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Exploring the relationship between HRM and Firm Performance:

A Meta-Analysis of Longitudinal Studies

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Abstract

Existing literature on human resource management (HRM) practices and firm performance suggests that there is a positive association between the two variables. Most of the studies, however, are based on cross-sectional datasets and only few of them use panel or longitudinal datasets, which better allow the researchers to deal with problems of endogeneity. This paper draws on meta-analysis techniques to estimate the effect size of the relationship between high performance work practices (HPWPs) and firm performance measures based on the available longitudinal studies. We also examine whether the effect is greater for a combination of HPWPs than for individual HPWPs, and for operational performance than for financial performance. The results from statistical aggregation of eight longitudinal HRM-performance studies demonstrate an overall reported correlation of 0.287. Additionally we find that a set of integrated, mutually reinforcing HPWPs has a stronger impact on firm performance than do HRM practices individually and that, this effect is statistically invariant between operational performance and financial performance.

1. Introduction

Since the first set of survey-based, statistically analysed studies of human resource management (HRM) and performance (Huselid, 1995; MacDuffie, 1995; Arthur, 1994) was launched in the 1990s, a burgeoning of HRM academic work has attempted to demonstrate that a set of well-defined, mutually reinforcing HR practices leads to better firm performance. Particularly, they argue that so called '*high performance work practices*' (HPWPs) in strategic HRM (SHRM) can enhance firm performance through improving employee knowledge, skills, competence, commitment and productivity (Datt et al., 2005; Appelbaum et al., 2000). HPWPs are conceptualised as a set of distinct but interrelated, mutually reinforcing HRM policies and practices, rather than isolated individual HRM practices. These it is said, aim to select, develop, retain and motivate a workforce to achieve superior intermediate indicators of firm performance (Becker and Huselid, 1998; Guthrie, 2001; Huselid, 1995).

Although a large majority of published studies provide empirical evidence of a positive association between HRM and firm performance, it is difficult to demonstrate a causal link (Guest et al., 2003; Combs et al., 2006; Boselie et al., 2005). This is largely because insufficient methodological rigor in analysis limits inferences about the direction of causality (Shadish et al., 2002). For example, it is difficult to know when, or by whom, HRM procedures are introduced (Guest, 2011). Some empirical research has tried to shed more light on this issue, but so far it has provided mixed findings. For example, some studies have reported a significant simultaneous and longitudinal relationship between HRM practices and firm performance indicators (Sheehan, 2014; Wright and Boswell, 2002; Becker and Gerhart, 1996). Others studies found that initially HRM leads to better firm performance but that this link disappears once past performance is controlled (Guest et al., 2003), suggesting that past

performance is a much stronger predictor of current performance and overtakes any impact of HRM.

By reviewing 68 empirical studies, Wright et al. (2005) summarise four types of research design amongst empirical studies assessing the relationship between multiple HR practices and firm performance: 'predictive', 'post-predictive', 'retrospective' and 'contemporaneous' research designs. The 'post-predictive' research design is by far the most prevalent design within the HRM-performance domain. In this design, HRM practices are measured after the performance period (see Black and Lynch, 2001). In 'retrospective' research, survey participants are asked to recall HR practices that existed prior to the performance period. Guthrie (2001) uses performance data from 1996/7 while asking respondents during that time to report the practices that existed during 1995/6. The 'contemporaneous' methodology use contemporaneous HR practices and performance data. For example, Delery and Doty (1996) use HR practices data during 1992 and year-end performance data in the estimation. Since the year-end data encompasses performance from months prior to and concurrent with HR practice measures, it is difficult to draw a firm and reliable cause-and-effect relationship. Finally, only a few studies can be classified as 'predictive'. In 'predictive' studies, the extent to which HRM practices assessed at one point in time can influence firm performance at a later point in time can be assessed. A good example is Snell and Youndt's (1995) study that relates HR practices to performance 3 years later (also see Youndt et al., 1996).

Generally, the 'predictive' research employs a more elaborate research design where causality is tested more rigorously using longitudinal data. Panel or longitudinal data offer several advantages compared to cross-sectional data - e.g. more degrees of freedom, more variability, more efficiency in estimation, ability to study dynamics, allows for time-invariant

unobservable variables and the sequence of events in time helps to reveal causation (e.g. Baltagi, 2008; Hsiao et al., 2006; Heckman et al., 1998; Rosenbaum and Rubin, 1985). However, the use of panel data is not a panacea for inferring causal relationships (see Shadish et al., 2002), but it provides a more informative setting than cross-sectional data to study statistical relationships between variables in non-experimental research designs.

Hence, this paper combines the evidence from ‘predictive’ and longitudinal studies and applies a meta-analysis. Indeed, researchers in various disciplines, including management and organisational behaviour, have used meta-analysis as a tool to accumulate data and synthesise them into generalisable knowledge (Hunter and Schmidt, 2004). To this end, a group of researchers (Jiang et al., 2012; Crook et al., 2011; Subramony, 2009; Combs et al., 2006) have adopted meta-analyses to examine the relationship between HRM practices or HPWPs and organisational performance. However, the existing body of meta-analyses has rarely differentiated between the research designs used in the pooled studies (see discussion by Rouse and Daellenbach, 1999). By aggregating extant ‘predictive’ and longitudinal studies only, this study will estimate the effect sizes and test whether the use of HPWPs leads to better firm performance.

The remainder of the paper is structured as follow. Section 2 discusses the primary theories and theoretical models (i.e. resource-based view, universalistic perspective and contingency/fit theory) within the HRM-performance nexus. Section 3 describes the sample and explains the meta-analysis technique. Section 4 presents the key results of meta-analysis. Section 5 discusses the findings and implications for each hypothesis. The final section concludes the paper.

2. Literature Review

Resource based view (RBV) of the firm

Increased interest in the HRM-performance nexus has led to the development of various theories and approaches to the question of whether and how HRM strategies can contribute to the creation of competitive advantage and superior performance. One widely accepted theoretical framework is the resource-based view (RBV) of the firm. RBV considers that relative firm performance depends on the interplay of human, physical and organisational resources over time (Barney, 1991). Initiated in the mid-1980s by Wernerfelt (1984), Rumelt (1984) and Barney (1986) and refined by Barney (1991), the RBV borrows heavily from earlier research by Penrose (1959). In her pioneering work of *The Theory of the Growth of the Firm*, Penrose (1959) suggests a theory of effective management of a firm's resources, productive opportunities, and diversification strategy. This provides an explanatory logic to unravel the relationship among internal resources, capabilities (where capabilities are defined as the abilities to manage the use of resource) and competitive advantage (Kor and Mahoney, 2004). Moreover, the theory asserts that organisations are viewed as collections of heterogeneous resources and capabilities that are imperfectly mobile across firms. By implication, this not only suggests asymmetries in firm resource endowments and capabilities, but also that these differences persist over time (Barney, 1991; Prahalad and Hamel, 1990; Conner, 1991; Conner and Prahalad, 1996).

Additionally, a group of scholars (e.g. Barney, 1986; 1991; Collis and Montgomery, 1995; Peteraf, 1993) have developed specific criteria for determining whether resources should be considered as heterogeneous and strategic to foster and sustain competitive advantage. Amongst others (e.g. Dierickx and Cool, 1989; Lippman and Rumelt, 1982), Barney's (1991) specification of the characteristics of a sustainable competitive advantage

that resources and capabilities must be valuable, rare, and imperfectly imitable or substitutable has received widespread recognition as well as criticism (for example, causal ambiguity). Firms that embrace such resources can gain a resource-based competitive advantage over rivals and enjoy improved short-term and long-term performance (Barney, 1991; 1997; Teece et al., 1997; Powell, 2001; Hoopes et al., 2003). In other words, the resource-based approach characterises costly-to-copy firm attributes as resources of economic rents and thus as the essential drivers of firm performance and competitive advantage (Barney, 1986; Rumelt, 1984). Empirically, a meta-analysis of 29,000 firms by Crook et al. (2008) and a review of empirical research by Newbert (2008) provide support for the tenets of the RBV framework in strategy and management literature.

RBV and SHRM

The resource-based approach suggests that sustainable competitive advantage derives from a firm's physical, human and organisational resource base (Colbert, 2004). Human capital resources, including training, experience, judgement intelligence, relationship and the insight of individual managers and employees in an organisation, are considered important for the achievement of competitive advantage and value-creation strategies (Barney, 1991) - hence, the integration of the RBV of the firm into SHRM literature and the claim that SHRM is naturally affiliated with the RBV of the competitive advantage (Wright et al., 2001).

Colbert (2004) concludes that the precepts of the RBV serve the SHRM field in two ways. On the one hand, the RBV has prompted HRM research on leveraging human capital, discretionary efforts and desired employee attitudes and behaviours (Bowen and Ostroff, 2004). Employees' characteristics add value to the organisation if they are reflected through positive attitudes and behaviours such as commitment and job satisfaction (Wright et al.,

1994). HR policies and practices that are considered as organisational competencies play an important role in this process by building knowledge, building a skill base and eliciting relevant responses and behaviours (Razouk, 2011; Lado and Wilson, 1994). Some, on the other hand, argue that the source of the competitive advantage is embedded in the human resources themselves (e.g. a highly skilled and highly motivated workforce), and not in the practices used to recruit, utilise or retain them, because any individual HR practices can be easily copied by competitors (Ferligoj et al., 1997; Wright et al., 1994).

However, the management of human resources is a complex, ambiguous and dynamic process (Barney and Wright, 1998; Becker and Huselid, 1998). Because of the causal ambiguity and social complexity associated with the development of sustained competitive advantage (Barney, 1991), abilities of competitors to imitate such resources are significantly constrained. In addition to this, the unique historical conditions within each firm make it difficult for rivals to obtain the same quality human capital (Barney, 1991; Razouk, 2011; Sheehan, 2014). Even if competitors realise that a system of HR mechanisms enhances competitiveness, it is difficult to replicate and reproduce it because of the time, money and management expertise involved in its development and implementation (Razouk, 2011; Becker and Gerhart, 1996). Regardless of the interpretation, both perspectives suggest that human resource play a critical role in successful firms, and that the adoption of sophisticated, well-defined, complementary HR practices and policies leads to superior organisational performance.

HPWPs and firm performance

Empirical SHRM research examining the HRM-firm performance relationship is divided into two perspectives: 1) a macro focus on the overall or standard set of HRM practices and firm

performance (e.g. Huselid and Becker, 1996; Huselid et al., 1997); and 2) a strategic perspective on HRM that emphasises the particular ‘fit’ between various HRM practices and a firm’s competitive advantage (Storey, 2011). The former view is related to a system view of HRM and considers the overall configuration or aggregation of HRM practices and policies rather than investigating the effects of individual HRM practices on employee or firm performance (Bowen and Ostroff, 2004). The latter view emphasises the alignment of various HRM practices towards their strategic goal and stresses that HR practices must complement one another if the firm’s business strategy is to be achieved (Wright et al., 1994). Such HRM-firm performance research has mainly applied two different approaches of SHRM: the *universalistic* or *best-practices* approach and the *contingency* approach. Both perspectives stress that HR can provide a sustainable competitive advantage for firms.

The best-practice perspective, which dominated the early HRM research in the late 1990s, emphasises the additive and positive impact of different best practices: the more such policies and practices are used, the better the business performance. In other words, regardless of context, the organisational performance is said to be enhanced when firms adopt best-practice. This approach has evolved subsequently to embrace the broad term ‘HPWPs’ (Sheehan, 2014), and more recently the work of Appelbaum et al. (2000) and Purcell and Hutchinson (2007) known as the Ability, Motivation and Opportunity (AMO) model. Integrated, complementary HPWS are designed not only to improve the knowledge, skills and abilities (KSAs) of employees, but also to encourage and motivate them to invest additional, discretionary, time and effort. Generally, KSAs are advanced through practices such as training and personal development, job design and compensation (i.e. ability-enhancing practices); while practices associated with incentive payment, performance-related reward, flexible work schedules, participation programs, information sharing and discretion and authority on the job are deployed to aid motivation (i.e. motivation-enhancing and opportunity

to participate practices) (Lai and Saridakis, 2013). In addition to this, HRM practices may also affect organisational performance by increasing flexibility and efficiency through their impact on firms' internal social structure (Evans and Davis, 2005).

However, this universalistic approach has been constantly debated and criticised. First, there is very little consensus about the structure of HRM systems and the practices therein. Second, HRM strategy can be potentially imitated by rival organisations. Third, it may restrict organisational creativity and innovation, as well as the ability to develop new practice corresponding to organisational culture. Fourth, this approach rarely considers the interaction between HRM and organisational variables (Colbert, 2004). For instance, the evidence is inconclusive regarding the success of attempts to apply the best-practice approach in different labour markets outside the US and the UK (Boselie and Dietz, 2003; Khatri, 2000).

The critiques of the best practices approach have prompted an alternative explanation for HRM-firm performance: *concept of fit* or *contingency* theory (Delery and Doty, 1996). The contingency approach proposes that particular HRM practices enhance the firm performance when HRM practices are compatible with each other (vertical fit) and align with the firm's strategic goals (horizontal fit). This approach is also widely known as the *configurational* perspective of SHRM. The contingency theory suggests that the way that best practices are applied should be conditional upon the type of employee and on organisational setting (e.g. size of firms). Along with the resource-based view of the firm, they provide legitimacy to SHRM's central assertion that people are strategically important to firm success. That is '*(HRM) responds accurately and effectively to the organisation's environment and complements other organisational systems (cf contingency theory) and ...it delivers 'added value' through the strategic development of the organisation's rare, inimitable and non-*

substitutable internal resources, embodied – literally – in its staff (cf the resource-based view)' (Boselie et al., 2005: 71).

Notwithstanding the fact that the debate between the universalist and contingency approaches has been settled long ago in favour of the latter, the majority of empirical studies tend to support a universalist model (Guest, 2011). Indeed, the evidence supporting a positive and direct relationship between bundles of HR practices and firm performance is overwhelming in the literature. This is probably because the dominant research design in examining the effect of HRM on firm performance focuses on mere statistical tests of whether individual HRM policies or systems of HRM practices have a significant positive relationship with firm performance (Katou and Budhwar, 2010). This mirrors the inability of current research to use rigorous methodological design to test the hypothesis that the adoption of HRM systems leads to better firm performance, rather than merely being associated with it.

This fits well with the basic assumption and the goal of HRM-performance, which is to provide justification to decision makers that the development and implementation of HR practices can increase performance (Wright et al., 2005). However, determining a causal link using observational data is not easy (see Shadish et al., 2002). Derived from the work of philosopher John Stuart Mill, Cook and Campbell (1979) suggest that cause inference should meet three criteria. First, there should be a covariation between the presumed cause and effect - that is, effect is present when cause is present, and effect is absent when cause is absent. Second, cause should precede effect (i.e. temporal precedence) - the proposed cause must exist in time prior to the proposed outcome. Third, alternative explanations for the cause-and-effect relationship should be ruled out – i.e., all other variables that might lead to the focal outcomes should be controlled for. Additionally, the implicit performance theories that arise from methodological limitations such as observed significant association between HR

practices and performance could be a result of subjective information from single sourced respondents (see Guest et al., 2013). Furthermore, a sample of autonomous business units within the same organisation is required when examining the relationship between HR practices and past, concurrent, and future measures of operational and financial performance.

This difficulty is apparent in existing HRM empirical literature. Additionally, evidences drawn upon longitudinal ‘predictive’ research designs regarding the HPWPs and firm performance relationship are mixed. For example, Guest et al. (2013) confirm the association between HRM and performances but fail to show that HRM leads to high performance. On the other hand, using 359 firms with over 12 years of longitudinal firm-level profit data, Kim and Ployhart (2014) suggest that selective staffing and internal training directly and interactively influence firm profit growth through their effect on labour productivity. Similarly, by using panel data to examine the potential casual order between HPWP systems and firm performance in small businesses, both Sheehan (2014) and Razouk (2011) find a positive significant relationship between HRM and performance, even after controlling for the past performance. Hence, overall, we hypothesise that:

H1: HPWPs lead to better firm performance.

There are two main streams of empirical research investigating the relationship between HPWPs and firm performance in SHRM literature. One focuses on the examination of the direct relationship between individual practices and firm performance, while the other directs its efforts towards identifying the effects of a collection of individual HPWPs. The latter situates its analysis within the universalistic, ‘more is better’, perspective and argues that the use of a combination of interrelated, mutually reinforcing HRM interventions should have stronger effects on firm performance than a single HR intervention (Combs et al., 2006; Jennings, 2006). Integrated, complementary HPWP systems are designed not only to improve

the competencies of workforce, but also to encourage and motivate them to use discretionary time and effort to perform tasks. For example, HR practices such as recruiting and selection, training and personal development are designed to enhance the competencies of the workforce, whereas HR interventions such as incentive payment, performance-related reward and appraisals are primarily designed to motivate employees to stay and elicit extra effort at work (Lai and Saridakis, 2013). We hypothesise that:

***H2:** The relationship between HPWPs and firm performance is stronger for HPWP systems than for individual HR practices.*

In the last decade, there have been repeated calls for an opening of the ‘black box’ that represents the missing link in HRM-performance nexus. The primary argument is that the interaction of HPWS at the firm level – employee attitudinal and behavioural responses at the individual level are central to our understanding of the cause-order relationship between HRM and performance (Truss et al., 2013; Paauwe, 2009). According to Dyer and Reeves (1995), an important factor of the HRM-performance relationship is HRM outcomes, that is, employee emotional and behavioural responses and reactions. More specifically, HR policies and practices operate through employee skills, motivation and work design, and then influence employees’ behavioural outcomes, such as discretionary efforts, creativity and productivity (Becker et al., 1997). These subsequently affect operational performance including employee turnover and labour productivity, which ultimately convert into financial performance (Dyer and Reeves, 1995; Huselid, 1995). According to this reasoning, HPWPs should affect operational performance more strongly than financial performance based on accounting returns, growth and market returns (Combs et al., 2006), as operational performance is more directly linked and closer to employees’ behavioural outcomes (Dyer and Reeves, 1995). In contrast to operational performance, financial performance is more

likely to be shaped by a variety of internal and external forces, e.g. market growth and macro-environment. Hence, we hypothesise that:

H3: The relationship between HPWPs and firm performance is stronger for operational performance measures than financial performance measures.

3. Methodology

3.1 Sample

To identify published and unpublished studies that investigate the statistical association between at least one HPWP and organisational performance, we searched for the multiple keywords ‘performance’ or ‘productivity’ or ‘turnover’ or ‘profitability’ and ‘human resource’ or ‘high performance work systems/practices’ ‘longitudinal’ and ‘panel’ in Pro Quest and Primo by Ex Libris. We then check the references list of each of the identified studies as well as reviews and meta-analysis of the SHRM literature (Jiang et al., 2012; Combs et al., 2006; Wright et al., 2005; Boselie et al., 2005; Becker and Gerhart, 1996). To be included in the analysis, a study had to a) examine the relationship between HRM/HPWPs and organisational outcome at macro or organisational level; b) examine the use of HR practices/systems but not the effectiveness or value of these practices or systems (Huselid et al., 1997); c) be a quantitative analysis of a panel dataset, and include sufficient statistical information for the calculation of effect sizes (Cappelli and Neumark, 2001), and d) meet the criteria of ‘predictive’ research design by having collected firm performance data a period of time after implementation of HR practices (i.e. HR practices data is collected at T_1 , whereas firm performance data is collected at T_2). Applying these criteria, eight studies that examined a total of 1,661 organisations survived (see Table 1).

[Table 1 about here]

3.2 Meta-analysis technique

Hunter and Schmidt (2004) suggest that meta-analysis statistically aggregates findings to establish whether a relationship exists and if so, estimate its size (see discussions by Field 2005a, 2005b; Field and Wright, 2006). Effect size estimates are calculated as the mean of the sample size weighted correlation (\bar{r}) from primary studies. Because the study is the unit of analysis in meta-analysis (Hunter and Schmidt, 1990), if a study reports correlations among the multiple measures of HPWPs and different indicators of organisational performance, the within-study correlations are averaged to yield a single estimate for the study (Hunter and Schmidt, 2004).

After sampling error, measurement error has the largest impact on effect sizes. Unfortunately, not all of the studies report reliability coefficients (especially for dependent variable), which makes it impossible to correct each study individually for measurement error. More specifically, two studies which surveyed multiple sources of respondents report interrater reliability (Wright et al., 2005; Youndt et al., 1996), two studies report Cronbach's α (Razouk, 2011; Snell and Youndt, 1995), and one study reports both (Sheehan, 2014). Hence, we use the mean of these available reliabilities to correct \bar{r} (i.e. \bar{r}_c), based on formulas (i.e. $\bar{r}_c = \frac{\bar{r}}{\sqrt{\bar{r}_{xx}\bar{r}_{yy}}}$) introduced by Hunter and Schmidt (2004). In particular, the average reliability for HPWPs (\bar{r}_{xx}) is 0.80, and the average reliability for firm performance (\bar{r}_{yy}) is 0.71.

Chi-square (i.e. χ^2) statistics are used to determine the stability of \bar{r} and to yield appropriate confidence intervals. If a χ^2 is significant this suggests heterogeneity in \bar{r} and

indicates that a wider confidence based is needed on the total variance of \bar{r} . It can be obtained based on the standard error of the total effect size variance, that is, $\sqrt{\sigma_{\bar{r}}^2/K}$ (Whitener, 1990). Alternatively, non-significant χ^2 suggests \bar{r} in a homogeneous population. All variance is assumed to be caused by sampling error, and a narrower confidence interval based on the residual variance of \bar{r} after sampling error is required.

4. Results

Table 2 presents the meta-analysis results. H1 predicts that HPWPs lead to better firm performance. More specifically, HPWPs adopted at time 1 will enhance organisational performances measured at time 2. As shown in Table 2, hypothesis 1 is supported with $\bar{r} = 0.216$ ($p < 0.001$, $\bar{r}_c = 0.287$). H2 states that HPWPs systems have a stronger effect on firm performance compared to individual HRM practices. For an integrated set of HPWPs, \bar{r} is 0.271 ($p < 0.05$, $\bar{r}_c = 0.36$) versus \bar{r} of 0.128 ($p < 0.01$, $\bar{r}_c = 0.17$) for individual HRM practices. More importantly, the difference is significant ($p < 0.001$), suggesting that the statistical relationship between HPWPs and firm performance is stronger when distinct but interrelated HRM systems are employed in organisations. Hence, H2 is supported. Finally, H3 investigates the magnitude of the effect size of HRM on operational and financial performance. Our findings show that the difference is non-significant and operational performance did not reveal stronger effects on financial performance ($\bar{r} = 0.225$, $\bar{r}_c = 0.298$ vs. $\bar{r} = 0.278$, $\bar{r}_c = 0.369$; *n.s.*). Hence, hypothesis 3 is not supported.¹

[Table 2 about here]

¹ There is some interdependence among the samples used to test hypotheses 3. Five studies reported both operational and financial performance measures (e.g. Kim and Ployhart, 2014; Sheehan, 2014).

We perform robustness tests of firm performance measures to ensure the integrity of results (see Table 3), because a single organisational performance dimension may outweigh others. According to the information provided in aggregated studies, we mainly focus on two particular dimensions – accounting returns (e.g. profitability, sales per employee, ROA etc), and productivity. According to the results presented in Table 3, they do not vary significantly from each other.

[Table 3 about here]

5. Discussion

The HRM-performance relationship has been one of the hotly debated topics in the HRM literature. There has been a considerable expansion in theory and research about HRM and performance for the past two decades - in particular, a welcome trend towards use of the dominance of ‘fit’ theory (or contingent framework) and RBV of the firm (Boselie et al., 2005). However, most empirical studies appear to favour a universalistic perspective. The normative HRM model assumes that HRM practices positively affect organisational performance, and often implies that in terms of HRM practices ‘more is better’ (De Winne and Sels, 2013; Kaufman, 2015). An extensive amount of research has supported a positive and direct association between HRM practices/systems and organisational performance, but has not yet shown a clear cause-order relationship between HRM and performance (Guest et al., 2011; Wright et al., 2005). This is largely due to a substantial shortage of methodological rigour in relation to a significant absence of studies using appropriate research designs and longitudinal datasets (for methodological discussion see Shadish et al., 2002).

Meta-analysis can substantially reduce the effects of primary study artifacts, such as sampling and measurement error by statistically aggregating research findings (Crook et al.,

2011), so we combine findings from eight longitudinal studies that estimate the size of the statistical relationship between HRM and firm performance. This is because longitudinal data offer several advantages compared to cross-sectional data, although it is not a panacea for inferring causal relationships. The results ($\bar{r}_c=0.287$, $p<0.001$) suggest that the adoption of HPWPs has a direct and positive impact on subsequent organisational performance.

In contrast, the 'fit' theory advocates argue that the way in which best practices on firm performance is conditional on contingent factors, and varies significantly between employee groups, organisational settings and contexts (e.g. firm size, industry type etc.). Using a meta-analysis of 92 studies to estimate the effect size of HRM on firm performance, Combs et al. (2006) find that HPWP systems improve effect sizes, but they also stress that the context (i.e. manufacturing vs service industry) also matters. Hence, one challenge for future research is to identify those important contextual variables and to match HPWPs systems to both context and overall HRM strategy. Our study focuses on the direct statistical relationship between HRM and firm performance and therefore research conducted at the individual level of analysis in order to understand how these mediators (e.g. employee skills, attitudes and behaviours) respond to HPWPS and subsequently affect organisational performance may merit investigation.

We find that a system of different but complementary HRM practices has a stronger effect on firm performance than individual HRM practices. This further supports the 'more is better' view or the additive and positive impact of different best practices. That is, the more such policies and practices are used, the better the firm performance (Delery and Doty, 1996; Pfeffer, 1998). Although the proposition that a system of HRM interventions has stronger effects than individual ones is evident in other research venues (e.g. Jennings, 2006), Becker et al. (1997) argue that certain combinations of HR practices may negatively affect firm

performance. Recently, some scholars have argued that although employees are exposed to a system of HR practices rather than individual practices, each bundle of HPWPs (e.g. ability-enhancing, motivation-enhancing, participation-enhancing – AMO framework by Appelbaum et al., 2000) are not necessarily equivalent in their impact on employee performance and, subsequently, on firm performance (Jiang et al., 2012). Hence, it may be worthwhile to explore the potential differing effects of each bundle of HPWPs on firm performance in the future research.

Contrary to SHRM theory (Dyer and Reeves, 1995; Huselid, 1995) and the findings from Crook et al.'s (2011) meta-analysis that a stronger relationship between HRM practices and operational performance, our analysis suggests that the magnitude of the statistical relationship are invariant to the choice of organisational performance measures. These findings are further supported by the robustness tests for two most widely investigated dimensions of firm performance – accounting returns and labour productivity. However, this finding is tentative, and the suggestion that relationship that HPWPs influence financial performance via operational performance requires further inquiry and investigation.

It is interesting to compare the estimated effect size obtained here with those reported in previous studies (Jiang et al., 2012; Crook et al., 2011; Subramony, 2009; Combs et al., 2006). Combs et al. (2006) and Subramony (2009) report an overall effect size of 0.20 and 0.23, respectively. However, they did not differentiate studies using 'predictive' research design based on longitudinal data from those using 'post-predictive', 'retrospective' and 'contemporaneous' design (mainly using cross-section dataset). The analysis of Jiang et al.'s (2012) work focuses on examining mediating mechanisms through which three dimensions of HR systems (i.e. skills-enhancing, motivation-enhancing, and opportunity-enhancing) linked to proximal (e.g. human capital and motivation) and distal (e.g. voluntary turnover,

operational and financial outcomes). Again, the different research methods and approaches used in selected studies were not considered in their meta-analysis. The only comparable study is Crook et al.'s (2011), which reports an overall effect size of 0.12 for lagged HRM-performance effect in comparison with 0.29 from the present study. One potential explanation for such variation is the way in which HRM measures are constructed. For example, Crook et al. (2011) apply a broader definition when constructing HRM variable (including specific, nonspecific, or general human capital at general, management, employee level etc.) whereas our HRM measure is relatively specific and appear in line with primary components of HPWPs and AMO framework. Another possibility is that specific HRM policies and practices may be more strategic in nature, creating greater value to firm relative to its costs and more difficult for competitors to imitate in strategy factor market for human capital (Amit and Schoemaker, 1993; Barney, 1986). Indeed, Crook et al.'s (2011)² effect size appears to be very close to ours when human capital is firm specific and strategic ($\bar{r}_c=0.30$).

The RBV of the firm is a theory of sustained competitive advantage and performance in SRHM literature (Barney, 2001; Crook et al., 2008), whilst the contingency theory of SHRM argues that the sustainability of advantage derived from firm-specific human resource may be subject to environmental conditions. For example, a more dynamic environment may lower the value of firm specificity and resource heterogeneity through shortening the time in which human capital skills and capabilities add value (Adner and Zemsky, 2006; Miller and Shamsie, 1996). More crucially, proponents of RBV stress not only the importance of initial resource development and exploration, but also the imperatives of continuously maintaining and renewing existing resource, capabilities and knowledge bases in order to protect

² Crook et al. (2011) also compare the magnitude of the relationship between HR practices and firm performance for studies relying on longitudinal data as opposed to cross-sectional one. The findings suggest that the difference is not statistically significant, suggesting that cross-sectional research captures the HRM-performance relationship to about the same extent as does longitudinal studies. It appears that the size of the relationship may not influenced by temporal factors overall, nature of research designs, and studies that tease out process elements are necessary to consider causality.

competitive advantage (Barney, 1991; Penrose, 1959; Kor and Mahoney, 2004). Thus, investigating how firms preserve and continuously refine human capital and value to sustain competitive advantage and long-term success is a potentially fruitful avenue for future research.

6. Conclusion and implications

Evidence that supports a positive relationship between HPWPs and firm performance has been overwhelming, whereas only a small number of longitudinal studies have investigated the statistical association between HRM and performance (see, e.g. Razouk, 2011; Wright et al., 2005; Guest et al., 2003). Surprisingly, whilst using cross-sectional datasets and non-predictive methodologies in the analysis, much research on HRM-performance linkage has used words like ‘affect’ or ‘impact’ in the discussion when its findings actually suggest an association rather than a causation (Guest et al., 2003). Although longitudinal studies are more informative about the nature of the relationship between HPWPs and firm performance, they can be challenging to execute because of their resource intensiveness (time, money) and complex nature and also because of the low follow-up response rate (between two time periods of data collection) caused by the usual time lag between introduction, implementation and impact of HR practices and firm performance (Wright et al., 2005) and only allow researchers to suggest a possible causal inference (for comprehensive discussion see Shadish et al, 2002).

Using meta-analysis to reduce the impact of sampling and measurement error, our findings provide some supports to the assertion that HPWPs positively affect firm performance, and more importantly, offers scholars a baseline estimate of its size using longitudinal studies. We estimate that firm performance can be enhanced and improved by

0.287 of a standardised unit for each unit increase in the adoption of HPWP, in particular, in a formation of a set of combined and mutually reinforcing HRM practices. However, given a limited number of existing longitudinal studies and difficulties associated with non-experimental research designs examining the causal link between HRM practices still remains a challenge. Future research is encouraged to further develop our hypotheses when more studies are contributed to and pooled into the literature and supplemented with field experiments.

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Table 1: Studies used in the Meta-analysis

Study	Journal	Sample size	HPWPs measures (T₁)^a	Performance measures (T₁)^b	Overall effects
Guest et al. (2003)	<i>British Journal of Industrial Relations</i>	366	Recruitment and selection; training and development; appraisal; financial flexibility; job design; two-way communication; employment security/internal labour market; single status and harmonisation; quality. (W)	Sales per employee (F), profit per employee (F)	0.085
Kim and Ployhart (2014)	<i>Journal of Applied Psychology</i>	359	Selective staffing; internal training. (I)	Profit (F), productivity (O)	0.145
Razouk (2011)	<i>The International Journal of HRM</i>	275	Appraisal linked to performance, training, and promotion; individual wage increases; profit-sharing; information on the formation, strategy, economic situation and employment evaluation; discussion of information; collective discussion; quality action and group of quality. (W)	Social climate for the social performance (O); Innovation (O); profitability (F)	0.69
Sheehan (2014)	<i>International Small Business Journal</i>	336	Recruitment and selection; performance appraisal; performance-based compensation pay; training and development; employee voice, consultation, participation and information sharing; strategic people management. (W)	Financial performance (F); innovation (O); labour turnover (O)	0.167
Snell and Youndt (1995)	<i>Journal of Management</i>	102	Behaviour control (performance, appraisal, standardised procedure, feedback); output control (performance management, evaluation and rewards); input control (staffing, training and development). (I)	Return on assets (F) ; Sales growth (F)	0.003
Welbourne and Andrews (1995)	<i>The Academy of Management Journal</i>	81	Human resource value (training, presence of HR officer, use of full-time employees regularly, employee relations climate); organisation-based rewards (compensation systems based on stock options and profit sharing). (I)	Tobin's Q (F); survival (O); percent price premium (F);	0.038

Wright et al. (2005)	<i>Personnel Psychology</i>	45	Selection; training; pay for performance and performance evaluation; participation. (W)	Workers compensation (O); quality (O); shrinkage (O); productivity (O); Operating expenses (F); profitability (F)	0.008
Youndt et al. (1996)	<i>The Academy of Management Journal</i>	97	Administrative HR; Human-capital enhancing HR (I)	Customer alignment (O); employee productivity (O); machine efficiency (O).	0.273

Notes: ^a Codes in parentheses depict HPWPs measured as HR practices (I) or an overall index (W). ^b Codes in parentheses depict performance as financial performance (F) or operational performance (O).

Table 2: Meta-analytic results

Hypothesis	N ^a	K ^b	\bar{r}	\bar{r}_c	$\sigma_{\bar{r}}^2$	σ_e^2	σ_p^2	% of $\sigma_{\bar{r}}^2$ from artefacts	χ^2	99% confidence interval ^c	95% confidence interval	P - value
H1:Overall SHRM	1,661	8	0.216	0.287	0.048	0.004	0.044	9.12%	11.023 n.s.	-0.32:0.76	-0.19:0.63	<0.001
H2: HPWP systems	1,022	4	0.271	0.36	0.066	0.003	0.063	5.09%	19.722***	-0.38: 0.92	-0.22: 0.76	<0.001
Individual HPWPs	639	4	0.128	0.17	0.007	0.006	0.001	88.74%	1.134 n.s.	0.08:0.20	0.07:0.18	
H3:Operational performance	1,193	6	0.225	0.298	0.092	0.005	0.087	4.96%	20.273***	-0.54:0.99	-0.36:0.80	n.s.
Finance performance ^c	1,564	7	0.278	0.369	0.050	0.004	0.046	7.70%	13.047**	-0.28:0.83	-0.14:0.70	

^aN: total sample size. ^bK: the number of study in the meta-analysis. ^cConfidence intervals are calculated based on \bar{r} (Whitener, 1991). They are partially determined by the amount of residual variance after removing sampling error variance. If χ^2 is significant, we assume residual variance is heterogeneous. Otherwise, homogeneity is assumed.

p**<0.05; ***p<0.001

Table 3: Robustness Tests: Performance measures

Hypothesis	N ^a	K ^b	\bar{r}	\bar{r}_c	$\sigma_{\bar{r}}^2$	σ_e^2	σ_p^2	% of $\sigma_{\bar{r}}^2$ from artefacts	χ^2	99% confidence interval ^c	95% confidence interval	P-value
Performance dimensions												
Accounting returns	1,564	7	0.27	0.358	0.054	0.004	0.050	7.16%	14.038**	-0.31:0.85	-0.17:0.71	<0.01
Productivity	867	4	0.152	0.202	0.006	0.004	0.001	76.21%	1.318 n.s.	0.06:0.25	0.08:0.23	<0.001

^aN: total sample size. ^bK: the number of study in the meta-analysis. ^cConfidence intervals are calculated based on \bar{r} (Whitener, 1991). They are partially determined by the amount of residual variance after removing sampling error variance. If χ^2 is significant, we assume residual variance is heterogeneous. Otherwise, homogeneity is assumed.

However, we are unable to perform the tests for individual HPWPs because we do not have enough studies (usually requires two or more) to conduct meta-analysis.

** $p < 0.05$