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Management practices and competitiveness: A multisector study in the Brazilian industry

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Abstract

The Practice-Based View (PBV) is an insightful approach among alternative theories of firm competitiveness. However, it hardly addresses industry level effects on the adoption of management practices and consequent performance impacts. We investigate if industrial sectors that are technologically sophisticated, more exposed to competition, and receiving greater government support adopt more advanced management practices and achieve superior performance. We built an intentional sample in seven industrial sectors, representative of the diversity of local industry, by selecting ten firms in each sector following specific criteria. Data collected following the method proposed by Bloom and Van Reenen was analyzed through Ordinary Least Squares regressions designed to assess our hypotheses. The outcomes confirm previous findings and reveal two insights. First, governmental support does not necessarily enhance management practices at the firm level. Second, the relationship between practices and performance seems to be jeopardized by the turbulence of the local business environment. We contribute to the PBV by shedding light on the implications of the sectoral perspective for the analysis of best practices adoption and performance impacts.

Key words: management practices; practice based view; industrial sectors; technology intensity; governmental incentives.

Introduction

The Practice-Based View (PBV) has become an insightful approach among alternative theories of firm competitiveness. Proponents of PBV assume that ordinary and public-domain practices may be sources of superior performance (Betts, Super, & North, 2018; Bromiley & Rau, 2014) and argue that performance heterogeneity can be explained from the choice and development of management practices (Bromiley & Rau, 2014, 2016). This perspective has gained prominence as it echoes the idea of best practices, which is increasingly popular not only among practitioners, but also among scholars (Silveira & Sousa, 2010; Voss, 2005). Moreover, PBV has enjoyed extensive empirical support from the research program *Measuring and explaining management practices across firms and countries* that Bloom and Van Reenen have been conducting since 2004, surveying data from more than ten thousand companies in 34 countries (Bloom, Sadun, & Van Reenen, 2016; Bloom & Van Reenen, 2006, 2007).

At the firm level, the decision making process for management practices selection and development may be influenced by external factors. Firms may adopt best practices because they operate in advanced industrial settings, whose fast-changing environment leads firms to imitate already proven management practices (Lei & Slocum, 2005; Zhang & Dhaliwal, 2009) or as a reaction triggered by tough competition (Dubey et al., 2017; Turkulainen, Kauppi, & Nermes, 2017). Government financing and support received in the context of industrial policies (Finchelstein, 2017; Wu, Ding, & Chen, 2012) may also influence the selection and adoption of management practices. However, industry level effects on the adoption and development of management practices are not problematized in PBV as possible explanations for performance heterogeneity (Carter, Kosmol, & Kaufmann, 2017).

In this study, we adopt a sectoral perspective to investigate the influence that the level of competition, the degree of technological advancement, and the intensity of governmental support in the form of subsidized loans may have on the adoption of management practices by firms. In other words, we ask: Do firms in sectors that are more open to competition, more technologically advanced and more assisted by the government display more advanced management practices and superior performance?

We address the research question through the analysis of data surveyed among firms distributed in seven important Brazilian industrial sectors, which represent every category of economic activity. An agro-industry (sugarcane) and an extractive one (mining) represent the primary sector while the secondary sector is represented by a make-to-order industry (graphics), a mass production one (food and beverage) and one continuous process production sector (chemicals). Finally the tertiary, the services sector, is represented by a high value-adding technology-intensive sector (telecommunications) and a low value-adding low technology sector (gas installation services). The sample encompasses 70 firms equally distributed among the seven sectors, which allows us to reduce biases caused by under/overrepresentation of any particular sector. Data collection at the firm level followed the method proposed by Bloom and Van Reenen for the scoring of management practices. Data gathered was analyzed through Ordinary Least Squares regressions designed to assess our hypotheses.

We contribute to PBV by shedding light on the implications of the sectoral perspective for the analysis of best practices adoption and performance impacts. In addition, the study of how external factors related to the business environment influence the development of management practices also brings insights at the theoretical level.

On the practical side, investigating the research question in a country like Brazil leads to practical insights. Brazil has been losing competitiveness year after year, currently occupying the 61st position among the 63 countries (IMD, n.d.). Studies show that at the firm level, external and internal threats jeopardize potential competitiveness (De Negri & Cavalcante, 2014). Inadequate management practices are the most important internal factor, followed by absenteeism and lack of investment in the modernization or expansion of productive capacity. External factors include tax burden, labor regulation, interest rate and lack of infrastructure. Therefore, this study contributes by disclosing some of the cause-effect relationships that make it difficult for the country to recover better competitive positions.

Theoretical Background and Hypotheses

By suggesting that management practices accessible to any company, passive of imitation and easily transferred between firms will influence firms' performance, PBV diverges from more conventional lenses such as those based on the Resource-based view (RBV) or Dynamic Capabilities. In fact, for RBV, only unique and inimitable resources become sources of competitive advantage (Barney, 1991; Barney & Clark, 2007). Under the lenses of capabilities, firm performance is related to the possession of dynamic capabilities, which firms can use to intentionally create, extend, or modify processes and services, their production or yet their consuming markets (Helfat et al., 2007; Winter, 2003). Dynamic capabilities are especially required when firms operate in rapidly changing or moderately dynamic business environments (Eisenhardt & Martin, 2000; Teece, 2014; Teece, Pisano, & Shuen, 1997).

Alternatively, PBV has a strong connection with Nelson and Winter's (1982) evolutionary theory of economic change, considering routines as regular and predictable behavior patterns of firms (Bromiley & Rau, 2014). It acknowledges somewhat more pragmatically that tradeable resources can also be valuable for firms, and that the way firms use such resources is important from the performance viewpoint. To some extent, PBV can still be related to the Capabilities Theory, as capabilities derive from an interaction between routines, learning mechanisms, and choices (Bromiley & Rau, 2014; Zollo & Winter, 2002). In this sense, PBV may be seen as a natural theoretical frame for studies investigating the performance effects of ordinary and public-domain practices (Betts et al., 2018; Bromiley & Rau, 2014).

Industries' characteristics and management practices

A PBV key concept is the level of management practice adoption, which deals with the heterogeneity in the application of a given practice in different firms (Bromiley & Rau, 2016). While the exact mean of "good" and "bad" management practices can be extremely idiosyncratic for each firm (Bloom & Van Reenen, 2006, p. 18), Bloom and Van Reenen are studying the adoption of common management practices, with the help of industry experts and consultancies to establish scales to measure the relative importance of each practice for each industrial sector (Bloom & Van Reenen, 2006, 2007). The outcomes of their research show a considerable dispersion in the adoption and development of management practices at the industry and country levels. In every country there is a group of companies with advanced practices, another with intermediate-level practices and a third group with poor practices. The differences among countries are associated with the distribution of firms in each group. For example, the United States stands out for having few poorly managed companies, while countries such as Brazil, China, and India, although also exhibiting companies with advanced practices, have larger groups of poorly managed companies (Bloom, Genakos, Sadun, & Van Reenen, 2012; Bloom, Mahajan, McKenzie, & Roberts, 2010).

Among the factors that contribute to the prevalence of poorly managed companies in less developed countries, Bloom, Mahajan, McKenzie and Roberts (2010) shed light on the low levels of competition faced by domestic firms. Protected domestic markets and lack of stimulus for competition allow the survival of incompetent companies. Competition can lead to the improvement overall levels of industry management practices either by expelling poorly managed companies from the market through natural selection processes or by stimulating companies' improvement efforts (Bloom & Van Reenen, 2007; Dubey et al., 2017). Bloom and Van Reenen verified this effect with different competition measures, such as imports indexes and companies' market power (Bloom & Van Reenen, 2010).

The studies conducted with Brazilian companies support the heterogeneity of management practices, but limitations in their sample sizes (Padrão, Motta, & Vieira, 2009) and in their focus on single industries (Brito & Sauan, 2016; Mauro & Brito, 2011) jeopardize more detailed assessment of this phenomenon. Therefore, we include the following hypothesis for the relationship between sectoral competition and the level of companies' management practices:

H1. The intensity of competition in an industrial sector is positively related to the level of the management practices adopted by companies in that sector.

The PBV literature pays little attention to the consequences of macro-level influences on the adoption of best practices by firms, even though Bromiley and Rau (2016, p. 103) acknowledge that "organizational history and context will matter not only by influencing the practices the firm considers using but also by influencing how the new practices influence firm performance". Accordingly, Bloom, Sadun and Van Reenen (2016) indicate that different industrial sectors tend to specialize in specific management practices. For example, capital-intensive industries tend to exhibit higher levels of practices associated with monitoring and targets, while labor-intensive industries tend to focus on practices related to human resource management. These authors suggest that this finding opens the possibility for different practices to have distinct uses in various contexts.

In this study, we discuss the influence of industries' labor or capital intensity on the general level of the management practices, irrespective of sectoral affinities with specific practices. Capital-intensive sector firms may have to invest in best practices if they want to keep up with the pace of technology development and remain competitive (Lei & Slocum, 2005). Industrial sectors that are capital- and technology-intensive are especially dependent on the availability of skilled labor (Malerba & Nelson, 2011), which usually constitutes a liability in less developed countries. Labor-intensive sectors are commonly associated with cost-based competition and the participation in less profitable activities in value-adding chains (Mudambi, 2007; Palpacuer, Gibbon, & Thomsen, 2005), which not only reduce the availability of resources for investment in modern management practices but also configure vulnerable contexts. Those remarks lead us to the following hypothesis:

H2. Firms from technology-intensive industrial sectors have superior levels of management practices than firms from labor-intensive industrial sectors.

Researchers, consultancies, and international agencies have identified the major difficulties for firms in accessing financial support for the upgrading of management practices, especially for smaller firms in less developed countries (e.g., Bain & Company, Inc., & Institute of International Finance, 2013; Bloom, Mahajan, et al., 2010; International Trade Centre [ITC], 2014). According to Bloom, Mahajan, et al. (2010), resources for investments in physical capital are usually more available than those required to finance advisory services or for training managers. Limited resource availability can also compromise the creation of new companies that could potentially compete with established and poorly managed firms. In such context, there is room for government to act, relying on different mechanisms to stimulate the business environment and increase competitiveness.

Even though some authors are critical of governmental influence because it may prevent poorly-managed companies from exiting the market, there are authors who defend the opposite, assuming that State interventions in the economy are justified for fostering the progress of domestic firms (Aghion, 1999). Government influence on business management takes shape through both direct and indirect channels (Inoue, Lazzarini, & Musacchio, 2013; Liang, Ren, & Sun, 2015). While the direct channels involve government participation as a shareholder of domestic firms, with some firms featuring full state ownership, the indirect channels represent subsidies that the government may grant to the private sector. These subsidies include low-cost loans, tax breaks, rent rebates, and other similar supports that aim at offsetting firms' operating costs.

Among the various forms of government support, we focus on the role of low-cost loans in materializing governments' influence on the adoption of best practices by firms in a given industrial sector. In fact, the urgency to improve management practices may be included as a clause of the contracts that firms sign to get such loans (Redwood, 2012). Low-cost loans also combine both the alleviation of costs (because of the reduced interests) with the availability of financial capital, which the firms are expected to invest in something that compensates for the interests that they are paying to the banks – like process improvement, machinery expenditures, consultancy hiring, etc. Tax cuts and related measures, in turn, only alleviate the cost side of firms' balance sheets and can easily be perceived as profit available to be distributed among shareholders without further concerns.

When it comes to low-cost loans, governmental development banks assume an important function due to their specialization in the supply of long-term credit lines with reduced costs (Aghion, 1999; Lazzarini, Musacchio, Bandeira-de-Mello, & Marcon, 2015). The activity of such banks addresses an institutional void left by private institutions, whose credit lines to firms in need of improvement may be too expensive or absent. By this reasoning, subsidized loans by development banks potentially contribute to increasing the average quality of national companies due to the reduction of the deficiency of capital for good projects. As the support of development banks follows governmental industrial policies that can be either horizontal or vertical (when they focus on specific industries), we propose the following hypothesis:

> **H3.** The intensity of government support to an industrial sector, measured through subsidized loans, is positively related to the level of management practices found in companies operating in that sector.

Management practices and performance

The relationship between firm performance and best practices has been researched for a long time, as for the emergence of the best practices paradigm in the 1980s amid attempts to explain the success of Japanese firms in Western countries (Laugen, Acur, Boer, & Frick, 2005; Voss, 1995). The adoption of best practices allows firms to realize operational gains by becoming more effective and efficient at what they do, in addition to becoming better at reconciling trade-offs in their competitive priorities (Davies & Kochhar, 2002; Flynn, Schroeder, & Flynn, 1999).

In spite of those arguments, the direct relationship between best practices and performance has never achieved consensus among scholars. Silveira and Sousa (2010) highlight the relevance of issues such as contextual fit, variation in implementation, and the existence of synergies among different practices to question the former relationship. This problem was already acknowledged by Voss (2005), for whom the context-specificity of best practices configured one of the major questions yet to be addressed. In particular, in turbulent contexts such as the empirical setting chosen for our study, it becomes highly complex for managers to assess the causal relationships connecting best practices adoption and performance outcomes (Lant & Mezias, 1992; Lant, Milliken, & Batra, 1992). These points cast reasonable doubt on the potential results that firms may get from publicly available practices, leading us to test the hypothesis:

> **H4.** The level of companies' management practices is positively related to their performance.

Control for firm-level variables

From previous studies about determinants of the adoption of management practices, the development level of those practices can be associated with some company characteristics:

- Multinationals' subsidiaries feature management practices with average levels superior to those of local firms across countries, suggesting that multinationals are able to transfer their best practices internationally despite local difficulties (Bloom et al., 2012; Burstein & Monge-Naranjo, 2009).

- Export activities provide advantages to national companies, placing them in a group with management practices that are intermediate between multinationals' subsidiaries and domestic-focused local companies, which tend to exhibit the worst management level (Bloom & Van Reenen, 2010; Helpman, Melitz, & Yeaple, 2004).

- Human capital development is seen as an important element for the level of companies' management practices, irrespective of considering the training of managers or the training of employees in other positions (Bloom & Van Reenen, 2010). In the first case, well-trained managers tend to have a better awareness of modern management practices; in the second case, the implementation of modern practices would be facilitated by a well-qualified workforce.

- Large companies tend to present superior practices more than smaller ones as a result of a virtuous circle: On the one hand, well-managed companies tend to capture higher market shares; on the other hand, a larger company size allows them to access more investments in management (Bloom et al., 2012; Bloom & Van Reenen, 2010).

- Family-managed companies are less likely to develop their management practices to the same extent than companies with professional management (Bloom et al., 2012).

In light of these findings reported in the literature, we control our results for the firms' origin of capital, ownership structure, investment in human capital, and size, in order to better isolate the industry-level effects in which we are interested.

Conceptual model and constructs

Figure 1 illustrates the conceptual model representing our discussion. In that figure, oval forms indicate constructs and boxes inform the variables used to their measurement. Arrows between oval forms illustrate relationships suggested by our hypotheses. We use boxes with dashed lines to indicate variables measured at the firm-level and industry-level.

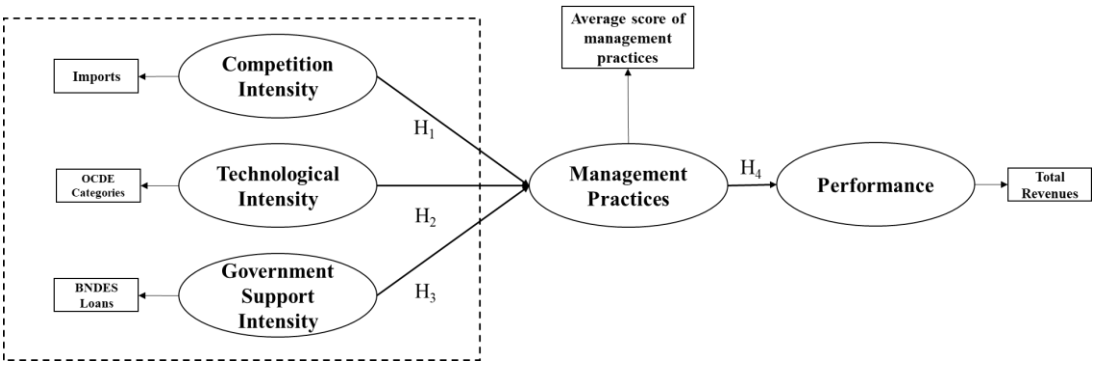

Figure 1. Conceptual Model

We defined the construct Management Practices as the average of the indicators Management Operations, Human Resources and Incentives, Goals, Performance Control, Sustainability, Technological Innovation and Innovation in Management, following the proposal of Bloom and Van Reenen and considering the modifications proposed by Mauro and Brito (2011). According to Bloom, Lemos, Sadun, Scur, and Van Reenen (2014), there is no natural unit of normalization to process the average score of management practices. We used a simple average of the indicators instead of computing a weighted average, because we did not have any ex-ante absolute support to assume that any practice is more important to firm performance than the remaining ones. Even more, for some authors, it is the synergies of management practices that are responsible for relevant performance effects, not the specific practices in isolation (Cua, McKone, & Schroeder, 2001; Flynn & Flynn, 2005; Voss, 2005). Other authors have followed approaches similar to ours before, as in Agarwal, Brown, Green, Randhawa, and Tan (2014) and Netland and Ferdows (2016). For Bloom and Van Reenen (2006, p. 29), a more "'refined' management measurement" could still be pursued but it would risk becoming "too close to crude data mining".

For assessing H1, we followed previous literature by measuring Competition intensity with the share of imports of each sector relative to the total of Brazilian imports (Bloom et al., 2012; Kathuria, 2002). We obtained the data for this variable from the Brazilian Ministry of Development, Industry, and Foreign Trade (MDIC). For evaluating H2, we characterized each sector's Technological intensity according to the categories of labor and technology intensity defined by the Organization for Economic Co-operation and Development (OECD) (Galindo-Rueda & Verger, 2016). Additionally, we computed H3 by measuring Government support intensity with the financing provided by the Brazilian National Development Bank (BNDES) to each sector, in billion BRL (Brazilian real). BNDES is one of the largest

development banks in the world and since its foundation has represented one of the major sources of subsidized long-term credit for the private sector in Brazil (Lazzarini et al., 2015).

The construct Performance supported the assessment of H4 and was defined in association with an indicator for companies' revenues: Total revenues, in billion BRL. In order to verify the relationship between the level of companies' management practices and their financial results, we weighted their total revenues based on their size (given by Total assets, in billion BRL) and the size of their sectors (Sector Size, measured by the total number of employees, in thousands). Weighting revenues with total assets and the importance of companies' sectors is necessary since larger firms tend to have higher revenues, making the simple relationship between revenues and practices misleading. The validity of this indicator can be verified in Dess and Robinson (1984), Santos and Brito (2012), and Venkatraman and Ramanujam (1986), among others.

Finally, we controlled our results with three binary items that have traditionally been associated with firms' level of management practices: Ownership structure, indicating open or closed capital; Origins of capital, indicating multinationals or domestic firms; and Training, indicating the adoption (or not) of labor training programs with specialized consultants of partnerships. We also used the sizes of both the sampled firms (Company Size, given by number of employees, in thousands) and their sectors (Sector Size) as control variables in our models.

Methods

Sampling and data collection

We studied a sample of firms intentionally sampled across seven industrial sectors of the Brazilian economy: sugarcane, mining, food and beverage, graphic, chemical, telecommunications, and gas installation services. These are sectors in which Brazil has relevant activity both at the local and the international levels (with the exception of gas services, which however has a high local importance because of its connections to the oil and gas value chain). By covering distinct areas of economic activity (namely primary, secondary, and tertiary industries), and varied configurations of production processes and business models, the sectors that we selected illustrate the different dimensions pertinent to this study, as indicated in Table 1. Their diversity helps us in addressing our research question; i.e., to investigate whether the adoption of superior management practices by firms can be associated with their operation in sectors that are more open to competition, more technologically advanced, and more assisted by the government.

Table 1

Distribution of the Sampled Sectors According to Dimensions Considered in this Study

	Level of competition/import share		
Technological profile	Low	Intermediate	High
Technological intensive	-	-	Telecommunications
Intermediary	-	Mining and Graphic	Chemical
Labor intensive	Gas installation services and Sugarcane	Food and Beverage	-

Note. Source: Technological intensity: Industrial Development Organization. (n.d.). *Classification of manufacturing sectors by technological intensity (ISIC Revision 4)*. Retrieved from https://stat.unido.org/content/focus/classification-of-manufacturing-sectors-by-technological-intensity-%2528isic-revision-4%2529;jsessionid=561400724511B33A01F1C32CEA4300FB; Import share: Ministério da Indústria, Comércio Exterior e Serviços. (n.d.). *Estatísticas de Comércio Exterior*. Retrieved from http://www.mdic.gov.br/comercio-exterior/estatisticas-de-comercio-exterior

Our final sample encompasses 70 companies, equally distributed among the mentioned sectors. We selected such companies based on suggestions from industrial sectoral entities and industry specialists. This strategy is pertinent to our purpose of investigating determinants of best practices adoption in the sub-population of firms that can be considered advanced among the large population of firms in an emerging country such as Brazil. In other words, we employ an intentional sampling as a way to control for the average level of firms' management practices early in our research design. Purposive sampling can be a valid strategy in different types of studies in applied sciences, as long as the appropriate limitations are considered (Smith, 1983).

Although our sampling strategy is non-probabilistic, we sought, as far as possible, to approach companies with different profiles to try to reduce our vulnerability to selection biases (Fink, 2003). In this sense, across the selected industrial sectors we contacted firms of different sizes and based on distinct geographical areas in Brazil. Table 2 indicates the range of firm sizes (given by the number of employees) and the respondents' profile that we contemplated in each sector, in addition to the geographical location of the sampled firms. In all of these firms, we interviewed respondents holding positions such as Coordinators, Managers, Directors, and CEOs. The profile of companies ranged from small family firms (4 employees) to large multinational companies (> 100,000 employees), coming from nine different Brazilian States.

Table 2

Sampled Company and Respondent Profiles

Sector	Region (Brazilian State)	Companies / Respondents' Profiles
Graphic	SP	• Employees → from 60 to 2,100 • Respondents: Managers, CEOs and Directors
Telecommunications	MG, RJ, and SP	• From 100 to 34,000 • Managers, CEOs and Directors
Chemical	SP, RS, and BA	• Employees → from 80 to 19,500 • Coordinators, Managers, and Directors
Mining	MG, ES, BA, GO, SP, RS, and SC	• Employees → From 180 to 50,000 • Coordinators, Managers, and Directors.
Food and Beverage	SP, MG, and SC	• Employees → From 200 to >100,000 • Coordinator, Managers, and Directors
Sugarcane	SP and PR	• Employees → from 500 to 4,000 • Managers and Directors
Gas Inst. Services	SP, RJ, and SC	• Employees → From 4 to 650 • Managers and Owners

Data collection followed the procedures adopted by Bloom and Van Reenen as well as by studies that have already replicated those authors' research in Brazil (Brito & Sauan, 2016; Mauro & Brito, 2011; Padrão et al., 2009). Based on those studies, we evaluated seven topics: Management Operations, Human Resources and Incentives, Goals, Performance Control, Sustainability, Technological Innovation and Innovation in Management. According to Bloom and Van Reenen (2007), establishing an appropriate scale and collecting accurate answers are some of the key challenges in achieving robust measures for management practices. Their research instrument explicitly leaves aside the strategic aspects of management, focusing on practices that are more accessible to companies, such as monitoring, goals, incentives, and the like (Bloom, Lemos, Sadun, Scur, & Van Reenen, 2014). Such practices can be assessed with terms like good or bad, while others are too contingent to be measured with such scale (Bloom & Van Reenen, 2006).

We established the scales of our research instrument after a careful analysis of the relevant literature, in particular technological forecasts prepared by international organizations that allowed for the identification of managerial trends in each sector. Experienced consultants provided additional information on the particular situation of each sector. Altogether, the degree to which companies have effectively adopted and implemented more advanced management practices was measured using five-point scales, from the worst practice to the best one.

The research instrument comprised open questions organized in six sections covering the topics assessed in Bloom and Van Reenen's method. We applied the questionnaires to plant managers during phone interviews, assisted by graduate students with business-related experience. Those students were responsible for conducting independent evaluations and comparing notes after each contact. Neither the managers knew they were being evaluated, nor the interviewers had upfront information about firms' performance. The formulation of questions as open inquiries allowed for discussions that provided examples and evidence for the assessment of management practices. Important statements from interviewees were registered for later analyses.

Secondary data

In addition to the survey data, we used information from the Brazilian Ministry of Development, Industry, and Foreign Trade (MDIC) to calculate Competition Intensity for each sector. Technology Intensity classification was established in line with OECD (Table 1), and Government Support data came from BNDES. Finally, we obtained Industry Size from data compiled by sectorial associations, besides using data for Total Revenues and Total Assets retrieved from the S&P Capital IQ and EMIS databases to compute the Performance construct.

Empirical Analysis and Discussion

Descriptive statistics

Table 3 presents the descriptive statistics of the variables that we used. This table reveals that the management practices that we measure exhibit a high correlation with each other, with most of them featuring values around 0.7 and 0.8. These values contribute to endorsing our operationalization of the firms' management practices scores as simple averages of the scores of individual practices, adding to the motivations that we mentioned before.

Table 3

Descriptive Statistics of the Variables

		Avg.	Variance	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Management Operations	3.67	1.13	1.00																	
2	Human Resources and Incentives	3.29	1.01	0.73	1.00																
3	Goals	3.19	1.73	0.58	0.82	1.00															
4	Performance Control	3.54	1.43	0.70	0.79	0.84	1.00														
5	Sustainability	3.33	1.96	0.70	0.70	0.66	0.70	1.00													
6	Technological Innovation	3.45	1.18	0.58	0.60	0.52	0.44	0.50	1.00												
7	Innovation in Management	3.08	1.84	0.75	0.70	0.67	0.75	0.65	0.57	1.00											
8	Avg. of Management Practices	3.28	443.90	0.85	0.90	0.87	0.89	0.84	0.70	0.87	1.00										
9	Ownership Structure	0.72	0.2	0.12	0.24	0.36	0.29	0.41	0.16	0.34	0.34	1.00									
10	Origins of Capital	0.28	0.2	0.25	0.42	0.40	0.32	0.43	0.22	0.26	0.39	0.31	1.00								
11	Labor Intensity	0.45	0.25	-0.22	-0.45	-0.48	-0.44	-0.38	-0.16	-0.15	-0.39	-0.10	-0.35	1.00							
12	Sector Size	700.52	780.00	-0.14	-0.21	-0.14	-0.13	-0.09	0.04	0.05	-0.10	0.25	-0.10	0.71	1.00						
13	Competition Degree	3.50	1,319.27	-0.04	0.23	0.30	0.21	0.21	0.23	0.07	0.21	0.23	0.38	-0.62	-0.06	1.00					
14	Government Support	0.75	940.20	-0.14	-0.21	-0.13	-0.11	-0.04	0.07	0.00	-0.09	0.24	0.00	0.55	0.93	0.12	1.00				
15	Company Size	4.76	93.23	0.15	0.26	0.23	0.14	0.16	0.18	0.10	0.20	0.21	0.37	0.01	0.20	0.16	0.25	1.00			
16	Training	0.17	0.14	0.18	0.35	0.29	0.27	0.37	0.27	0.24	0.34	0.28	0.22	-0.31	-0.29	0.20	-0.17	0.15	1.00		
17	Total Revenue	7.31	423.22	0.26	0.37	0.36	0.17	0.32	0.34	0.11	0.33	-	0.56	-0.21	-0.09	0.27	0.00	0.64	0.12	1.00	
18	Total Assets	19.35	282.46	0.18	0.31	0.31	0.10	0.24	0.30	0.04	0.25	-	0.44	-0.24	-0.21	0.19	-0.13	0.53	0.24	0.90	1.00

Note. Sources: Own data. S&P Capital IQ. Emis. Valor. Company and association websites. MDIC and BNDES. Average scores of practices measured on a 5-point scale.
Average size of companies expressed in thousands of employees.
Average level of competition in each sector expressed by the percentage of imports registered in each sector relative to the total imports in Brazil.
Average government support for each sector expressed in billion BRL.
Average size of each sector expressed in thousands of employees.
Average revenues of each company expressed in billion BRL.
Variances calculated as follows: First, the share of each observation was assessed within each variable, then, the variances of these shares were calculated.

The average scores of management practices registered for each of the seven sectors analyzed appear in Table 4. Comparing the different sectors, the graphic features the best average scores for the observed practices while the gas installation services recorded the lowest averages. Such contrast can be attributed to the characteristics of those sectors and the sampling criterion we adopted. The graphic sector is traditional, extremely spread, and exhibits a large percentage of small businesses. In this sector, guided by specialized consultants' advice, we chose leading companies that work with state-of-the-art technology and serve extremely demanding markets. Conversely, the gas installation services sector is still under development and encompasses few and young companies, which provide a service that is routinized and subject to strict safety standards. The telecommunications sector has the highest average scores after the graphic one, followed by the chemical and mining sectors.

Table 4

Average Scores of Management Practices by Sector

Sector	Management Practice
Graphic	4.2
Telecommunications	3.7
Chemical	3.4
Mining	3.4
Food and Beverage	3.2
Sugarcane	3.2
Gas installation services	2.0

Note. Data measured on a 5-point scale. Source: Own elaboration.

Analyses of hypotheses

Proceeding to the test of hypotheses, we first analyze the relationship between management practices and characteristics of the sampled companies and their sectors (H1 to H3). For this, an Ordinary Least Squares (OLS) regression is estimated as defined by Equation (1), allowing the measurement of the impacts of each independent variable at the firm-level and industry-level on management practices' scores.

$$\begin{aligned} Management\ Practices &= \beta_0 \\ &+ \beta_1 Competition\ Degree + \beta_2 Labor\ Intensity \\ &+ \beta_3 Government\ Support + \beta_4 Sector\ Size \\ &+ \beta_5 Ownership\ Structure + \beta_6 Origins\ of\ Capital \\ &+ \beta_7 Trainig + \beta_8 Company\ Size + \varepsilon \end{aligned} \quad (1)$$

For testing H4, a defined OLS regression (Equation 2) is used to analyze the relationship between companies' revenues or performance (taken by their total revenues) and their management practices, taking into account calculation of the companies' total assets and their sector sizes:

$$\begin{aligned} Performance = \ & \beta_0 + \beta_1 Management\ Practices + \beta_2 Total\ Assets \\ & + \beta_3 Sector\ Size + \varepsilon \end{aligned} \quad (2)$$

Results for H1, H2, and H3

Table 5 informs the regression results estimated by Equation 1 for the tests of H1 and H2 to H3. In regards to H1, the data in Table 5 show that a one-percent increase in the imports registered in a given

sector in relation to the total of imports in Brazil is accompanied by a reduction of 0.177 in the average scores of management practices (statistically significant, with $p < 0.01$, but with a small magnitude). Such a result contradicts to some extent what we expected for H1, which included a positive effect of sectorial competition on the adoption of best practices by firms. Looking at our dataset closely, the explanation for such a result seems to lie in the practices scores and in the import rate registered in the Sugarcane sector. In fact, this sector has relatively high practice scores, but remains one of those with the lowest import levels in the sample, pulling down the estimates, thus justifying the negative signal mentioned for the variable Competition Intensity. Because of this bias in the data, we cannot make any exact claim based on the statistical results that we obtained for this hypothesis.

Table 5

OLS Results for Management Practices and Individual and Sectoral Characteristics

	Management Practices[a]	
Intercept	3.721***	3.135***
	(0.341)	(0.336)
Competition Degree (H1)b	-0.159**	-0.177***
	(0.063)	(0.057)
Labor Intensity (H2)c	-2.636***	-2.448***
	(0.566)	(0.545)
Government Support (H3)d	-0.736	-1.194**
	(0.541)	(0.517)
Sector Size (Control variable)e	0.003***	0.003***
	(0.001)	0.003***
Ownership Structure (Control variable)f		-0.016
		(0.286)
Origins of Capital (Control variable)g		0.636**
		(0.270)
Training (Control variable)h		0.970***
		(0.322)
Company Size (Control variable)i		0.003
		(0.008)
N	67	64
Adjusted R-squared	0.254	0.436
F-statistic	6.613***	7.086
	(4, 62)	(8, 55)
p-value	0.000	0.000

Note. [a] Measured by the percentage of imports of each industrial sector relative to the total of Brazilian imports. [b] Dummy variable: 1 if a sector was classified as labor intensive in Table 1; 0 otherwise. [c] Measured by the financing provided by BNDES to each industrial sector, in billion BRL (Brazilian real). [d] Company average of the indicators for the individual management practices, ranging from 0 to 5. [e] Thousands of employees in each sector. [f] Dummy variable: 1 if publicly traded company; 0 otherwise. [g] Dummy variable: 1 if multinational subsidiary; 0 otherwise. [h] Dummy variable: 1 if the company adopted labor training programs with specialized consultants; 0 otherwise. [i] Thousands of employees in each company.
* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Relative to H2, our results confirm what we anticipated. Firms sampled from labor-intensive industries exhibit average management practice scores 2.448 points lower than those in technology-intensive ones, reinforcing certain stereotypes of less developed practices in those sectors ($p < 0.01$). Our results for this proposition advance the empirical understanding of PBV currently supported by Bloom and Van Reenen. In fact, these authors have recently suggested that specific practices are contingent on the characteristics of companies' sectors, particularly in relation to the intensity of human and fixed capital (Bloom et al., 2016). However, they do not enter in a deep discussion of this topic, leaving it open as a research opportunity to be seized. According to their study, capital-intensive sectors tend to exhibit higher average scores in monitoring and targeting practices, while firms in human capital-intensive practices focus on people management and incentives practices. Our identification that technology-intensive sectors also exhibit average scores of practices superior to those of labor-intensive sectors helps to understand the combined effect of those trends in an inter-sectorial perspective.

The variable responsible for the test of H3 (Government Support), in turn, reveals that an increase of one billion BRL in financing to a given sector is accompanied, on average, by a decrease of 1.194 points in the average level of management practices in that sector ($p < 0.05$), hence providing evidence against our initial hypothesis. These results can be considered incompatible with the developmental function associated with an institution such as BNDES, in comparison to traditional banks. Differently from conventional banking institutions, loans from development banks such as BNDES are granted at interest rates that are much lower than those practiced in the market, which should in principle stimulate companies' development in line with BNDES' role in Brazilian industrial policies.

In spite of that, our results support claims already reported in the literature about the hazardous effect that government influence may have on the economy. For some authors, government influence allows for the maintenance of firms that otherwise would have no means to survive in the market, which may offset any developmental effect expected (Bloom et al., 2012; Bloom, Mahajan, et al., 2010; Bloom, Sadun, et al., 2010). According to Lazzarini (2013, p. 97), inducing firm-level competitive advantage through industrial policy "is a difficult endeavor and requires the interplay of three conditions: insertion in global production networks, geographical specificity, and governmental capability". Clearly, the political turbulence witnessed in Brazil since 2010 makes Lazzarini's conditions the very plausible explanations for the lack of efficiency in recent policy efforts undertaken in the country.

Our unexpected results can also be understood in the context of recent studies that have highlighted the inappropriate destination of resources provided by BNDES. According to those studies, reductions in the cost of debts assumed relative to BNDES are not reflected in consistent improvements in companies' performance and investment levels (Lazzarini et al., 2015). Among the major reasons for this, they indicate that BNDES' loans tend to be granted to companies with a track of good financial performance and with easy access to other sources of resources. In addition to that, we can speculate that the certainty of the governmental support may make firms less proactive. In other words, it may lead firms to consider that defense and protection measures are not needed since the State is on their side to protect them from turbulence and other shocks.

Finally, our results for the control variables are consistent with the empirical support that PBV finds in Bloom and Van Reenen's research, in what comes to the effects of firm-level variables on the adoption of management practices by firms. Accordingly, those authors have indicated that export activity, foreign ownership (multinational status), more educated human capital, and professional management are characteristics shared by firms with higher average management practices scores (Bloom et al., 2012; Bloom, Mahajan, et al., 2010).

Results for H4

The relationship between management practices and performance (H4) draws on the results of Equation 2, reported in Table 6. This table indicates that management practices are positively related to firms' performance (expressed by their total revenues), after controlling for the size of assets and sector size, offering some support to H4 (β=2.735, $p < 0.1$). However, additional tests that we performed

considering operational indicators (more specifically, net income, return on assets, and net assets), which are alternative measures for financial performance, did not exhibit the same significance levels. These conflicting results challenge us to make sense of the actual effects of best practice adoption for the firms that we sampled.

Table 6

OLS results for Company Performance and Management Practices

		Performance[a]
Intercept	-14.962	-10.457*
	(10.878)	(5.693)
Management Practices (H3)[b]	6.337**	2.735*
	(3.016)	(1.401)
Total Assets (Control variable)[c]		0.247***
		(0.020)
Sector Size (Control variable)[d]		4.260*
		(2.291)
N	39	39
Adjusted R-squared	0.082	0.824
F-statistic	4.415**(1, 37)	60.404*** (3, 35)
p-value	0.000	0.000

Note. [a] Company total revenues, in billion BRL. [b] Company average of the indicators Management Operations, Human Resources and Incentives, Goals, Performance Control, Sustainability, Technological Innovation and Innovation in Management, from 0 to 5. [c] Company total assets, in billion BRL. [d] Sector number of employees, in thousands.
* p < 0.1; ** p < 0.05; *** p < 0.01

On the one hand, the possibility of a positive connection between best practices and performance would confirm the common sense of practitioners and the view of authors who have defended best practices as a paradigm of operations strategy. Since the 80s, authors have scrutinized whether and how ordinary practices could help firms in achieving superior results (Silveira & Sousa, 2010; Voss, 2005). Under the umbrella of PBV, previous research by Bloom and Van Reenen have reinforced expectations that firms with superior average scores in their management practices also exhibit superior performance (Bloom et al., 2016; Bloom & Van Reenen, 2007). On the other hand, the conflicting results that we achieved with our robustness tests do limit our capacity for making similar claims. Even though total revenues represent a valid proxy for performance, as seen in previous studies (Hult et al., 2008), we must acknowledge that superior sales do not guarantee firms any advantage if they have problems in the enlarged domain of their operations and organizational effectiveness (Venkatraman & Ramanujam, 1986).

We must also acknowledge that the heterogeneity of financial results shown by the sampled companies and their limited number in each industrial sector may play a role in explaining our findings. Notwithstanding, it seems plausible to speculate that particular features of the Brazilian context may be part of the explanation of this divergence. Actually, the turbulence of the institutional and the business environments associated with the so-called Brazil cost may be influencing the different sectors and companies differently, jeopardizing the competitive dynamics that could be expected in efficient markets. We would only be able to assess this hypothesis if our sample encompassed firms operating under different turbulence conditions, such as if we sampled firms from different countries or if we collected data from firms in a single country at different moments of time. Yet, previous studies have already supported the possibility that contextual turbulence be a relevant variable in understanding

firms' performance (Farashahi & Hafsi, 2009; Yu, Tao, Tao, Xia, & Li, 2018). This leads us to consider this possibility as plausible. The summary of our results appears in Figure 2.

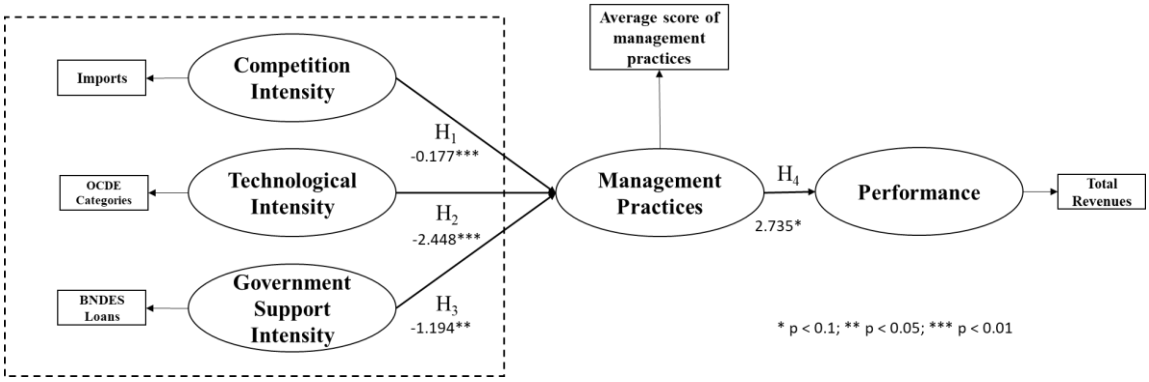

Figure 2. Summary of Results

Conclusion

This study aimed at investigating if industrial sectors that are technologically sophisticated, more exposed to competition, and that receive greater government support adopt more advanced management practices and achieve superior performance. The first relationship was confirmed: firms in sectors that are technologically advanced display more advanced management practices, which confirms previous studies on aggregate levels. The second relation – competition intensity and management practices adoption - was inconclusive due to sample heterogeneity. In regards to the other two relationships, some insights came out.

First, our analysis revealed that depending on the criteria that development banks adopt to select companies to receive subsided loans, governmental investment may be useless: companies will not automatically upgrade their management practices and both, firms and country, will not increase their competitiveness. That brings a new constraint to Bloom's and Van Reenen's generalizations on that issue. In other words, governmental support not necessarily enhances management practices at firm level and public investment does not necessarily have positive returns. In terms of PBV, that introduces a contextual constraint (Voss, 2005) to be observed in studies looking at policies to stimulate the diffusion of best practices.

Second, the relationship between management practices and performance seems to be somehow blurred. From the standpoint of our research, it may be plausible that the turbulence in the Brazilian context plays a role in that outcome. As previously mentioned, Lant and Mezias (1992) and Lant, Milliken and Batra (1992) found out that in turbulent environments it becomes highly complex for managers to assess the causal relationships connecting best practices adoption and performance outcomes. That may have affected managers' judgements in assessing their choices. If this is confirmed, it creates a limitation in the PBV that is yet to be discussed: up to what level of environmental uncertainty would the logic that guides PBV analysis (the adoption of common practices leads to superior performance) be valid?

On the empirical analysis side, the outcomes suggest that surveys focusing on the relationship between management practices and country competitiveness should use both technological level and governmental support indicators as moderators. For example, firms in countries characterized by high technology and low governmental support are expected to have more advanced practices than the others.

Our methodological choices bring critical limitations to the results. Since we focused our discussion on firms intentionally sampled from the population of Brazilian companies in particular

sectors, we cannot generalize the results beyond groups with a similar profile. Additional studies with larger, randomized samples should be conducted in the future in order to expand the validity of our findings to other sectors.

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Contributions

1st author: definition of research problem; development of hypotheses or research questions (empirical studies); development of theoretical propositions (theoretical work); theoretical foundation / literature review; data collection; analysis and interpretation of data; critical revision of the manuscript; manuscript writing.
2nd author: development of hypotheses or research questions (empirical studies); development of theoretical propositions (theoretical work); theoretical foundation / literature review; data collection; manuscript writing.
3rd author: theoretical foundation / literature review; data collection; manuscript writing.
4th author: theoretical foundation / literature review; definition of methodological procedures; data collection; statistical analysis; analysis and interpretation of data; manuscript writing.
5th author: definition of research problem; development of hypotheses or research questions (empirical studies); development of theoretical propositions (theoretical work); theoretical foundation / literature review; definition of methodological procedures; data collection; analysis and interpretation of data; critical revision of the manuscript; manuscript writing.

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