms benefiting from better conditions to implement structured practices. The results generally remain qualitatively identical when considering each category individually. Considering the control variables included, it is relevant to highlight that longer manager tenure is significantly associated with higher management scores in the Incentives category. However, it is important to consider that this association may reflect how better matches between firms and managers are made when incentive-related practices are in place. After some robustness checks, the conclusions drawn were still valid.

Moreover, Hypothesis 7 sought to test the association between firm performance, in particular productivity, and overall management scores, and also its different dimensions (7a, 7b, and 7c). All of them were confirmed, as higher management scores are associated with higher productivity, when controlling for a range of additional factors that may also influence it. One interesting result is that the Incentives category seems to be more influential in driving productivity than the other two categories, which is relevant as the firms in the sample present the lowest scores in this category. When testing for other performance measures, higher management scores are also associated with higher ROCE and profit margins, and when considering subsets of the sample, including only firms operating in the manufacturing industry and only firms with more than 100 employees, the results remain.

However, while this study offers valuable insights, it is also subject to some limitations. Firstly, there is only available survey data for the years of 2016 and 2022, and the number of firms present in both years is reduced. Likewise, there is an inability to track the same firms over time, which precludes the possibility of using a fixed effects approach to mitigate endogeneity issues driven by omitted variables. Moreover, survey data provides self-reported measures, which may introduce bias and affect the reliability of the results. Given these limitations, this

study does not attempt to make causal claims, focusing instead on descriptive analysis and observed associations.

Future research could benefit from qualitative case studies to explore causal mechanisms more deeply and examine how some other unobserved factors, such as internal organisational culture or leadership quality, interact with structured management practices. Additionally, the availability of new waves of the study that could allow for panel data analysis could provide richer results. Future research could also investigate which specific management practices are most strongly linked to improved firm performance, as well as the barriers that prevent Portuguese firms from adopting them. This may provide insights on why the average management score is lower compared to other countries, despite strong evidence supporting the benefits of such practices.

Overall, this dissertation provides valuable contributions by reinforcing the importance of structured management practices in enhancing firm performance and by shedding light on the contextual factors that shape their adoption. Understanding the factors that influence the adoption of management practices can be key for the creation of policies that may allow companies to become more productive and to grow, and foster a more competitive economy overall. In particular, the development and implementation of incentive-related practices may be especially beneficial, as this category not only appears to have a stronger positive influence on productivity, but also registers the lowest scores among the firms analysed.

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Disclaimer

Artificial Intelligence tools, namely ChatGPT, were employed for proofreading, in order to refine sentence structure and enhance sentence clarity. Prompts similar to the following ones were inserted throughout the development of this dissertation:

- While maintaining academic rigour, could you slightly reduce the dimension of this part, keeping all the authors and references.
- Can you rewrite this paragraph in C1 academic English, keeping all the ideas the original paragraph presents?
- Is there a better way to write this sentence, in academic C1 English?

Annexes

Annex A. Interest Variables

Table A.1.: Interest Variables in the study

Variable	Description	Source
Firm Characteristics		
Number of Employees	Total Number of Employees in the firm.	IPG
Micro Firm	Dummy Variable: 1 if firm is a Micro Firm, 0 otherwise. According to IPG criteria (Number of employees < 10 and Turnover ≤ 2 000 000€).	IPG
Medium Firm	Dummy Variable: 1 if firm is a Medium firm, 0 otherwise. According to IPG criteria (Number of employees < 250, Turnover ≤ 50 000 000€, and not a micro firm).	IPG
Large Firm	Dummy Variable: 1 if firm is a Large Firm, 0 otherwise. According to IPG criteria (Number of employees ≥ 250 and Turnover > 50 000 000€).	IPG
Firm Age	Firm Age, in years (current year - birth year).	QP
Firm is Not Family Owned	Dummy Variable: 1 if firm is not a Family Firm, 0 otherwise. Firm is Family Owned if 50% or more is owned by the founders or founders' family.	IPG
Family Firm is managed by the Founder or by the Founder's Family	Dummy Variable: 1 if Family Firm is managed by the Founder or by their Family, 0 otherwise.	IPG
Family Firm is not managed by the Founder or by the Founder's Family	Dummy Variable: 1 if Family Firm is not managed by the Founder or by their Family, 0 otherwise.	IPG
Firm has Foreign Ownership	Dummy Variable: 1 if firm has Foreign Ownership, 0 otherwise. Firm has Foreign Ownership if 50% or more is owned by foreign entities.	QP
Firm has Public Ownership	Dummy Variable: 1 if firm has Public Ownership, 0 otherwise. Firm has Public Ownership if 50% or more is owned by the state.	QP

Variable	Description	Source
“Norte” Region	Dummy Variable: 1 if firm is located in the “Norte” Region, 0 otherwise. (Firm’s NUT II on October 31st).	QP
“Algarve” Region	Dummy Variable: 1 if firm is located in the “Algarve” Region, 0 otherwise. (Firm’s NUT II on October 31st).	QP
“Centro” Region	Dummy Variable: 1 if firm is located in the “Centro” Region, 0 otherwise. (Firm’s NUT II on October 31st).	QP
“Lisboa” Region	Dummy Variable: 1 if firm is located in the “Lisboa” Region, 0 otherwise. (Firm’s NUT II on October 31st).	QP
“Alentejo” Region	Dummy Variable: 1 if firm is located in the “Alentejo” Region, 0 otherwise. (Firm’s NUT II on October 31st).	QP
“Açores” Region	Dummy Variable: 1 if firm is located in the “Açores” Region, 0 otherwise. (Firm’s NUT II on October 31st).	QP
“Madeira” Region	Dummy Variable: 1 if firm is located in the “Madeira” Region, 0 otherwise. (Firm’s NUT II on October 31st).	QP
“Estrangeiro” Region	Dummy Variable: 1 if firm is located in the “Estrangeiro” Region, 0 otherwise. (Firm’s NUT II on October 31st).	QP
Agriculture and Natural Resources Industry	Dummy Variable: 1 if firm operates in the Agriculture and Natural Resources Industry. CAE Rev.3 1 letter classification (A or B).	QP
Manufacturing Industry	Dummy Variable: 1 if firm operates in the Manufacturing Industry. CAE Rev.3 1 letter classification (C).	QP
Service Industry	Dummy Variable: 1 if firm operates in the Service Industry. CAE Rev.3 1 letter classification (D-U).	QP
Market Share	Turnover (Net Sales and Services Revenue, excluding Value-Added Tax (VAT) / Industry Turnover (CAE Rev.3 2-digit classification).	QP
Works Council	Dummy Variable: 1 if firm has Works Council, 0 otherwise.	IPG
Workforce Composition and Characteristics		
Number of Female Employees	Total Number of Female in the firm.	IPG
Percentage of Female Employees	Total Number of Female in the firm / Total Number of Employees in the firm.	IPG
Percentage Top Managers	Number of Top Managers in the firm / Total Number of Employees in the firm.	IPG
Percentage Female Top Managers	Number of Female Top Managers in the firm / Total Number of Top Managers in the firm.	IPG
Dummy Percentage Female Top Managers	Dummy Variable: 1 if 50% or more Top Managers are Female, 0 otherwise.	IPG
Percentage Female Intermediate Managers	Number of Female Intermediate Managers in the firm / Total Number of Intermediate Managers in the firm.	IPG
Percentage Female Operational Managers	Number of Female Operational Managers in the firm / Total Number of Operational Managers in the firm.	IPG

Variable	Description	Source
Percentage of College Managers is 0%	Dummy Variable: 1 if estimated Percentage of Managers with a College Degree or higher is 0%, 0 otherwise.	IPG
Percentage of College Managers between 1-20%	Dummy Variable: 1 if estimated Percentage of Managers with a College Degree or higher is 1-20%, 0 otherwise.	IPG
Percentage of College Managers between 21-40%	Dummy Variable: 1 if estimated Percentage of Managers with a College Degree or higher is 21-40%, 0 otherwise.	IPG
Percentage of College Managers between 41-60%	Dummy Variable: 1 if estimated Percentage of Managers with a College Degree or higher is 41-60%, 0 otherwise.	IPG
Percentage of College Managers between 61-80%	Dummy Variable: 1 if estimated Percentage of Managers with a College Degree or higher is 61-80%, 0 otherwise.	IPG
Percentage of College Managers is >80%	Dummy Variable: 1 if estimated Percentage of Managers with a College Degree or higher is more than 80%, 0 otherwise.	IPG
Percentage of College Non-managers is 0%	Dummy Variable: 1 if estimated Percentage of Non-managers with a College Degree or higher is 0%, 0 otherwise.	IPG
Percentage of College Non-managers between 1-20%	Dummy Variable: 1 if estimated Percentage of Non-managers with a College Degree or higher is 1-20%, 0 otherwise.	IPG
Percentage of College Non-managers between 21-40%	Dummy Variable: 1 if estimated Percentage of Non-managers with a College Degree or higher is 21-40%, 0 otherwise.	IPG
Percentage of College Non-managers between 41-60%	Dummy Variable: 1 if estimated Percentage of Non-managers with a College Degree or higher is 41-60%, 0 otherwise.	IPG
Percentage of College Non-managers between 61-80%	Dummy Variable: 1 if estimated Percentage of Non-managers with a College Degree or higher is 61-80%, 0 otherwise.	IPG
Percentage of College Managers is >80%	Dummy Variable: 1 if estimated Percentage of Non-managers with a College Degree or higher is more than 80%, 0 otherwise.	IPG
Percentage College Managers	Total Number of Managers with College Degree in the firm / Total Number of Managers in the firm. Managers identified by the “Classificação Portuguesa de Profissões” (CPP 2010 - 2 digit (12, 13, and 14) and CPP 2010 - 3 digit (112)). College Degree identified by 1-digit variable for educational qualifications (These include “Bacharelato”, “Licenciatura”, “Mestrado” and “Douturamento”).	QP
Percentage College Non-managers	Total Number of Non-managers with College Degree in the firm / Total Number of Non-managers in the firm. Non-managers identified by the “Classificação Portuguesa de Profissões” (CPP 2010 - 2 digit (All others than 12, 13, and 14) and CPP 2010 - 3 digit (All others than 112)). College Degree identified by 1-digit variable for educational qualifications (These include “Bacharelato”, “Licenciatura”, “Mestrado” and “Douturamento”).	QP
Managers Average Age <35	Dummy Variable: 1 if Managers Average Age is less than 35 years, 0 otherwise.	IPG

Variable	Description	Source
Managers Average Age 35-54	Dummy Variable: 1 if Managers Average Age is 35-54 years, 0 otherwise.	IPG
Managers Average Age >54	Dummy Variable: 1 if Managers Average Age is more than 54 years, 0 otherwise.	IPG
Non-managers Average Age <35	Dummy Variable: 1 if Non-managers Average Age is less than 35 years, 0 otherwise.	IPG
Non-managers Average Age 35-54	Dummy Variable: 1 if Non-managers Average Age is 35-54 years, 0 otherwise.	IPG
Non-managers Average Age >54	Dummy Variable: 1 if Non-managers Average Age is more than 54 years, 0 otherwise.	IPG
Managers Average Age	Average Age, in years, of the firm's Managers identified by the "Classificação Portuguesa de Profissões" (CPP 2010 - 2 digit (12, 13, and 14) and CPP 2010 - 3 digit (112)).	QP
Non-managers Average Age	Average Age, in years, of the firms' Non-managers identified by the "Classificação Portuguesa de Profissões" (CPP 2010 - 2 digit (All others than 12, 13, and 14) and CPP 2010 - 3 digit (All others than 112)).	QP
Managers Average Tenure <5	Dummy Variable: 1 if Managers estimated Average Tenure is less than 5 years, 0 otherwise.	IPG
Managers Average Tenure 5-14	Dummy Variable: 1 if Managers estimated Average Tenure is 5 to 14 years, 0 otherwise.	IPG
Managers Average Tenure >14	Dummy Variable: 1 if Managers estimated Average Tenure is more than 14 years, 0 otherwise.	IPG
Non-managers Average Tenure <5	Dummy Variable: 1 if Non-managers estimated Average Tenure is less than 5 years, 0 otherwise.	IPG
Non-managers Average Tenure 5-14	Dummy Variable: 1 if Non-managers estimated Average Tenure is 5 to 15 years, 0 otherwise.	IPG
Non-managers Average Tenure >14	Dummy Variable: 1 if Non-managers estimated Average Tenure is more than 14 years, 0 otherwise.	IPG
Managers Average Tenure	Average Tenure, in years, of the firm's managers. Managers identified by the "Classificação Portuguesa de Profissões" (CPP 2010 - 2 digit (12, 13, and 14) and CPP 2010 - 3 digit (112)).	QP
Non-managers Average Tenure	Average Tenure, in years, of the firms' non-managers. Non-managers identified by the "Classificação Portuguesa de Profissões" (CPP 2010 - 2 digit (All others than 12, 13, and 14) and CPP 2010 - 3 digit (All others than 112)).	QP
Financial Variables		
Output (Production)	"Produção".	SCIE
Total Fixed Assets	"Ativos fixos tangíveis" (Capital inputs).	SCIE
Intermediate Consumption	"Consumos intermédios".	SCIE
Total Sales	"Total de Vendas (mercadorias, produtos e ativos biológicos)".	SCIE
Operating Profit - EBIT	"Resultado operacional".	SCIE

Variable	Description	Source
Capital Employed	Current Assets + Non-current Assets - Current Liabilities.	SCIE
ROCE	Operating Profit / Capital Employed.	SCIE
Value Added	Total Sales - Cost of Goods Sold and Materials Consumed.	SCIE
Profits	Value Added - Wages and Salaries.	SCIE
Profit Margin	Profits / Total Sales.	SCIE

Annex B. Summary Statistics of Interest IPG Questions

Table B.1.: Management Score by Question

Question	Mean	Median	SD	N
op1 - 1. Existence and type of management practices.	0.696	0.500	0.272	6577
op2 - 2. When a service or production problem arose, what best describes the action undertaken by the firm?	0.877	1.000	0.221	6577
tb1 - 3. What is the strategic target of the firm?	0.549	0.667	0.282	6577
tb2 - 4. Which type of good or services is the firm producing?	0.641	1.000	0.455	6577
tth - 5. What best describes the time horizon of service or production targets of the firm?	0.794	1.000	0.306	6577
ts - 6. Degree of ambitiousness of targets: How easy/difficult would it have been to achieve service or production targets at this firm?	0.569	0.500	0.190	6577
mpcc - 7. Workforce awareness of firms' goals.	0.572	0.500	0.213	6577
mpt1 - 8. How many key performance indicators does your firm monitor?	0.428	0.400	0.316	6577
mpt2 - 9. How frequently are these key performance indicators measured?	0.551	0.667	0.308	6577
mpt3 - 10. How frequently are these key performance indicators measured - for top managers?	0.538	0.667	0.317	6577
mpt6 - 13. How frequently are these key performance indicators measured - for non-managers?	0.359	0.167	0.351	6577
mpc - 14. Does the firm display key performance outcomes? How many dissemination tools-private platform, e-mail, newsletter, meetings, posters, multiple tables - does the firm use to display performance indicators?	0.222	0.167	0.198	6577
mpd1 - 15. Involvement of non-managers employees in the decision process of the firm.	0.516	0.500	0.213	6577
mpd2 - 16. Extent of information shared in the decision process of the firm.	0.670	0.750	0.211	6577
pifpp1 - 17. When the firm is under-performing, are there consequences to workers?	0.332	0.000	0.471	6577
pifpp2 - 18. If part of the business is under-performing, workers join "Intensive training program duration" .	0.201	0.000	0.341	6577
pifpp3 - 19. If part of the business is under-performing, workers undergo "job rotation duration" .	0.188	0.000	0.317	6577
pifpp4 - 20. If part of the business is under-performing, workers are dismissed.	0.163	0.000	0.283	6577
pirhp1 - 21. Is performance related to rewards (bonuses)?	0.474	0.000	0.499	6577
pirhp2 - 22. What percentage of managers received performance bonuses?	0.323	0.000	0.433	6577
pirhp3 - 23. What percentage of non-managers received performance bonuses?	0.298	0.000	0.407	6577
pirhp4 - 24. What are managers' performance bonuses usually based on in your firm?	0.221	0.000	0.325	6577
pirhp5 - 25. What are non-managers' performance bonuses usually based on in your firm?	0.264	0.000	0.370	6577
piphp1 - 26. Criteria for managers promotion.	0.520	0.667	0.477	6577
piphp2 - 27. Criteria for non-managers promotion.	0.569	0.667	0.466	6577
pirhc1 - 28. Does the firm have programs to retain youth talent?	0.080	0.000	0.272	6577
pirhc2 - 29. Does the firm hire highly educated young workers to train and retain in the firm?	0.348	0.000	0.476	6577

Based on Monteiro and Straume (2024). Source: IPG (Portugal 2016 & 2022)

Annex C. Management Scores and Interest Variables

Table C.1.: Management Score by Firm Size (Portugal 2016 & 2022)

	Mean	Median	Min	Max	SD	N
Micro Firm	0.320	0.310	0.000	0.747	0.137	1044
Medium Firm	0.417	0.413	0.019	0.880	0.156	3586
Large Firm	0.558	0.575	0.037	0.891	0.153	1947
Total	0.443	0.441	0.000	0.891	0.173	6577

Source: IPG

Table C.2.: Management Score by Firm Age (Portugal 2016 & 2022)

	Mean	Median	Min	Max	SD	N
Less than 3 years	0.407	0.394	0.037	0.799	0.157	277
3-9 years	0.418	0.422	0.031	0.874	0.160	1459
10 or more years	0.453	0.451	0.000	0.891	0.176	4841
Total	0.443	0.441	0.000	0.891	0.173	6577

Source: IPG and QP

Table C.3.: Management Score in Family Firms and Non-Family Firms (Portugal 2016 & 2022)

	Mean	Median	Min	Max	SD	N
Family-Owned	0.410	0.402	0.022	0.891	0.166	3641
Not Family Owned	0.484	0.490	0.000	0.880	0.172	2936
Total	0.443	0.441	0.000	0.891	0.173	6577

Source: IPG

Table C.4.: Management Score in Family Firms Managed by the Founder or by their Family and all Other Firms (Portugal 2016 & 2022)

	Mean	Median	Min	Max	SD	N
Other Firms	0.483	0.489	0.000	0.891	0.170	3716
Family Firms managed by Founder or their Family	0.392	0.380	0.022	0.857	0.162	2861
Total	0.443	0.441	0.000	0.891	0.173	6577

Source: IPG

Table C.5.: Management Score in Foreign Owned Firms (Portugal 2016 & 2022)

	Mean	Median	Min	Max	SD	N
Not Foreign Owned	0.419	0.412	0.000	0.891	0.169	5323
Foreign Owned	0.547	0.561	0.090	0.879	0.149	1254
Total	0.443	0.441	0.000	0.891	0.173	6577

Source: IPG and QP

Table C.6.: Management Score in Public Owned Firms (Portugal 2016 & 2022)

	Mean	Median	Min	Max	SD	N
Not Public Owned	0.444	0.443	0.000	0.891	0.174	6455
Public Owned	0.410	0.406	0.133	0.755	0.116	122
Total	0.443	0.441	0.000	0.891	0.173	6577

Source: IPG and QP

Table C.7.: Management Score by Industry (Portugal 2016 & 2022)

	Mean	Median	Min	Max	SD	N
Agriculture and Natural Resources	0.356	0.331	0.019	0.780	0.159	413
Manufacturing	0.436	0.431	0.025	0.880	0.172	2736
Services	0.459	0.461	0.000	0.891	0.172	3428
Total	0.443	0.441	0.000	0.891	0.173	6577

Source: IPG and QP

Table C.8.: Management Score by Region (Portugal 2016 & 2022)

	Mean	Median	Min	Max	SD	N
"Norte" Region	0.426	0.423	0.031	0.891	0.171	2338
"Algarve" Region	0.398	0.374	0.043	0.811	0.169	184
"Centro" Region	0.415	0.402	0.025	0.857	0.167	1534
"Lisboa" Region	0.493	0.501	0.000	0.880	0.171	2034
"Alentejo" Region	0.412	0.409	0.022	0.811	0.163	406
"Açores" Region	0.452	0.463	0.151	0.827	0.147	40
"Madeira" Region	0.516	0.541	0.226	0.812	0.153	41
Total	0.443	0.441	0.000	0.891	0.173	6577

Source: IPG and QP

Table C.9.: Management Score by Market Share (Portugal 2016 & 2022)

	Mean	Median	Min	Max	SD	N
<5%	0.436	0.434	0.000	0.891	0.170	6330
>=5% & <20%	0.612	0.633	0.185	0.880	0.150	207
>=20%	0.636	0.666	0.281	0.880	0.139	40
Total	0.443	0.441	0.000	0.891	0.173	6577

Source: IPG and QP

Table C.10.: Management Score by presence of Works Council (Portugal 2016 & 2022)

	Mean	Median	Min	Max	SD	N
Firm does not have Works Council	0.434	0.431	0.000	0.891	0.171	6089
Firm has Works Council	0.554	0.579	0.071	0.874	0.158	488
Total	0.443	0.441	0.000	0.891	0.173	6577

Source: IPG

Table C.11.: Management Score by Managers Education (Percentage with College Degree)
(Portugal 2016 & 2022)

	Mean	Median	Min	Max	SD	N
0%	0.305	0.293	0.000	0.752	0.135	1120
0-20%	0.418	0.410	0.037	0.857	0.160	1495
21-40%	0.495	0.496	0.096	0.873	0.158	540
41-60%	0.483	0.484	0.031	0.891	0.161	644
61-80%	0.517	0.519	0.117	0.880	0.159	584
>80%	0.501	0.509	0.043	0.880	0.159	2030
Total	0.447	0.446	0.000	0.891	0.172	6413

Source: IPG

Table C.12.: Management Score by Non-managers Education (Percentage with College Degree) (Portugal 2016 & 2022)

	Mean	Median	Min	Max	SD	N
0%	0.332	0.316	0.000	0.873	0.145	1494
0-20%	0.462	0.466	0.019	0.891	0.164	2613
21-40%	0.508	0.517	0.068	0.875	0.155	826
41-60%	0.506	0.518	0.096	0.880	0.155	498
61-80%	0.511	0.510	0.077	0.880	0.179	369
>80%	0.497	0.503	0.088	0.867	0.161	569
Total	0.447	0.446	0.000	0.891	0.172	6369

Source: IPG

Table C.13.: Management Score by Managers Average Age (Portugal 2016 & 2022)

	Mean	Median	Min	Max	SD	N
<35	0.436	0.435	0.043	0.845	0.165	362
35-54	0.461	0.462	0.000	0.891	0.171	5258
>54	0.352	0.337	0.022	0.845	0.155	918
Total	0.444	0.442	0.000	0.891	0.172	6538

Source: IPG

Table C.14.: Management Score by Non-managers Average Age (Portugal 2016 & 2022)

	Mean	Median	Min	Max	SD	N
<35	0.486	0.499	0.056	0.891	0.166	1351
35-54	0.437	0.431	0.000	0.880	0.172	4971
>54	0.349	0.330	0.056	0.780	0.148	176
Total	0.445	0.443	0.000	0.891	0.172	6498

Source: IPG

Table C.15.: Management Score by Managers Average Tenure (Portugal 2016 & 2022)

	Mean	Median	Min	Max	SD	N
<5	0.421	0.415	0.019	0.867	0.159	1188
5-14	0.457	0.460	0.031	0.891	0.171	2832
>14	0.442	0.433	0.000	0.880	0.178	2489
Total	0.445	0.443	0.000	0.891	0.172	6509

Source: IPG

Table C.16.: Management Score by Non-managers Average Tenure (Portugal 2016 & 2022)

	Mean	Median	Min	Max	SD	N
<5	0.438	0.441	0.019	0.867	0.168	1973
5-14	0.453	0.451	0.000	0.891	0.173	3183
>14	0.435	0.427	0.022	0.880	0.176	1335
Total	0.445	0.443	0.000	0.891	0.172	6491

Source: IPG

Annex D. Additional Regressions

Table D.1.: Management Practices Drivers in Manufacturing Firms and Firms with more than 100 employees (Portugal 2016 & 2022)

	Management z-score (all)	Management z-score (manufacturing)	Management z-score (>100 employees)
Firm Characteristics			
Log of Number of Employees	0.202*** (0.011)	0.283*** (0.019)	0.120*** (0.025)
<i>Omitted: Firm is not Family-Owned</i>			
Family Firm is managed by the Founder or by the Founder's Family	-0.154*** (0.025)	-0.119*** (0.037)	-0.278*** (0.046)
Family Firm is not managed by the Founder or by the Founder's Family	-0.012 (0.033)	0.036 (0.049)	0.017 (0.050)
Firm has Foreign Ownership	0.202*** (0.030)	0.192*** (0.045)	0.134*** (0.043)
Firm has Public Ownership	-0.668*** (0.074)	-0.440 (0.422)	-0.754*** (0.087)
Market Share	1.026*** (0.272)	1.218*** (0.469)	0.950*** (0.252)
Workforce Characteristics			
<i>Omitted: Percentage of College Managers is 0%</i>			
Percentage of College Managers between 1-20%	0.234*** (0.033)	0.220*** (0.046)	0.384*** (0.114)
Percentage of College Managers between 21-40%	0.428*** (0.044)	0.329*** (0.069)	0.622*** (0.121)
Percentage of College Managers between 41-60%	0.389*** (0.043)	0.352*** (0.066)	0.578*** (0.120)
Percentage of College Managers between 61-80%	0.501*** (0.045)	0.397*** (0.067)	0.678*** (0.119)
Percentage of College Managers is >80%	0.475*** (0.034)	0.497*** (0.053)	0.608*** (0.115)
<i>Omitted: Percentage of College Non-managers is 0%</i>			
Percentage of College Non-managers between 1-20%	0.211*** (0.029)	0.180*** (0.043)	0.290*** (0.076)
Percentage of College Non-managers between 21-40%	0.340*** (0.038)	0.352*** (0.059)	0.450*** (0.083)
Percentage of College Non-managers between 41-60%	0.311*** (0.045)	0.242*** (0.073)	0.427*** (0.091)
Percentage of College Non-managers between 61-80%	0.394*** (0.055)	0.257*** (0.102)	0.517*** (0.110)
Percentage of College Non-managers is >80%	0.374*** (0.043)	0.226*** (0.073)	0.650*** (0.099)
<i>Omitted: Managers Average Age <35</i>			
Managers Average Age 35-54	-0.039 (0.045)	-0.053 (0.070)	0.067 (0.102)

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	Management z-score (all)	Management z-score (manufacturing)	Management z-score (>100 employees)
Managers Average Age >54	-0.217*** (0.053)	-0.220*** (0.082)	-0.190 (0.124)
<i>Omitted: Non-managers Average Age <35</i>			
Non-managers Average Age 35-54	-0.192*** (0.027)	-0.170*** (0.044)	-0.184*** (0.049)
Non-managers Average Age >54	-0.280*** (0.065)	-0.256*** (0.090)	-0.394** (0.159)
<i>Omitted: Managers Average Tenure <5</i>			
Managers Average Tenure 5-14	0.034 (0.033)	0.033 (0.053)	-0.068 (0.065)
Managers Average Tenure >14	0.060 (0.040)	0.055 (0.063)	0.008 (0.073)
<i>Omitted: Non-managers Average Tenure <5</i>			
Non-managers Average Tenure 5-14	0.035 (0.030)	-0.001 (0.051)	0.058 (0.052)
Non-managers Average Tenure >14	-0.022 (0.039)	-0.100 (0.062)	-0.031 (0.065)
Log of Firm Age	-0.004 (0.015)	-0.021 (0.023)	0.068*** (0.026)
Percentage of Female Employees	-0.090** (0.043)	-0.233*** (0.065)	-0.180** (0.077)
Percentage Top Managers	0.271 (0.177)	0.880*** (0.286)	2.776*** (1.033)
50% or more Top Managers are Female	-0.010 (0.024)	0.015 (0.037)	-0.025 (0.044)
Time Dummies	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes
Region Dummies	Yes	Yes	Yes
R ²	0.382	0.403	0.232
Observations	6577	2736	2358
F-stat	109.1	54.0	19.9
p-value	0.000	0.000	0.000
Standard errors in parentheses			
Standard errors clustered at the firm level			
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$			

Table D.2.: Management Practices and Firm Performance in Manufacturing Firms and Firms with more than 100 employees (Portugal 2016 & 2022)

	log(output/ employee) (all)	log(output/ employee) (manufacturing)	log(output/ employee) (>100 employees)
Management z-score	0.043*** (0.006)	0.045*** (0.008)	0.029*** (0.010)
Log of Capital Inputs per Employee	0.008** (0.004)	0.007 (0.006)	-0.010* (0.006)
Log of Intermediate Inputs per Employee	0.638*** (0.007)	0.683*** (0.012)	0.576*** (0.011)
Log of Labour Inputs	0.000 (0.006)	-0.014* (0.008)	-0.029** (0.013)
<i>Omitted: Percentage of College Managers is 0%</i>			
Percentage of College Managers between 1-20%	0.045*** (0.016)	0.012 (0.023)	0.002 (0.055)
Percentage of College Managers between 21-40%	0.032 (0.021)	0.026 (0.023)	-0.006 (0.056)
Percentage of College Managers between 41-60%	0.078*** (0.021)	0.040 (0.027)	0.030 (0.057)
Percentage of College Managers between 61-80%	0.083*** (0.021)	0.031 (0.025)	0.030 (0.056)
Percentage of College Managers is >80%	0.106*** (0.017)	0.031 (0.023)	0.070 (0.055)
<i>Omitted: Percentage of College Non-managers is 0%</i>			
Percentage of College Non-managers between 1-20%	0.031** (0.013)	0.002 (0.017)	0.045 (0.031)
Percentage of College Non-managers between 21-40%	0.082*** (0.019)	0.068*** (0.022)	0.112*** (0.035)
Percentage of College Non-managers between 41-60%	0.081*** (0.025)	0.028 (0.035)	0.117*** (0.044)
Percentage of College Non-managers between 61-80%	0.154*** (0.026)	0.013 (0.033)	0.175*** (0.050)
Percentage of College Non-managers is >80%	0.165*** (0.024)	0.077* (0.046)	0.240*** (0.044)
Percentage of Female Employees	-0.152*** (0.022)	-0.104*** (0.030)	-0.319*** (0.033)
Percentage Top Managers	0.079 (0.094)	-0.297** (0.135)	2.952*** (0.424)
50% or more Top Managers are Female	-0.002 (0.012)	0.016 (0.014)	-0.005 (0.022)
<i>Omitted: Firm is not Family-Owned</i>			
Family Firm is managed by the Founder or by the Founder's Family	-0.004 (0.011)	-0.013 (0.014)	0.013 (0.021)
Family Firm is not managed by the Founder or by the Founder's Family	-0.026 (0.017)	0.001 (0.019)	-0.035 (0.023)

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	log(output/ employee) (all)	log(output/ employee) (manufacturing)	log(output/ employee) (>100 employees)
Firm has Foreign Ownership	0.089*** (0.015)	0.032** (0.016)	0.071*** (0.019)
Firm has Public Ownership	-0.058 (0.047)	0.024 (0.217)	-0.059 (0.053)
Log of Firm Age	0.006 (0.006)	-0.007 (0.008)	0.003 (0.012)
Market Share	1.119*** (0.239)	1.410*** (0.352)	1.343*** (0.313)
Firm has Works Council	0.013 (0.020)	0.025 (0.022)	0.068*** (0.023)
Time Dummies	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes
Region Dummies	Yes	Yes	Yes
R ²	0.872	0.914	0.897
Observations	6267	2650	2277
F-stat	527.0	315.7	247.0
p-value	0.000	0.000	0.000
Standard errors in parentheses			
Standard errors clustered at the firm level			
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$			