



RESEARCH PAPER

# Strategic management in Australian firms

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## Abstract

Management practices appear to be a key driver of firm outcomes, however evidence suggests that firms have little awareness of how their management practices compare with those of other firms and best practice. To improve understanding of management capability in Australia and facilitate self-assessment, we develop a simple classification of strategic management using a cross section of the Australian Bureau of Statistics' Management and Organisational Capabilities Module. Our measure of strategic management correlates strongly with broader management practices and with a separately constructed, data-driven summary measure of management practices created using multiple correspondence analysis. The strategic management classification is positively associated with: rates of innovation; search for collaborative opportunities; responsiveness to skill and supply chain issues; and labour productivity at the firm level. We examine several potential drivers of strategic management capability and find that higher levels of education and foreign ownership contribute to stronger strategic management capabilities.

**JEL Codes:** L2, M2

**Keywords:** Management practices, management categories, management capability, strategic management, productivity, firm performance.



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**The Australian Bureau of Statistics' (ABS) Business Longitudinal Analysis Data Environment  
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The results of these studies are based, in part, on Australian Business Register (ABR) data supplied by the Registrar to the ABS under A New Tax System (Australian Business Number) Act 1999 and tax data supplied by the Australian Tax Office (ATO) to the ABS under the Taxation Administration Act 1953. These require that such data is only used for the purpose of carrying out functions of the ABS. No individual information collected under the Census and Statistics Act 1905 is provided back to the Registrar or ATO for administrative or regulatory purposes. Any discussion of data limitations or weaknesses is in the context of using the data for statistical purposes, and is not related to the ability of the data to support the ABR or ATO's core operational requirements. Legislative requirements to ensure privacy and secrecy of this data have been followed. Only people authorised under the Australian Bureau of Statistics Act 1975 have been allowed to view data about any particular firm in conducting these analyses. In accordance with the Census and Statistics Act 1905, results have been confidentialised to ensure that they are not likely to enable identification of a particular person or organisation.

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## Key points

- This research project develops a simple classification of strategic management capability based on firms' strategic planning and use of key performance indicators. The project makes use of data from the inaugural ABS Management Capability Survey.
- Around 58 per cent of firms are classed as having Low Engagement Management, with either no strategic plan or no monitoring of key performance indicators. At the other end of the spectrum, roughly 6 per cent of firms are classed as having Strategic Management, possessing a written strategic plan and monitoring three or more key performance indicators across two or more areas. The remaining 36 per cent of firms fall between these two extremes, classed as either Ad hoc (23 per cent) or Narrow Focus (13 per cent).
- Strategic management practices are primarily driven by firm size. Firms employing more than 100 employees are over six times more likely to have high strategic management capability than firms employing 5 to 19 employees
- Strategic management capability is also positively associated with: innovation; search for collaborative opportunities; responsiveness to skill and supply chain issues; and labour productivity at the firm level.
- Education and foreign investment appear to be two drivers of management capability. More educated — particularly university educated — principal managers and foreign ownership are both associated with higher proportions (levels) of strategic management.

# 1. Introduction

Management practices play an important role in firms' success. In recent years, several large-scale studies have found structured management practices to be associated with firm performance in manufacturing, health and education.<sup>1,2,3</sup> In fact, one estimate suggests that a 1 point increase in management practices (on a scale of 1 to 4) has an equivalent impact on output to a 25 per cent increase in the labour force and a 65 per cent increase in invested capital.<sup>4</sup>

Moreover, management practices appear to explain not only differences in performance across firms, but also across countries. For example, Agarwal et al.<sup>5</sup> find a positive association between labour productivity and average management scores in manufacturing across 17 countries, and Bloom, Sadun and Van Reenen estimate that differences in management capability account for about 30 per cent of the differences in total factor productivity (TFP) between countries.

In this paper, we use a novel cross-sectional dataset based on the Australian Bureau of Statistics' Management and Organisational Capabilities Module of the Business Characteristic Survey. Using this data, we develop a simple, broadly-applicable classification of strategic management practices to facilitate self-assessment. This classification is based on three management practices: strategic planning; the number of key performance indicators (KPIs) used; and the number of focus areas monitored with KPIs. These practices broadly correspond to those emphasised in the Balanced Scorecard (BSC) framework,<sup>6</sup> a widely adopted tool for guiding the implementation of management practices which has been linked to superior firm performance in several studies.<sup>7,8</sup> Our measure of strategic management correlates strongly with broader management practices and with a data-driven measure of structured management created using multiple correspondence analysis (MCA).

We find that firms with higher levels of strategic management have higher levels of labour productivity, even after accounting for firm size. We also identify

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<sup>1</sup> Bloom, N., Lemos, R. & Sadun, R. (2013) Does Management Matter in Schools? Discussion Papers 13-032, Stanford Institute for Economic Policy Research.

<sup>2</sup> Bloom, N. & Van Reenen, J. (2006) Measuring and Explaining Management Practices Across Firms and Countries. NBER Working Papers 12216, National Bureau of Economic Research, Inc.

<sup>3</sup> Bloom, N., Sadun, R. & Van Reenen, J. (2013) Does Management Matter in Healthcare. Discussion Papers 13-032, Stanford Institute for Economic Policy Research.

<sup>4</sup> Bloom, N., Drgan, S., Downdy, J. & Van Reenen, J. (2007) Management Practice and Productivity: Why They Matter; A McKinsey Report.

<sup>5</sup> Agarwal, R., Bajada, C., Brown, P. and Green, R. (2015) Global Comparisons of Management Practices, in Handbook of Research on Managing Managers, Editors: Wilkinson, A., Townsend, K. and Suder., Edward Elgar, Cheltenham, UK.

<sup>6</sup> Kaplan, R. S. & Norton, D. P. (1992) The Balanced Scorecard: Measures that Drive Performance. Harvard Business Review, pp. 71–79.

<sup>7</sup> De Geuser, F., Mooraj, S. & Oyon, D. (2009) Does the Balanced Scorecard Add Value? Empirical Evidence on its Effect on Performance. European Accounting Review, 18(1), pp. 93–122.

<sup>8</sup> Davis, S. & Albright, T. (2004) An investigation of the effect of balanced scorecard implementation on financial performance. Management accounting research, 15(2), pp. 135–153.

several channels through which strategic management may influence firm outcomes, finding that strategic management is associated with innovation, seeking out collaborative opportunities and responding to supply chain and skill shortage issues. There is also evidence that there are information gaps relating to management capability, leading to market failures (see section 2). Given this, and the importance of management capability to firm performance, there is scope for government intervention.

The paper is structured as follows: Section 2 provides a stage-setting literature review. Data is discussed in Section 3. Section 4 outlines the methods used. Sections 5, 6 and 7 discuss the relationship between strategic management and firm characteristics and performance. Section 8 analyses some of the determinants of management capability. Section 9 summarises the key findings and draws policy inferences.

## 2. Literature review

Management has been an important concern for modern economists. This concern is evident in the definition of the firm and its link to management. For example, Penrose<sup>9</sup> defines a firm as an administrative entity with the control over potentially valuable resources and its managers as employees who make decisions about how firm activities and resources are deployed. She identifies two types of capabilities in firms: entrepreneurial and managerial capabilities. While entrepreneurial capabilities are a function of imagination, managerial capabilities are largely practical in orientation, and are associated with the execution of ideas. Entrepreneurial capabilities are not a sufficient condition for firm growth as they must be accompanied by managerial capabilities for growth to occur.<sup>10</sup>

Management capabilities allow for the systematisation and routinisation of activities that are critical for growth or survival in an organisation.<sup>11,12,13</sup> Management capabilities are embedded in professional management, which drives the structure of modern firms.<sup>14</sup> More importantly, management capabilities are fundamental to support successful commercialisation and marketing of innovations.<sup>15</sup> Innovative firms may fail to capture economic returns on their inventions if they do not have enough managerial capabilities

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<sup>9</sup> Penrose E. (1959) *The Theory of Growth of the Firm*. Blackwell: Oxford.

<sup>10</sup> Ibid.

<sup>11</sup> An organizational routine is a repeated action sequence which has its roots in organizational procedures and systems, one that informs how the firm is to get things done. See Feldman, M. S. and Pentland, B. T., (2003) Reconceptualizing Organizational Routines as a Source of Flexibility and Change, *Administrative Science Quarterly*, Vol. 48, No. 1 (Mar., 2003), pp. 94–118.

<sup>12</sup> Nelson and Winter Nelson, R. R. and Winter, S. G. (1982) *An Evolutionary Theory of Economic Change*, Cambridge: The Belknap Press

<sup>13</sup> Management capabilities in this context are often referred to as “dynamic capabilities”.

<sup>14</sup> Chandler A. (1977) *The Visible Hand: The Managerial Revolution in American Business* (The Belknap Press of Harvard University Press

<sup>15</sup> Teece D. (1987). Technological Change and the Nature of the Firm, in D. Teece (ed.) *The Competitive Challenge*, pp. 256–281. Harper and Row: New York

to organise and successfully execute marketing, finance, distribution or manufacturing operations.

Bloom, Sadun and Van Reenen estimate what share of the gap between various countries' TFP and that of the US is explained by management practices. For Australia, management practices appear to explain a particularly large share — around 50 per cent (Figure 1.1a) — largely due Australian firms reporting less structured management practices. Indeed, Australian manufacturing firms interviewed in the World Management Survey received an average management score below many comparable countries, including Germany, Canada, the United Kingdom France, and Italy (Figure 1.1b).

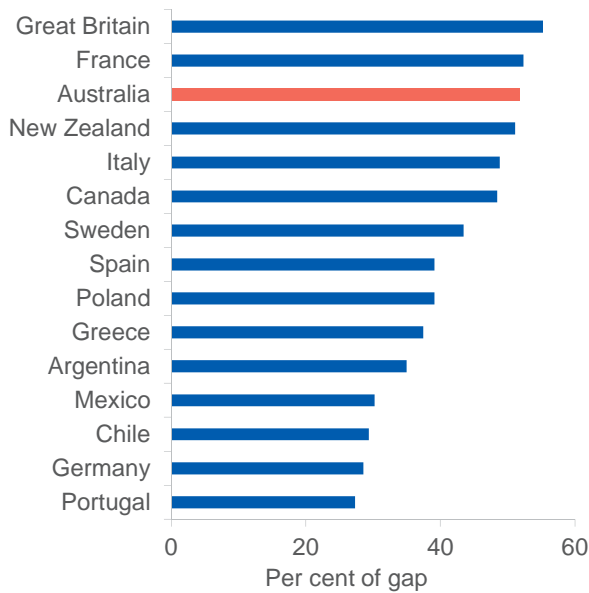
The evidence that there is room for improvement in Australian management practices has not been limited to the World Management Survey. As early as 1995, the Karpin report identified a need for Australian managers to improve in several areas, including strategic management.<sup>16</sup> More recently, data from external administrators' reports lodged with the Australian Securities and Investments Commission have revealed that a substantial share of firms commonly cite poor strategic management as a reason for their failure (Figure 1.1c).

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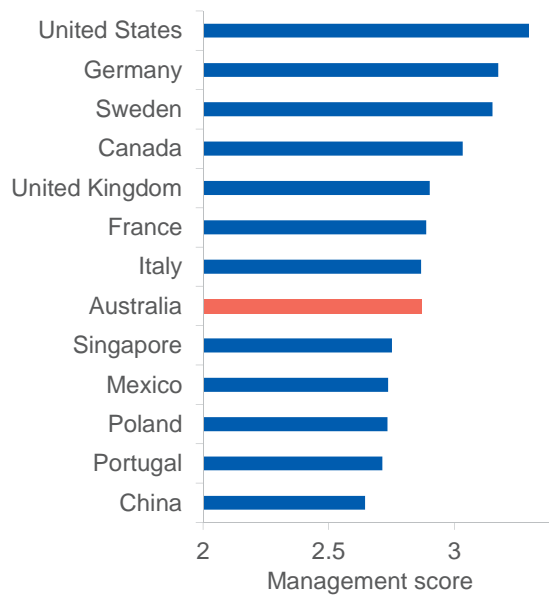
<sup>16</sup> Karpin, D. (1995) *Enterprising Nation: Reviewing Australia's Mangers to Meet the Challenges of the Asia-Pacific Century: Report of the Industry Task Force on Leadership and Management Skills*. Canberra: Commonwealth of Australia.

Figure 1.1: Management capability in Australia and overseas

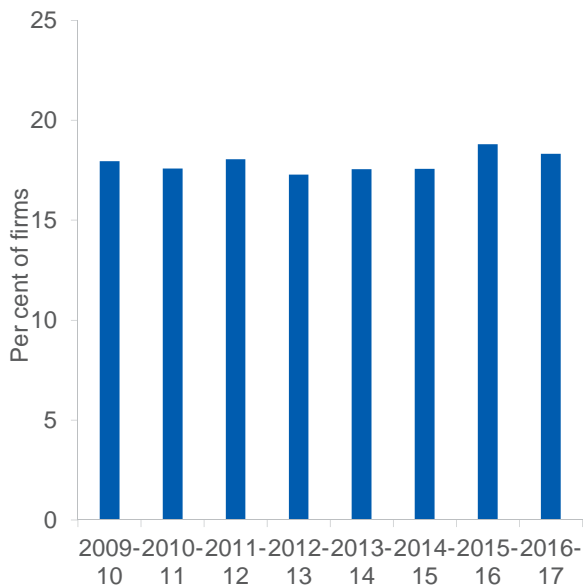
(a) Share of TFP gap with the United States explained by management



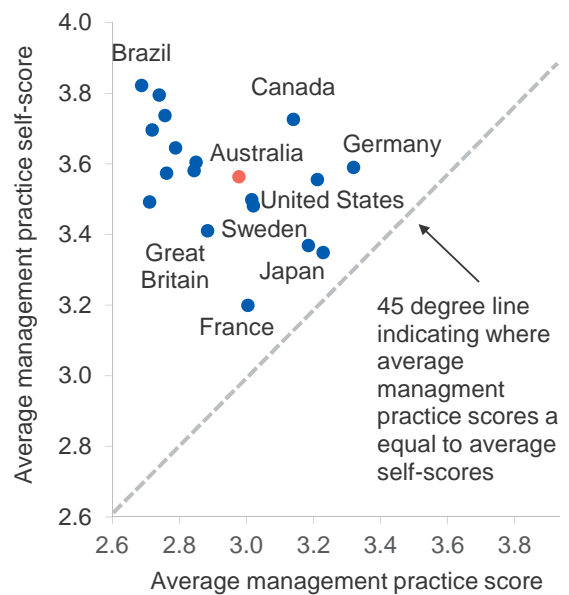
(b) Average management score of domestic firms by country



(c) Poor strategic management of business as cause of business failure



(d) Actual and self-assessed management scores by country



Notes: (b) Scores represent unweighted means of management scores among domestic manufacturing firms.

Source: (a,b) Data were digitally extracted from Bloom, Sadun and Van Reenen (2017); (c) Data were digitally extracted from Maloney (2017, p.5); (d) ASIC (2017) Insolvency statistics: External administrators' reports.



It is unclear what accounts for differences in management capability between firms and countries, and what the role for government is in promoting the adoption of structured management practices. Indeed, some firms may opt for less structured management to *promote* performance. In some cases, the costs associated with introducing structured management practices — such as the monitoring of key performance indicators (KPIs) or development of a strategic plan — may exceed any associated benefits. This may be especially true for smaller firms.

However, it is also possible that firms lack information on optimal management practices and forgo implementing more structured management practices despite net benefits. Indeed, there is evidence that firms systematically lack information on how structured their management practices are with respect to others, with firms' self-assessed management scores poorly predicting externally assessed management scores and firm performance.<sup>17</sup> Moreover, at a national level, self-assessment of management capability is *negatively* related to external assessments (Figure 2.1d). Supporting the notion that this may translate to poor outcomes, there is evidence that some firms systematically introduce management practices — for example, compensation schemes — that are not value-maximising.<sup>18,19</sup>

Given these informational issues, policies aimed at increasing firms' awareness of their management capability and financial performance with respect to others and best practice are likely to be beneficial. The Inland Revenue Department in New Zealand currently allows firms to compare their financial performance with industry-level benchmarks (box 2.1). A similar tool for management practices is one potential policy response.

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#### Box 2.1: The New Zealand Inland Revenue Department's financial benchmarking

The Industry Benchmarking Tool developed by the New Zealand Inland Revenue Department and Statistics NZ enables small to medium enterprises to compare their financial performances with industry benchmarks. The benchmarks are based on data from firms' financial statements and tax returns and cover 45 industries grouped by the Australia and NZ Standard Classification (ANZSIC). Statistics NZ treats that data to ensure no individual of business can be identified from information provided by the tool. The benchmarking information provided includes: gross profit ratio; stock turnover per annum; salary and wages as a share of turnover; return on total assets; and return equity.

Source: New Zealand Department of Inland Revenue (2017).

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A more tailored approach to providing firms with information and advice on management practices and strategy is currently implemented by the Department of Industry, Innovation and Science's Entrepreneur's Programme, which includes a Business Management element that pairs firms with

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<sup>17</sup> Bloom, N., Drgan, S., Downdy, J. & Van Reenen, J. (2007) Management Practice and Productivity: Why They Matter; A McKinsey Report.

<sup>18</sup> Brown, P. J., Matolcsy, Z. P. and Wells, P. (2014) Group versus individual compensation schemes for senior executives and firm performance: Some evidence based on archival data. *Journal of Contemporary Accounting and Economics*, 10 (2), pp. 100–114.

<sup>19</sup> Agarwal, R., Brown, P. J., Green, R., Randhawa, K. and Tan, H. (2014) Management Practices of Australian manufacturing firms: Why are some firms more innovative? *International Journal of Production Research*, 52 (21), pp. 6496-6517.

experienced Business Advisers and Facilitators and includes access to benchmarking information (see section 8).

This paper develops a classification of strategic management to facilitate self-assessment. Large-scale studies of management practices to date typically produce management scores, aggregating information from interviews on a large number of management practices to produce *continuous* representations of management capability. These measures do not lend themselves to self-assessment as providing information on the full range of management practices can be burdensome. Moreover many existing scores of management capability are dated or focus on a single sector such as manufacturing and do not generalise.

The management capabilities data collected by the Australian Bureau of Statistics (described in section 3) captures Australian business capabilities in a number of key areas of management including the use of key performance indicators, use of data in decision making, presence of strategic plans, management of supply chain and management of digital technologies. The analysis of this novel data enables investigation of several important hypotheses in the management literature.

### 3. Data

We use data from the Australian Bureau of Statistics' Management and Organisational Capabilities (MOC) module, collected as part of the Business Characteristics Survey (BCS). This dataset represents a significant contribution to data on Australian firms' management practices. It is the first collection to measure management practices on a near economy-wide basis, omitting only a few sectors (see appendix A).

The BCS is an annual survey of Australian firms. It collects data relating to a wide range of firm characteristics and activities, including structure, access to finance, use of information technology and innovation. The MOC module was introduced to the BCS in 2015-16.<sup>20</sup>

As a module of the BCS, the MOC collects management practices data from over 14500 firms to produce a representative sample of the population of Australian businesses.<sup>21</sup> The questions of the MOC were designed with a view to consistency with the US Census Bureau's Management of Operational Practices survey (MOPS).<sup>22</sup> This enables international comparisons. However, the US MOPS only surveys large firms in the manufacturing sector, excluding small and medium sized firms.

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<sup>20</sup> The Management and Organisational Capabilities Survey questionnaire was created in a collaboration between the Australian Bureau of Statistics, the Department of Industry, Innovation and Science's Office of the Chief Economist, the University of Technology Sydney, and with the technical assistance of Professor Nick Bloom of Stanford University in the United States.

<sup>21</sup> The number of contributing units was just over 12,500. The difference between the number of surveyed firms and contributing units is due to non-response, inclusion of firms no longer in operation in the survey sample, and issues with data verification.

<sup>22</sup> <https://www.census.gov/programs-surveys/mops.html>

The cross-sectional analysis undertaken in this paper uses two separate derivations of MOC data: The Management and Organisational Capabilities of Australian Businesses Microdata (referred to as the *MOC microdata* hereafter), and a dataset linking the MOC microdata with administrative data collected for tax purposes via the Business Longitudinal Analysis Data Environment (referred to hereafter as BLADE — see Box 3.1 for an outline of BLADE).

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#### Box 3.1: The Business Longitudinal Analysis Data Environment

BLADE is a series of integrated, linked longitudinal datasets over the period 2001 02 to 2015 16. It is based on retrospectively reconciling the different reporting structures in ATO and ABS data to facilitate linking survey and administrative data for businesses.

The BLADE data used in this project is from two main sources: the MOC microdata collected as part of the Business Characteristics Survey (BCS) and Business Activity Statements (BAS) collected by the Australian Tax Office. In addition, demographic information (such as firm age or industry classification) is derived by a combination of data from the ABS Business Register and historical ATO reporting patterns.

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The BLADE data is subject to less confidentiality than the MOC microdata, allowing for more in-depth analysis. However, it does not contain population weights and therefore sample estimates are biased by the overrepresentation of larger firms, which have higher probability of inclusion in the BCS. As such, for estimates where national representativeness is important, the MOC microdata is used. For estimates requiring more detail than what is present in MOC microdata, BLADE will be used.

#### Sample construction

The analysis presented in this paper uses a subsample of the firms for which information on management practices is available. For analysis using the MOC microdata, a sample of 12,539 firms is used. For analysis using the BLADE data, a sample of 10,626 firms is used. The criterion for excluding firms in the BLADE data, and how many firms are excluded by each criteria is presented in Table 1.1. Most notably, we remove non-employed firms as we consider our strategic management classification to be less appropriate for these firms.

Table 3.1: Sample construction for BLADE analysis

Criterion	Observations Removed
Initial Sample	12,539
Zero or missing turnover	712
Zero or missing wages	667
Zero or missing operational expenditure	353
Non-employing	131
More than 50 salaried directors	19
More than 10 working proprietors and partners	31
<b>Remaining sample</b>	<b>10 626</b>

Source: ABS (2018) Business Longitudinal Analysis Data Environment.

## 4. Method

### The rationale behind a categorical approach

Previous studies have used data on management practices to construct continuous management scores ranging from 'best' to 'worst'. However, management categories or *modes* are another — potentially more interpretable — approach to capturing differences in management. As we use information on only three management practices, the drivers of differences in assessed firms' management is clear and transparent<sup>23</sup> compared with score-based approaches, which typically aggregate information on a larger range of management practices.<sup>24</sup>

### Creating levels of strategic management

A firm's management approach is a complex combination of management practices which can differ along many dimensions. This is reflected in the wide array of taxonomies presented in the management literature. For example, management practices have been conceptualised as contributing to task, relations and/or change behaviour.<sup>25</sup> Other studies have been more comprehensive — for example, Tett et al.<sup>26</sup> identified 47 distinct managerial competencies, associating them with nine general categories including traditional functions (decision making and directing), communication (listening skills and oral communication) and developing self and others (developmental

<sup>23</sup> Especially in terms of helping businesses gauge their own management capability.

<sup>24</sup> Despite the limited inputs into the classification, we demonstrate below that our levels of strategic management correspond closely to other measures of structured management.

<sup>25</sup> Yukl, G., Gordon, A. & Taber, T., 2002. A Hierarchical Taxonomy of Leadership Behavior: Integrating a Half Century of Behavior. *Journal of Leadership and Organizational Studies*, 7(1), pp. 15–32.

<sup>26</sup> Tett, R. P., Guterman, H. A., Bleier, A. & Murphy, P. J. (2000) Development and Content Validation of a "Hyperdimensional" Taxonomy of Managerial Competence. *Human Performance*, 13(3), pp. 205–251.

goal setting and self-development). Overall, there is little consensus underpinning a taxonomy and classification of management approaches.

This paper does not aim to create a holistic classification of management approaches. Rather, we focus on strategic management, identifying different levels of engagement with strategic management practices. The management taxonomy presented in this paper classifies firms according to four levels: Low Engagement, Ad hoc, Narrow-Focus and Strategic. Firms are assigned to these categories based on three aspects of their management:<sup>27</sup>

- **Possession of a strategic plan** — firms may indicate whether they have a written, unwritten or no strategic plan.
- **Number of KPIs monitored** — firms indicate whether they monitor: 1 or 2; 3 to 5; 6 to 9; 10 or more; or no KPIs.
- **Number of topics covered by KPIs** — firms indicate whether they monitor financial, operational, quality, innovation, human resources, environmental, social and health and safety measures.

These three facets of management broadly correspond to the Business Scorecard (BSC) framework, which focusses on aligning firms operations with overall strategy. The framework was developed by Kaplan and Norton<sup>28</sup> and — in addition to focussing on the development of strategic plans and corresponding KPIs — emphasises the importance of monitoring a *variety* of indicators to counter overreliance on financial measures. This prompts firms to not only consider indicators of previous performance (financial measures) but also drivers of future performance

The BSC framework is widely used by management consultants. Bain and Company (2015) list the BSC approach as one of 25 popular tools included in its survey of Management Tools and Trends. The most recent international survey of around 14,000 executives found that approximately 30 per cent of firms were using this tool. In addition, several studies have found this tool to be associated with improved firm outcomes. For example, a survey of 76 business units found BSC to have a positive impact on firm performance through increased translation of strategy into operations.<sup>29</sup> A quasi-experimental study found superior financial performance among bank branches implementing the BSC approach compared with other branches within the same organisation.<sup>30</sup>

The questions within the Management Capabilities Module were not designed to detect firms' implementation of the BSC approach (which requires more than the creation of a strategic plan and monitoring of KPIs). Nonetheless, the levels of strategic management do reflect the degree to which firms have implemented practices closely associated with essential elements of the BSC

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<sup>27</sup> See appendix C for the distributions of firms engaged in each level of these management practices.

<sup>28</sup> Kaplan, R. S. & Norton, D. P. (1992) The Balanced Scorecard: Measures that Drive Performance. *Harvard Business Review*, pp. 71–79.

<sup>29</sup> De Geuser, F., Mooraj, S. & Oyon, D. (2009) Does the Balanced Scorecard Add Value? Empirical Evidence on its Effect on Performance. *European Accounting Review*, 18(1), pp. 93–122.

<sup>30</sup> Davis, S. & Albright, T. (2004) An investigation of the effect of balanced scorecard implementation on financial performance. *Management accounting research*, 15(2), pp. 135–153.

framework which are critical to strategic management. Our four levels of strategic management, each reflecting practices within the BSC framework, are described in Table 4.1.

Table 4.1: Categories of strategic management

Level of strategic management	Description
Strategic	The firm has active management practices, reporting structured planning, monitoring of performance across a range of indicators.
Narrow-Focus	The firm may demonstrate active management in one area but lack either formal strategic planning or comprehensive monitoring.
Ad hoc	The firm has a reactive approach to management with limited strategic planning and managerial practices occurring on ad hoc basis.
Low Engagement	The firm does not undertake strategic planning and does not monitor its performance.

The criteria associated with each category are presented in Figure 4.1. The category representing the most active management behaviour, Strategic Management, includes firms that have a written strategic plan and monitor more than one KPI across more than one topic.

Figure 4.1: Criteria for management categories

**Written strategic plan**

Number of KPIs	Number of KPI topics			
	0	1	2	3 or more
Zero or don't know	Low Engagement	Low Engagement	Low Engagement	Low Engagement
1 to 2	Low Engagement	Narrow-Focus	Narrow-Focus	Narrow-Focus
3 to 5	Low Engagement	Narrow-Focus	Strategic	Strategic
6 or more	Low Engagement	Narrow-Focus	Strategic	Strategic

**Unwritten strategic plan**

Number of KPIs	Number of KPI topics			
	0	1	2	3 or more
Zero or don't know	Low Engagement	Low Engagement	Low Engagement	Low Engagement
1 to 2	Low Engagement	Ad hoc	Ad hoc	Ad hoc
3 to 5	Low Engagement	Narrow-Focus	Narrow-Focus	Narrow-Focus
6 or more	Low Engagement	Narrow-Focus	Narrow-Focus	Narrow-Focus

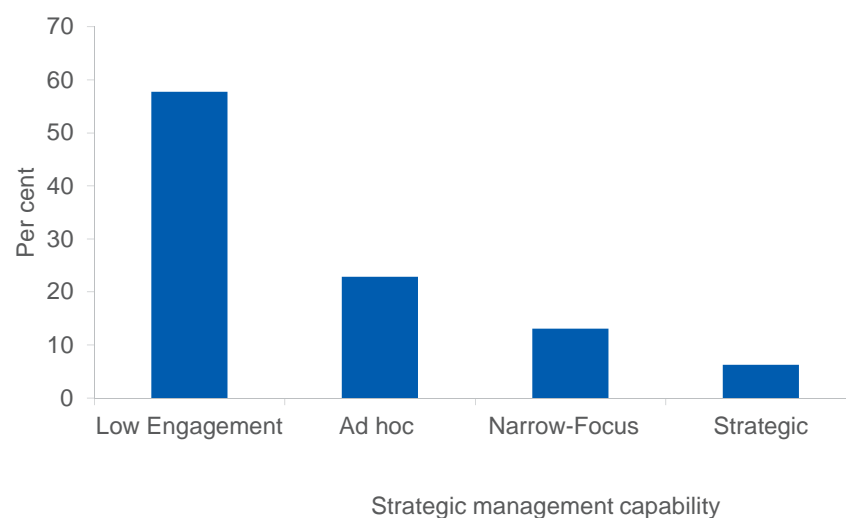
**No strategic plan**

Number of KPIs	Number of KPI topics			
	0	1	2	3 or more
Zero or don't know	Low Engagement	Low Engagement	Low Engagement	Low Engagement
1 to 2	Low Engagement	Ad hoc	Ad hoc	Ad hoc
3 to 5	Low Engagement	Ad hoc	Ad hoc	Ad hoc
6 or more	Low Engagement	Ad hoc	Ad hoc	Ad hoc

Strategic
  Narrow-Focus
  Ad hoc
  Low Engagement

While this appears a modest requirement, only 10 and 24 per cent of firms have written strategic plans and monitor more than two KPIs, respectively. Only 6 per cent of firms meet all three criteria (Figure 4.2). At the other end of the spectrum, firms in the bottom category, Low Engagement Management, do not track any KPIs and do not have a written or unwritten strategic plan. A surprisingly large share of Australian firms — 58 per cent — fit within this category. Our Narrow-Focus and Ad hoc categories include 23 and 12 per cent of firms, respectively. Supporting the notion that these levels of management reflect firms’ general engagement with management practices, we demonstrate below a strong relationship between our categories, other structured management practices and a data-driven score of active management.

Figure 4.2: Distributions of the management capability taxonomy



Notes: Weights have been applied to provide nationally representative estimates.

Source: ABS Management and Organisational Capabilities of Australian Business Microdata, 2015-16 Cat. No. 8172.0.55.001

### The strategic management classification and other facets of management

The development of the criteria presented above was based on *a priori* judgements of the importance of several strategic management behaviours. One test of this criteria’s validity is whether our levels of strategic management are associated with other strategic management behaviours.

We find strong relationships between our levels of strategic management and the number of contributors to strategic plans, number of employees listed as having responsibility for strategic plan implementation and the number of areas covered in the strategic plan, among other management practices (Table 4.3). Moreover, the more closely the behaviour in Table 4.3 is associated with strategic planning, the stronger its association with our levels of strategic management capability.



Table 4.2: Correlations between strategic management categories

Management practices	Correlation coefficient
Number of contributors to strategic plan	0.74
Number of employees listed as having responsibility for strategic plan implementation	0.73
Number of areas covered in the strategic plan	0.73
Number of information sources accessed for management practices	0.61
Use of KPIs for promoting non-managers	0.56
Use of KPIs for promoting managers	0.55

Notes: Correlation coefficients reported in the table are Spearman rank correlation coefficients.

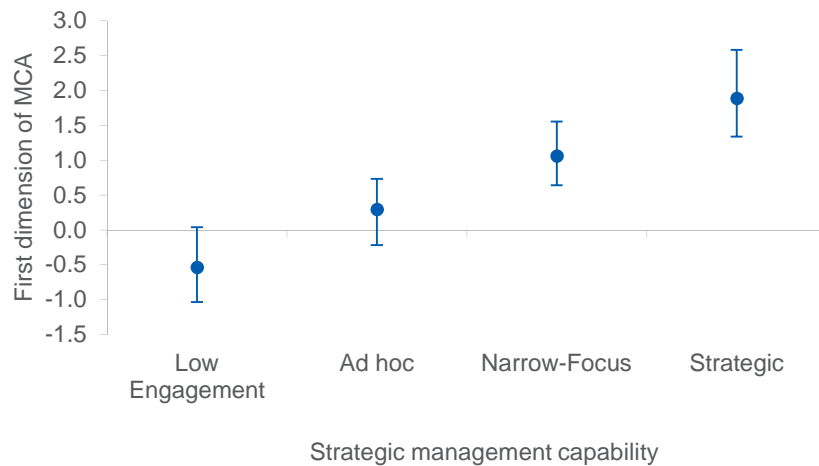
Source: OCE estimates based on Business Longitudinal Analysis Data Environment (2018)

Our levels of strategic management also have a strong relationship with a separately constructed summary measure of management practices developed using a data-driven approach. Specifically, we use multiple correspondence analysis (MCA) — an analogue to principle component analysis — to detect and represent underlying structures in MCM data on management practices. MCA reduces datasets with large numbers of categorical variables to a smaller number of dimensions. These dimensions are constructed as combinations of correlated variables, independent of one another and explain the largest amount of variance possible. The first dimension of MCA analysis captures the most variation.

Our MCA analysis used a wide array of variables, including those relating to: use of data; search for management practice information; promotion practices; environmental management practices and the variables used to construct our levels of strategic management capability (see Table E.2 for a complete list of variables used). The first dimension produced by our MCA analysis has loadings from a wide range variables used and appears to broadly represent active management, with firms that score higher in this dimension engaging in a larger number of active management practices.

Our levels of strategic management have a strong association with this dimension. Figure 4.3 illustrates how the levels of strategic management constructed in this paper correspond to the 1<sup>st</sup> dimension produced by MCA — higher levels of strategic management are associated with higher scores of the first dimension. In fact, our classifications are roughly linearly associated with the first dimension MCA analysis. The chart also shows little overlap of scores for the middle 50 per cent of firms in each level of strategic management. This suggests that our levels of management capability reflect not only broader strategic behaviours, but also underlying structures in the MOC microdata that appear to represent active management.

Figure 4.3: Strategic management capability and the first dimension of MCA



Notes: Dots represent median values and bars represent 25<sup>th</sup> and 75<sup>th</sup> percentiles.

Source: OCE estimates based on ABS Management and Organisational Capabilities of Australian Business Microdata, 2015-16 Cat. No. 8172.0.55.001

## 5. Levels of strategic management and firm characteristics

A large degree of the variation in management capability across industries is likely driven by systematic differences in firm size across industries. Firms employing more than 100 employees<sup>31</sup> are over six times more likely to have high strategic management capability than firms employing 5 to 19 employees (Figure 5.1a). This relationship between management and size is well established internationally (see, for example, Bloom, Sadun & Reenen<sup>32</sup>), perhaps reflecting the need for larger firms to more proactively manage information (for example, through the use of KPIs) and the costs associated with formal planning, which contain a fixed component and therefore become more manageable at scale.

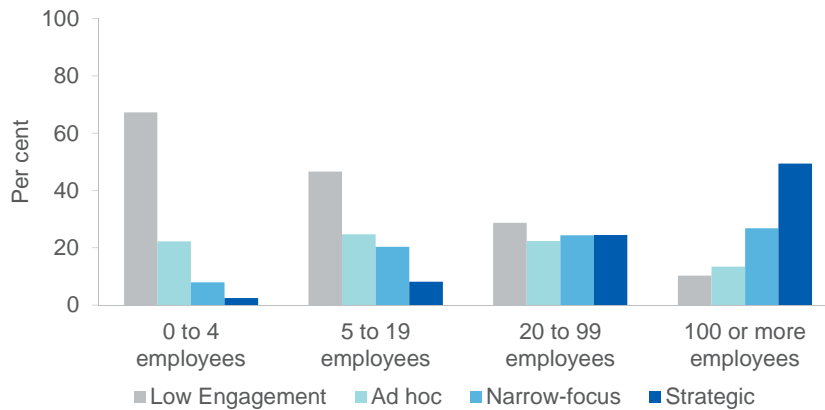
Our four levels of strategic management also vary substantially across industry divisions, with industry characteristics influencing management practices for a range of potential reasons. For instance, the output of some industries — such as finance and mining — lend themselves to the identification and tracking of KPIs. Industries with the highest share of firms in our top level of strategic management include: financial and insurance services; arts and recreation services; electricity, gas, water and waste services; and mining (Figure 5.1b). At the other end of the spectrum, firms most commonly in the lowest tier include: agriculture, forestry and fishing; construction; and transport, postal and warehousing. Interestingly, firms in manufacturing — a sector with measurable outputs — tend to place in relatively lower tiers of strategic management capability.

<sup>31</sup> This section classifies large firms as those employing more than 100 employees. This is the cut-off provided in the CURF. In later analysis we use a cut-off of 200, a more commonly used criteria.

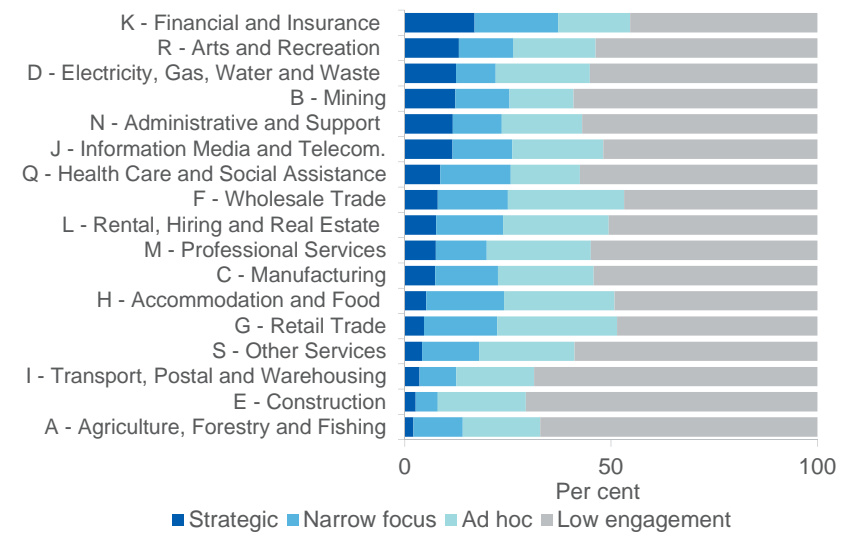
<sup>32</sup> Bloom N. & Brynjolfsson E., Foster L., Jarmin R, Patnaik M, Saporta-Eksten I & Van Reenen J. (2017) "What Drives Differences in Management?" CEP Discussion Papers dp1470, Centre for Economic Performance, LSE.

Figure 5.1: Strategic management capability by industry and firm size

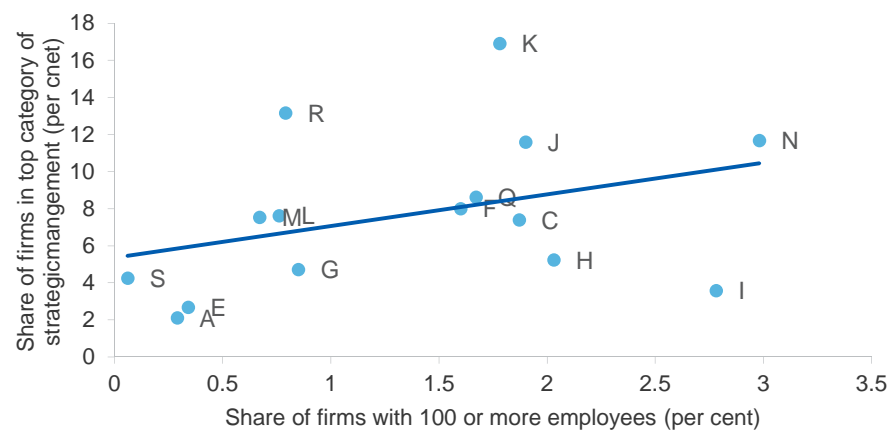
(a) Firm size and strategic management capability



(b) Industry and strategic management capability



(c) Strategic management capability and large firm share by industry



Note: (c) Letter indicate ANZSIC industry codes.

Source: Authors' estimates based on ABS Management and Organisational Capabilities of Australian Business Microdata, 2015-16 Cat. No. 8172.0.55.001

Figure 5.1c presents the relationship between size and management by industry division, showing that the share of firms with more than 100 employees in an industry is positively associated with the share of firms in the top level of strategic management. That said, the Financial and Insurance and Arts and Recreational Services industries have higher rates of top-tier management capability than the average of firms with similar size structure. Panel 3 of Figure 5.1 also suggests Agriculture; Construction; Retail; and Transport, Postal and Warehousing tend to have lower management capability with respect to comparable industries.

## 6. Strategic management capability and firm performance

Management capability has been linked to labour productivity in several recent international studies. Bloom et al.<sup>33</sup> examined management practices and labour productivity in more than 4,000 medium sized manufacturing operations in Europe, the US and Asia. They found more structured management to be positively correlated with labour productivity across a range of countries. Importantly, this relationship persisted after controlling for factors such as firms' sector and skill level. Overall, they found a single point improvement in management score to be equivalent in its effect on labour productivity to a 25 per cent increase in the labour force or a 65 per cent increase in invested capital.

Consistent with this research, we find higher labour productivity in firms with higher levels of strategic capability (Figure 6.1, panel 1), such that firms in the third, second and first tiers of strategic management capability have 15, 27 and 85 per cent higher levels of labour productivity than those in the bottom tier. These differences are partly driven by size — larger firms tend to have higher labour productivity and higher levels of strategic management. Nonetheless, at each level of firm size, firms with higher levels of management capability still have higher levels of labour productivity (Figure 6.2, panel 2).

In addition to firm size, other factors are likely to explain labour productivity and confound the relationship between management and labour productivity. For example, higher levels of capital intensity may lead to both more engaged strategic management and increased labour productivity. But this relationship may also be partly causal. Strategic planning encourages a higher degree of future long-term orientation, and may drive activities — such as capital accumulation — for which benefits accrue over the longer term (Mitchelmore and Rowley, 2013).<sup>34</sup> Indeed, several sub-components of strategic planning (including defining corporate purpose, scanning business environment, identification of strategic issues, strategy choice and setting up of

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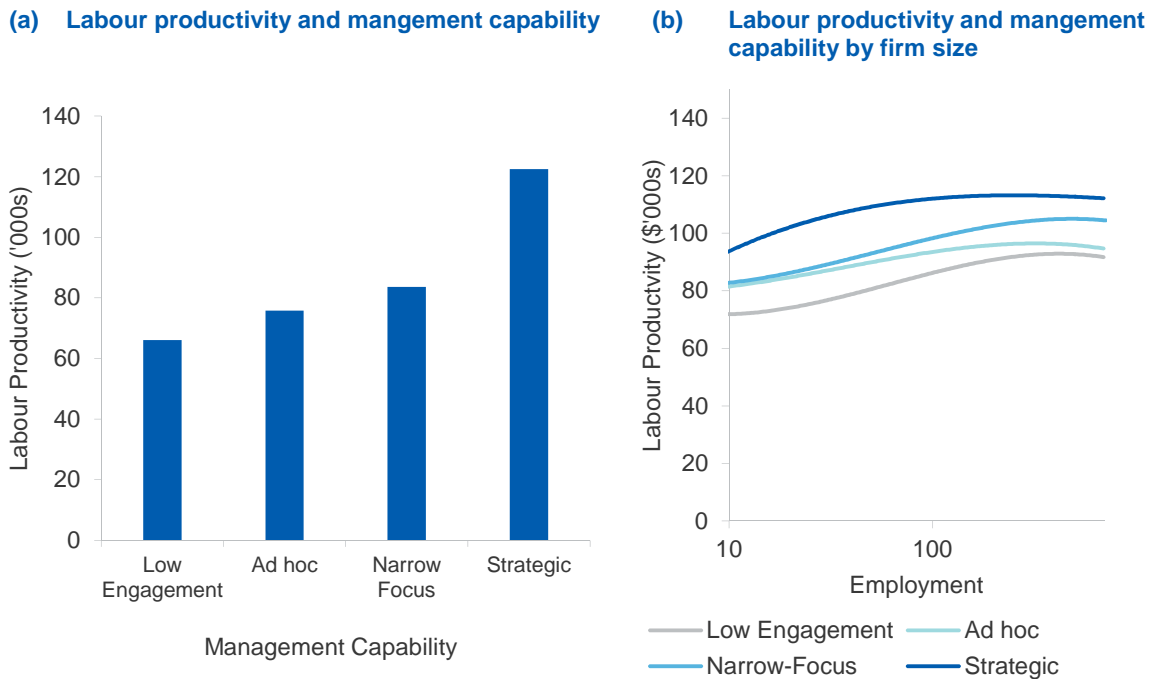
<sup>33</sup> Bloom, N. & Van Reenen, J. (2006) Measuring and Explaining Management Practices Across Firms and Countries

<sup>34</sup> Further analysis needs to be undertaken to understand the causal relationship between management capability and labour productivity.

implementation, evaluation and control systems) have been found to be associated with company performance.<sup>35</sup>

Several associations between management capability and firm behaviours found in the MCM module suggest a potential mechanism through which a causal relationship may operate.

Figure 6.1: Strategic management and labour productivity



Notes: The right-hand panel represents the line of best fit produced by a regression of labour productivity on total employment, with labour productivity modelled as third degree polynomial in total employment. Firms with negative labour productivity or productivity in the top five per cent of firms have been removed. The model has been applied to all levels of employment, however predicted values are only presented for employment levels that have sufficient underlying observations for all levels of strategic management. Labour productivity is calculated as turnover less non-capital purchases, divided by number of employees (both values refer to the same years).

Source: OCE estimates based on Business Longitudinal Analysis Data Environment (2018)

## 7. Potential channels of the relationship between management and performance

Firms with high levels of strategic management operate differently to firms with lower management capability. Figure 7.1a shows that firms with higher levels of strategic capability report higher innovation rates across all firm size groups.<sup>36</sup> It also shows that this difference is largest for smaller firms. A similar pattern is observed for the relationship between strategic management and search for collaborative opportunities. Across all firm size groups, firms

<sup>35</sup> Arasa, R. & K'Obonyo, P. (2012) The Relationship between Strategic Planning and Firm Performance. *International Journal of Humanities and Science*, 2(12), pp. 201-213.

<sup>36</sup> Rates of innovation reported are higher than typically population estimates because these figures are derived from the BLADE datasets for which population weights are not available.

with higher levels of strategic capability are more likely to report searching for collaborative opportunities (Figure 7.1b). Moreover, Figures 7.1c and 7.1d suggest that firms in higher strategic management categories are more likely to report taking steps to address skill and supply chain issues.

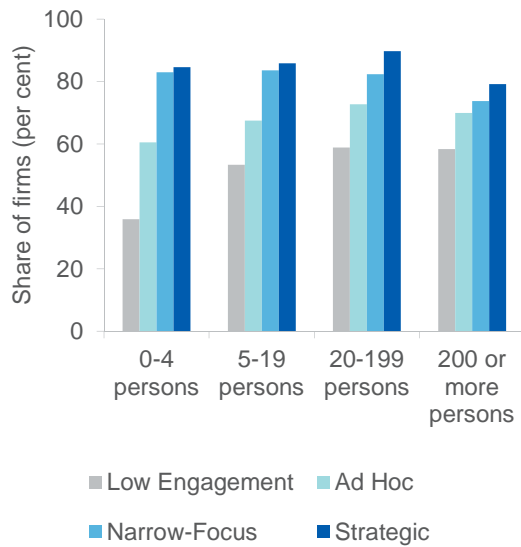
All of these firm behaviours are plausible drivers of the relationship between strategic management and firm performance. Innovation and collaboration have been found to drive better firm performance (see, for example, Majeed forthcoming) and both are activities enabled by foresight and long-term planning. Similarly, active supply chain management is associated with better firm performance (see, for example, Hsu et al.<sup>37</sup>).

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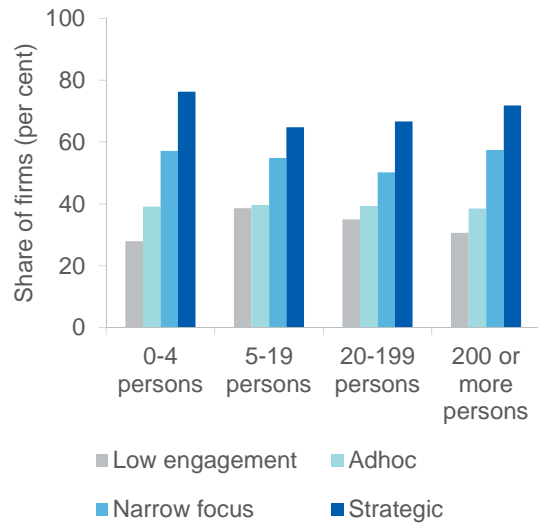
<sup>37</sup> Hsu, C. C., Tan, K. C. & Kannan, V. (2009) Supply chain management practices as a mediator of the relationship between operations capability and firm performance. *International Journal of Production Research*, 47(3), pp. 835-855.

Figure 7.1: Management capability and firm behaviour

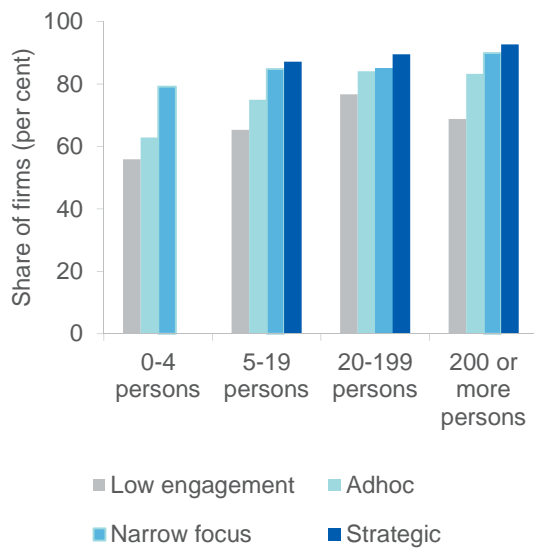
(a) Rate of Innovation



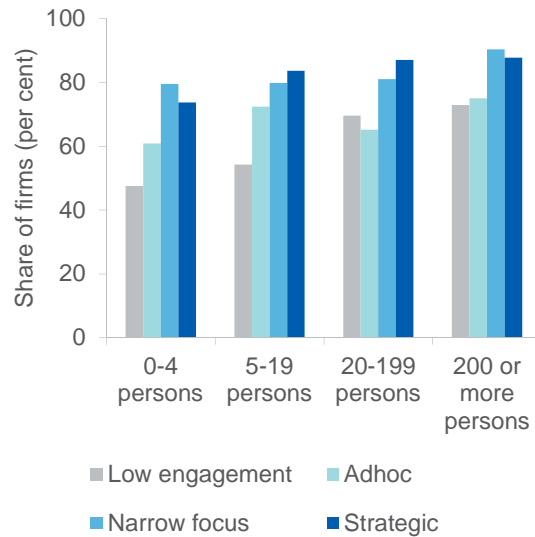
(b) Search for collaboration



(c) Responsiveness to skill deficiencies



(d) Responsiveness to supply chain issues



Notes: Missing columns indicate instances where insufficient observations are available. "Rate of Innovation" indicates the share of firms that report any innovation. Firms recorded as searching for collaborative opportunities either agree or strongly agree with the statement "this business continually seeks out new partners to collaborate with". Firm recorded as responsive to skill shortages of supply chain issues are those that report taking some action to address these issues if an issue is reported.

Source: Authors' estimates based on Business Longitudinal Analysis Data Environment (2018)

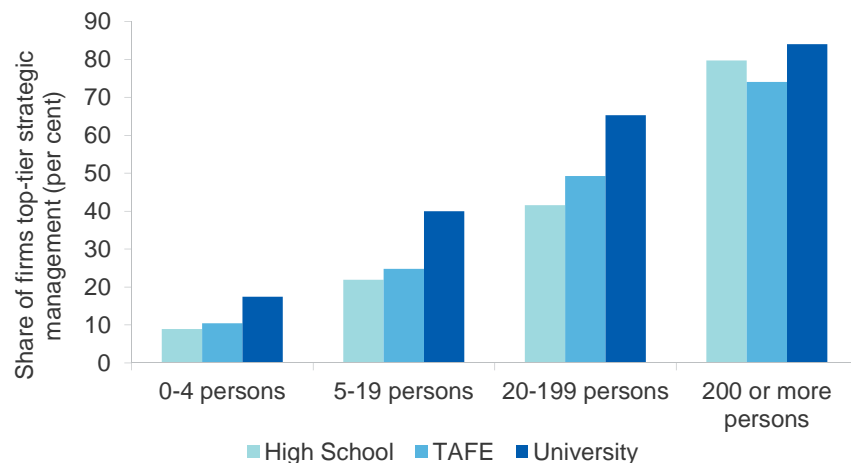
## 8. Potential drivers of strategic management capability

Given the apparent benefits of better strategic management capability, how might it be improved? A growing body of research has revealed several factors that influence management capability. Most notably, education, foreign investment, and product market competition appear to be important drivers.

### Education of principal manager

One potential source of improved management practices is education. Bloom and Van Ran Reenen,<sup>38</sup> Agarwal & Green<sup>39</sup> and Agarwal et al.<sup>40</sup> find a strong relationship between education, skills and management capability. Consistent with this, we find higher levels of education to be associated with higher levels of management capability in principal managers. In particular, we find university education to be associated with an increased probability of top-tier levels of management, especially in small and medium-sized firms (Figure 8.1). Moreover, this association is robust to controls for firm size, age and industry (table F.1).

Figure 8.1: Management capability and education levels of principal managers



Source: Authors' based on Business Longitudinal Analysis Data Environment (2018)

<sup>38</sup> Bloom N. & Brynjolfsson E., Foster L., Jarmin R, Patnaik M, Saporta-Eksten I & Van Reenen J. (2017) "What Drives Differences in Management?," CEP Discussion Papers dp1470, Centre for Economic Performance, LSE.

<sup>39</sup> Agarwal, R. & Green, R. (2011) "The role of education and skills in Australian management practice and productivity" published in the NCVET innovation book of readings titled "Fostering enterprise: the innovation and skills nexus – research readings"; ISBN: web edition – 978 1 921809 83 5, Print edition – 978 1 921809 84 2, June 2011; pp 79-102

<sup>40</sup> Agarwal, R., Brown, P. J., Green, R., Randhawa, K. and Tan, H. (2014) Management Practices of Australian manufacturing firms: Why are some firms more innovative?, International Journal of Production Research, 52 (21), pp. 6496-6517



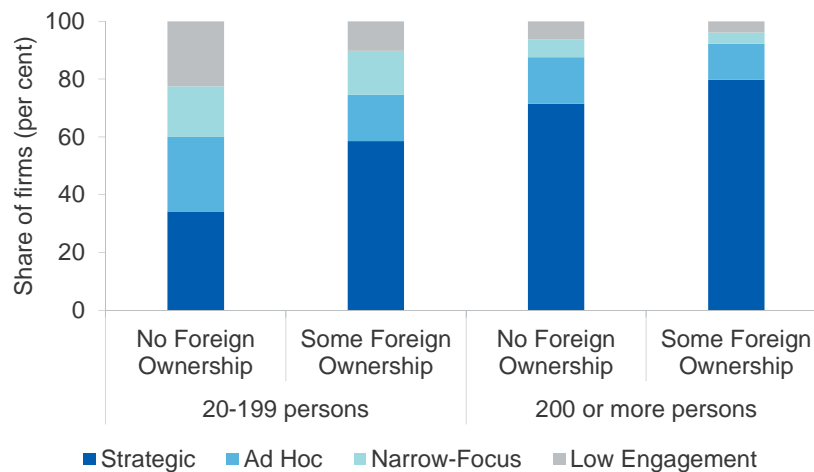
## Foreign ownership

Foreign multinationals have been found to have more active management than domestic firms in a range of countries.<sup>41,42</sup> Foreign investment may facilitate improvement in management capability, by infusing active management practices.

Our findings present support for this relationship among large and medium-sized firms. Figure 8.2 shows that medium-sized firms with some degree of foreign ownership are almost twice as likely to be classed in the top strategic management group as counterparts with no foreign ownership. Among large firms, foreign ownership is associated with high levels of strategic management, but the size of this difference is comparatively small, roughly 8 percentage points.

Among all firms, having some foreign ownership greater is associated with an increased probability of placing in the top level of our strategic management categories, evening after controlling for firm age, industry and size (table F.1).

Figure 8.2: Strategic management taxonomy and foreign ownership



Source: Authors' estimates based on Business Longitudinal Analysis Data Environment (2018)

<sup>41</sup> Bloom N., Sadun R. & John Van Reenen J., 2016. Management as a Technology? NBER Working Papers 22327, National Bureau of Economic Research, Inc.

<sup>42</sup> Agarwal, R., Brown, P. J., Green, R., Randhawa, K. and Tan, H. (2014) Management Practices of Australian manufacturing firms: Why are some firms more innovative? International Journal of Production Research, 52 (21), pp. 6496–6517.

## Concentration

A positive relationship between product market competition and measures of management capability has been found in some studies,<sup>43</sup> but not others.<sup>44, 45</sup> Such a relationship may be causal where low levels of competition allow less efficiently operated firms to persist.

We find that high levels of strategic management capability appear to be more common in less concentrated markets (Figure 8.3), though this association is likely driven primarily by the relationship between firm size and management capability, as concentrated markets tend to contain larger firms, and larger firms tend to have higher levels of management capability. Importantly, we use a different measure of competition to previous studies — the Herfindahl-Hirschman Index.<sup>46</sup> Whilst this is a less direct measure of competition, it may be more relevant to considering the influence institutional settings. Competition policy is likely to not only change firms' profit rates, but also average firm size — for example, through preventing mergers. As such, the confounding effect of size in the association presented in Figure 8.3 may be an important consideration when examining the effect of policy on management capability. Moreover, our measure focusses on *strategic* management capability, which may produce results different to those associated with broader measures of management capability, which has used in previous studies.

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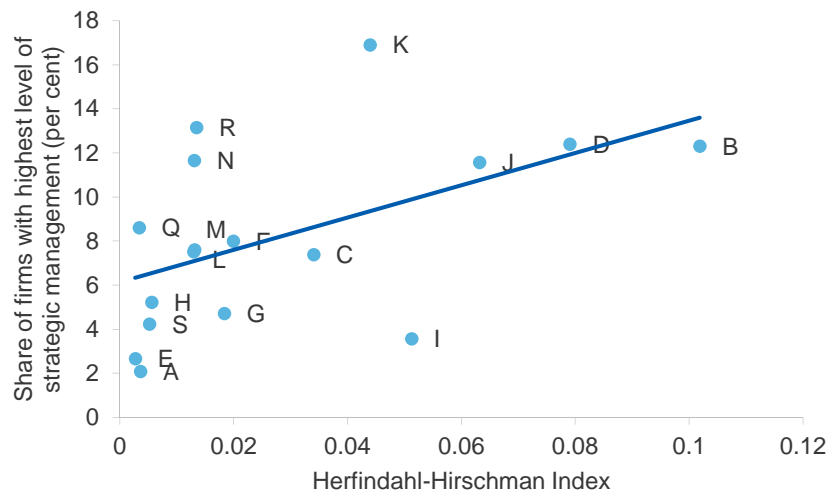
<sup>43</sup>Bloom N. & Brynjolfsson E., Foster L., Jarmin R, Patnaik M, Saporta-Eksten I & Van Reenen J. (2017) "What Drives Differences in Management?," CEP Discussion Papers dp1470, Centre for Economic Performance, LSE.

<sup>44</sup> Agarwal, R., Brown, P. J., Green, R., Randhawa, K. and Tan, H. (2014) Management Practices of Australian manufacturing firms: Why are some firms more innovative?, *International Journal of Production Research*, 52 (21), pp. 6496–6517.

<sup>45</sup> Agarwal, R., Green, R., Brown, P. J., Tan, H. and Randhawa, K., 2013, Determinants of quality management practices: An empirical study of New Zealand manufacturing firms, *International Journal of Production Economics*, 142 (1) March, pp. 130-145.

<sup>46</sup> This may contribute the inconsistencies between our findings and those of Bloom et al. (2017).

Figure 8.3: Management capability and product market concentration



Notes: The Herfindahl-Hirschman Index is a measure of market concentration. For a given industry, it is calculated as the sum of each firm's squared market share.

Source: Authors' estimates based on ABS Management and Organisational Capabilities of Australian Business Microdata, 2015-16 Cat. No. 8172.0.55.001 and Business Longitudinal Analysis Data Environment (2018).

## Public programmes

In addition to indirect measures, government programs aimed directly at developing management capability can be beneficial. The Department of Industry, Innovation and Science's Entrepreneurs' Programme is an example of such a programme. It includes a Business Management element, which pairs experienced Business Advisers and Facilitators. These Advisers and Facilitators provide:

- **Business Evaluation**, which involves developing a Business Evaluation Action Plan with recommended strategies for business improvement or growth. The Evaluation includes up to 12 months of mentoring to help implement the strategies.
- **Growth Services**, which develops their unique growth plan. Advisers/Facilitators mentor the business through the implementation of their plan, facilitating access to knowledge and expertise, research, funding and other assistance.
- **Supply chain facilitation**, which works with firms to strengthen their supply chain and improve their ability to access new markets.
- **Tourism partnerships**, which provides groups of tourism businesses in northern Australia with access to an experienced Business Facilitator for over 12 months to create a Tourism Partnerships Action Plan and opportunities and strategies for common business interests.

Business Growth Grants are also available under the program. These grants provide matched funding of up to \$20,000 to hire an expert for help with

implementing the advice and strategies recommended in the one of the above programs.

Providing firms with access to information on management practices and strategic advice helps to address the informational problems identified early in this paper: firms are often unaware of how their management practices compare and what practices they could introduce. The effect of this program on management practices and firm outcomes will be examined in the future by linking data on program participation to Management and Organisational Capabilities survey data in BLADE. A subset of firms that participated in the Entrepreneurs' Programme we included in the Management and Organisational Capabilities sample to enable such an analysis.

## 9. Conclusion

This paper is the first management study undertaken using BLADE. It aims to provide an initial overview of strategic management capability in Australia and facilitate future research. The findings presented above, together with the existing literature in this area, highlight that management capability is a rich area of inquiry and an important consideration for policymakers.

The paper finds that around 58 per cent of firms are classed as having Low Engagement Management, with either no strategic plan or no monitoring of key performance indicators. At the other end of the spectrum, roughly 6 per cent of firms are classed as having Strategic Management, possessing a written strategic plan and monitoring three or more key performance indicators across two or more areas. The remaining 36 per cent of firms fall between these two extremes, classed as either Ad Hoc (23 per cent) or Narrow Focus (13 per cent). The paper also finds that firm size is an important predictor for management practices. Firms employing more than 100 employees are over six times more likely to have high strategic management capability than firms employing 5 to 19 employees.

The paper further finds that strategic management capability is also positively associated with: innovation; search for collaborative opportunities; responsiveness to skill and supply chain issues; and labour productivity at the firm level. Education and foreign investment appear to be two drivers of management capability. More educated — particularly university educated — principal managers and foreign ownership are both associated with higher proportions (levels) of strategic management.

## Appendix A: Scope of the Business Characteristics Survey


Table A.1: Firms excluded from the Business Characteristics Survey

Industry Classification	Industry Code
SISCA	3000 General government
SISCA	6000 Rest of the world
ANZSIC06	Division O Public administration and safety
ANZSIC06	Division P Education and training
ANZSIC06	Group 624 Financial asset investing
ANZSIC06	Group 633 Superannuation funds
ANZSIC06	Group 954 Religious services
ANZSIC06	Group 955 Civic, professional and other interest groups services
ANZSIC06	Subdivision 96 Private households employing staff

Source: ABS (2017) Selected Characteristics of Australia, 2015–16: Explanatory Notes.

# Appendix B: Management capability survey questions used to classify firms

Figure B.1: Management capability survey form



**Business Characteristics Survey**  
**Management Capabilities Module 2015-16**

**Part 3 – Key Performance Indicators**

*Notes for Questions 10–17*

- The next 8 questions ask about if and how the business measures its own performance. Performance measures are used by businesses to define and measure progress.
- For ease of understanding, the questions use the common business performance measurement term of Key Performance Indicator.
- Key Performance Indicators can cover a range of subjects, for example, financial measures such as income and expense levels, production targets, inventory amounts, delivery time, energy consumption and quality measures.
- When you answer these questions, please only include Key Performance Indicators that were used by the business during the financial year of 1 July 2015 to 30 June 2016.

**10 During the year ended 30 June 2016, how many Key Performance Indicators were monitored by this business?**

Tick one box

(a) 1 or 2 .....

(b) 3 to 5 .....

(c) 6 to 9 .....

(d) 10 or more .....

(e) Don't know .....

(f) No Key Performance Indicators monitored.....  **Go to Question 16**

**11 What were the topics of focus for the Key Performance Indicators monitored by this business?**

Tick all that apply

(a) Financial measures (e.g. profit, sales, market share, return on investment) .....

(b) Operational measures (e.g. asset utilisation, on-time delivery).....

(c) Quality measures (e.g. customer satisfaction, defect rates) .....

(d) Innovation measures (e.g. new processes, new value added products) .....

(e) Human resource measures (e.g. job satisfaction, skills development) .....

(f) Environmental measures (e.g. recycling program, energy efficiency) .....

(g) Social measures (e.g. social license to operate, community engagement) ...

(h) Health and safety measures (e.g. hazard analysis) .....

(i) None of the above .....

**Part 6 – Strategic plans**

**29 During the year ended 30 June 2016, did this business have a strategic plan or policy?**

*Definition*

- A strategic plan or policy is the plan implemented by a business to achieve its goals. It may include specific goals and decision-making on investment, allocation of resources and revenue generation.

Tick one box

(a) No .....  **Go to Question 33**

(b) Yes, and described in a written document .....

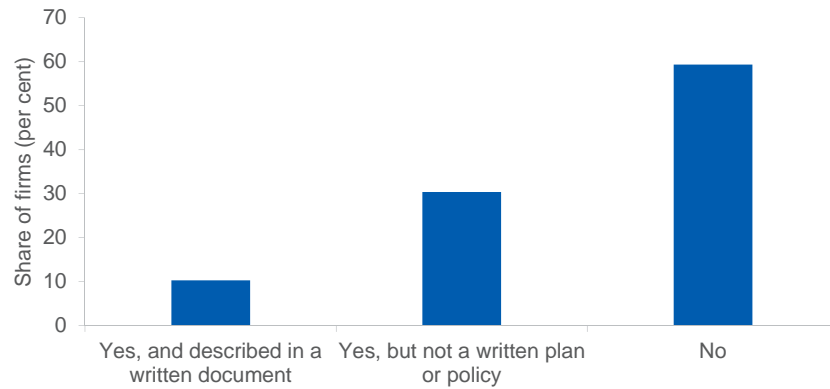
(c) Yes, but not a written plan or policy .....

Source: Australian Bureau of Statistics (2017) Business Characteristics Survey, Management Capability Module (2015-16).

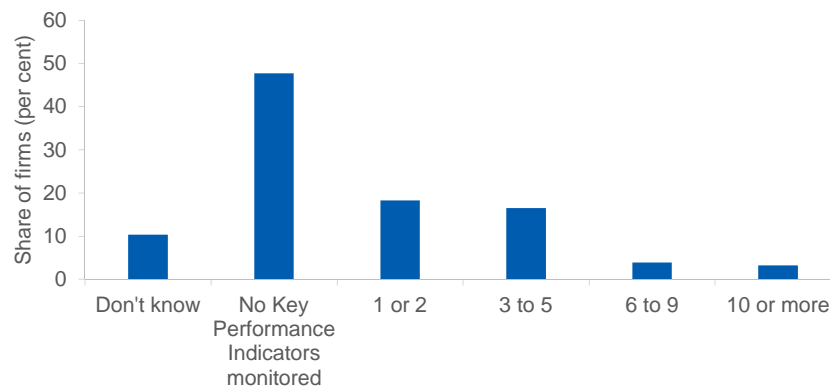
## Appendix C: Distributions of variables contributing to levels of strategic management

Table C.1: Distributions of variables contributing to levels of strategic management

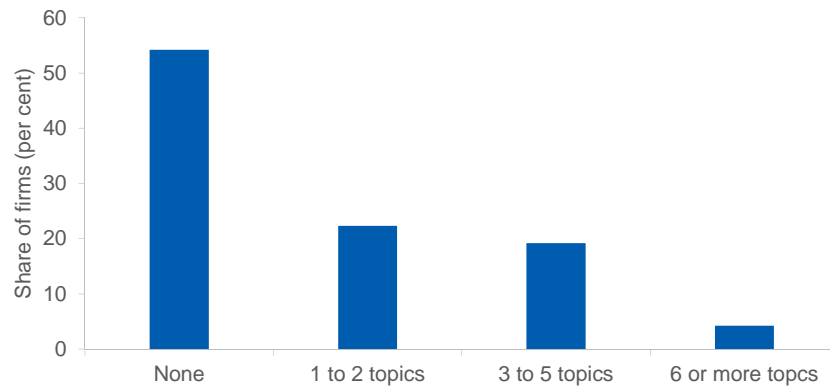
### (a) Strategic plan or policy in place



### (b) Number of key performance indicators monitored



### (c) Number of key performance indicator topics monitored



Source: Business Longitudinal Analysis Data Environment (2018)

## Appendix D: Counts and proportions of firms in the datasets used in the analysis

Table D.1: Distribution of firms by size according to source

Size of the firm	MOC Microdata				BLADE	
	Weighted		Unweighted		Unweighted	
	Counts	Per cent	Counts	Per cent	Counts	Per cent
0-4 employees	7 681	61	5 393	43	4 126	39
5-19 employees	3 901	31	3 204	26	2 964	28
20-99 employees	809	6	1 244	10	1 158	11
100 or more employees	146	1	2 695	21	2 378	22
<b>Total</b>	<b>12 536</b>	<b>100</b>	<b>12 536</b>	<b>100</b>	<b>10 626</b>	<b>100</b>

Source: Business Longitudinal Analysis Data Environment (2018)



Table D.2. Distribution of firms by industry according to data source

Industry	MOC Microdata			BLADE		
	Weighted		Unweighted	Unweighted		
	Counts	Per cent	Counts	Per cent	Counts	Per cent
A Agriculture, Forestry and Fishing	567	4.5	807	6.4	472	4.4
B Mining	467	3.7	49	0.4	388	3.7
C Manufacturing	3099	24.7	716	5.7	2714	25.5
D Electricity, Gas, Water and Waste Services	347	2.8	45	0.4	297	2.8
E Construction	541	4.3	2224	17.7	477	4.5
F Wholesale Trade	772	6.2	631	5.0	675	6.4
G Retail Trade	685	5.5	1152	9.2	604	5.7
H Accommodation and Food Services	430	3.4	963	7.7	378	3.6
I Transport, Postal and Warehousing	818	6.5	591	4.7	707	6.7
J Information Media and Telecommunications	626	5.0	124	1.0	502	4.7
K Financial and Insurance Services	483	3.9	361	2.9	383	3.6
L Rental, Hiring and Real Estate Services	190	1.5	499	4.0	154	1.4
M Professional, Scientific and Technical Services	1654	13.2	1809	14.4	1355	12.8
N Administrative and Support Services	433	3.5	623	5.0	372	3.5
Q Health Care and Social Assistance	724	5.8	937	7.5	605	5.7
R Arts and Recreation Services	527	4.2	208	1.7	398	3.7
S Other Services	173	1.4	796	6.3	145	1.4

Source: ABS (2018) Business Longitudinal Analysis Data Environment (2018); ABS (2018) Management and Organisational Capabilities of Australian Business Microdata, 2015-16 Cat. No. 8172.0.55.001

## Appendix E: Variables used and summary statistics

Table E.1: Share of inertia by dimensions produced in MCA analysis

Dimension number	Share of inertia (per cent)
1	86.8
2	5.2
3	3.6
4	2.3
5	2.1

Source: Business Longitudinal Analysis Data Environment (2018)

Table E.2: Variables used in MCA analysis

Variable name		
C_UNDERPERF_M	C_DATADECPRDTEC_NA	C_FREQDEMAND_Q
C_EXTENTEXTKNOW	C_DATADECPRDTEC_Q	C_FREQDEMAND_W
C_UNDERPERF_NM	C_DATADECPRDTEC_W	C_DIGTECACCHSB
C_EXTENTINCREM	C_DATADECFEEDNM_A	C_FREQNEWGOODS_A
C_EXTENTFIRST	C_DATADECFEEDNM_AH	C_FREQNEWGOODS_AH
C_PROMOTION_NM	C_DATADECFEEDNM_D	C_FREQNEWGOODS_D
C_EXTENTHIRISK	C_DATADECFEEDNM_M	C_FREQNEWGOODS_M
C_EXTENTREVIEW	C_DATADECFEEDNM_NA	C_FREQNEWGOODS_NA
C_EXTENTPROACT	C_DATADECFEEDNM_Q	C_FREQNEWGOODS_Q
C_PROMOTION_M	C_DATADECFEEDNM_W	C_FREQNEWGOODS_W
C_EXTENTCOLLAB	C_FREQSUPCHAIN_A	C_DIGTECMOBINT
C_FREQENVMAN_A	C_FREQSUPCHAIN_AH	C_PROJECTS
C_FREQENVMAN_AH	C_FREQSUPCHAIN_D	C_MANPRACBUS
C_FREQENVMAN_D	C_FREQSUPCHAIN_M	C_MANPRACCLIENT
C_FREQENVMAN_M	C_FREQSUPCHAIN_NA	C_MANPRACCOMLAB
C_FREQENVMAN_NA	C_FREQSUPCHAIN_Q	C_MANPRACCOMP
C_FREQENVMAN_Q	C_FREQSUPCHAIN_W	C_MANPRACCONS
C_FREQENVMAN_W	C_DATADECFEEDM_A	C_MANPRACGOVT
C_DATADECEXTERN_A	C_DATADECFEEDM_AH	C_MANPRACINDASS
C_DATADECEXTERN_AH	C_DATADECFEEDM_D	C_MANPRACMBA
C_DATADECEXTERN_D	C_DATADECFEEDM_M	C_MANPRACNEWEMP
C_DATADECEXTERN_M	C_DATADECFEEDM_NA	C_MANPRACNONE
C_DATADECEXTERN_NA	C_DATADECFEEDM_Q	C_MANPRACPNPRES
C_DATADECEXTERN_Q	C_DATADECFEEDM_W	C_MANPRACPROFCONF
C_DATADECEXTERN_W	C_FREQDEMAND_A	C_MANPRACSUPP
C_DATADECPRDTEC_A	C_FREQDEMAND_AH	C_MANPRACUNI
C_DATADECPRDTEC_AH	C_FREQDEMAND_D	C_MANPRACWEBPUB
C_DATADECPRDTEC_D	C_FREQDEMAND_M	C_PREDANALADHOC
C_DATADECPRDTEC_M	C_FREQDEMAND_NA	C_PREDANALANNUAL
C_STRATPLAN	C_FOCKPIENVMEASURE	C_FOCKPIHRMEASURE
C_KPIMONITORED	C_FOCKPIFINMEASURE	C_FOCKPIHTHSAFMEAS
C_DATACOLOTH	C_STRATPLAN	C_KPIMONITORED
C_FOCKPISOCMEASURE	C_ENVMANLIFECYCL	C_ENVMANSTAFFRESP
C_PREDANALDAY	C_ENVMANPRODDES	C_ENVMANSUSTCUST
C_PREDANALMONTH	C_ENVMANRECYCMAT	C_ENVMANWASTEAUD
C_PREDANALNEVER	C_ENVMANREDENGCON	C_DATACOLCUST
C_PREDANALQURT	C_ENVMANREDFPNGSP	C_DATACOLEMP
C_PREDANALWEEK	C_ENVMANREDFPRND	C_DATACOLGOVTREG
C_ENVMANACTNONE	C_ENVMANREDH2OCON	C_DATACOLMANBUS
C_ENVMANAIRPOLL	C_ENVMANREDPOLL	C_DATACOLMANOTHBUS
C_ENVMANEDUSTAFF	C_ENVMANREDRAWMAT	C_DATACOLNONE
C_ENVMANGRNPURCH	C_ENVMANRISKASS	C_FOCKPIINNOVMEAS
C_ENVMANIMPPOL	C_FOCKPIQUALMEAS	C_FOCKPIOPMEASURE

Source: Business Longitudinal Analysis Data Environment (2018)

## Appendix F: Logistic regression

Table F.1: Logistic regression results

Independent Variable	Low engagement	Ad hoc	Narrow focus	Strategic management
<b>Foreign Ownership</b>				
Foreign ownership > 50%	-0.663*** (-5.58)	-0.111 (-0.92)	-0.138 (-1.27)	0.984*** (10.21)
<b>Education of principle manager</b>				
Bachelor's degree	-1.700*** (-4.60)	0.309 (0.74)	0.887 (1.68)	1.930*** (11.70)
Advanced diploma	-1.459*** (-3.91)	0.548 (1.30)	0.711 (1.33)	1.328*** (7.32)
Trade certificate	-1.099** (-2.95)	0.469 (1.11)	0.556 (1.04)	0.536** (2.81)
Year 12	-1.128** (-3.03)	0.407 (0.96)	0.685 (1.29)	0.819*** (4.38)
Year 11 or less	-0.678 (-1.81)	0.296 (0.70)	0.128 (0.24)	(Omitted)
No schooling (baseline)				
<b>Firm age</b>				
Years of operation	-0.016*** (-6.38)	0.00161 (0.64)	0.00152 (0.65)	0.0203*** (8.55)
Years of current ownership	0.0112*** (3.82)	-0.00325 (-1.07)	-0.00760** (-2.63)	0.000480 (0.17)
<b>Firm size</b>				
Turnover (\$millions)	-0.00538*** (-5.81)	-0.000492 (-1.56)	-0.000461** (-2.96)	0.00153*** (6.41)
Number of employees	-0.00283*** (-6.66)	-0.00225*** (-8.17)	-0.0000316 (-0.48)	0.00119*** (9.68)
<b>Industry Division</b>				
Not reported				
<b>Model statistics</b>				
Observations	8998	8998	8998	8955
Degrees of freedom	25	24	24	23
Chi <sup>2</sup> statistic	1718.8	409.9	141.7	2834.9
P-value	0.00	0.00	0.00	0.00
Pseudo-R <sup>2</sup>	0.141	0.046	0.018	0.293

Source: Business Longitudinal Analysis Data Environment (2018)

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