People Management Practices that Underpin Lean Management Outcomes

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Abstract

While evidence exists for an association between people management practices (PMP), firm characteristics and lean manufacturing practices (LMP), there is limited research focusing on different sized firms. What is not understood is (i) what PMP bundles are chosen by different sized firms which adopt LMP, and (ii) what firm characteristics play a role in explaining these choices. The empirical evidence is based on archival data sourced from the world management dataset comprising of 299 Australian and New Zealand manufacturing firms. Using path analysis and disaggregated data on a set of commonly adopted PMP, we test for six PMP, namely, instilling a talent mindset, promoting, rewarding, retaining and attracting high performance as well as removing poor performers; and identify PMP chosen by firms which have a lean manufacturing strategy (LMS) and that adopt LMP. We find that relatively smaller firms that adopt many LMP also chose removing poor performers and promoting high performers to complement their LMS. The education level of management in those same relatively smaller sized firms is found to be a key factor explaining this PMP bundle. Deeper inspection of the results reveals differences between smaller versus larger firms. The study contributes to lean and people management literature that helps identify bundles of PMP chosen by different sized enterprises to complement their lean manufacturing strategy and practices.

Keywords: management practices, lean manufacturing strategy, lean management practices, people management practices, flexibility.

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1. INTRODUCTION

Lean manufacturing practices (LMP) can be described of comprising tools, techniques and methods used for reducing non-value add activities that consume resources, including waste, that limits maximum value-add outcomes (see Yang, Hong and Modi, 2010; Browning and Heath, 2009; Shah and Ward, 2007; Krafcik, 1988), implying that if lean processes are optimized, significant improvement in firm performance will follow. There are numerous examples of how LMP is linked to firm productivity and performance (Negrão, Filho and Marodin, 2017, Agarwal et al, 2013; Agarwal et al. 2014; Sadikoglu and Zehir, 2010). Thus, LMP is regarded by many as 'bet' management practice in the context of manufacturing (see Bloom and van Reenen, 2007). LMP results in significant strategic outcomes (Wadell and Bodek, 2005; Gonzalez-Benito and Gonzalez-Benito, 2008) and has been shown to improve the financial performances of firms (Hofer et al., 2012). It also standardises the firm's operations (Linderman, 2008; Naveh, Marcus and Moon, 2004), improves efficiency and inventory turnover (Demeter and Matsuyz, 2011), and overall operational and supply chain performance (White, Ojha, and Kuo, 2010; Flynn and Flynn, 2005). Moreover, LMP improves the efficiency of the focal firm made by lean management at the internal and supply chain levels (Moyano-Fuentes et al., 2020).

Given this, there are a range of rationalities for lean manufacturing strategy (LMS), ranging from reactionary actions of imitating competitors through to day-to-day operational activities, which include traditional cost management and people management as part of a human resource management (HRM) strategy (see Bloom and van Reenen, 2007). Lean manufacturing not only concerns a company's technical operations but its strategic approach to people management practices (PMP). For example, Bellisario and Pavlov (2018) suggest that lean manufacturing organisations integrate the operational and the strategic levels by using management practices that drive organisational learning through employee involvement and engagement. The more effective is PMP the greater is the potential for sustained competitive advantage (Ichniowski, Shaw, and Prenushi, 1997) and also significantly related to transformational and transactional leadership (Knies, Leisink and van de Schoot 2020).

While there are several case studies and some quantitative evidence on LMP and PMP (a subset of HRM practices), little is known about the flexibility in selecting PMP practices and which PMP bundles are commonly chosen by different sized organisations that implement lean manufacturing practices (see Beauvallet and Houy, 2010). For example, Bevilacqua et al. (2017) and Furlan et al. (2011) examine only a limited set of PMP. The deployment of LMP tends to yield performance benefits and operational performance is influenced by employee behaviour outcome and conditioned by physical work environment and job characteristics (Gaiardelli et al, 2019). There is substantial evidence that suggests that the adoption of 'better' management practices, including both LMP and PMP, are associated with a set of firm

characteristics (Netland, 2016; Sheehan, 2014; Razouk, 2011), which includes characteristics such as ownership concentration, level of unionisation, level of education of managers and level of competition. According to Longoni (2013) how lean and PMP practice bundles has been debated and that the combined use of PMP practices might not always be beneficial for employees (Ogbonnaya, *et al.*, 2017). Recently Bocquet, Dubouloz and Chakor (2019) did consider bundles of practices to obtain a more accurate understanding of lean effects and how various factors may differ according to the different stages of lean adoption in the case of healthcare; yet what is not clear is how different sized firms are flexible if at all, and how they choose the more appropriate PMPs amongst PMP bundles for organisations with LMP.

As such, the objective of this study is to explore the composition of PMP bundles chosen by different sized firms that adopt lean manufacturing, thus also demonstrating flexibility in adoption of PMP for these firms. We also theorize a number of firm characteristics that are likely to be associated with the composition of PMP bundles. To do this, we use archival data from a survey of 299 Australian and New Zealand manufacturing firms obtained from the World Management Survey dataset. To the best of our knowledge, this study is the first that systematically pays attention to the role of LMS and LMP, firm size as well as firm characteristics to explain the relations between PMP and LMP for variation in firm size for manufacturing firms.

The remainder of the paper structure is as follows. In Section 2 we provide an overview of the literature on PMP and LMP, as well as presenting a set of firm characteristics including firm size which may explain variation in the composition of PMP bundles. In Section 3 we provide a summary of the variables and dataset and in Section 4 we introduce a structural equation model (SEM). In Section 5 we provide the results of estimating the SEM via path analysis. In Section 6 we discuss the results and conclude.

2. LITERATURE REVIEW AND THEORY DEVELOPMENT

Lean Manufacturing Practices

Several works have documented that lean manufacturing practices yield financial performance benefits to organizations (Hofer et al., 2012), improve efficiency and result in better inventory turnover performance (Demeter and Matyusz, 2011). Historically, the introduction of practices precursors of lean production goes back to WWII in the US and determined large and persistent effects on the performance of US adopting firms (Bianchi and Giorcelli, 2020). Later on, such practices were exported to Japan, where they were codified in the lean production practices, and to other 27 countries (Dinero, 2005). As today, most of these best practices in lean operations have been standardized and institutionalized through the use of the ISO 9000 series standards for the implementation of Total Quality Management, and other well-defined systems known to be both operationally efficient and strategically effective such as Six Sigma approach (Pilkington, 1988; Wadell and Bodek, 2005; Gonzalez-Benito and Gonzalez-Benito, 2008, Haleem et al. 2012). Furlan et al. (2011) apply the theory of complementarity to find evidence in support of the role of PMP as a strategically important enabler of complementarity between Total Quality Management (TQM) and Just-In-Time (JIT) bundles of practices. In this

context, a bundle of practices is defined as a set of interrelated and internally consistent practices (Shah and Ward, 2003, 2007).

As with lean production research, the literature on HRM (including PMP) is divided into various perspectives, two of which include the contingency and universalistic or 'universal applicability' (Netland, 2016) perspectives. The contingency perspective emphasises that what managers undertake in practice is conditional on the situation at hand (Sousa and Voss, 2008; Donaldson, 2001), that is, there is an opportunity for alignment of PMP with the workings of the organisation which improves performance (see Delery and Doty, 1996, Lengnick-Hall and Lengnick-Hall, 1988). On the other hand, the universalistic perspective suggests that specific PMP impact the performance of the organisation (see Pfeffer, 1998; Tzafrir, 2006) and those that are largely context-free, and hence can be applied successfully to a wide range of organisational situations (see Geringer, Frayne and Milliman, 2002). Such 'better practices' can result in improved employee attitudes and better organisational performance (Golding, 2004). Wang et al. (2019) offers an overview of the "employees HR perceptions" and 'what', 'how' and 'why' they impact firm outcomes. Lucianetti et al. (2018) recent findings provide evidence that both theories are not completely incompatible, arguing that contingency factors play an important role in explaining the selection of advanced manufacturing tools (AMT) and practices (AMP), and that once adopted (irrespective of contingencies), AMT and AMP are associated with organisation performance (in more of a universalistic manner).

While the association between LMP and organisation performance is well known, what is not fully understood is (i) what PMP bundles are chosen in firms which adopt LMP, and how different sizes play a role in explaining these choices.

Lean Manufacturing and People Management Practices

Various authors have argued that PMP provide organisations the capacity to build human capital resource in order to convey competitive advantage (Capelli and Crocker-Hefter, 1996, Narayan, Sidhu, and Volberda, 2020; Sanders and De Cieri, 2020). Lawler and Mohrman (2003) highlight the importance of organisations to take a strategic focus on PMP as well as incorporate technical or operational PMP to pursue a high performing workplace strategy. Boxall (1992) found that a high performance workplace strategy delivers two significant advantages: (1) a human capital advantage and (2) an organizational process advantage. The first is based on organization's higher performing people through attracting, engaging and retaining the best employees as compared to their competitors, while the latter adopts better effective workplace HRM practices (including PMP), such as effective recruitment, training, implementing appraisal systems and payroll processes.

The work practices in manufacturing plants came under significant criticisms during the 1970's for deskilling production workers. This gave rise to the notion of High Performance Work Systems (HPWS) (see Boxall and Macky, 2009; Appelbaum, Bailey, Berg and Kalleberg, 2000). HPWS and LMP are not synonymous even though they both emphasise the importance of people management. HPWS in manufacturing is regarded as "work organised to permit front line workers to participate in decisions that alter organisational routines" (Appelbaum et al.,

2000, p.7). Forrester (1995) argues that lean processes must be people driven because it is only the employees who are best placed to identify ways of improving processes in production. To achieve these benefits, LMP therefore requires strategic investment in PMP including education and training and remuneration practices (see Appelbaum et al., 2000; Gittell, Seidner and Wimbush, 2010).

Beltran-Martin, et. al., (2008) argues that performance related remuneration, which may also include non-monetary rewards, helps provide the impetus for employees to contribute to the productivity of the organisation. Education and training needs ought to focus on both technical and soft skill development, with an emphasis where possible on self-managed teams as a way of empowering employees to work independently for the benefit of the organisation (Manz and Sims, 1987) and to develop their problem-solving capabilities. These PMP driven practices have been found to explain performance differences in airlines (Gittell et al., 2010), high tech firms (Collins and Clark, 2003), call centres (Batt, 1999), steel-finishing lines (Ichniowski, Shaw and Prennushi, 1997), and banks (Richard and Johnson, 2004). In a similar vein, Bellisario and Pavlov (2018) suggest that lean manufacturing integrated at both operational and strategic levels by using performance management practices that drive organisational outcomes through employee involvement and engagement. Additionally, human critical success factors such as employee involvement, employee commitment, teamwork, culture and communications are found to be critical in adoption of sustainable manufacturing practices (Ahuja et al, 2019). The process by which all this happens however is still a matter of discussion and debate. Evans and Davis (2005) and Gitell et al. (2010) argue that internal social structures facilitating interactions have significant positive impacts while Beltran-Martin et al. (2008) highlight that human resource flexibility is the mediating factor.

Firms with greater HR flexibility have been shown to significantly improve their performance (Beltran-Martin et. al., 2008) and therefore can be regarded as a form of competitive advantage (for example, see Wright et al., 2001, and Bhattacharya et al., 2005). HR flexibility impacts directly on employee performance and productivity (Ketkar and Sett, 2009), particularly as it brings out diversity and individuality (Sekhar, et. al., 2016) through allowing employee voice (Jena and Memon, 2018). For example, when firms inspire their employees to be proactive in ideas generation and other direct contributions to enhancing the firm's performance, it not only raises their satisfaction at work (Galinsky, et. al., 2011) but it enhances their effort which drives improvements in productivity. In addition, firms with greater HR flexibility are able to adapt quite effectively to changing external conditions (Snell, et. al., 1996 and Wright and Boswell, 2002). HR flexibility can also impact positively to creativity and innovation (Pradhan, et. al., 2017).

With the above discussion in mind, it is worth considering that in their review of LMP, Jasti and Kodali (2015) found that employee commitment was one of the key characteristics of the success of LMP. Arguably employee commitment is influenced by a variety of HRM practices. What is notable from the above discussion is that key PMP which are geared to promote employee commitment, such as employee performance management, instilling a talent mindset, promoting, rewarding, retaining and attracting high performance practices, are likely

to be important to explaining the success of LMP adoption. Whether removing poor performers as a PMP practice is beneficial or not, is unknown, however firms that are flexible given the circumstances they find themselves in, forms part of HR flexibility. Further, little is known about the composition of PMP bundles chosen in manufacturing firms that adopt lean manufacturing (c.f. Lucianetti et al., 2018).

Firm size

Firm size can play an important role in explaining the adoption of best management practices for both PMP and LMP. As generally evident in an equilibrium state, better managed firms are larger in size; primarily attributed to the fact larger firms have the resources and incentives to employ better management practices (Lucas, 1978). As the complexity of larger firms' demands for more sophisticated management practices, this finding is not rare, as evident from the research work on management practices by Agarwal et al. (2014), Agarwal et al (2013), Bloom et al (2019), Bloom and Van Reenen (2010), Bloom et al. (2007), Giorcelli (2019). What is not clear from the literature, is what PMP bundles are chosen by relatively smaller firms, to complement LMP.

Other firm characteristics

Other firm characteristics can also play an important role in explaining the adoption of management practices for both PMP and LMP. As this study is based on archival data, rather than include an exhaustive list of characteristics, the discussion focuses on the characteristics for which data is available, that is, ownership structure, competition, manager education and unionization.

Ownership structure

While many manufacturing companies are owned by dispersed shareholders, a multitude of firms are owned and managed by private individuals or founding members. Such differences in ownership structures can also play a role in the varying efficacy of management practices. For example, a common argument is that investors in dispersed shareholder firms want to see returns on their investments, they are incentivised to remove underperforming managers and promote "professional managers…on the basis of merit" in order to deliver better performance and ensure a profit for the company (Friedrich, 2020; Bloom and Van Reenen, 2010; Bloom, Dorgan, Dowdy and Van Reenen, 2007).

Intensity of Competition

Competition has long been regarded as an effective method of augmenting the productivity of an economy and bolstering the general prosperity of a society. Competition provides greater opportunities for comparison of performance and a highly competitive market would incentivise owners to improve their managerial efforts in order to remain competitive. This in turn may lead to managers being offered incentives to improve their efforts (Nickell, 1996). Empirical investigation has been undertaken into the impact of competition on productivity and corporate performance in selected industries (Nickell, 1996; Syverson, 2004). However, with few exceptions (e.g. Bloom and Van Reenen, 2007; Bloom et al., 2010) the empirical evidences on the relationship between competition and management quality is relatively thin.

Education level of managers

Education is essential in fostering skill-sets required by firms and plays an important role in firm performance and productivity. The literature highlights several well-known studies on skills acquisition, skills utilisation and skill gaps which highlight the impact of education on productivity (Richardson 1994; Toner 2007, 2011; Agarwal and Green 2011, Saidu, 2019). Several other scholars (Jayne, 2007; Massey, Gawith, Perry, Ruth and Wilson, 2005; Fisher et al., 2012) provide robust evidence that suggests that firms with a higher skilled and educated workforce tend to have better management practices overall, and hence they enhance the sustenance, economic viability, and competitive advantage of the firms.

Unionization

Unionised work places may influence or be influenced by the management practices, in particular on the mix and HR practices adopted by the organisation. The Australian experience on management practices (see Green et al., 2009) has suggested that the deployment of people management practices is fairly restrictive given the high proportion of union membership in the firms' employee base. Ng and Maki (1994), Bennett and Kaufman (2011) and Kochan and Kimball (2019) found that unionized membership is correlated with more formal HR practices with a move away from performance-based payments system to a performance appraisal system.

3. DATASET AND SAMPLE

To identify which PMP are chosen by different sized firms to complement their lean management strategy and practices, we estimate a structured equation model, as described in the next section. To that end we examine: (1) whether the motivation for adoption of lean practices (LMS) is associated with certain PMP; (2) whether PMP or combinations thereof, are influenced by firm characteristics and market structure; and (3) the extent to which certain PMP and LMS are associated with varying levels of adopting LMP.

Archival data on manufacturing firms was sourced from the world management survey dataset on Australian and New Zealand Management Matters Productivity Global Benchmarking projects (Green et al., 2009; Green et al., 2010). The World Management Survey dataset was chosen as is contains data on PMP, LMP and various contingency variables of interest. The sample selection process is described in Table 1.

<Insert table 1 here>

A key challenge in surveys is to minimise bias in responses to questions. In order to reduce the likelihood of bias several techniques were used. The interviews were conducted in a conversational style mode which followed an open-ended question format. This allowed managers to articulate their responses in their own words and enabled the interviewers to get a less biased understanding of the firm's management practices (due to less framing than surveys that utilise more traditional methods) when giving them a quantitative score between 1-5. On

average, it took 17 minutes to conduct the portion of the interviews for the 8 dimensions of LMP and PMP. The interviewers had been specially trained to schedule and conduct interviews, collect accurate responses and quantitatively score the management practices, ensuring global benchmarking with the LSE global study (Bloom and van Reenen, 2007). To ensure consistency and reliability of the scores, and to minimize any response or scoring bias, a 'double blind, double scored' methodology was used (see Bloom et al., 2007). Additionally, 80% of all interviews were 'double scored', implying that scoring was 'doubled' by a silent listener, whose role was to 'double score' the responses[1]. These scores are used for analysing the eight practices with quantitative scores ranging from 1 (worst) to 5 (best).

Table 2 identifies the industry groupings to which the sample firms belongs, and shows that sample has representation from across the Australian and New Zealand manufacturing sectors.

<Insert table 2 here>

Table 3 Panel A provides a definition of the two LMP metrics *Adoption of LMP* and *Lean manufacturing strategy* and the six PMP and how the practices have been defined for each of the eight dimensions of management practices. As outlined in earlier work, each firm is located a scale from 1 to 5, with higher shores being allocate to practices which prior work suggests is better for typical firms (Bloom and Van Reenen, 2007). Panel B presents the definitions for the firm characteristics.

<Insert table 3 here>

Table 4 reports the descriptive statistics, and shows that there is substantial variation across the sample for all variables. The average scores for *Adoption of LMP* and *LMS* are similar, with approximately similar standard deviation. Greater variability is evident across the PMP scores. Interestingly no firm reported that they would 'do what it takes' to retain top talent. The maximum score reported for this PMP metric was 4. Manufacturing firm size in the dataset varies between those employing 50 staff to very large organisations employing over 9000 staff. The sample of firms in the dataset were grouped in the following categories: (i) firms employing up to 250 employees, with robustness testing for three further groupings (ia) up to 100 employees; (ib) between 100 and 250 employees; and (ic) more than 250 employees. The percentage of managers with college degrees also varies considerably, in some cases there are no managers with post-secondary qualifications. On average, a typical manufacturing firm has approximately 41% of its management with some form of post-secondary qualifications. The percentage of employees with union representation also varies but on average it is approximately 32%. Although there is considerable variation, the typical firm has approximately 7 direct competitors for the sale of its products.

[1] As per privacy regulation, interviewees in Australia and New Zealand were informed of their call being monitored for quality and control purposes.

In Table 5 we report the bivariate correlations between each of the PMP scores that describe lean objectives and practices, and firm characteristics. All the lean and PMP scores exhibit significant correlation except for *Removing poor performers* or *Instilling a talent mindset*. There is also variability within the correlations, for example, the correlation of *Promoting high performers* on *Attracting high performers* has a coefficient value of 0.368 which can be contrast to 0.194 for *Removing poor performers* or *Rewarding top performers*. This variability suggests that although on average firms who score high on one score will also score high on another score, they are not perfectly correlated and therefore consistent with the contingency approach (as compared a universalist approach). The firm size category (number of employees) and other firm characteristics have a level of variability in the size and significance of correlations. Education of management displays high levels of correlation LMP, LMS and PMP.

<Insert table 5 here>

4. STRUCTURAL EQUATION MODEL USING PATH ANALYSIS

To examine the bundle selection of people management practices by different sized firms in adopting lean manufacturing practices, we adopt a path analysis, a special case of structural equation modelling (SEM) methodology. In Figure 1 we provide a visual representation of the set of associations which identifies the various direct and indirect effects. Each of the firm characteristics including size in Figure 1 are defined in Table 3.

<Insert figure 1 here>

Adoption of LMP with LMS and PMP bundles

The extent to which a different sized firms implement a high degree of lean (*Adoption of LMP*) depends in part upon the firm's strategic intentions on lean (*Lean manufacturing strategy LMS*) and the organisation's PMP bundle. In other words, those firms that have indicated a high degree of adoption of lean practices are more likely to have had significant institutional ambition to adopt such LMS practices and have chosen a PMP bundle as the vehicle to deliver and support this. On the other hand, these PMP may in fact be conditioned by LMS which in turn impacts the degree of *Adoption of LMP*. PMP may both enable and be enabled by the firm's *LMS*.[2] From the data, we find that of those firms that have indicated a high degree of lean practices (high score on *Adoption of LMP)* also indicating a strong institutional intention to adopt lean (high score on *LMS*) (with a correlation of 0.777 in Table 5).

What this does not tell us is the nature of the PMP bundle that is chosen by firms to support such objectives. That is, applying theory of complementarity it is not clear what combination of *Instilling a talent mindset* to *Retaining high performers* are required to produce the most effective outcome, or an outcome which explains the level of lean adoption and performance.

[2] The question of causality is an important, however it is beyond the scope of this study as the dataset used is cross-sectional, not time series.

Using a SEM methodology allow us to identify the bundles of PMP strategies that have been adopted by firms and which potentially explain the level of lean outcomes. However, the specific bundles are most likely dependent on the size of the firm, that is, we would expect to see different bundles of PMP implemented both those relatively smaller firms (less than 100 employees) compared to the larger firms to support their different levels of lean adoption and performance; which is explored in the robustness testing.

5. DATA ANALYSIS AND ROBUSTNESS TESTS

In this section, we report on the estimated SEM as depicted in Figure 1. The SEM path analysis is estimated using maximum likelihood estimation, and each variable is an observed measure, as discussed above. Accordingly, we can identify the direct associations (effects) between variables, as specified by the paths in Figure 1; as well as the direct, indirect and total effects of a variable. In our analysis, we are mainly interested in the total effects of PMP on *Adoption of LMP* and LMS, and the total effects of LMS on *Adoption of LMP*.

Structural Equation Modelling (SEM) results

Table 6 reports the results from the SEM model depicted in Figure 1. Associations 1 to 12 in Table 6 report the total, direct and indirect effects on *Adoption of LMP* with PMP and firm characteristics. As expected, there is a direct association between *Adoption of LMP* with LMS and PMP, namely *Removing poor performers*, and *Promoting high performers*. Notably *Attracting high performers* has an indirect effect, as do the firm characteristics of number of employees and manager education (in associations 8 to 12). There is no association of *Adoption of LMP* with *Instilling a talent mindset*, *Rewarding top performers*, *Attracting high performers*, *Retaining high performers*, competition, union and Dispersed ownership.

<Insert Table 6 here>

Associations 13 to 18, 24, 30, 36, 42 and 48 in Table 6 report the association of PMP and firm characteristics with LMS. The findings show the LMS is associated with all the PMP. This result highlights the complexity of trying to untangle the links between PMP and lean practices. While it might be tempting to speculate as to why there would be less adoption of key PMP for those firms which adopt more LMP, the findings suggest an opportunity for more detailed qualitative work to understand the rationale behind these choices. As with *Adoption of LMP*, there is no association between LMS and the firm characteristics of competition, union and ownership concentration. Associations 18 to 53 present the direct associations between firm characteristics, LMS and individual PMP scores.

The result in Table 6 are consistent with our expectations that the extent to which a firm implements a high degree of lean (*Adoption of LMP*) depends upon the firm's strategic intentions on lean (*Lean manufacturing strategy LMS*) and the institutionalised characteristics which define the organisation's PMP. In addition, we identify which PMP and firm characteristics are implicated in this nexus of relations for these different sized firms.

Robustness Test: Firm size with PMP and LMS

The literature suggests that various sized firms are likely to see various levels of associations between PMP and lean. For example, Agarwal et al. (2013; 2014) and Bloom and Van Reenen (2007) find that firm is linked with adoption of best management practice, including lean and PMP. Accordingly, any model which is seeking to explain the links between PMP and lean needs to consider the influence of firm size. But what is not known is how the links between configurations vary as a function of size characteristics.

<Insert Table 7 here>

Table 7 present results of an estimated SEM model, where the sample has been partitioned based on different size profiles. The findings are juxtaposed, where: 0 denotes firms with 50 to 100 employees (n. 110); 1 is firms with 101 to 250 employees (n. 189); and, 2 is firms with greater than 250 employees (n. 259). The findings show that there is substantial variation between the size groupings. The key finding is that the two key PMPs associated with LMP differ between groups, with *Removing poor performers* being significant for the smaller firms in the sample (less than 100 employees); whereas *Promoting high performers* is significant for those firms slightly larger (between 100 and 250 employees). Notably, *Instilling a talent mindset* is significant for those firms with less than 100 employees. The only PMS significantly associated with LMP is *Attracting high performers*. It is also notable, that LMS is associated with most PMS, albeit with some exceptions; such as the association with *Retaining high performers* being significant only for those firms employing 100 to 250 employees (see association 48).

6. DISCUSSION, IMPLICATIONS AND CONCLUSION

The objective of this study was to explore (i) which PMP bundles are chosen by different sized firms that adopt LMP, and (ii) which firm characteristics play a role in explaining these choices. The PMP found were *Removing poor performers, Promoting high performers* and *Instilling a talent mindset*. Our findings contribute theoretically to the stream of HR flexibility literature by investigating which PMP are adopted by firms who choose LMP (e.g. Shah and Ward, 2003, Furlan et al 2011; Bevilacqua et al., 2017). To our knowledge, we are the first study to provide detailed empirical evidence on the composition and variation of PMP chosen by managers to support LMS and LMP.

The HR flexibility brought about through the firm's mix of people management practices plays a role in the LMS and LMP outcomes noted earlier. It is notable that of the 6 PMP domains, well theorised practices were not being adopted by firms of different sizes nor with different characteristics. For example, the PMP practice of devoting resources to retaining human capital that provided a source of sustained competitive advantage (Huselid, 1995; Ichniowski, Shaw, and Prenushi, 1997) was not the preferred strategy of many managers in the relatively smaller sized firms (less than 250 employees). Our findings also differ from earlier studies, in that rather than comprehensive bundles of PMP which are similar across firms, managers are

choosing one or two key practices to complement LMP for the relatively smaller firms. However, firms that have an LMS, tend to adopt a more comprehensive set of PMP. Consequently, there is a significant implication for managers as they select PMP domains for different firm sizes especially when implementing LMP and LMS practices. Managers need not implement all PMP domains within their organisation , instead implementing HR flexibility as suited to their organisation (Beltran-Martin et. al., 2008) to position themselves competitively (Wright et al., 2001; Bhattacharya et al., 2005). Although this research does not examine individual employee performance, the adoption of HR flexibility through particular PMPs will enhance employee performance and productivity (Ketkar and Sett, 2009) and increase employee satisfaction at work (Galinsky, et. al., 2011). More specifically, they also bring out diversity and individuality (Sekhar, et. al., 2016) through allowing employee voice (Jena and Memon, 2018) and providing firms with ability to adapt quite effectively to changing external conditions (Snell, et. al., 1996 and Wright and Boswell, 2002) while also impacting positively to creativity and innovation (Pradhan, et. al., 2017).

In terms of the influence of firm characteristics (number of employees, education of managers, dispersed ownership, competition and union membership) that were expected to help identify bundles of PMP for organisations that opt for LMP and LMS, only the number of employers and education of management were consistently significantly associated to higher adoption. Firms whose management is characterised by high levels of management education typically adopt PMPs. This finding with specific bundles of PMP is in line with previous scholarly findings (Fisher et al., 2012; Agarwal and Green. 2011; Bloom and Van Reenen 2007) who provide robust evidence suggesting firms with a higher skilled and educated workforce tend to have better management practices, and hence enhance the competitive advantage of the firm (Fuller-Love, 2006), thus resulting in greater HR flexibility impacting positively on the firm's capacity to be both creative and innovative (Pradhan, et. al., 2017).

Despite these findings, making a theoretical contribution and have managerial implications, they beg a question as to why managers are making these choices in the first place. Further research utilising multiple contracting case studies and or semi structured interviews for firms who have LMS and LMP will be necessary to explain why these choices have been made.

There are a number of limitations in this study which provide the opportunity for future research. As we were utilising an archival dataset, there are additional PMP which have not been included in the results. Also, the dataset did not include firms with less than 50 employees. Further work utilising an expanded dataset which includes additional PMP and smaller firms would yield additional fruitful insights.

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Figure 1 – *Path Model of Expected links between Firm Characteristics, People Management Practices and Lean Manufacturing Practices*

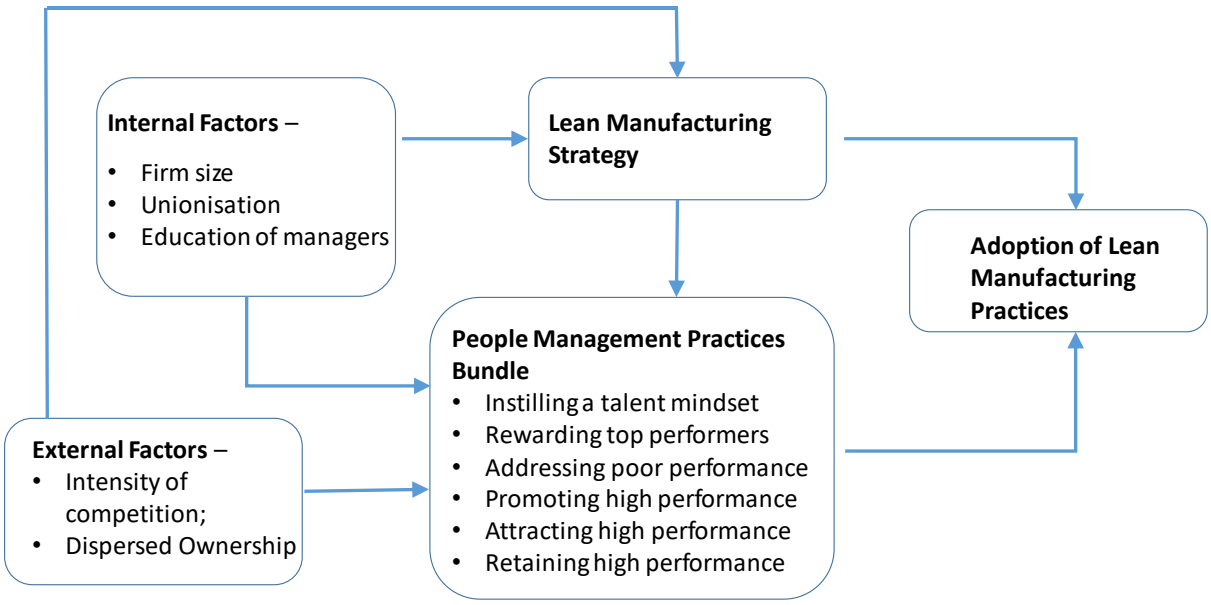

Table 1 - *Dataset Sample selection*

	Number of Firms
Australian and New Zealand Firms identified as a manufacturing firm in Orbis or Dun and Bradstreet databases by ANZSIC code with greater than 50 employees.	4875
Firms not in manufacturing or no longer operational	864
Eligible universe	4702
Firms randomly contacted	2333
Firms in interviewed sample	591
Less firms where data is missing for one or more key variables	37
Full sample firms	558
Sample of firms with up to 250 employees	**299**

Table 2 - *ANZSIC Industry Grouping*

Industry group	Frequency	%
21: Food, Beverage and Tobacco Manufacturing	56	18.73
22: Textile, Clothing, Footwear and Leather Manufacturing	16	5.35
23: Wood and Paper Product Manufacturing	24	8.03
24: Printing, Publishing and Recorded Media	7	2.34
25: Petroleum, Coal, Chemical and Associated Product Manufacturing	45	15.05
26: Non-Metallic Mineral Product Manufacturing	16	5.35
27: Metal Product Manufacturing	42	14.05
28: Machinery and Equipment Manufacturing	77	25.75
29: Other Manufacturing.	16	5.35
Total	**299**	**100.0**

Table 3 – Variable descriptions

Panel A - *Lean Manufacturing and People Management Practices Dimensions and Scoring Grid showing quantitative scores ranging from 1 (worst) to 5 (better)*

Lean Manufacturing Dimensions	
Variable	**Description**
Adoption of Lean Manufacturing Practices (LMP)	**Score 1:** Other than JIT delivery from suppliers few modern manufacturing techniques have been introduced, (or have been introduced in an ad-hoc manner) **Score 3:** Some aspects of modern (lean) manufacturing techniques have been introduced, through informal/isolated change programmes **Score 5:** All major aspects of modern/lean manufacturing have been introduced (Just-in-time, automation, flexible manpower, support systems, attitudes and behaviour) in a formal way
Rationale for adopting lean manufacturing strategy (LMS)	**Score 1:** Modern (lean) manufacturing techniques were introduced because others were using them. **Score 3:** Modern (lean) manufacturing techniques were introduced to reduce costs **Score 5:** Modern (lean) manufacturing techniques were introduced to enable us to meet our business objectives (including costs)
PMP Practices Dimensions	
Variable	**Description**
Instilling a talent mindset	**Score 1:** Senior management does not communicate that attracting, retaining, and developing talent throughout the organisation is a top priority. **Score 3:** Senior management believes and communicates that having top talent throughout the organisation is a key way to win. **Score 5:** Senior managers are evaluated and held accountable on the strength of the talent pool they actively build.
Rewarding top performers	**Score 1:** People within our organisation are rewarded equally irrespective of performance level. **Score 3:** Our organisation has an evaluation system for the awarding of performance-related rewards. **Score 5:** We strive to outperform the competitors by providing ambitious stretch targets with clear performance-related accountability and rewards.
Addressing poor performance	**Score 1:** Poor performers are rarely removed from their positions. **Score 3:** Suspected poor performers stay in a position for a few years before action is taken. **Score 5:** We move poor performers out of the organisation or to less critical roles as soon as a weakness is identified.
Promoting high performance	**Score 1:** People are promoted primarily upon the basis of tenure. **Score 3:** People are promoted upon the basis of performance. **Score 5:** We actively identify, develop, and promote our top performers.
Attracting high performance	**Score 1:** Our competitors offer stronger reasons for talented people to join their companies. **Score 3:** Our value proposition to those joining our organisation is comparable to those offered by others in the sector. **Score 5:** We provide a unique value proposition to encourage talented people to join our organisation above our competitors.
Retaining high performance	**Score 1:** We do little to try and keep our top talent. **Score 3:** We usually work hard to keep our top talent. **Score 5:** We do whatever it takes to retain our top talent.

Panel B –*Firm Characteristics Variable Descriptions*

Variable	Definition
Number of employees	Count of the number of employees. The variable is logged for the statistical tests
Competition	Number of direct competitors (capped at 10)
Dispersed ownership	Firms where a significant proportion of ownership is controlled by an individual or small coalition, e.g. family-run or founder-run businesses =1; Firms that have multiple shareholders = 0
Unionization	Percentage of employees with union representation
Education	Percentage of managers with college qualification

Table 4 - *Descriptive Statistics*

	N	average	median	Standard deviation	min	max
Lean Management Practices						
Adoption of LMP	299	2.9	3	0.959	1	5
Lean manufacturing strategy (LMS)	299	3.01	3	0.912	1	5
PMP Practices						
Instilling a talent mindset	299	1.98	2	0.835	1	5
Rewarding top performers	299	2.53	3	0.774	1	4
Removing poor performers	299	2.77	3	0.783	1	4
Promoting high performers	299	2.78	3	0.739	1	5
Attracting high performers	299	2.83	3	0.712	1	5
Retaining high performers	299	2.37	2	0.798	1	4
Firm Characteristics						
Number of firm employees	299	134	120	57	50	250
Percentage of managers with a college degree	299	41.3	40	29.3	0	100
Number of competitors	299	7.09	9	3.13	1	10
Percentage of employees with union representation	299	31.7	15	35	0	100
Dispersed ownership	299	0.288	0	0.453	0	1

[a] The variable is capped at 10 in the dataset, where 10 is equivalent to 10 or more competitors, hence the average is not meaningful.

Table 5 - *Pearson Correlations for all variables*

	Adoption of LMP	Lean manufacturing strategy	Instilling a talent mindset	Rewarding top performers	Removing poor performers	Promoting high performers	Attracting high performers	Retaining high performers	No. Employees	Edu. Mgmt.	Competition	Unionization	Dispersed ownership
Adoption of LMP	1.000												
Lean manufacturing strategy (LMS)	0.777***	1.000											
Instilling a talent mindset	0.295***	0.278***	1.000										
Rewarding top performers	0.255***	0.213***	0.286***	1.000									
Removing poor performers	0.295***	0.235***	0.024	0.194***	1.000								
Promoting high performers	0.427***	0.378***	0.292***	0.395***	0.274***	1.000							
Attracting high performers	0.303***	0.319***	0.367***	0.320***	0.164***	0.368***	1.000						
Retaining high performers	0.244***	0.233***	0.258***	0.350***	0.130**	0.268***	0.321***	1.000					
No. employees	0.085	0.125**	0.220***	0.208***	0.050	0.140**	0.167***	0.070	1.000				
Edu. Mgmt.	0.180***	0.160***	0.158***	0.191***	0.129**	0.150***	0.101*	0.096*	0.025	1.000			
Competition	-0.027	-0.016	-0.099*	-0.067	0.072	0.024	0.013	0.080	0.099*	-0.094*	1.000		
Union	0.073	0.020	0.058	-0.092	-0.039	0.043	-0.008	-0.118**	-0.047	0.056	-0.075	1.000	
Dispersed ownership	0.115**	0.088	0.157***	0.225***	-0.004	0.087	0.093*	0.066	0.152***	0.165***	-0.070	0.178***	1.000

Notes: *** Correlation is significant at the 0.001 level. ** Correlation is significant at the 0.01 level. * Correlation is significant at the 0.05 level.

Table 6 - *Estimated structural equation model using path analysis of the associations between the Adoption of LMP, Lean manufacturing strategy (LMS), PMP practices and firm characteristics (up to 250 employees)*

		Total effects		**Direct effects**		**Indirect effects**	
Assoc		**Coef.**	**P>z**	**Coef.**	**P>z**	**Coef.**	**P>z**
	$Adoption\ of\ LMP = f(Lean\ manufacturing\ strategy, PMP, Firm\ Characteristics)$						
1	Lean manufacturing strategy (LMS)	0.807***	*(0.000)*	0.724***	*(0.000)*	0.084***	*(0.000)*
2	Instilling a talent mindset	0.069	*(0.126)*	0.069	*(0.126)*	*no path*	
3	Rewarding top performers	0.030	*(0.549)*	0.030	*(0.549)*	*no path*	
4	Removing poor performers	0.117**	*(0.010)*	0.117**	*(0.010)*	*no path*	
5	Promoting high performers	0.146**	*(0.007)*	0.146**	*(0.007)*	*no path*	
6	Attracting high performers	-0.013	*(0.812)*	-0.013	*(0.812)*	*no path*	
7	Retaining high performers	0.024	*(0.611)*	0.024	*(0.611)*	*no path*	
8	No. employees	0.249*	*(0.013)*	*no path*		0.249*	*(0.013)*
9	Edu. Mgmt	0.005**	*(0.002)*	*no path*		0.005**	*(0.002)*
10	Competition	-0.001	*(0.969)*	*no path*		-0.001	*(0.969)*
11	Unionization	0.000	*(0.941)*	*no path*		0.000	*(0.941)*
12	Dispersed Ownership	0.092	*(0.354)*	*no path*		0.092	*(0.354)*
	$Lean\ manufacturing\ strategy = f(Firm\ Characteristics)$						
13	No. employees	0.239**	*(0.045)*	0.239*	*(0.045)*	*no path*	
14	Edu. Mgmt	0.005**	*(0.010)*	0.005**	*(0.010)*	*no path*	
15	Competition	-0.003	*(0.870)*	-0.003	*(0.870)*	*no path*	
16	Unionization	0.000	*(0.881)*	0.000	*(0.881)*	*no path*	
17	Dispersed Ownership	0.088	*(0.458)*	0.088	*(0.458)*	*no path*	
	$Instilling\ a\ talent\ mindset = f(Lean\ manufacturing\ strategy, Firm\ Characteristics)$						
18	Lean manufacturing strategy (LMS)	0.211***	*(0.000)*	0.211***	*(0.000)*	*no path*	
19	No. employees	0.406***	*(0.000)*	0.356***	*(0.001)*	0.050*	*(0.071)*
20	Edu. Mgmt	0.004*	*(0.025)*	0.003*	*(0.095)*	0.001*	*(0.028)*
21	Competition	-0.027*	*(0.075)*	-0.026*	*(0.073)*	-0.001	*(0.870)*
22	Unionization	0.001	*(0.503)*	0.001	*(0.514)*	0.000	*(0.881)*
23	Dispersed Ownership	0.166	*(0.117)*	0.147	*(0.153)*	0.019	*(0.465)*
	$Rewarding\ top\ performers = f(Lean\ manufacturing\ strategy, Firm\ Characteristics)$						
24	Lean manufacturing strategy (LMS)	0.134**	*(0.004)*	0.134**	*(0.004)*	*no path*	
25	No. employees	0.307**	*(0.002)*	0.275**	*(0.004)*	0.032*	*(0.100)*
26	Edu. Mgmt	0.004**	*(0.004)*	0.004*	*(0.015)*	0.001*	*(0.054)*
27	Competition	-0.016	*(0.225)*	-0.016	*(0.229)*	0.000	*(0.871)*
28	Unionization	-0.003*	*(0.017)*	-0.003*	*(0.014)*	0.000	*(0.881)*
29	Dispersed Ownership	0.327***	*(0.001)*	0.316***	*(0.001)*	0.012	*(0.472)*
	$Removing\ poor\ performers = f(Lean\ manufacturing\ strategy, Firm\ Characteristics)$						
30	Lean manufacturing strategy (LMS)	0.189***	*(0.000)*	0.189**	*(0.000)*	*no path*	
31	No. employees	0.071	*(0.490)*	0.026	*(0.797)*	0.045*	*(0.075)*
32	Edu. Mgmt	0.004*	*(0.015)*	0.003*	*(0.059)*	0.001*	*(0.032)*
33	Competition	0.019	*(0.180)*	0.020	*(0.158)*	-0.001	*(0.870)*
34	Unionization	-0.001	*(0.546)*	-0.001	*(0.514)*	0.000	*(0.881)*
35	Dispersed Ownership	-0.038	*(0.715)*	-0.054	*(0.589)*	0.017	*(0.466)*

	$Promoting\ high\ performers = f(Lean\ manufacturing\ strategy, Firm\ Characteristics)$						
36	Lean manufacturing strategy (LMS)	0.284***	*(0.000)*	0.284***	*(0.000)*	*no path*	
37	No. employees	0.216*	*(0.025)*	0.148	*(0.104)*	0.068*	*(0.056)*
38	Edu. Mgmt	0.004*	*(0.014)*	0.002	*(0.101)*	0.001*	*(0.017)*
39	Competition	0.007	*(0.598)*	0.008	*(0.532)*	-0.001	*(0.870)*
40	Unionization	0.001	*(0.531)*	0.001	*(0.540)*	0.000	*(0.881)*
41	Dispersed Ownership	0.065	*(0.499)*	0.040	*(0.657)*	0.025	*(0.461)*
	$Attracting\ high\ performers = f(Lean\ manufacturing\ strategy, Firm\ Characteristics)$						
42	Lean manufacturing strategy (LMS)	0.229***	*(0.000)*	0.229***	*(0.000)*	*no path*	
43	No. employees	0.249**	*(0.008)*	0.194*	*(0.030)*	0.055*	*(0.061)*
44	Edu. Mgmt	0.002	*(0.122)*	0.001	*(0.413)*	0.001*	*(0.020)*
45	Competition	0.002	*(0.876)*	0.003	*(0.831)*	-0.001	*(0.870)*
46	Unionization	0.000	*(0.797)*	0.000	*(0.752)*	0.000	*(0.881)*
47	Dispersed Ownership	0.092	*(0.324)*	0.071	*(0.422)*	0.020	*(0.463)*
	$Retaining\ high\ performers = f(Lean\ manufacturing\ strategy, Firm\ Characteristics)$						
48	Lean manufacturing strategy (LMS)	0.191***	*(0.000)*	0.191***	*(0.000)*	*no path*	
49	No. employees	0.078	*(0.458)*	0.032	*(0.756)*	0.046*	*(0.075)*
50	Edu. Mgmt	0.003*	*(0.088)*	0.002	*(0.248)*	0.001*	*(0.032)*
51	Competition	0.020	*(0.164)*	0.021	*(0.144)*	-0.001	*(0.870)*
52	Unionization	-0.003*	*(0.027)*	-0.003*	*(0.022)*	0.000	*(0.881)*
53	Dispersed Ownership	0.125	*(0.229)*	0.109	*(0.286)*	0.017	*(0.466)*

Notes: *** is significant at the 0.001 level. ** is significant at the 0.01 level. * is significant at the 0.05 level. # is significant at the 0.10 level.

Table 7 - *Estimated structural equation model using path analysis of the associations between Adoption of LMP, Lean manufacturing strategy (LMS), PMP practices and firm size*

$$Adoption\ of\ LMP = f(Lean\ manufacturing\ strategy, PMP, Firm\ Characteristics)$$

Assoc	Sample of employees 0 = 440 to 100 (n. 110) 1 = 101 to 250 (n. 189) 2 = 251+ (n. 259)		Total effects Coef.		P>z	Direct effects Coef.		P>z	Indirect effects Coef.		P>z
1	Lean manufacturing strategy (LMS)	0	0.779	***	*(0.000)*	0.631	***	*(0.000)*	0.148	***	*(0.001)*
		1	0.836	***	*(0.000)*	0.761	***	*(0.000)*	0.075	***	*(0.001)*
		2	0.829	***	*(0.000)*	0.782	***	*(0.000)*	0.048	**	*(0.004)*
2	Instilling a talent mindset	0	0.233	**	*(0.006)*	0.233	**	*(0.006)*	*no path*		
		1	0.006		*(0.914)*	0.006		*(0.914)*	*no path*		
		2	0.042		*(0.318)*	0.042		*(0.318)*	*no path*		
3	Rewarding top performers	0	-0.033		*(0.708)*	-0.033		*(0.708)*	*no path*		
		1	0.085		*(0.166)*	0.085		*(0.166)*	*no path*		
		2	0.033		*(0.499)*	0.033		*(0.499)*	*no path*		
4	Removing poor performers	0	0.205	**	*(0.007)*	0.205	**	*(0.007)*	*no path*		
		1	0.060		*(0.281)*	0.060		*(0.281)*	*no path*		
		2	0.030		*(0.568)*	0.030		*(0.568)*	*no path*		
5	Promoting high performers	0	0.125		*(0.176)*	0.125		*(0.176)*	*no path*		
		1	0.158	*	*(0.016)*	0.158	*	*(0.016)*	*no path*		
		2	-0.019		*(0.736)*	-0.019		*(0.736)*	*no path*		
6	Attracting high performers	0	0.039		*(0.654)*	0.039		*(0.654)*	*no path*		
		1	-0.040		*(0.564)*	-0.040		*(0.564)*	*no path*		
		2	0.128	*	*(0.021)*	0.128	*	*(0.021)*	*no path*		
7	Retaining high performers	0	-0.022		*(0.788)*	-0.022		*(0.788)*	*no path*		
		1	0.051		*(0.364)*	0.051		*(0.364)*	*no path*		
		2	0.035		*(0.448)*	0.035		*(0.448)*	*no path*		
8	No. employees	0	0.175		*(0.623)*			*no path*	0.175		*(0.623)*
		1	0.093		*(0.646)*			*no path*	0.093		*(0.646)*
		2	-0.034		*(0.512)*			*no path*	-0.034		*(0.512)*
9	Edu. Mgmt	0	0.008	**	*(0.005)*			*no path*	0.008	**	*(0.005)*
		1	0.004	*	*(0.034)*			*no path*	0.004	*	*(0.034)*
		2	0.007	***	*(0.000)*			*no path*	0.007	***	*(0.000)*
10	Competition	0	0.039		*(0.120)*			*no path*	0.039		*(0.120)*
		1	-0.021		*(0.231)*			*no path*	-0.021		*(0.231)*
		2	0.007		*(0.573)*			*no path*	0.007		*(0.573)*
11	Unionization	0	-0.001		*(0.596)*			*no path*	-0.001		*(0.596)*
		1	0.002		*(0.262)*			*no path*	0.002		*(0.262)*
		2	0.001		*(0.340)*			*no path*	0.001		*(0.340)*
12	Dispersed Ownership	0	0.241		*(0.195)*			*no path*	0.241		*(0.195)*
		1	0.023		*(0.852)*			*no path*	0.023		*(0.852)*
		2	0.117		*(0.218)*			*no path*	0.117		*(0.218)*

						$Lean\ manufacturing\ strategy = f(Firm\ Characteristics)$					
13	No. employees	0	0.243		*(0.563)*	0.243		*(0.563)*	*no path*		
		1	0.017		*(0.943)*	0.017		*(0.943)*	*no path*		
		2	-0.060		*(0.330)*	-0.060		*(0.330)*	*no path*		
14	Edu. Mgmt	0	0.008	**	*(0.010)*	0.008	**	*(0.010)*	*no path*		
		1	0.003		*(0.102)*	0.003		*(0.102)*	*no path*		
		2	0.007	***	*(0.000)*	0.007	***	*(0.000)*	*no path*		
15	Competition	0	0.035		*(0.224)*	0.035		*(0.224)*	*no path*		
		1	-0.022		*(0.282)*	-0.022		*(0.282)*	*no path*		
		2	0.010		*(0.509)*	0.010		*(0.509)*	*no path*		
16	Unionization	0	-0.003		*(0.215)*	-0.003		*(0.215)*	*no path*		
		1	0.003		*(0.139)*	0.003		*(0.139)*	*no path*		
		2	0.002		*(0.202)*	0.002		*(0.202)*	*no path*		
17	Dispersed Ownership	0	0.237		*(0.275)*	0.237		*(0.275)*	*no path*		
		1	0.021		*(0.881)*	0.021		*(0.881)*	*no path*		
		2	0.146		*(0.193)*	0.146		*(0.193)*	*no path*		
						$Instilling\ a\ talent\ mindset = f(Lean\ manufacturing\ strategy, Firm\ Characteristics)$					
18	Lean manufacturing strategy (LMS)	0	0.258	***	*(0.000)*	0.258	***	*(0.000)*	*no path*		
		1	0.197	**	*(0.004)*	0.197	**	*(0.004)*	*no path*		
		2	0.268	***	*(0.000)*	0.268	***	*(0.000)*	*no path*		
19	No. employees	0	0.018		*(0.957)*	-0.045		*(0.887)*	0.063		*(0.568)*
		1	0.453	*	*(0.044)*	0.449	*	*(0.041)*	0.003		*(0.943)*
		2	0.060		*(0.392)*	0.076		*(0.264)*	-0.016		*(0.344)*
20	Edu. Mgmt	0	0.003		*(0.243)*	0.001		*(0.735)*	0.002	*	*(0.036)*
		1	0.004	*	*(0.048)*	0.003	#	*(0.095)*	0.001		*(0.154)*
		2	0.008	***	*(0.000)*	0.006	***	*(0.000)*	0.002	**	*(0.004)*
21	Competition	0	0.015		*(0.504)*	0.006		*(0.774)*	0.009		*(0.249)*
		1	-0.047	*	*(0.015)*	-0.043	*	*(0.024)*	-0.004		*(0.313)*
		2	0.004		*(0.833)*	0.001		*(0.955)*	0.003		*(0.515)*
22	Unionization	0	0.004	#	*(0.057)*	0.005	*	*(0.015)*	-0.001		*(0.241)*
		1	-0.001		*(0.691)*	-0.001		*(0.475)*	0.001		*(0.187)*
		2	-0.002		*(0.336)*	-0.002		*(0.194)*	0.001		*(0.225)*
23	Dispersed Ownership	0	0.094		*(0.586)*	0.033		*(0.841)*	0.061		*(0.297)*
		1	0.226	#	*(0.089)*	0.222	#	*(0.088)*	0.004		*(0.882)*
		2	-0.069		*(0.585)*	-0.108		*(0.380)*	0.039		*(0.217)*
						$Rewarding\ top\ performers = f(\ Lean\ manufacturing\ strategy, Firm\ Characteristics)$					
24	Lean manufacturing strategy (LMS)	0	0.000		*(0.997)*	0.000		*(0.997)*	*no path*		
		1	0.218	***	*(0.000)*	0.218	***	*(0.000)*	*no path*		
		2	0.273	***	*(0.000)*	0.273	***	*(0.000)*	*no path*		
25	No. employees	0	0.614	*	*(0.050)*	0.614	*	*(0.050)*	0.000		*(0.997)*
		1	0.189		*(0.348)*	0.185		*(0.341)*	0.004		*(0.943)*
		2	0.059		*(0.341)*	0.075		*(0.207)*	-0.016		*(0.341)*
26	Edu. Mgmt	0	0.005	*	*(0.025)*	0.005	*	*(0.030)*	0.000		*(0.997)*
		1	0.004	*	*(0.043)*	0.003	#	*(0.098)*	0.001		*(0.136)*

		2	0.007	***	*(0.000)*	0.005	***	*(0.001)*	0.002	** *(0.002)*
27	Competition	0	0.016		*(0.465)*	0.016		*(0.468)*	0.000	*(0.997)*
		1	-0.030	#	*(0.080)*	-0.026		*(0.128)*	-0.005	*(0.302)*
		2	-0.014		*(0.357)*	-0.017		*(0.254)*	0.003	*(0.514)*
28	Unionization	0	0.000		*(0.894)*	0.000		*(0.894)*	0.000	*(0.997)*
		1	-0.004	**	*(0.010)*	-0.005	**	*(0.002)*	0.001	*(0.171)*
		2	0.000		*(0.776)*	-0.001		*(0.514)*	0.001	*(0.220)*
29	Dispersed Ownership	0	0.480	**	*(0.003)*	0.480	**	*(0.003)*	0.000	*(0.997)*
		1	0.297	*	*(0.013)*	0.293	*	*(0.011)*	0.005	*(0.882)*
		2	0.076		*(0.500)*	0.036		*(0.740)*	0.040	*(0.211)*
$Removing\ poor\ performers = f(Lean\ manufacturing\ strategy, Firm\ Characteristics)$										
30	Lean manufacturing strategy (LMS)	0	0.203	**	*(0.009)*	0.203	**	*(0.009)*	*no path*	
		1	0.173	**	*(0.006)*	0.173	**	*(0.006)*	*no path*	
		2	0.125	*	*(0.012)*	0.125	*	*(0.012)*	*no path*	
31	No. employees	0	0.161		*(0.650)*	0.111		*(0.746)*	0.049	*(0.572)*
		1	0.151		*(0.470)*	0.148		*(0.470)*	0.003	*(0.943)*
		2	0.091	#	*(0.069)*	0.098	*	*(0.046)*	-0.008	*(0.364)*
32	Edu. Mgmt	0	0.007	*	*(0.013)*	0.005	#	*(0.064)*	0.002	# *(0.067)*
		1	0.002		*(0.193)*	0.002		*(0.320)*	0.001	*(0.160)*
		2	0.001		*(0.307)*	0.000		*(0.719)*	0.001	* *(0.031)*
33	Competition	0	0.043	#	*(0.083)*	0.035		*(0.141)*	0.007	*(0.271)*
		1	0.011		*(0.548)*	0.015		*(0.409)*	-0.004	*(0.316)*
		2	0.009		*(0.475)*	0.008		*(0.536)*	0.001	*(0.523)*
34	Unionization	0	0.000		*(0.871)*	0.000		*(0.889)*	-0.001	*(0.263)*
		1	-0.001		*(0.604)*	-0.001		*(0.413)*	0.000	*(0.193)*
		2	0.000		*(0.678)*	0.000		*(0.826)*	0.000	*(0.255)*
35	Dispersed Ownership	0	0.263		*(0.152)*	0.215		*(0.231)*	0.048	*(0.315)*
		1	-0.150		*(0.223)*	-0.154		*(0.204)*	0.004	*(0.882)*
		2	-0.066		*(0.466)*	-0.084		*(0.348)*	0.018	*(0.248)*
$Promoting\ high\ performers = f(Lean\ manufacturing\ strategy, Firm\ Characteristics)$										
36	Lean manufacturing strategy (LMS)	0	0.308	***	*(0.000)*	0.308	***	*(0.000)*	*no path*	
		1	0.263	***	*(0.000)*	0.263	***	*(0.000)*	*no path*	
		2	0.197	***	*(0.000)*	0.197	***	*(0.000)*	*no path*	
37	No. employees	0	-0.202		*(0.529)*	-0.277		*(0.346)*	0.075	*(0.566)*
		1	0.324		*(0.103)*	0.319	#	*(0.090)*	0.004	*(0.943)*
		2	-0.017		*(0.746)*	-0.006		*(0.914)*	-0.012	*(0.346)*
38	Edu. Mgmt	0	0.004		*(0.142)*	0.001		*(0.653)*	0.003	* *(0.024)*
		1	0.004	*	*(0.028)*	0.003	#	*(0.079)*	0.001	*(0.124)*
		2	0.004	**	*(0.003)*	0.003	*	*(0.047)*	0.001	** *(0.005)*
39	Competition	0	0.047	*	*(0.036)*	0.036	#	*(0.081)*	0.011	*(0.240)*
		1	-0.012		*(0.478)*	-0.006		*(0.694)*	-0.006	*(0.295)*
		2	0.007		*(0.624)*	0.005		*(0.726)*	0.002	*(0.516)*
40	Unionization	0	0.000		*(0.978)*	0.001		*(0.607)*	-0.001	*(0.231)*
		1	0.002		*(0.317)*	0.001		*(0.573)*	0.001	*(0.160)*

		2	0.001		*(0.657)*	0.000		*(0.873)*	0.000		*(0.228)*
41	Dispersed Ownership	0	0.285	#	*(0.086)*	0.212		*(0.165)*	0.073		*(0.289)*
		1	-0.031		*(0.793)*	-0.036		*(0.745)*	0.005		*(0.882)*
		2	0.141		*(0.149)*	0.113		*(0.240)*	0.029		*(0.219)*
$Attracting\ high\ performers = f(Lean\ manufacturing\ strategy, Firm\ Characteristics)$											
42	Lean manufacturing strategy (LMS)	0	0.259	***	*(0.000)*	0.259	***	*(0.000)*	*no path*		
		1	0.204	***	*(0.000)*	0.204	***	*(0.000)*	*no path*		
		2	0.195	***	*(0.000)*	0.195	***	*(0.000)*	*no path*		
43	No. employees	0	0.524		*(0.118)*	0.461		*(0.147)*	0.063		*(0.568)*
		1	0.315	#	*(0.087)*	0.312	#	*(0.079)*	0.003		*(0.943)*
		2	0.035		*(0.504)*	0.046		*(0.360)*	-0.012		*(0.345)*
44	Edu. Mgmt	0	0.004	#	*(0.098)*	0.002		*(0.401)*	0.002	*	*(0.036)*
		1	0.001		*(0.475)*	0.000		*(0.768)*	0.001		*(0.134)*
		2	0.005	***	*(0.000)*	0.004	**	*(0.010)*	0.001	**	*(0.005)*
45	Competition	0	0.006		*(0.785)*	-0.003		*(0.898)*	0.009		*(0.249)*
		1	-0.002		*(0.914)*	0.003		*(0.858)*	-0.004		*(0.301)*
		2	-0.001		*(0.933)*	-0.003		*(0.809)*	0.002		*(0.515)*
46	Unionization	0	-0.002		*(0.373)*	-0.001		*(0.608)*	-0.001		*(0.241)*
		1	0.001		*(0.653)*	0.000		*(0.948)*	0.001		*(0.169)*
		2	-0.001		*(0.389)*	-0.001		*(0.236)*	0.000		*(0.227)*
47	Dispersed Ownership	0	0.227		*(0.192)*	0.166		*(0.317)*	0.061		*(0.297)*
		1	0.034		*(0.754)*	0.030		*(0.776)*	0.004		*(0.882)*
		2	0.064		*(0.501)*	0.035		*(0.703)*	0.028		*(0.218)*
$Retaining\ high\ performers = f(Lean\ manufacturing\ strategy, Firm\ Characteristics)$											
48	Lean manufacturing strategy (LMS)	0	0.097		*(0.193)*	0.097		*(0.193)*	*no path*		
		1	0.236	***	*(0.000)*	0.236	***	*(0.000)*	*no path*		
		2	0.059		*(0.315)*	0.059		*(0.315)*	*no path*		
49	No. employees	0	-0.424		*(0.199)*	-0.447		*(0.172)*	0.023		*(0.597)*
		1	0.271		*(0.208)*	0.267		*(0.199)*	0.004		*(0.943)*
		2	0.020		*(0.735)*	0.023		*(0.690)*	-0.004		*(0.484)*
50	Edu. Mgmt	0	0.001		*(0.616)*	0.000		*(0.858)*	0.001		*(0.245)*
		1	0.004	*	*(0.045)*	0.003		*(0.104)*	0.001		*(0.135)*
		2	0.003	*	*(0.038)*	0.003	#	*(0.079)*	0.000		*(0.328)*
51	Competition	0	0.075	***	*(0.001)*	0.072	**	*(0.002)*	0.003		*(0.374)*
		1	-0.006		*(0.765)*	0.000		*(0.983)*	-0.005		*(0.301)*
		2	-0.009		*(0.534)*	-0.010		*(0.507)*	0.001		*(0.581)*
52	Unionization	0	-0.004	#	*(0.055)*	-0.003	#	*(0.077)*	0.000		*(0.369)*
		1	-0.002		*(0.284)*	-0.002		*(0.134)*	0.001		*(0.170)*
		2	-0.002		*(0.191)*	-0.002		*(0.166)*	0.000		*(0.430)*
53	Dispersed Ownership	0	0.610	***	*(0.000)*	0.587	***	*(0.001)*	0.023		*(0.403)*
		1	-0.089		*(0.487)*	-0.093		*(0.447)*	0.005		*(0.882)*
		2	-0.009		*(0.931)*	-0.018		*(0.867)*	0.009		*(0.426)*

Notes: *** is significant at the 0.001 level. ** is significant at the 0.01 level. * is significant at the 0.05 level. # is significant at the 0.10 level.

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