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The impact of pay dispersion on organizational performance

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Resumo

Embora existam muitas teorias e vários estudos com o objetivo de explicar o impacto da dispersão salarial no desempenho organizacional, a existência e a direção dessa relação, bem como que fatores o moderam, permanecem incertas. Utilizando a metodologia PRISMA, o presente estudo executou uma revisão sistemática de literatura e reuniu uma amostra de 26 artigos sobre o tema de forma a compreender de que forma a dispersão salarial é definida e conceitualizada, se existe uma relação entre a dispersão salarial e o desempenho da empresa e se o impacto da primeira no último é positivo ou negativo, reunir e estudar as teorias existentes que conectam a dispersão salarial e o desempenho organizacional e entender quais explicam os impactos encontrados, verificar se existem variáveis que moderem esse relacionamento e, em caso afirmativo, quais. Este estudo constatou que, embora os estudos sobre dispersão vertical de salários encontrem principalmente um impacto positivo, confirmando os argumentos da teoria dos torneios, e os estudos sobre dispersão horizontal encontrem um impacto negativo, confirmando argumentos de equidade/justiça, a existência de um relacionamento, a sua direção, e intensidade parecem depender de vários fatores contextuais, apontando para uma perspetiva de contingência.

Palavras-chave: dispersão salarial, compensação, desempenho organizacional, desempenho empresarial

Classificação JEL:

J3 – Wages, Compensation, and Labor Costs

M5 – Personnel Economics

Abstract

Although there are many theories and several studies aiming to explain the impact of pay dispersion on firm performance, the existence and direction of this relationship, as well as what factors moderate it, remains unclear. Using the PRISMA methodology, the present study performed a systematic literature review and gathered a sample of 26 papers on the topic to understand how pay dispersion is defined and conceptualized, if a relationship between pay dispersion and firm performance exists and if the impact of the first on the latter is positive or negative, to gather and study the existing theories that connect pay dispersion and organizational performance and understand which ones explain the found impacts, to verify if there are any variables that moderate this relationship and, if so, which ones. The present study has found that although studies on vertical pay dispersion mainly find a positive impact, confirming tournament arguments, and studies on horizontal dispersion find a negative one, confirming equity/fairness arguments, the existence of a relationship, its direction and intensity seems to depend on several contextual factors, pointing towards a contingency perspective.

Keywords: pay dispersion, compensation, organizational performance, firm performance

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1. Introduction

Although there is some enlightenment on what types of dispersion have a more significant impact on performance, on the way this impact takes place, and on which variables moderate this influence, a broader understanding of this relationship and the way it takes place is needed in order to reach generalizable conclusions.

Bloom (1999) highlights that the main goal of compensation policy makers is to design pay distributions in a way that leads to organizational success, and that a key question for decision makers in firms is whether a more compressed or more hierarchical pay distribution has impacts for both employee and organizational performance. These considerations make pay dispersion an important area for empirical research (Bloom, 1999). Shaw, Gupta, and Delery (2002) also note that the most significant human resource management system for an effective strategy implementation is, arguably, an organization's compensation system. The theoretical conundrum in literature concerning reward allocations in organizations (Pfeffer and Langton, 1993) – pay compression versus pay dispersion – has led researchers to take an interest in this topic and, for the past two decades, studies attempted to conclude whether pay structures should be compressed or dispersed in order to foster individual motivation and organizational effectiveness (Shaw, 2014).

Empirically, the direction of the relationship between pay dispersion and performance remains unclear, as studies on this topic have not reached a definite consensus. For example, studies using evidence from professional sports usually find either a negative or insignificant relationship between pay dispersion and performance, while studies focusing on executive compensation or firm level dispersion usually reach different conclusions (Braakman, 2008).

There are six main reasons why there is presently a lack of clarity regarding the dynamics of pay dispersion (Gupta, Conroy, and Delery, 2012). First, pay dispersion can be conceptualized and operationalized in different ways (e.g. the effects of within-job dispersion may be very different from the ones of across-job dispersion). Second, pay dispersion can be attributed to a great number of factors and these sources may have different effects (e.g. variations in performance, in markets, in the organization's strategy or structure, etc.). Third, the impact of pay dispersion on outcomes may be different depending on the measured outcome (e.g. individual perceptions, employee performance, workforce performance, organizational financial performance and profits). Fourth, different measurements of pay dispersion may lead to different conclusions (e.g. pay range, coefficient of variation, Gini coefficient, etc.). Fifth,

the definition of pay may vary across studies (e.g. annual pay, prize money, annual pay and overtime, etc.). Sixth, the effects of pay dispersion on outcomes may be moderated by other factors.

As the relationship between pay dispersion and organizational performance remains unclear, the first objective of the present study is to find out how pay dispersion is defined and conceptualized (which constructs are commonly used). The second is to understand what kind of relationship exists between pay dispersion and firm performance (if it exists and if this impact is positive or negative). The third is to gather and study the existing theories that connect dispersion and organizational performance and understand which ones explain the found impacts. Finally, the fourth objective is to understand if there are any variables that moderate this relationship and, if so, which ones. These objectives will be achieved through a systematic literature review.

This dissertation will be helpful for understanding the relationships between pay dispersion and firm performance and is expected to ultimately help managers design pay structures which allow the achievement of better organizational results. It will be comprised of (1) an introduction – which will include the relevance of the topic, objectives of the study, and keywords; (2) literature review – which will elaborate on the main concepts and theories; (3) methodology – divided into method, inclusion criteria, article selection, review method, and analysis; and (4) conclusions – including the conclusions derived from the results of the data analysis, managerial implications, limitations of the study, and directions for future research.

2. Literature Review

2.1. Pay dispersion

Pay distributions within an organization are the set of pay levels – the absolute rates of compensation assigned to employees or jobs within an organization (Bloom, 1999) – paid for differences in work responsibilities, human capital, or individual performance (Milkovich and Newman, 1996). Two types of distributions are common: hierarchical and compressed. Dispersed pay distributions are spread out so that high earners make substantially more than low earners (Downes and Choi, 2014) - a greater proportion of pay is concentrated in relatively few levels, jobs, or individuals that are near the top of the distribution (Bloom, 1999). As such, there is less equality across pay levels, which may be several, as pay is more widely dispersed. Conversely, in compressed pay systems, high and low earners are fairly close to each other when it comes to total rewards (Downes and Choi, 2014) - pay is more concentrated and is spread more equally across jobs or individuals. A compressed pay distribution may also have fewer pay levels than a hierarchical one (Bloom, 1999).

The difference between hierarchical and compressed pay distributions is in the amount of pay dispersion. Shaw (2014) defines pay dispersion - also known as pay variation, pay range, pay spread, or pay inequality - as the difference in pay levels between individuals within and across jobs or organizational levels. Bloom and Michel (2009) define it as the amount of inequality in pay which is due to a firm's pay structure. Gupta *et al.* (2012) provide a shorter definition and define pay variation as the extent to which pay varies within a collective.

There are also two different concepts regarding where pay dispersion occurs – horizontal pay dispersion and vertical pay dispersion.

According to Shaw (2015), horizontal dispersion exists when employees doing similar jobs are paid different rates. Thus, if individuals in the same job level or with similar job roles are getting paid very differently, one can say that horizontal pay dispersion is high. Downes and Choi (2014: 57) define horizontal pay dispersion as "the degree that pay varies for employees within a given job or hierarchical level". Siegel and Hambrick (2005) argue that two factors influence horizontal dispersion: different perceptions of value to the organization may lead to different compensation, and pay structures that reward individual/sub-unit performance rather than group performance.

Also Shaw (2015), referencing Gupta *et al*. (2012) and Shaw (2014), defines vertical dispersion as the spread of pay across organizational echelons (Shaw, 2015). This means that vertical pay dispersion is high when there is a large pay gap between job levels within the organization. Downes and Choi (2014: 57) define it as a "between-job construct that generally relates to the "slope" of the pay structure within a firm", meaning that steeper pay structures exhibit a higher vertical dispersion than flatter (more compressed) structures. Siegel and Hambrick (2005) mention two factors that may contribute to vertical pay dispersion: the creation of extreme tournaments within the organization (*vide* subchapter 2.3.1), and a hierarchy with great distances between social, informational and status levels.

Overall, it can be said that pay dispersion is the amount of inequality in pay levels between jobs at the same level or echelon (horizontal dispersion), or jobs in different levels or echelons (vertical dispersion).

2.1.1. Measurement

There are several measures of dispersion present in pay dispersion literature, which mainly depend on the available data and the purpose of the analysis. These measures or indicators may be unconditional – calculated without adjusting for different characteristics of the workforce or organization – or conditional – calculated controlling for observable characteristics such as education, experience, and gender (Hunnes, 2009).

Unconditional measures include, but are not limited to, (1) the Gini coefficient – one of the most commonly used measures of income inequality in management and economics (Shaw, 2015) –, (2) the coefficient of variation, (3) the difference (range) between pay levels or maximum and minimum pay, (4) the ratio between pay levels or maximum and minimum pay, (5) ratio of the 80th to 20th percentiles of wages (or 90th to 10th) (a kind of range: the greater the range, the greater the dispersion), (6) standard deviation of pay level, (7) the Herfindahl-Hirshmann index, and (8) the Theil index.

As for conditional measures, one of the first authors to propose using the standard error of a wage regression as a measure of pay inequality, as they state "the pay structure should account for different observable productivities, and only the residual inequality should matter" were Winter and Zweimüller (1999). They proposed to run for each firm and for each year a separate tobit wage regression, whose standard errors are taken as the conditional wage differential. Other authors have also used the same or other wage regressions to compute pay dispersion in

similar approaches. In addition, Martins (2008) has also used the ratio of the 90th to 10th percentiles of the residuals of the wage equation as a measure for pay dispersion.

Unconditional measures are more frequently used than conditional measures. The latter are applicable mainly to vertical pay dispersion, although any of the aforementioned constructs may be applicable to measure this kind of dispersion. Several papers use unconditional indicators of pay dispersion, while 'tournament' and 'fairness' theories suggest the use of conditional indicators, as they assume workers with comparable characteristics (Mahy, Rycx, and Volral, 2011). Studies which measure horizontal pay dispersion usually use unconditional measures such as the difference, ratio, or standard deviation between pay levels / between maximum and minimum pay.

Table 1		
Measures of pay dispersion		
Unconditional indicators		
Indicator	Calculation	Type of dispersion
Gini coefficient	$Gini\ coefficient = 1 + \frac{1}{n} - \frac{2}{n^2 \bar{y}}\ (y_1 + 2y_2 + \cdots + ny_n)$ (1), where • y_1 to y_n are the annual pay levels of employees arranged in decreasing order of size; • $\bar{y}$ is the mean pay level; • n is the number of full-time employees	Vertical
Coefficient of Variation	$Coefficient\ of\ Variation = \frac{standard\ deviation}{sample\ mean}$ (2)	Vertical
Difference (range) between pay levels / maximum and minimum pay	$Pay\ dispersion = maximum\ pay\ (or\ pay\ level\ 1) - minumum\ pay\ (or\ pay\ level\ 2)$ (3)	Vertical Horizontal
Ratio between pay levels / maximum and minimum pay	$Pay\ dispersion = \frac{maximum\ pay\ (or\ pay\ level\ 1)}{minumum\ pay\ (or\ pay\ level\ 2)}$ (4)	Vertical
Ratio of the 80th to 20th (or 90th to 10th) percentiles of pay	$Pay\ dispersion = \frac{80^{th}\ (90^{th})\ percentile\ of\ wages}{20^{th}\ (10^{th})\ percentile\ of\ wages}$ (5)	Vertical
Standard deviation of pay level	$\sigma_{pay\ level} = \sqrt{Var[pay\ level]}$ (6)	Vertical Horizontal
Herfindahl-Hirshmann index	$\sum_i \left(\frac{x_i}{\bar{x}}\right)^2$ (7), with $\frac{x_i}{\bar{x}}$ representing each worker i's share of wages	Vertical

Table 1 (continued)		
Unconditional indicators		
Indicator	Calculation	Type of dispersion
Theil index	$T(w,n) = T(w^1, \ldots, w^R; n) = \sum_r \frac{n_r \bar{w}_r}{n \bar{w}} T(w^r; n_r) + \frac{1}{n} \sum_r n_r \frac{\bar{w}_r}{\bar{w}} log \frac{\bar{w}_r}{\bar{w}}$ (8) where $\quad w = (w_1, \ldots, w_n)$ and $\quad \bar{w} = \sum_i \frac{w_i}{n}$; $i = 1, \ldots, n$ and where $\sum_r \frac{n_r \bar{w}_r}{n \bar{w}} T(w^r; n_r)$ represents within-group pay dispersion and $\frac{1}{n} \sum_r n_r \frac{\bar{w}_r}{\bar{w}} log \frac{\bar{w}_r}{\bar{w}}$ represents between-group pay dispersion	Vertical Horizontal
Conditional indicators		
Residual/standard error of wage regression (or standard deviation of residual/standard error)	$\ln W_{ijt} = a_{jt} + \sum_k b_{k,jt} Z_{k,ijt} + \varepsilon_{ijt}$ (9) $\ln W_{ijt} = \ln W_{ijt}^*$ if earnings are not top-coded $\ln W_{ijt} = \ln T_t$ if earnings are top-coded at T_t j indexes firms; t indexes time; i indexes individuals the annual pay levels of employees arranged in decreasing order of size	Vertical
Ratio of the 90th to 10th percentiles of the residuals of the wage equation	$Pay\ dispersion = \frac{80^{th}\ percentile\ of\ residuals}{20^{th}\ percentile\ of\ residuals}$ (10)	Vertical

2.2. Organizational performance

There isn't a consensus among researchers on a definition of performance and, many times, there is some confusion between performance and effectiveness. In fact, Richard, Devinney, Yip, and Johnson (2009) present a list of 14 papers in which effectiveness measures were used to describe performance. The authors further explain that performance is a type of effectiveness indicator, whereas organizational effectiveness is a broader concept, which includes organizational performance, but is based in organizational theory that entertains alternate performance goals (Richard *et al.*, 2009).

Organizational performance includes three main areas of organizational outcomes (Richard *et al.*, 2009): financial performance, product market performance, and shareholder return. Organizational effectiveness, on the other hand, is broader and not only includes organizational performance, but also many other internal performance outcomes and other external measures (e.g. corporate social responsibility) (Richard *et al.*, 2009).

2.2.1. Measurement

Richard *et al*. (2009) divide measures of organizational performance into objective (accounting measures, financial market measures, mixed accounting/financial market measures, and survival) and subjective measures, and further elaborate and provide examples.

Accounting measures are the most common and readily available, and include (1) cash flow from operations, (2) earnings before interest and taxes (EBIT), (3) earnings before interest, taxes, depreciation, and amortization (EBITDA), (4) market share, (5) net operating profits (earnings), (6) net operating profit less adjusted taxes (NOPLAT), (7) profit margin, (8) return on assets (ROA), (9) return on book-valued assets, (10) return on capital employed (ROCE or ROC – return on capital), (11) return on equity (ROE), (12) return on investment (ROI), (13) return on invested capital (ROIC), (14) return on net assets (RONA), (15) return on sales (ROS), (16) return on total assets, (17) risk-adjusted return on capital (RAROC or RORAC – return on risk-adjusted capital), (18) sales, (19) sales growth, and (20) variance in accounting profitability.

Financial market measures are most used in strategy, economics, and finance literature, and include (1) beta coefficient, (2) earnings-per-share (EPS), (3) Jensen's alpha, (4) market value (or market capitalization), (5) price-to-earnings ratio (P/E), (6) return on market-valued assets, (7) stock price, (8) total shareholder return (TSR), and (9) tracking stocks.

Mixed accounting/financial market measures are better than accounting measures at balancing risk against operational performance issues, which are sometimes lost in market measures, and include (1) balanced scorecard, (2) cash flow per share, (3) cash flow return on investment (CFROI), (4) cash value added (CVA), (5) discounted cash flows (DCF), (6) economic value added (EVA), (7) free cash flows, (8) internal rate of return (IRR), (9) market-to-book value, (10) market value added (MVA), (11) net present value (NPV), (12) shareholder value analysis (SVA), (13) Tobin's *q*, (14) total business return (TBR), weighted equity value (WEV), (15) weighted average cost of capital (WACC), and (16) Z-score.

Survival is pertinent to both managers and researchers, as many firms fail, and is a common dependent variable in organizational sociology and entrepreneurship. It is usually measured by a categorical variable which captures the ongoing presence of the organization.

Subjective measures derive from asking well-informed subjects, termed key informants, about the performance of the firm, and can be divided into two categories: fully subjective measures and quasi-objective (which replicate objective measures).

Table 2	
Measures of organizational performance	
Accounting measures	
Usage	Indicator
Most common and readily available	Cash flow from operations
	Earnings before interest and taxes (EBIT)
	Earnings before interest, taxes, depreciation, and amortization (EBITDA)
	Market share
	Net operating profits (earnings)
	Net operating profit less adjusted taxes (NOPLAT)
	Profit margin
	Return on assets (ROA)
	Return on book-valued assets
	Return on capital employed (ROCE)
	Return on capital (ROC)
	Return on equity (ROE)
	Return on investment (ROI)
	Return on invested capital (ROIC)
	Return on net assets (RONA)
	Return on sales (ROS)
	Return on total assets
	Risk-adjusted return on capital (RAROC or RORAC – return on risk-adjusted capital)
	Sales
	Sales growth
	Variance in accounting profitability

Table 2 (continued)	
Financial market measures	
Usage	Indicator
Most used in strategy, economics, and finance literature	Beta coefficient
	Earnings-per-share
	Jensen's alpha
	Market value (or market capitalization)
	Price-to-earnings ratio (P/E)
	Return on market-valued assets
	Stock price
	Total shareholder return (TSR)
	Tracking stocks
Mixed accounting / financial market measures	
Usage	Indicator
Better than accounting measures at balancing risk against operational performance issues, which are sometimes lost in market measures	Balanced scorecard
	Cash flow per share
	Cash flow return on investment (CFROI)
	Cash value added (CVA)
	Discounted cash flows (DCF)
	Economic value added (EVA)
	Free cash flows
	Internal rate of return (IRR)
	Market-to-book value
	Market value added (MVA)
	Net present value (NPV)
	Shareholder value analysis (SVA)
	Tobin's q
	Total business return (TBR)
	Weighted equity value (WEV)
	Weighted average cost of capital (WACC)
	Z-score

Table 2 (continued)	
Survival	
Usage	Indicator
Pertinent to both managers and researchers, as many firms fail, and is a common dependent variable in organizational sociology and entrepreneurship	Categorical variable which captures the ongoing presence of the organization
Subjective measures	
Usage	Indicator
Derive from asking well-informed subjects, termed key informants, about the performance of the firm	Fully subjective measures
	Quasi-objective measures (which replicate objective measures)

2.3. Main theories

Downes and Choi (2014) propose that different types of pay dispersion have different impacts on performance, such as performance-based and non-performance-based dispersion and vertical and horizontal dispersion. The combination of both types of pay dispersion should affect firm-level performance by impacting individual motivation (e.g., effort, engagement, extra-role behaviours) and sorting (attraction, recruiting, hiring, and retention) (Downes and Choi, 2014).

There are opposing views which aim to explain how these effects take place, and advocate for different kinds of pay structures. There are several theories that can be grouped into main categories which represent these different perspectives, such as:

(1) tournament theory;

(2) equity/fairness theories;

(3) efficiency wage theory;

(4) legitimacy perspective / pay basis approach;

(5) contingency theory and

(6) motivational theories.

Researchers from social psychology and organizational behaviour support more compressed pay structures, mostly grounded on equity/fairness considerations from equity (Adams, 1963), relative deprivation (Martin, 1981), and social comparison (Festinger, 1954) theories. Popular theories also include organizational justice theory and the fair-wage effort hypothesis (Akerlof and Yellen, 1990). Levine (1991) states that pay compression improves cohesiveness and reduces conflict between employees in an organization, and adds that in case that a high degree of cooperation and communication is needed, the increase in cohesiveness derived from pay compression should increase the firm's total productivity - perceived inequity due to a high degree of pay dispersion should eventually lead to competitive and sabotaging behaviours (Lazear, 1989; Levine, 1991). Another strand of literature that supports wage compression is Milgrom (1988) and Milgrom and Roberts' (1990) 'theory of organizational politics'. The authors state that wage compression should reduce workers' propension to: (i) try to increase their influence by withholding information from management, (ii) engage in costly rent-seeking activities instead of productive work and (iii) take decisions based on personal interest, without concern for the organization's profitability.

Opposingly, tournament theory claims that pay dispersion has a motivating effect, in that it encourages competition for the prize of higher rank and pay (Lazear and Rosen, 1981), and is the basic argument for merit-based compensation systems. However, tournament theory implies that tournament pay conditions leads employees to aggressively self-promote, regardless of the consequences to others, and even engage in sabotaging behaviours (Lazear, 1989). This leads Lazear (1989) to suggest that a compressed wage structure should be chosen over a dispersed one in the case that low work cohesion due to sabotaging behaviours overwhelms the initial incentive effect of a performance-related pay system.

However, some authors advocate that pay dispersion *per se* neither improves nor reduces performance, and adopt a contingency theory to account for the organizational contingencies and social psychological factors that may affect the impact of pay dispersion on firm performance (e.g. Beaumont and Harris, 2003). Others use legitimacy factors as grounds to justify the effectiveness of dispersion on increasing firm performance, predicting that this impact would be positive if pay differences are viewed as justified – or legitimate – and negative if otherwise (e.g. differences in human capital, performance-related pay).

Additional theories that focus on the relationship between pay dispersion and organizational performance include (1) efficiency wage theory – which argues that an

employee's effort depends on the degree of pay dispersion within the firm, and not only on their pay level; (2) managerial power theory (outside of the scope of the present study, since it focuses only on top management team, or TMT, compensation) and which defends that a larger wage gap between CEOs and other executives reflects a powerful CEO's ability to allocate more benefits to themselves, as it is easier than to design optimal contracts to maximize shareholder value; (3) motivational theories – which state that the implementation of explicit incentive schemes generate excessive external monitoring, reducing employees' intrinsic motivation to achieve good performance.

Other theories are also used as ground as supporting arguments for the main theories applied (e.g. Shaw *et al*. (2002) use expectancy, goal-setting, operant conditioning, justice, and institutional theories to support the base argument that pay dispersion increases workforce performance in the presence of formal individual incentive systems, although one could argue that the main theories applied in this study are legitimacy and contingency).

2.3.1. Tournament theory

Tournament theory considers a group of employees who compete against each other for the prize of high rank and pay (Lazear and Rosen, 1981) and is the basic argument for merit-based compensation systems. "Winning" the tournament means getting promoted to upper echelons in the organization and receiving higher pay, which is why a larger reward at higher rather than lower ranks motivates the participants to increase their efforts and therefore their chances of getting better results, committing themselves to organizational interests and priorities (Becker and Huselid, 1992). According to Prendergast (1999), the incentive effect on managers to compete in the tournament and effort to win the prize are greater when both high levels of pay dispersion between hierarchies and uncertainty over who will be promoted are present.

The incentive effects of pay structures that reward employees according to their relative ranks in the organization's hierarchy rather than their absolute levels of output were first pointed out by Lazear and Rosen (1981).

Rosen (1986) argues that the value of reaching a certain rank is reduced the fewer ranks there are left to attain, since the value of winning the contest at every level (except the highest) includes not only the prize for that rank, but also the possibility – or option – to compete for

further prizes higher in the hierarchy. Therefore, the ratio of pay between ranks needs to be increased so that participants have an incentive to remain in the tournament. When participants reach the highest rank, there are no further prizes to win, which is why the reward for reaching this level must be very large. Rosen (1986) has found that as an employee moves up in the organization's hierarchy, the inter-rank pay gap increases – this gap is largest between the CEO and second-tier managers – making the optimal pay structure one with a convex relationship between pay and job level, with an additional premium for top-ranking prizes (Rosen, 1986).

Tournament models also predict that, for risk-neutral players, the prize spread increases with market uncertainties such as randomness (Lazear and Rosen, 1981) – in risky business environments, employees' motivation and effort to try to get promoted decreases, leading firms to increase the rewards so to offset this effect.

The number of contestants (McLaughlin, 1988; Main, O'Reilly, and Wade, 1993; Eriksson, 1999; Prendergast, 1999; Conyon, Peck, and Sadler, 2001) would also impact dispersion, as a marginal increase in effort would only have a small effect in the likelihood of winning (McLaughlin, 1988). Thus, to induce employee effort, organizations would need to provide a large enough reward. There is also evidence that there is a positive relationship between the number of vice-presidents and the pay gap between the CEO and vice-presidents. However, some authors have also found evidence of a negative impact of the number of managers with significant responsibilities and pay dispersion (O'Reilly *et al*.,1988; Henderson and Fredrickson, 2001).

Other factors that increase pay dispersion include stock return volatility (Lippert and Porter, 1997), and noisy environments - so to compensate for the reduction in effort caused by the random component in pay (Eriksson, 1999).

Lazear (1989) shows in his 'industrial politics and sabotage' model that if employees are competing for the same prize, they may redirect their efforts from competition to sabotaging rivals to induce their failure in order to win the prize themselves. The author concludes that a compressed wage structure may work better than a hierarchical one when the initial incentive effect of a hierarchical pay structure is offset by some employees' sabotage behaviours, which lead to low work cohesion. In their 'theory of organizational politics', Milgrom and Roberts (1988) suggest that a higher pay gap would increase lower management to increase their effort to achieve a better performance. However, this improvement would often be due to individual

endeavour instead of an increased collaboration among employees. In some cases, individuals might even engage in political sabotage so to increase their chances of getting promoted ahead of their peers.

Chen (2003) agrees that aggressive workers may work to undermine the performance of others through sabotage if it proves easier and less costly than improving their own performance, in situations where pay and rank depend on relative performance. Thus, hierarchical pay structures may lead to aggressive risk-taking, unhealthy competition, uncooperative behaviour, or even sabotage, leading to a poorer firm performance (Becker and Huselid, 1992; Lazear, 1989; Lazear, 1995).

While tournament theory is usually applied to vertical pay dispersion, Gupta *et al*. (2012) argue that, in specific instances, it may be possible to apply tournament theory in horizontal pay variation. For example, when pay is structured as a zero-sum game - when employees compete amongst each other for higher pay - tournament mechanisms could be operative. The authors add that tournament dynamics would occur only when such zero-sum systems are present (e.g. competition among employees could happen in cases where only the highest performer will get a pay raise).

2.3.2. Equity/fairness theories

2.3.2.1. Equity theory

Equity theory states that employee rewards should be proportional to the level of their input, since they evaluate whether the employer-employee exchange relationship is fair by comparing input-outcome ratios. The inputs are effort and skills, and the outputs are pay and other rewards (Adams 1963; Cowherd and Levine 1992). If the ratio of an employee is different from their colleagues', they will perceive inequity. In this case, employees may either change their inputs (such as lowering their effort) or outcomes (such as negotiating a pay raise), or the way the difference in ratios between them and their counterparts is perceived. However, if the difference in pay is seen as justified, by either the colleagues' greater inputs or outcomes, it will be perceived as fair.

Since employees rely on pay to assess the fairness of their rewards, pay imbalances may lead to feelings of inequity, injustice, and jealousy, leading to a reduction in satisfaction and commitment. Thus, it is generally accepted by adepts of this perspective that pay dispersion should lead to a decrease in motivation, effort, and cooperation (Cowherd and Levine, 1992), and may ultimately lead to turnover (Bloom and Michel, 2002; Dye, 1984; Gupta *et al.*, 2012).

There is empirical evidence which supports a negative impact of pay dispersion on some performance-related outcomes (Bloom, 1999; Fredrickson, Davis-Blake, and Sanders, 2010; Grund and Westergaard-Nielsen, 2008; Siegel and Hambrick, 2005).

Grounds of equity theory led Milgrom and Roberts (1988) and Levine (1991) to conclude that pay compression leads to a reduction in conflict and an improvement in cohesiveness between members of the organization. Levine adds that in a firm where teamwork is essential, the increase in cohesiveness derived from pay compression should increase the firm's total productivity.

2.3.2.2. Social comparison theory

Social comparison theory states that individuals often compare themselves with referent others whom they consider to be similar to them in certain attributes such as demographic characteristics, abilities, or position (Festinger, 1954), so to make sense of their own abilities and assess the fairness of rewards (Finkelstein, Hambrick, and Cannella, 2009). In case their comparison is unfavourable, morale and motivation may decrease, leading to a reduction in the firm's long-term performance trend.

2.3.2.3. Relative deprivation theory

The relative deprivation theory (Martin, 1981) states that people draw their conceptions of fairness from comparisons with salient others. According to this theory, employees experience deprivation when comparing their wages to those of a reference group and find that they receive less. The reference group can be composed of workers in similar occupations in the same firm, in dissimilar occupations in the same firm, or workers in other firms. If employees feel that they are getting paid under what they perceive as fair, they experience a feeling of deprivation,

leading to absenteeism, strikes, or other adverse reactions. Additionally, since workers become less committed to organizational goals, there is a decrease in cooperation and cohesiveness (Cowherd and Levine, 1993; Deutsch, 1985).

According to Martin (1981), relative deprivation considers that employees compare their outcomes with little regard for differences in inputs (effort, ability, or skills), as differences in pay are more evident, whereas input differences are hard to measure, leading employees to assess their rewards rather than their contributions (Pfeffer and Langton, 1993). Thus, a large pay dispersion should lead to employee dissatisfaction, even in cases when it is due to actual differences in productivity (Bloom, 1999; Cowherd and Levine, 1992; Pfeffer and Langton, 1993).

2.3.2.4.   Organizational justice theory

Organizational justice arguments (Sheppard, Lewicki, and Minton, 1992) state that pay dispersion could be beneficial for performance if resulting from the use of individual incentives. The linking of individual incentives and pay dispersion to outcomes desired by the organization involves a consideration of the appearance of justice, as perceptions of justice will lead to behavioural reactions such as improved workforce performance, and perceptions of injustice to effort reduction, retaliation, scepticism, and sabotage (e.g., Bishop, 1987; Skarlicki and Folger, 1997).

Impressions of the decisions about allocation of outcomes among organizational members are continually managed by the organization, which is why consistency is critical. Formal procedures, such as individual incentive systems, reduce the perceptions of violation of justice rules and likelihood of getting unexpected results (Gergen, Greenberg, and Willis, 1988), and consequently the perceptions that political factors such as favouritism or nepotism can account for pay dispersion among employees (Gupta and Jenkins, 1996). Furthermore, incentive systems convey an increased perception of control over the outcomes of the system (pay dispersion), an essential component of organizational justice (Folger and Greenberg, 1985).

However, Meyer (1975) states that, while basing pay on performance should lead to employees' perception of fairness and justice, people tend to overestimate their own performance. Thus, they may feel unfairly treated and engage in negative behaviours such as

reducing effort or leaving their jobs, when their rewards are low. In pay systems with large performance-based distinctions, these perceptions and reactions should be mainly focused on low performers, since high performers will feel they are being treated fairly and therefore have positive responses. Both cases should lead to an increase in workforce productivity. However, if the distinctions in performance-based pay are small, high performers will perceive injustice, since their rewards will only be slightly better than those of poorer performers, and engage in negative behaviours as well, resulting in a poorer workforce productivity (Shaw and Gupta, 2007; Trevor, Gerhart, and Boudreau, 1997).

2.3.2.5.   Fair wage-effort hypothesis

The fair wage-effort hypothesis was developed by Akerlof and Yellen (1990) based on equity theory (Adams, 1963) and relative deprivation theory (Martin, 1981) from social psychology, social exchange theory (Blau, 1955) from sociology, and efficiency wage theory from economics (Summers, 1988). The hypothesis suggests that employees compare their wages internally (with those of colleagues within the same firm) and/or externally (with those of workers from other firms or industries) to assess whether they are being paid fairly, and that they believe that compressed pay structures are fairer than productivity differentials.

The fair wage-effort hypothesis predicts that employees proportionately reduce their efforts as their wages fall short of what they consider fair (Akerlof and Yellen, 1990). If employees feel they are underpaid, they tend to withdraw effort and/or engage in sabotage towards their employer, absenteeism, strike, vandalism, or violence (Crosby, 1984), reducing workforce productivity. Pay differences would lead to feelings of inequity, competitiveness, reduction in cooperation and commitment and dissatisfaction. Thus, performance levels would be reduced (Bloom, 1999; Levine, 1991; Pfeffer and Langton, 1993).

2.3.3. Efficiency wage theory

Akerlof and Yellen (1988), based on the effort version of the 'efficiency wage' theory (Solow, 1979), argue that in an organization where employees' characteristics are not totally observable and where it is not possible to perfectly monitor their actions, there is a need to find

well-suited incentives to maximize their effort. The authors provide an effort function of a worker which shows that an employee's effort depends not only on their pay level but also on the degree of pay dispersion within the organization. The authors add that a compressed wage distribution improves labor relations and increases employee effort, leading to a greater output per worker.

2.3.4. Legitimacy perspective / pay basis approach

According to Bishop (1987), dispersed pay structures yield three primary benefits: they motivate employees to increase their effort, they attract a higher calibre of workforce, and they reduce the likelihood of employees looking for better jobs elsewhere. These arguments assume that said dispersion is due to legitimate reasons, and that highly valued human capital receives a higher compensation than less valued human capital. However, these benefits are unlikely to be achieved when pay dispersion occurs for reasons viewed as illegitimate. Gupta and Jenkins (1996) argue that dispersion due to dysfunctional procedures, a lack of formal procedures, game-playing, or politics will most likely be ineffective. Thus, the benefits presented by Bishop (1987) are due, not to a high degree of pay dispersion per se, but to legitimate and/or normatively accepted dispersion-creating practices.

Although Bloom (1999) and Pfeffer and Langton (1993) both argued that pay dispersion was negatively related to performance, Gerhart and Rynes (2003) and Trevor, Reilly, and Gerhart (2012) argue that explained and unexplained pay dispersion each has different effects on firm performance, defending that human capital and pay basis variables are of critical interest to pay dispersion research. This requires the assumption that acquiring and developing human capital is the primary mechanism through which pay dispersion impacts firm performance. For example, the difference in pay between a more highly educated and experienced employee would be considered explained in the Gerhart and Rynes approach, as the organization must pay more to acquire such an individual, and the acquisition of those skills (at the collective level) should lead to a higher firm performance.

This raises questions about how the coefficient of a pay dispersion measure should be interpreted when human capital or pay basis variables are included (thus controlled for) in the model. For example, controlling for human capital could exclude a part of the variance in the pay dispersion measure that is due to employees having higher levels of ability or performance.

In this case, the independent variable would represent pay dispersion not tied to individual differences in performance, coining this residual "unexplained pay dispersion", meaning a non-individual performance-related pay. Thus, models which control for human capital are often misinterpreted to imply that pay dispersion negatively impacts performance (e.g., Pfeffer and Langton, 1993). These arguments would require a more careful interpretation, which is that unexplained pay dispersion negatively impacts performance.

Gupta *et al*. (2012) argued that pay variation due to performance-related pay should increase performance by increasing motivation, which would not happen due to other factors (e.g., seniority or politics). This difference in terminology is important from an employee reaction perspective to pay dispersion. For example, pay differences based on individual differences in skills would not be "performance-based" according to Gupta *et al*.'s (2012) language, but most likely would be "explained" using Trevor *et al*.'s (2012) language. The pay basis approach to pay dispersion suggests that employees will not perceive unfairness if the pay differences between individuals are legitimately based on differences in performance outcomes (Downes and Choi, 2014). When there is a tight connection between performance and pay, dispersed pay structures would positively impact individual motivation, as high-performers would have the opportunity to be better paid than in a compressed pay structure.

2.3.5. Managerial power theory

Although managerial power theory is used to justify an adverse impact of pay dispersion on firm performance, it is outside the scope of the present study, as it focuses on the pay differentials between the CEO and other executives. This theory states that there is a possibility that a powerful CEO could extract additional rents from shareholders by allocating to him/herself a larger percentage of the global top executive pay (Bebchuk, Cremers, and Peyer, 2011; Shen, Gentry, and Tosi, 2010). A larger wage gap between CEOs and other executives would be indicative of CEO power (Lambert, Larcker, and Weigelt, 1993), as they are entrenched and would find it easier to allocate more benefits to themselves than to design optimal contracts to maximize shareholder value. Empirical studies show that an excessive executive wage gap might reflect agency problems and reduce firm value and performance (e.g. Adams *et al*., 2005; Bebchuk *et al*., 2011).

2.3.6. Motivational theories

2.3.6.1. Expectancy theory

Expectancy theory (Vroom, 1964) suggests that if employees wish for an outcome such as higher pay, believe that they can achieve the necessary performance levels, and believe that performance will lead to the desired outcome, they will be motivated to perform. (Gupta *et al.*, 2012). According to this theory, pay dispersion will be motivating if (1) employees value outcomes such as a higher pay level (valence), (2) believe that a higher level of effort will lead to a higher level of performance (expectancy or E→P), and (3) perceive that a higher level of performance will lead to a higher level of outcomes (instrumentality or P→O) (Vroom, 1964; Downes and Choi, 2014). Thus, larger rewards such as pay will lead to a greater motivation through increased valence, and a closer relationship between performance and pay will lead to a greater motivation through increased instrumentality (Downes and Choi, 2014).

Gupta *et al.* (2012) enumerate four considerations implicit in the expectancy approach to pay dispersion: (1) it is performance-contingent pay dispersion, rather than pay dispersion *per se*, which fosters high performance; (2) Expectancy theory is a perceptual theory, meaning that the P→O connection is more likely to be observed when differences in pay are large – the greater the performance-based dispersion, the stronger the P→O expectancy and, thus, the motivation to achieve a higher performance; (3) P→O expectancy is likely to be higher when for horizontal pay dispersion than for vertical, as pay dispersion among employees holding the same job is more likely to be due to differences in performance than among people holding different jobs at different levels in the organization hierarchy – performance-based variations are also more likely to increase valence (a large pay increase has higher valence than a smaller one); (4) expectancy theory may be used to explain other kinds of behaviour, such as promotion – the valence of pay could vary with the difference in pay associated with promotion (high vertical dispersion) and the overall motivation to achieve it: promotion has a high positive valence for many employees, the employee believes that performance is achievable (high E→P expectancy), and believes promotion is linked to performance (high P→O expectancy).

Essentially, horizontal pay dispersion may strengthen motivation for performance in a direct way, whereas vertical dispersion can strengthen it through its relationship with promotion (Gupta *et al.*, 2012).

2.3.6.2. Intrinsic motivation

Frey (1997) and Frey and Osterloh (1997) contribute to existing literature by focusing on the relationship between wage dispersion and intrinsic motivation, emphasizing the importance of a correct match between pay structures/schemes and a firm's monitoring environment (Belfield and Marsden, 2003). According to the authors, intrinsic motivation may be crowded out by implementing explicit incentive contracts (e.g. performance-based pay systems) by the generation of excessive external monitoring (particularly for high-responsibility workers who need autonomy in their job). However, intrinsic motivation can also be enhanced through the support of the employees' own motivation, self-esteem and feeling of competence.

2.3.7. Contingency theory

Although most literature is based on opposing views on the relationship between pay dispersion and firm performance, actual empirical evidence provides mixed results, not favouring either view (Connelly *et al.*, 2014; Gupta *et al.*, 2012). Attempting to reconcile said results, some authors have adopted a contingency theory (e.g. Beaumont and Harris, 2003; Shaw *et al.*, 2002), which proposes that organizational contingencies and social psychological factors influence the relationship between pay dispersion and firm performance. Shaw *et al.* (2002: 504) argued that "dispersion *per se* is neither functional nor dysfunctional; rather, situational contingencies determine the strategic effectiveness of dispersion (or lack thereof)".

Milkovich and Newman (1999) and Beaumont and Harris (2003) predict that the hierarchical model will have a positive relationship with performance in settings where work is mostly independent, while the compressed model will be most effective in settings requiring extensive collaboration, team working arrangements and a co-operative pattern of interaction". Shaw *et al.* (2002) adds – grounded on a legitimacy perspective of pay dispersion – that dispersion will also have a positive impact on performance if it is the result of the use of individual financial incentive systems.

Some authors (e.g. Yang and Klaas, 2011; Firth, Leung, Rui, and Na, 2015) mention cultural factors as factors that may influence the impact of pay dispersion on performance. Firth *et al.* (2015) argue that workers in state-controlled firms in China may be exposed to propaganda on socialism and egalitarianism and therefore be indoctrinated - leading to poorer

work performance and lower firm efficiency if they perceive inequality -, while Yang and Klaas (2011) argue that cultural norms in South Korea may help to legitimize pay dispersion among those within the same job category.

2.3.8. Synthesis

Theories can be divided into those who advocate for a larger degree of dispersion in order to increase performance, and those who argue that the opposite should be done. Tournament theory suggests that a larger degree of dispersion leads participants to increase their effort in order to obtain the "prize" of higher pay. Opposite to this is the "fairness" perspective, which includes theories such as equity, social comparison, organizational justice theories and the fair wage-effort hypothesis, which mainly state that individuals assess their contributions and/or rewards by comparing themselves to others to assess the justice of their rewards. If they feel they are being treated unfairly, they may withdraw their efforts and performance can be jeopardized.

Other theories can also be found in literature, such as the efficiency wage theory, which states that incentives should be used when employees' characteristics are not totally observable and their actions are not possible to monitor, and that compressed pay structures should be preferred since they improve labor relations and increase employee effort – the authors provide a worker's effort function showing that an employee's effort depends on both their pay level and the degree of pay dispersion within the organization. The legitimacy perspective/pay basis approach argues that employees will accept differences in pay if the reasons for these are viewed as legitimate, such as differences in human capital or performance-based. The managerial power theory states that since CEO's may allocate a large percentage of the global top executive pay to themselves, this will create a pay gap that might reflect agency problems and reduce firm value and performance. As for motivational theories, two were found that advocate for opposite structures. Expectancy theory argues that greater performance can be achieved with larger pay gaps if employees desire an outcome such as higher pay, believe that they can reach the necessary performance levels, and that these higher performance levels will lead to an increase in pay, they will be motivated to increase their performance. However, views on intrinsic motivation state that the implementation of explicit incentive contracts such

as performance-based pay systems may crowd out intrinsic motivation by generating excessive external monitoring.

Finally, some authors adopt a contingency view on pay dispersion, proposing that the relationship between pay dispersion and performance is influenced by organizational and social psychological factors, such as interdependence (Shaw *et al.*, 2002; Beaumont and Harris, 2003), incentives (Shaw et al., 2002), or culture Yang and Klaas, 2011; Firth *et al.*, 2015).

Summarily, theories which advocate for larger pay dispersion to increase performance are tournament theory, the legitimacy/pay basis approach (depending on whether the differences in pay are viewed as legitimate), and expectancy theory (depending on each employees' values and/or beliefs). Equity/fairness, efficiency wage and managerial power theories, as well as views on the reduction of extrinsic motivation, all argue for a lower degree of pay dispersion in order to achieve greater performance.

2.4.   Moderators

A moderator variable is one that affects or modulates the magnitude of the effect of an independent variable on a dependent one. Moderators may be characteristics of people or characteristics of situations. Moderation implies an interaction between the independent variable and the moderator (Judd, 2002).

In this particular study, moderator variables are variables that influence the impact of pay dispersion on organizational performance. Existing literature and theoretical considerations lead to expect ambiguous results, which are confirmed by empirical studies. These results may be explained by the results' dependency on several sources of heterogeneity - such as the institutional context, sector of the economy, estimation method, measures of dispersion (unconditional vs. conditional indicators) and of firm performance (e.g. profitability vs. productivity indicators) - and working environments (e.g. skills of the workforce) (Downes and Choi, 2014). However, even when taking these factors into account, studies still present different results, making a pattern difficult to identify.

3. Methodology

3.1. Method

Bishu and Alkadri (2017:67) define a systematic review as "a research tool that helps collect, summarize, and synthesize findings from past studies in a meaningful way". It uses findings from past studies to help reach conclusions about a subject matter, understand trends and predict cumulative findings (Glass, McGaw, and Smith, 1981). A systematic review synthesizes independently conducted research on a subject matter over a long period of time, aiding in the identification of trends, similarities, or differences in findings, and helping to identify research gaps and directions for future studies.

A systematic review may or may not conduct a statistical analysis (Petticrew and Roberts, 2006), which may be helpful to collectively estimate findings from previous studies. However, this analysis can only be performed if the studies included in the review share similar statistical estimation capable of being combined and analysed in a meaningful way. Thus, the present study does not include a statistical estimation and only performs a systematic review on the subject, as the studies included in this review do not share parameters that can be analysed collectively.

3.2. Inclusion criteria

The present study includes articles based on three criteria. The articles must:

(1) Focus on (or include an analysis of) the impact of pay dispersion on firm performance – this is essential as one of the objectives of the present study is to analyse if the impact of the dispersion on performance exists, if it is the first that impacts the latter or vice-versa, and if this impact is positive or negative. It will also permit to analyse which pay dispersion constructs are most commonly used by authors;

(2) Include an empirical analysis – crucial to quantify pay dispersion, firm performance, and to understand the strength and direction of the influence of the first on the latter and the impact of any existing moderating variables;

(3) Be published peer-reviewed journal articles from recognized publishers – the review process these articles have been through assures their quality, improving the review's overall reliability and validity.

3.3. Article selection

The needed papers were obtained from the ISI Web of Knowledge and ABI/Inform (ProQuest) databases using Bookends software in order to perform a structured keyword search. The keywords used were "pay ranges", "pay dispersion", "wage dispersion", "wage premium", "vertical dispersion", "horizontal dispersion", "payment differences", "broad-banding", "pay level", "compensation equity", "pay equity", "wage equity", "compensation equality", "pay equality", "wage equality", "compensation fairness", "pay fairness", "wage fairness", "compensation inequity", "pay inequity", "wage inequity", "compensation disparity", "pay disparity", "wage disparity", "compensation equity", "pay equity", and "wage equity". Regarding the latter database, a distinction was made between journals registered at Scopus versus other sources that, despite being registered at the ABI/Inform database, may not be registered at Scopus. This was done in order to ensure only publications from peer-reviewed journals were being considered.

The output, a .txt file containing data on 647 papers, was then imported to Microsoft Excel for screening and analysis. The file was comprised of seven columns – "author", "year", "title", "journal", "keywords", "pages", and "abstract".

The selection of the articles to include (or exclude) from the review was made by interrater agreement. Of the initial 647, 12 duplicates were found, which were removed. A further 582 were excluded, upon analysis of their title and abstract, as they were not relevant to the study on account of addressing different study areas, of not addressing pay dispersion, performance, or both, for focusing on kinds of relationships not relevant to the present study (e.g. impact of pay dispersion on individual or team performance instead of organizational) or for being qualitative studies.

The remaining full-text articles were then assessed for eligibility, which led to another 15 articles being excluded due to addressing individual or team performance, instead of organizational (or other kinds of relationships not relevant to the present study), or for not

containing quantitative data. 13 studies which focused only on pay dispersion for top management were also excluded, an article which had been retracted, one in which both variables under analysis were dependent, and one which focused on pay levels rather than on pay dispersion.

Upon analysing the articles, 4 additional articles were added by cross-reference. The final 26 articles were included in qualitative synthesis and subject to analysis.
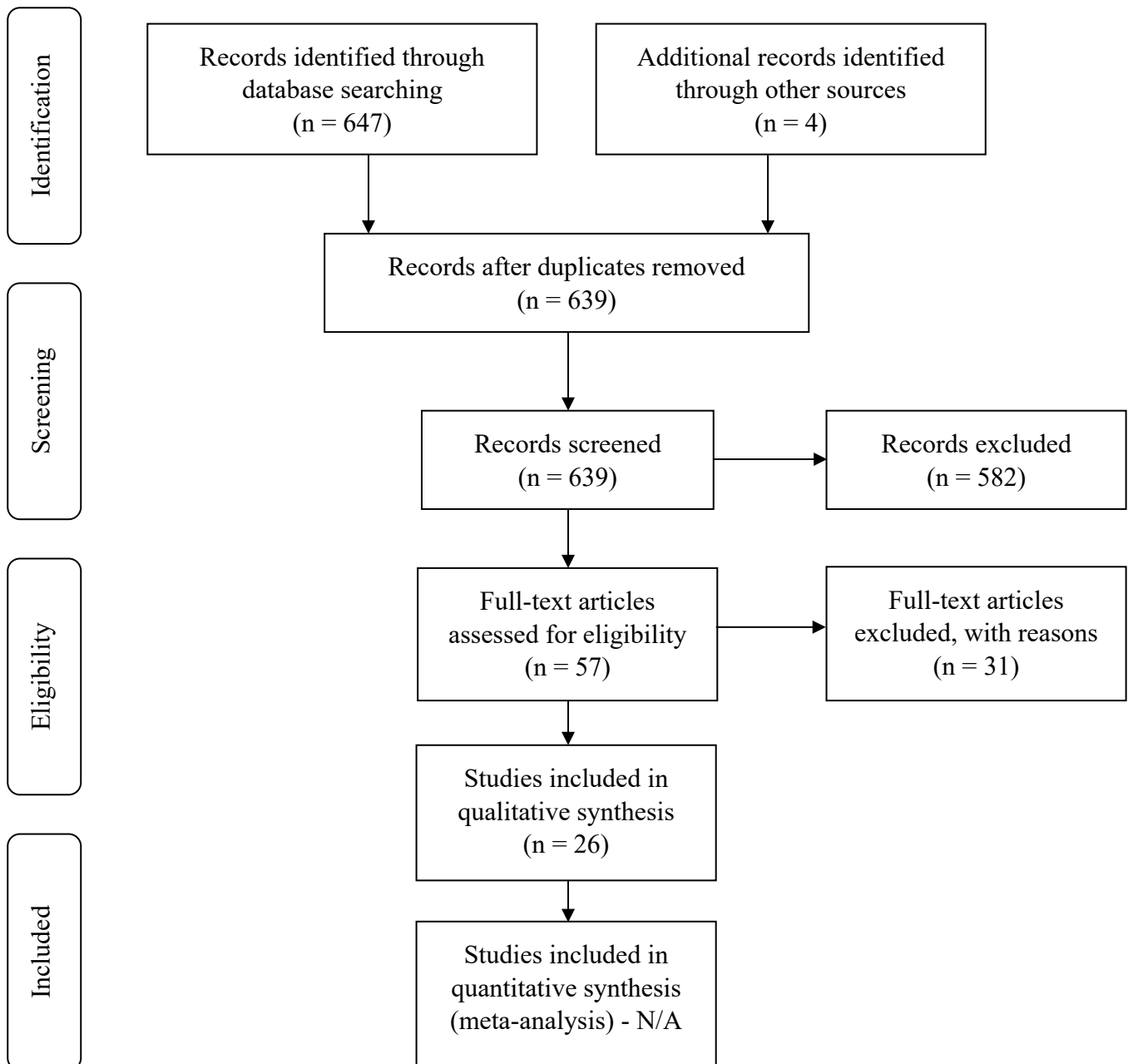

Fig. 1. Flow of information through the different phases of the systematic review (Moher, Tetzlaff, and Altman, 2009:1009)

3.4. Review method

After the articles for analysis were selected, the Excel workbook was adapted, and categories were added: "studied theories", "verified theories", "method", "sample", "measure(s) of the independent variable(s)", "measure(s) of the dependent variable(s)", "moderating variable(s)", "main findings", "country", "correlation matrix". The reasons for including each of these categories are were the following:

(1) Studied theories: Included to verify which of the theories (tournament, equity/fairness, etc.) used as bases for the studies were most common;

(2) Verified theories: Included to verify which of the theories (tournament, equity/fairness, etc.) used in the studies were verified, and if they varied according to the purpose/context of the study (e.g. vertical vs. horizontal dispersion);

(3) Method: Included not only to assess the overall validity of each study, but mainly to verify if results varied according to the applied method;

(4) Sample: Included to assess whether the type and amount of data included in each study influences the results (e.g. industry, size of the firm, size of the sample, type of data collected, country, etc.);

(5) Measure(s) of the independent variable(s): Included to study which measures of pay dispersion were most common, if the choice of measure influenced the results, and study the differences in results depending on the type of measure used (conditional vs. unconditional);

(6) Measure(s) of the dependent variable(s): Included to understand whether certain measures of performance were most impacted by pay dispersion and, if so, which ones;

(7) Moderating variable(s): Included to verify whether the presence of certain contingencies influenced or changed the results (if the impact of pay dispersion on performance is contingent on contextual factors);

(8) Main findings: Included for ability to compare results of different studies;

(9) Country: Included to understand if differences in the contexts (cultural, political etc.) of the countries of each study influenced the mobilized theories, variables applied, and results obtained;

(10)   Correlation matrix (Y/N): Initially included to assess the possibility of performing a meta-analysis or a statistical analysis of the systematic review (confirmed not viable);

After analysing the articles, the workbook was filled in with the relevant information for each category and article. The workbook was then used to build three different tables : Table 3 (Appendix A), with the purpose of analysing if the usage of different measures or variables had an impact on the relationship between pay dispersion and performance, Table 4 (Appendix B), with the purpose of analysing this impact taking into consideration the type of dispersion, industries, countries, and the theories studied and verified, and Table 5 (Appendix C), which aims to synthesise the moderators used in each study and their impact on results. These tables provide the basis for the analysis which is the focus of the present study.

Upon building the tables, a few issues were immediately noticeable. First, the results obtained by the authors on the impact of pay dispersion on performance could not be classified as merely "positive" or "negative", as some studies found hump-shaped relationships (Winter-Ebmer and Zweimüller, 1999; Grund and Westergaard-Nielsen, 2008; Hunnes, 2009; Mahy, Rycx and Volral, 2009; Mahy *et al.*, 2011), U-shaped relationships (Grund and Westergaard-Nielsen, 2008; Hunnes, 2009) or even no relationship (Shaw *et al.*, 2002; Brown *et al.*, 2003; Frick *et al.*, 2003; Brown, 2006; Jirjahn and Kraft, 2007; Hunnes, 2009; Kepes *et al.*, 2009; Hamann and Ren, 2013), and results were depending on several factors: in many studies, the existence or direction of the relationship between dispersion and performance were dependent on (1) moderators (Shaw *et al.*, 2002; Brown, Sturman, and Simmering, 2003; Beaumont and Harris, 2003; Brown, 2006; Jirjahn and Kraft, 2007; Grund and Westergaard-Nielsen, 2008; Kepes, Delery, and Gupta, 2009; Hamann and Ren, 2013), (2) on the measure of the independent variable (Hamann and Ren, 2013), (3) on the independent variable itself (e.g. dispersion within firms vs. dispersion between firms, dispersion of pay vs. dispersion of pay increases, dispersion in the fixed part of pay vs. dispersion in the variable part of pay) (Hibbs and Locking, 2000; Grund and Westergaard-Nielsen, 2008; Hunnes, 2009), (4) on the measure of the dependent variable (Shaw *et al.*, 2002; Brown *et al.*, 2003; Ding *et al.*, 2009; Kepes *et al.*, 2009; Connelly, Haynes, Tihanyi, Gamache and Devers, 2016), (5) on the method (Shaw *et al.*, 2002; Brown *et al.*, 2003; Ding *et al.*, 2009; Kepes *et al.*, 2009; Connelly *et al.*, 2016) and (6) on the type of dispersion (vertical vs. horizontal). These issues were marked next to each author and described in each table's footnote, and will be addressed as part of the analysis.

3.5. Analysis

3.5.1. Measures of dispersion

The analysis of Table 3 (Appendix A) allows to verify that the most used unconditional measures for pay dispersion are the ratio between pay levels or maximum and minimum pay – 11 studies (Bloom, 1999; Eriksson, 1999; Beaumont and Harris, 2003; Lallemand, Plasman, and Rycx, 2004., 2004; Heyman, 2005; Jirjahn and Kraft, 2007; Kepes *et al.*, 2009; Yang and Klaas, 2011; Hamann and Ren, 2013; Firth, Leung, Rui and Na, 2015; Connelly *et al.*, 2016), the coefficient of variation – 9 studies (Bloom, 1999; Hibbs and Locking, 2000; Shaw *et al.*, 2002; Lallemand *et al.*, 2004; Heyman, 2005; Grund and Westergaard-Nielsen, 2008; Ding, Akhtar and Ge, 2009; Hunnes, 2009; and Mahy *et al.*, 2009), and difference (range) between pay levels or maximum and minimum pay – 7 studies (Bloom, 1999; Shaw *et al.*, 2002; Beaumont and Harris, 2003; Heyman, 2005; Jirjahn and Kraft, 2007; Kepes *et al.*, 2009; Connelly *et al.*, 2016) for the unconditional measures, whereas the most used conditional one is the residual/standard error of wage regressions, or standard deviation of residual/standard error – 10 studies (Cowherd and Levine, 1992; Winter-Ebmer and Zweimüller, 1999; DeBrock, Hendricks, and Koenker, 2004; Lallemand *et al.*, 2004; Heyman, 2005; Martins, 2008; Hunnes, 2009; Mahy *et al.*, 2009; Mahy *et al.*, 2011; Hamann and Ren, 2013). The use of unconditional measures greatly exceeds the use of conditional ones, despite the residual/standard error of wage regressions (or standard deviation of residual/standard error) being one of the most used measures.

Only Hamann and Ren (2013) find different relationships depending on the measure (using the ratio of the 80th to 20th percentiles of pay they find a relationship whose direction depends on firm ownership, but find no relationship when using the ratio of the wages of registered nurses to certified nursing assistants).

3.5.2. Independent variables

The impact of pay dispersion on performance seems to depend more on the variable chosen (what is actually being measured) than on the measure of dispersion (dispersion of pay levels vs. dispersion of pay increases, dispersion of the fixed part of pay vs. dispersion of the variable part of pay). Grund and Westergaard-Nielsen (2008) find a hump-shaped relationship between

pay level dispersion and firm performance only when using Ordinary Least Squares (OLS) – finding no significant relationship using fixed-effects – but find a U-shaped relationship (both with OLS and fixed-effects) for the dispersion of pay increases. Hunnes (2009) finds a positive relationship between the dispersion of fixed part of the wage and firm performance using OLS (no significant link using fixed-effects), but a U-shaped relationship for the dispersion of the variable part of the wage.

3.5.3. Method

As the previous paragraph suggests, in some studies the method used also affected the relationship between pay dispersion and performance. This is the case for Grund and Westergaard-Nielsen (2008), Hunnes (2009), Martins (2008) and Winter-Ebmer and Zweimüller (1999). For the first two studies, these differences were addressed in the previous paragraph. Martins (2008) find a positive relationship between pay dispersion and performance, regardless of the measure using OLS, but fixed effects estimations revealed a strong negative relationship. As for Winter-Ebmer and Zweimüller (1999), OLS showed a hump-shaped relationship between pay dispersion and productivity, but fixed-effects revealed a flatter hump for white-collar workers and no significant impact for blue-collar workers.

3.5.4. Measures of performance

Some studies revealed that different indicators of performance were differently impacted by pay dispersion. Brown *et al.* (2003) found different impacts for resource efficiency (patient length of stay) and patient care outcomes (adjusted coronary survival rate), and financial performance (ROA). Connelly *et al.* (2016) discovered a positive association between a pay dispersion and short-term firm performance, but negative for long-term performance. Ding *et al.* (2009) found that, although vertical pay dispersion positively impacted performance regardless of the performance measure, horizontal pay dispersion among managers had a negative effect on the firm's financial performance (sales growth) but no effect on non-financial performance (product/service quality), and horizontal pay dispersion among workers had a negative effect on firm's non-financial performance but no effect on financial performance. Kepes *et al.* (2009) find a significant impact of pay dispersion on both measures

of workforce productivity (accident frequency ratio and out-of-service percentage) and of organizational performance (operating ratio and ROE), but the interaction of pay dispersion with each of the moderators (performance-based pay and politically-based pay) has different effects depending on the performance indicator. Shaw *et al.* (2002) also find that the interaction of pay dispersion with moderators (individual incentives and work interdependence) impact each of the performance measures differently.

3.5.5. Countries

The aggregated studies analyse data from different countries: 11 from the United States of America (Cowherd and Levine, 1992; Bloom, 1999; Shaw *et al.*, 2002; Brown *et al.*, 2003; Frick *et al.*, 2003; DeBrock *et al.*, 2004; Jewell and Molina, 2004; Brown, 2006; Kepes *et al.*, 2009; Hamann and Ren, 2013; Connelly *et al.*, 2016), 3 from Belgium (Lallemand *et al.*, 2004; Mahy *et al.*, 2009; Mahy *et al.*, 2011), 2 from China (Ding *et al.*, 2009; Firth *et al.*, 2015), 2 from Denmark (Eriksson, 1999; Grund and Westergaard-Nielsen, 2008), 2 from Sweden (Hibbs and Locking, 2000; Heyman, 2005), 1 from Austria (Winter-Ebmer and Zweimüller, 1999), 1 from Germany (Jirjahn and Kraft, 2007), 1 from Korea (Yang and Klaas, 2011), 1 from Norway (Hunnes, 2009), 1 from Portugal (Martins, 2008), and 1 from the United Kingdom (Beaumont and Harris, 2003). Being evident that most of the studies were based on USA data, the remaining are not very geographically diverse (e.g. no studies using African firms) and are in insufficient number or variety to establish differences according to different socio-economic settings (e.g. varieties of capitalism). It is therefore risky to draw conclusions on whether the influence of pay dispersion on performance differs across countries, although it is noteworthy that Beaumont and Harris (2003) find different relationships for UK- and US-owned plants.

3.5.6. Industries

As for industries, the sample of studies includes 4 studies on the sports industry (Bloom, 1999; Frick *et al.*, 2003; DeBrock *et al.*, 2004; Jewell and Molina, 2004), 3 on health (Brown *et al.*, 2003; Brown, 2006; Hamann and Ren, 2013), 2 on motor carrier (Shaw *et al.*, 2002; Kepes *et al.*, 2009), 1 on concrete pipe (Shaw *et al.*, 2002), 1 on pharmaceuticals (Beaumont

and Harris, 2003), 1 on electronic data processing (Beaumont and Harris, 2003), 1 on motor vehicles and their engines (Beaumont and Harris, 2003), 1 on aerospace (Beaumont and Harris, 2003) and 1 on miscellaneous foods (Beaumont and Harris, 2003), but the remaining 16 studies are not restricted to an industry or do not specify one. Some studies focus on more than one industry (Beaumont and Harris, 2003; Shaw *et al.*, 2002). Beaumont and Harris (2003) found that the relationship between pay dispersion and performance varies across industries, but that this relationship is also dependent on the type of dispersion and other moderators.

3.5.7. Type of dispersion

From the 26 studies included in this review, only 7 focused on horizontal dispersion (Bloom, 1999; Shaw *et al.*, 2002; Frick *et al.*, 2003; DeBrock *et al.*, 2004; Jewell and Molina, 2004; Kepes *et al.*, 2009; Yang and Klaas, 2011), and 2 studied both types of dispersion (Ding *et al.*, 2009; Hunnes, 2009). The remaining ones all focused exclusively on vertical pay dispersion.

It seems clear that, overall, horizontal pay dispersion negatively impacts performance, although Yang and Klaas (2008) found a hump-shaped relationship. Vertical pay dispersion usually leads to an increase in performance, with a few noteworthy exceptions such as the studies by Cowherd and Levine (1992), Hibbs and Locking (2000) for dispersion between firms, Beaumont and Harris (2003) for UK-owned plants, Martins (2008), Hamann and Ren (2013) for non-profit firms, Firth *et al.* (2015), and Connelly *et al.* (2016) for long-term performance.

These results are, however, not a rule for either type of dispersion, as there are studies which find hump-shaped (Winter-Ebmer and Zweimüller, 1999; Grund and Westergaard-Nielsen, 2008; Mahy *et al.*, 2009; Mahy *et al.*, 2011; Yang and Klaas, 2011) or U-shaped (Grund and Westergaard-Nielsen, 2008; Hunnes, 2009) relationships, or no significant relationship at all (Shaw *et al.*, 2002; Brown *et al.*, 2003; Frick *et al.*, 2003; Brown, 2006; Jirjahn and Kraft, 2007; Hunnes, 2009; Kepes *et al.*, 2009; Hamann and Ren, 2013).

For both types of dispersion, many of these findings are also dependent on measures or moderators.

3.5.8. Theories

3.5.8.1. Studied theories

In order to formulate their hypothesis, the authors researched and presented several theories or perspectives as the foundation for their work. In many cases, the authors did not name the theories they were presenting or describing, so they were inferred for the purpose of the present study. It is noteworthy that Ding *et al.* (2009) refer to tournament theory as "efficiency wage theory" although the latter is most commonly used to refer to the theory by Akerlof and Yellen (1988).

The most mentioned theories or perspectives in studies on vertical pay dispersion were tournament theory, mentioned in 15 studies (Eriksson, 1999; Winter-Ebmer and Zweimüller, 1999; Beaumont and Harris, 2003; Lallemand *et al.*, 2004; Heyman, 2005; Jirjahn and Kraft, 2007; Grund and Westergaard-Nielsen, 2008; Martins, 2008; Ding *et al.*, 2009; Hunnes, 2009; Mahy *et al.*, 2009; Mahy *et al.*, 2011; Hamann and Ren, 2012; Firth *et al.*, 2015; Connelly *et al.*, 2016), cohesiveness arguments (e.g. Levine, 1991), mentioned in 11 studies (Winter-Ebmer and Zweimüller, 1999; Hibbs and Locking, 2000; Beaumont and Harris, 2003; Lallemand *et al.*, 2004; Jirjahn and Kraft, 2007; Grund and Westergaard-Nielsen, 2008; Hunnes, 2009; Mahy *et al.*, 2009; Mahy *et al.*, 2011; Hamann and Ren, 2013; Firth *et al.*, 2015), the fair wage-effort hypothesis, mentioned in 10 studies (Winter-Ebmer and Zweimüller, 1999; Hibbs and Locking, 2000; Beaumont and Harris, 2003; Lallemand *et al.*, 2004; Grund and Westergaard-Nielsen, 2008; Martins, 2008; Ding *et al.*, 2009; Hunnes, 2009; Mahy *et al.*, 2009; Hamann and Ren, 2013), the industrial politics and sabotage model, mentioned in 6 studies (Winter-Ebmer and Zweimüller, 1999; Lallemand *et al.*, 2004; Jirjahn and Kraft, 2007; Hunnes, 2009; Mahy et al., 2009; Mahy et al., 2011), equity theory, mentioned in 5 studies (Cowherd and Levine, 1992; Brown *et al.*, 2003; Brown, 2006; Grund and Westergaard-Nielsen, 2008; Ding *et al.*, 2009), intrinsic motivation, mentioned in 4 studies (Winter-Ebmer and Zweimüller, 1999; Lallemand *et al.*, 2004; Grund and Westergaard-Nielsen, 2008; Hunnes, 2009) and the theory of organizational politics, also mentioned in 4 studies (Lallemand *et al.*, 2004; Hunnes, 2009; Mahy et al., 2009; Mahy et al., 2011). Other theories or perspectives presented include contingency theory, neoclassical theory, legitimacy perspective, social comparison theory, efficiency wage theory, relative deprivation theory, and considerations on industry structure.

In studies on horizontal pay dispersion, the most mentioned theories or perspectives were tournament theory, mentioned in 5 studies (Bloom, 1999; Frick *et al.*, 2003; DeBrock *et al.*, 2004; Ding *et al.*, 2009; Hunnes, 2009), the legitimacy perspective, mentioned in 4 studies (Shaw *et al.*, 2002; Ding *et al.*, 2009; Kepes *et al.*, 2009; Yang and Klaas, 2011), the industrial politics and sabotage model, mentioned in 4 studies (Bloom, 1999; Shaw *et al.*, 2002; Hunnes, 2009; Kepes *et al.*, 2009), contingency theory, mentioned in 3 studies (Shaw *et al.*, 2002; Ding *et al.*, 2009; Yang and Klaas, 2011), the fair wage-effort hypothesis, mentioned in 3 studies (Jewell and Molina, 2004; Hunnes, 2009; Kepes *et al.*, 2009), cohesiveness, mentioned in 3 studies (Frick et al., 2003; Jewell and Molina, 2004; Hunnes, 2009), and social comparison theory, mentioned in 2 studies (Ding *et al.*, 2009; Yang and Klaas, 2011). Other mentioned theories or perspectives include tournament theory, equity theory, social comparison theory, expectancy theory, efficiency wage theory, and other theories (goal-setting, operant conditioning, organizational justice, institutional theories, sociological and economic efficiency theories).

Although the theories enumerated here are the ones the authors have studied as background information for their work, they aren't necessarily the theories/perspectives in which they have based their hypothesis or were proposing to test. In many cases, this information was not presented or was not clear in each study.

3.5.8.2. Verified theories

Although several theories were mentioned in the authors' literature reviews, when presenting the results most did not mention which theory(ies) was/were verified with their studies, so these were inferred. Upon analysing the authors' results, it is clear that contingency theory is the most prevalent one - even though most authors did not present it as such - as most studies which included moderators found that the existence, direction, or intensity of an impact of pay dispersion on firm performance depended on these. This holds for studies on both vertical (Winter-Ebmer and Zweimüller, 1999; Beaumont and Harris, 2003; Brown *et al.*, 2003; Lallemand *et al.*, 2004; Brown, 2006; Jirjahn and Kraft, 2007; Grund and Westergaard-Nielsen, 2008; Mahy *et al.*, 2009; Mahy *et al.*, 2011; Hamann and Ren, 2013; Connelly *et al.*, 2016) and horizontal pay dispersion (Shaw *et al.*, 2002; Kepes *et al.*, 2009; Yang and Klaas, 2011). One could argue that hump-shaped (inverse U) relationships between dispersion and performance

could reveal a non-mentioned moderator: the degree of dispersion. This is because as dispersion increases, so does performance (tournament effect), but only until a certain point – when the degree of pay dispersion reaches a critical point, increases in dispersion will lead to a decrease in performance (fairness or sabotage effects). Thus, the hump-shaped relationships found could validate a contingency argument. The same rationale could be applied (inversely) to U-shaped relationships. Studies which found these relationships were enumerated in the previous sub-chapter.

Apart from contingency, studies on horizontal pay dispersion mostly confirmed fairness arguments. Bloom (1999) and Shaw *et al*. (2002) validated the industrial politics and sabotage model, Shaw *et al*. (2002) the legitimacy perspective / pay basis approach, and DeBrock *et al*. (2004) and Ding *et al*. (2009) equity theory. Hunnes (2009) found no support for any theory since he found no significant relationship between pay dispersion within hierarchical levels and performance after controlling for hierarchy.

Also leaving contingency findings aside, studies on vertical pay dispersion mostly confirmed tournament arguments. Three noteworthy exceptions are Cowherd and Levine (1992), who proposed a new distributive justice model based on equity and relative deprivation theories and were able to validate it, Martins (2008), who found support for the fair wage-effort hypothesis, and Firth *et al*. (2015), who validated fairness arguments (relative deprivation and social comparison theories), by finding a negative impact of pay dispersion on performance. Tournament theory was verified by Eriksson (1999), Hibbs and Locking (2000), Lallemand *et al.*, (2004), Heyman (2005), and Ding *et al*. (2009). Winter-Ebmer and and Zweimüller (1999) found evidence for the industrial politics and sabotage model and reduction of intrinsic motivation effects and Grund and Westergaard-Nielsen validated Levine's (1991) cohesiveness arguments. As for horizontal pay dispersion, Hunnes (2009) didn't validate any theories, as the author found no significant relationship between pay dispersion between hierarchical levels and performance after controlling for hierarchy.

3.5.9. Moderators

As mentioned previously, the existence, direction or intensity of dispersion on performance was found to be influenced by moderators. Most studies include moderators as part of the investigation, and their description and effects as found by the authors can be found in Table 5

(Appendix C). While some studies on vertical pay dispersion found that the existence or direction of a relationship between pay dispersion and performance was dependent on moderators, others found that they increased this impact, and some found that they did not affect the relationship at all. Findings depend on many factors, one of them being the moderator(s) chosen for each study.

3.5.9.1. Horizontal dispersion

3.5.9.1.1. Incentives

The role of incentives in the relationship between pay dispersion and firm performance was studied by Shaw *et al*. (2002) and Kepes *et al*. (2009).

Shaw *et al*. (2002) performed two studies. The first study used data from the motor carrier industry and analysed the impact of horizontal dispersion on workforce performance (accident frequency ratio, out of service percentage, perceptual performance), with the use of incentives as a moderator. Results revealed a strong negative impact of pay dispersion on accident frequency ratio and out-of-service percentage (better performance) when the use of individual incentives was high, and positive when low (worse performance). However, there was a negative impact on perceptual performance, stronger when the use of incentives was low. As for the second study, data was from the concrete pipe industry and also analysed the impact of horizontal dispersion on workforce performance, albeit with different measures (labour hours per ton, lost-time accidents, perceptual performance). Here, moderators were both the use of incentives and work interdependence. Performance was reduced (labour hours per ton and lost-time accidents, no significance for perceptual performance) when pay dispersion was high and incentives were low. Incentives also played a role when work interdependence was also considered. A higher use of incentives attenuated the negative relationship between pay dispersion and labour hours per ton when work interdependence was high, but a lower one enhanced this relationship. In the absence of incentives and low interdependence, there was a positive impact of pay dispersion on accident frequency ratio (poorer performance), and a negative one when it was high, regardless of the use of incentives.

Kepes at al. (2009) studied the impact of horizontal dispersion on workforce productivity (accident frequency ratio, out-of-service percentage) and organizational performance

(operating ratio, ROE), using pay basis (performance- vs. politically-based pay) as a moderator, which can be considered a type of incentive. Results showed a negative impact of pay dispersion on accident frequency ratio (higher productivity) when performance-based pay was high, and positive (lower productivity) when performance-based pay was low, but no significant association was found between the interaction of pay range and performance-based pay on either measure of financial performance. Pay dispersion was found to have a positive impact on accident frequency ratio (lower productivity) when politically-based pay was high, and negative (higher productivity) when politically-based pay was low. Findings also revealed a positive association of pay dispersion with ROE when politically-based pay was low and none when politically-based pay was high.

3.5.9.1.2. Interdependence

Shaw *et al.* (2002)'s second study, as mentioned previously, also studied the role of interdependence as a moderator of the relationship between pay dispersion and performance. The poorest performance was found in all measures when both dispersion and work interdependence were high. No relationship was found between pay dispersion and labour hours per ton when interdependence was low, but a negative one was found on accident frequency ratio (in the absence of incentives).

3.5.9.1.3. Pay competitiveness, managerial size, performance evaluation

Yang and Klaas (2011) tested the impact of horizontal dispersion on firm performance using pay competitiveness, managerial size, and performance evaluation as moderators, and found a hump-shaped relationship where the positive slope of the curve inverted at higher levels of dispersion as pay competitiveness, managerial size, and the extensiveness of performance evaluation increased.

3.5.9.2. Vertical dispersion

3.5.9.2.1. Firm size

Beaumont and Harris (2003) found a positive impact of pay dispersion on productivity at an aggregate level, but size and country seemed to affect differently firms from different industries. For the pharmaceutical industry, a greater negative impact of pay dispersion on performance was found for small UK owned plants than for large ones. For large foreign-owned plants, greater pay dispersion led to higher productivity, but firm size didn't affect the relationship for firms in the Aerospace industry (US and UK).

3.5.9.2.2. Firm country

As previously mentioned, Beaumont and Harris (2003)'s study also found that country played a role in the relationship between pay dispersion and performance. A negative impact was found for UK owned plants in the pharmaceutical industry, whereas for large foreign-owned plants, greater pay dispersion led to higher productivity.

3.5.9.2.3. Industry

Beaumont and Harris (2003)'s study studied the impact of pay dispersion on productivity in different industries. As mentioned, this impact was positive at an aggregate level, but varied according to the industry. For the pharmaceutical industry, the authors found a negative impact of pay dispersion on performance for UK owned plants, whereas for large foreign-owned plants, greater pay dispersion led to higher productivity. For other industries, the authors found a positive impact of pay dispersion on performance for foreign plants (weaker for Electronic Data Processing and Motor Vehicles and their Engines), but small for Miscellaneous Foods.

3.5.9.2.4. Pay level / pay structure

Brown (2006) found that pay levels influenced the impact of pay dispersion on performance, as no significant relationship was found between hospitals' nursing professional

pay dispersion and hospitals' risk-adjusted heart attack outcomes, but as pay levels increased, pay dispersion became more positively related to an increase in performance.

Brown *et al*. (2003) studied the relationship using different measures of performance, and pay levels and pay structures as moderators. The authors discovered that the relationship between hierarchy in the pay structure and organizational performance was not significant. However, they found that for low pay levels, pay dispersion had a positive impact on length of stay and adjusted survival, (virtually no effect at high pay levels), and that pay dispersion was best at predicting ROA under an egalitarian pay system lagging the market or a hierarchical pay system leading the market.

3.5.9.2.5. Composition of the workforce

Winter-Ebmer and Zweimüller (1999) used the composition of the workforce as a moderator. OLS found a hump-shaped relationship between pay dispersion and productivity for both white-collar and blue-collar workers, but fixed-effects revealed a flatter hump-shaped relationship for white-collar workers, and no significant relationship for blue-collar workers.

Lallemand *et al*. (2004) found a positive impact of pay dispersion on performance, but lower for firms with a greater proportion of white-collar workers.

Heyman (2005) found a positive impact of pay dispersion on performance, regardless of the composition of the workforce (white vs. blue collar workers).

Grund and Westergaard-Nielsen (2008) measured the impact of both pay dispersion and the dispersion of pay increases in two measures of firm performance (value added per employee and profits). Their results, as mentioned previously, depended on the indicator and the method (hump-shaped relationship between pay level dispersion and firm performance using OLS – no significant relationship using fixed-effects – and a U-shaped relationship between wage increase dispersion and firm performance. However, for blue-collar workers, neither pay dispersion, nor the dispersion of pay increases had a significant effect on value added, but there was a U-shaped association between pay increase dispersion among white-collar workers and firm performance. No significant association was found between pay differentials between white-collar workers and blue-collar workers and firm performance.

3.5.9.2.6. Product market competition

Firth *et al*. (2015) found that the degree of competitiveness within an industry did not affect the negative association found between relative pay and both their measures of performance (total factor productivity and sales to number of employees).

3.5.9.2.7. Capital-labour ratio

Heyman (2005) found that the capital-labour ratio did not affect the positive impact of pay dispersion on performance.

3.5.9.2.8. Industrial relations

Jirjahn and Kraft (2007) found a much lower effect of pay dispersion on productivity in the presence of a works council, or if the establishment was covered by a collective bargaining agreement.

Mahy *et al*. (2011) found a hump-shaped relationship between pay dispersion and performance, unaffected by the industrial relations regime.

3.5.9.2.9. Monitoring

Lallemand *et al*. (2004) found a higher positive impact of pay dispersion on performance for firms with a high degree of monitoring.

3.5.9.2.10. Incentives

Jirjahn and Kraft (2007) found positive effects of pay dispersion on performance, but smaller if the establishments rewarded relative performance. However, the use of individual piece rates increased the positive impact of pay dispersion on productivity, with an even stronger effect when group piece rates were used.

3.5.9.2.11. Interdependence

Eriksson (1999) found a positive effect of pay dispersion on profits and average pay, but using interdependence as a moderator did not result in any differences in the author's finding.

Firth *et al*. (2015) found that the negative association between relative pay and both their measures of performance (total factor productivity and sales to number of employees) was more pronounced for firms requiring more teamwork.

3.5.9.2.12. Uncertainty of the economic environment

Mahy *et al*. (2009) found a hump-shaped relationship between pay dispersion and performance, with a greater effect in less uncertain environments.

3.5.9.2.13. Skills of the workforce

Also Mahy *et al*. (2009, 2011) found that the hump-shaped relationship between pay dispersion and performance was more pronounced for firms with a highly skilled workforce.

3.5.9.2.14. Ownership

Hamann and Ren (2013) used ownership (non-profit, for-profit and government-owned firms) as moderators for the impact of pay dispersion on nursing home residents' quality of life, and found that one of the dispersion measures (80th/20th pay differential) was positively related to resident quality of life (but negatively for non-profit firms), but that the ratio of the wages of registered nurses to certified nursing assistants was not a significant predictor of residents' quality of life (albeit significant for non-profit firms).

Firth *et al*. (2015) found that ownership (private vs. publicly owned firms) did not affect the negative association between relative pay and both total factor productivity and sales to number of employees.

3.5.10. Inverse relationship

During the research for articles for the present study, two were found which aimed to study the inverse relationship – whether firm performance had an impact on pay dispersion or pay compression. Firth, Leung, and Rui (2010) studied top management compensation on Chinese listed firms and found a positive impact of firm performance (stock returns and return on assets) on pay disparity, suggesting performance is used as a mean to justify large pay differences between top managers and the average employee, important in the Chinese context - transition from a centrally planned socialist system to a market based economy.

Chizema, Liu, Lu, and Gao (2015), also using data on Chinese listed firms and drawing on social comparison theory, found a positive link between firm performance (return on stock and return on assets) and pay compression (lower pay dispersion), weakened by politically-connected boards.

4. Results

The present study had 4 main objectives, all of which were achieved to a certain point. Regarding the first objective, which was to find out how pay dispersion is defined and conceptualized (including which constructs are most commonly used), it was found that pay dispersion – the extent to which pay varies within a collective (Gupta *et al.*, 2012) – is mainly divided into two types: horizontal, which is the degree of variation in pay within the same job or hierarchical level, and vertical, which is the degree of variation in pay between jobs or hierarchical levels (Siegel and Hambrick, 2005; Downes and Choi, 2014; Shaw, 2015). From the 26 studies included in this review, only 7 focused on horizontal dispersion (Bloom, 1999; Shaw *et al.*, 2002; Frick *et al.*, 2003; DeBrock *et al.*, 2004; Jewell and Molina, 2004; Kepes *et al.*, 2009; Yang and Klaas, 2011), and 2 studied both types of dispersion (Ding *et al.*, 2009; Hunnes, 2009).

When it comes to measures of pay dispersion, unconditional measures were more widely used than conditional ones, the most frequent of these being the ratio between pay levels or maximum and minimum pay, found in 11 studies (Bloom, 1999; Eriksson, 1999; Beaumont

and Harris, 2003; Lallemand *et al.*, 2004; Heyman, 2005; Jirjahn and Kraft, 2007; Kepes *et al.*, 2009; Yang and Klaas, 2011; Hamann and Ren, 2013; Firth *et al.*, 2015; Connelly *et al.*, 2016), the coefficient of variation, found in 9 studies (Bloom, 1999; Hibbs and Locking, 2000; Shaw *et al.*, 2002; Lallemand *et al.*, 2004; Heyman, 2005; Grund and Westergaard-Nielsen, 2008; Ding *et al.*, 2009; Hunnes, 2009; and Mahy *et al.*, 2009), and the difference (range) between pay levels or maximum and minimum pay, found in 7 studies (Bloom, 1999; Shaw *et al.*, 2002; Beaumont and Harris, 2003; Heyman, 2005; Jirjahn and Kraft, 2007; Kepes *et al.*, 2009; Connelly *et al.*, 2016). However, the residual/standard error of wage regressions (or standard deviation of residual/standard error) – a conditional measure – is also one of the most used measures and was found in 10 studies (Cowherd and Levine, 1992; Winter-Ebmer and Zweimüller, 1999; DeBrock *et al.*, 2004; Lallemand *et al.*, 2004; Heyman, 2005; Martins, 2008; Hunnes, 2009; Mahy *et al.*, 2009; Mahy *et al.*, 2011; Hamann and Ren, 2013).

The second objective of the present study was to understand if a relationship between pay dispersion and performance actually existed, and if it was positive or negative. Despite the fact that studies focusing on vertical pay dispersion mostly pointed at a positive impact (e.g. Eriksson, 1999; Hibbs and Locking, 2000; Lallemand *et al.*, 2004; Heyman, 2005; Ding *et al.*, 2009) – with a few exceptions found by Cowherd and Levine (1992), Hibbs and Locking (2000) for dispersion between firms, Beaumont and Harris (2003) for UK-owned plants, Martins (2008), Hamann and Ren (2013) for non-profit firms, Firth *et al.* (2015), and Connelly *et al.* (2016) for long-term performance – and that studies on horizontal pay dispersion mostly pointed at a negative one (e.g. Shaw *et al.*, 2002; Frick et al., 2003; DeBrock *et al.*, 2004; Jewell and Molina, 2004; Ding *et al.*, 2009; Kepes et al., 2009), the present study did not find only linear relationships – hump-shaped (Winter-Ebmer and Zweimüller, 1999; Grund and Westergaard-Nielsen, 2008; Mahy *et al.*, 2009; Mahy *et al.*, 2011; Yang and Klaas, 2011) and U-shaped relationships (Grund and Westergaard-Nielsen, 2008; Hunnes, 2009) were also found. For hump shaped relationships, this points to tournament effects being effective up until a certain of dispersion, with fairness effects being more prevalent after that point is reached (the opposite for U-shaped relationships).

The third objective was to identify, gather, and study existing theories that justify a possible impact of pay dispersion on organizational performance. Many different rationales were found, but two main perspectives were identified: one which focused on incentive effects of pay dispersion (tournament), and one which focused on the reduction of morale and effort due to

fairness considerations (equity/fairness). However, when it comes to verified theories, an overwhelming number of studies found evidence of a mostly unmentioned perspective: a contingency theory. This means that the existence, direction and intensity of the relationship between pay dispersion and performance depends on contextual factors, i.e. moderators. Studies which found evidence for this include, for vertical pay dispersion, Winter-Ebmer and Zweimüller (1999), Beaumont and Harris (2003), Brown et al. (2003), Lallemand et al. (2004), Brown (2006), Jirjahn and Kraft (2007), Grund and Westergaard-Nielsen (2008), Mahy et al. (2009), Mahy et al. (2011), Hamann and Ren (2013) and Connelly et al. (2016); and for horizontal dispersion Shaw et al. (2002), Kepes et al. (2009) and Yang and Klaas (2011). If one considers the degree of dispersion as an unmentioned moderator, then the studies mentioned in the previous paragraph about hump- and U-shaped relationships may be added to this list.

Some factors were found to influence the results obtained in each of the studies under analysis, such as the chosen independent variables (Grund and Westergaard-Nielsen, 2008; Hunnes, 2009), the measures of the dependent (Shaw et al., 2002; Brown et al., 2003; Ding et al., 2009; Kepes et al., 2009; Connelly et al., 2016) and independent (Hamann and Ren, 2013) variables, and the method used (Shaw et al., 2002; Brown et al., 2003; Ding et al., 2009; Kepes et al., 2009; Connelly et al., 2016). However, the present study found that the existence, intensity, and direction of an impact of pay dispersion on performance depends not only on the type of dispersion but also on several moderators. The fourth objective focuses on these.

Before diving into the moderators chosen by each author, the present study analysed the countries and the industries from which the data for each of their studies derived, as these may moderate the relationship between pay dispersion and performance. Most studies (11) used data from firms in the United States of America (Cowherd and Levine, 1992; Bloom, 1999; Shaw et al., 2002; Brown et al., 2003; Frick et al., 2003; DeBrock et al., 2004; Jewell and Molina, 2004; Brown, 2006; Kepes et al., 2009; Hamann and Ren, 2013; Connelly et al., 2016), which didn't allow to draw sound conclusions on whether the data's country of origin had an influence on the results, as studies form non-USA countries were in insufficient number and not very geographically disperse (15 studies in 10 countries). As for industries, the most frequent ones were sports (Bloom, 1999; Frick et al., 2003; DeBrock et al., 2004; Jewell and Molina, 2004) and health (Brown et al., 2003; Brown, 2006; Hamann and Ren, 2013), but 16 studies did not specify an industry. Other industries include motor carrier (2), concrete pipe

(1), pharmaceuticals (1), electronic data processing (1), motor vehicles and their engines (1), aerospace (1) and miscellaneous foods (1). Like for countries, the possibility that they may impact the relationship between pay dispersion and performance cannot be discarded. Beaumont and Harris (2003), for example, found that the relationship between pay dispersion and performance varies across both industries and countries (United Kingdom vs. United States of America), despite also being dependent on other moderators.

Authors studied several moderators, and while some were found to increase the impact (positive or negative) of pay dispersion on performance, others were found to have no impact whatsoever. However, since most moderators were only studied in one (or few) studies, definite conclusions cannot be reached. Moreover, it is noteworthy that studies reach different results when testing similar moderators.

For horizontal pay dispersion, incentives (Shaw *et al.*, 2002; Kepes *et al.*, 2009) and interdependence (Shaw *et al.*, 2002) were the key moderators found, the first increasing the positive impact of pay dispersion on performance, and the second one reducing it. Pay competitiveness, managerial size and performance evaluation influence the relationship as the positive slope of the hump-shaped relationship between dispersion and performance inverts at higher levels of dispersion as these variables reach higher values (Yang and Klaas, 2011).

Vertical pay dispersion, however, has several more moderators to consider, possibly due to the fact that a much higher number of studies were performed on this type of dispersion. In a few instances, the moderators by themselves could not be identified as having a positive or negative effect on the relationship between pay dispersion and performance, as they were found to interact with other moderators, such as firm size, country and industry (Beaumont and Harris, 2003).

Moderators which were found to increase the positive impact of pay dispersion on performance include monitoring (Lallemand *et al.*, 2004) and skills of the workforce (Mahy *et al.*, 2009). Uncertain economic environments seem to reduce this impact (Mahy *et al.*, 2009). Some moderators appear to not have a significant impact, such as product market competition (Firth *et al.*, 2015) and capital-labour ratio (Heyman, 2005).

However, as mentioned above, results on some moderators vary according to the study (possibly due to differences in the definition of variables, data samples or method). For pay levels, Brown *et al.* (2003) found a positive effect of pay dispersion on performance only at

low pay levels, whereas Brown (2006) found that as pay levels increased, so did the positive impact of pay dispersion on performance. The composition of the workforce was studied by several authors, and for this case no definite conclusion was reached either, as results differed across studies: Winter-Ebmer and Zweimüller (1999) found a flatter hump-shaped relationship for white-collar workers than for blue-collar ones and Lallemand *et al*. (2004) found that the positive impact of pay dispersion on performance was lower for firms with a greater proportion of white-collar workers, but Grund and Westergaard-Nielsen (2008) found a U-shaped relationship between pay increase dispersion among white-collar workers and performance (none for blue-collar ones) and Heyman (2005) found that pay dispersion had a positive effect on firm performance regardless of the moderator. Industrial relations (works council presence, collective bargaining coverage) were found to lower the impact of pay dispersion on productivity (Jirjahn and Kraft, 2007), but Mahy *et al*. (2011) did not find such influence from the industrial relations regime/unionization. Interdependence was studied by Eriksson (1999), who found that this moderator did not influence the positive impact of pay dispersion on performance, and by Firth *et al*. (2015), who found a negative association between pay dispersion and performance, more pronounced for firms requiring cooperative teamwork. Finally, the role of incentives is also different depending on their definition, as differences were found within the same study: incentives based on relative performance reduce the positive effects of pay dispersion on performance, but the use of individual piece rates increase it, and the use of group piece rates have an even stronger impact (Jirjahn and Kraft, 2007).

Another finding of the present study, although not a part of the objectives, were two studies on the opposite relationship – the impact of firm performance on pay dispersion (Firth *et al*., 2010; Chizema *et al*., 2015). Although lacking in diversity (both studies were very similar in nature, and both based on Chinese listed firms), they find that firm performance can, in fact, influence pay dispersion – further studies in different settings would be needed to reach generalizable conclusions.

5. Conclusion

The present study was able to achieve its 4 main objectives. The first objective was to find out how pay dispersion is defined and conceptualized, and which constructs are most

commonly used, and found that pay dispersion is the degree of variation of pay within a collective, and can be divided into two types: horizontal and vertical. This review included 17 studies on vertical pay dispersion and 7 on horizontal – 2 studied both types. As for measures of dispersion, the analysis of Table 3 (Appendix A) found that the use of unconditional measures vastly surpassed that of conditional ones, although one of the most used measures was a conditional one – the residual/standard error of wage regressions (or standard deviation of residual/standard error).

The second objective was to understand if there was indeed a relationship between pay dispersion and performance and, if so, if it was positive or negative. Despite the fact that the chosen dependent and independent variables, their measures, and the method used influenced the results, the present study has found in Table 3 (Appendix A) that studies on vertical dispersion mainly found a positive impact and that studies on horizontal pay dispersion found the opposite. However, for both types of dispersion, hump-shaped and U-shaped relationships were also found. For hump-shaped relationships, this points to tournament effects overcoming fairness up until a certain degree of dispersion, with the latter becoming more prevalent after that point. The opposite happens for U-shaped relationships.

When it comes to theories which justify impacts of pay dispersion on performance found and verified – the third objective of the present study – the analysis of Table 4 (Appendix B) allowed for the identification of several, but two main ones were identified: arguments for an increase of dispersion as a means to increase motivation and effort to achieve larger rewards (tournament theory), and arguments for a decrease in dispersion as a means to increase perceptions of justice so to increase morale and effort (equity/fairness considerations). However, studies mostly found that the existence, direction and intensity of the relationship between pay dispersion and performance are contingent on contextual factors thus validating a contingency theory.

The fourth objective of the present study was to identify these contextual factors (moderators) and understand their impact on the relationship between pay dispersion and performance. It has found that there are insufficient studies on each of the moderators found to draw sound conclusions, that moderators may have different impacts when interacting with one another, and that studies testing the same or similar moderators reach different results. The country of origin of the data for most studies was the USA, leaving little room for comparison. The same can be said for industries, the most frequent ones being sports and health. However,

one study found that an impact of the firm's country and industry in the relationship between pay dispersion and performance. For horizontal pay dispersion, incentives were found to increase the impact of pay dispersion on performance, and interdependence to reduce it. Pay competitiveness, managerial size and performance evaluation decrease this impact for higher levels of dispersion. As for vertical pay dispersion, monitoring and skills of the workforce seem to increase the positive impact of pay dispersion on performance, and uncertain economic environments seem to reduce this impact. Product market competition and capital-labour ratio have no apparent impact, and results for pay levels, composition of the workforce, industrial relations and interdependence differ across studies (results for incentives differ within the same study depending on their definition). Findings on moderators may be found on Table 5 (Appendix C).

The two studies found on the opposite relationship – the impact of firm performance on pay dispersion – find that firm performance may also influence pay dispersion. However, since both are based on Chinese settings, and are insufficient in number, no conclusions could be drawn. They do, however, provide a noteworthy perspective, and would be an interesting field of study for future research.

The present review allows to verify that although results are valid within each study, they are not consistent across studies and, as such, do not allow for sound cross-study comparisons: data sets, dependent and independent variables, measures, methods and moderators all seem to influence the obtained results.

So, tournaments, or fairness? The obvious answer would be to increase dispersion between hierarchical levels and to reduce it within these levels. However, as with most Human Resources practices, a one-size-fits-all solution when it comes to designing pay structures seems to be a utopic goal. The present study has shown that upon defining compensation practices there are many factors to consider, and that the degree of pay dispersion by itself is no guarantee of the expected results when it comes to firm performance. Although it seems evident that fairness considerations overcome the incentive effects of tournaments when it comes to horizontal dispersion, and that the opposite happens when it comes to vertical dispersion, several contextual factors appear to influence this relationship and a contingency perspective must be adopted. Thus, having so much to take into account upon designing pay structures to increase firm performance, the answer so far seems to be: it depends.

6. Limitations and directions for future research

As with most Human Resources practices, a one-size-fits-all solution when it comes to designing pay structures seems to be a utopic goal. This study has shown that upon defining compensation practices there are many factors to consider, and that the degree of pay dispersion by itself is no guarantee of the expected results when it comes to firm performance. Although it seems evident that fairness considerations overcome the incentive effects of tournaments when it comes to horizontal dispersion, and that the opposite happens when it comes to vertical dispersion, several factors appear to influence this relationship.

Of course, taking the present study's findings into consideration upon designing pay structures is not a fail-proof option. Like all others, there are several limitations which prevent the drawing of sound and generalizable conclusions and cannot, therefore, be overlooked. First, this review is comprised of only 26 studies, which is a small sample. Second, this sample is rather homogenous and would benefit from a more geographically and socio-economically diverse data set. Third, being a systematic literature review, the present study inherits all limitations of the studies it comprises – whether they derive from the size and provenience of the samples, data limitations, definition of variables, method, or interpretation of results. Mahy *et al*. (2011: 457) warn that "…findings must be interpreted with caution because of methodological and/or data limitations (i.e. in terms of indicators used, data coverage or estimation strategy)".

Drawing on these limitations, directions for future research can be derived. There are very few studies on horizontal pay dispersion, and a larger number of studies on the topic could allow for a better understanding on the role of "fairness" in the relationship between intra-hierarchy pay dispersion and performance. Furthermore, a larger number of studies in several different countries with different varieties of capitalism could allow for a broader understanding of the socio-economic and cultural settings' influence on the effects of pay dispersion. New studies should focus on matched panel data and analyse the relationship between changes in pay inequality and productivity using fixed-effects models so to verify if this relationship is, in fact, a causal one (Mahy *et al*., 2009). Finally, there seems to also be a need for more studies on reverse causality: pay dispersion may well influence performance, but there is some evidence that the opposite may also be true. This evidence is very limited,

and mostly confined to the Chinese setting, so more studies on this subject would bring additional insights to existing knowledge on this area of study.

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Appendices

Appendix A – Measures of variables

Table 3

Measures of variables

Impact	Type of measure	Measure	Study(ies)	Independent variable(s)	Dependent variable(s)
			Shaw et al. (2002) [1,2]	Pay dispersion	Workforce performance (accident frequency ratio; out of service percentage; perceptual performance)
			Shaw et al. (2002) [1,2]	Pay dispersion	Workforce performance (labour hours per ton; lost-time accidents; perceptual performance)
		Gini coefficient	Brown et al. (2003) [1,2]	Pay dispersion	Risk-adjusted heart attack mortality rates
			Brown (2006) [1]	Pay dispersion	- Resource efficiency (average length of stay) - Patient care outcomes (adjusted coronary survival rate) - Financial performance (ROA)
			Grund and Westergaard-Nielsen (2008) [1,4,6]	Pay level dispersion; Pay increase dispersion	Firm performance (log of value added per employee; profits)
	Unconditional		Hibbs and Locking (2000) [6]	Pay dispersion	Firm performance (real value added; real value added/blue-collar hours)
			Shaw et al. (2002) [1,2]	Pay dispersion	Workforce performance (accident frequency ratio; out of service percentage; perceptual performance)
Positive		Coefficient of Variation	Shaw et al. (2002) [1,2]	Pay dispersion	Workforce performance (labour hours per ton; lost-time accidents; perceptual performance)
			Lallemand et al. (2004)	Pay dispersion	Firm performance (gross operating surplus per worker)
			Heyman (2005)	Pay dispersion	Firm performance (profits per employee)
			Grund and Westergaard-Nielsen (2008) [1,4,6]	Pay level dispersion; Pay increase dispersion	Firm performance (log of value added per employee; profits)
			Ding et al. (2009) [2,5]	Pay dispersion between managers and workers	Firm performance (sales growth and product/service quality)
			Hunnes (2009) [4,6]	Dispersion in the fixed part of pay	Firm performance (gross production value per employee; profits per employee)

Table 3

Impact	Type of measure	Measure	Study(ies)	Independent variable(s)	Dependent variable(s)
Positive	Unconditional	Difference (range) between pay levels / maximum and minimum pay	Shaw et al. (2002) [1,2]	Pay dispersion	Workforce performance (accident frequency ratio; out of service percentage; perceptual performance)
			Shaw et al. (2002) [1,2]	Pay dispersion	Workforce performance (labour hours per ton; lost-time accidents; perceptual performance)
			Beaumont and Harris (2003) [1]	Pay dispersion (pay compression)	Firm performance (value added per worker)
			Heyman (2005)	Pay dispersion	Firm performance (profits per employee)
			Jirjahn and Kraft (2007) [1]	Pay dispersion	Firm performance (log of productivity: value-added per employee)
			Kepes et al. (2009) [1,2]	Pay dispersion	- Workforce productivity (accident frequency ratio; out-of-service percentage) - Organizational performance (operating ratio; ROE)
		Ratio between pay levels / maximum and minimum pay	Connelly et al. (2016) [2]	Pay dispersion	- Short-term performance (ROA in the focal year of analysis) - Long-term performance trend (slope of the regression of annual ROA over 5 subsequent years, beginning in the focal year of analysis)
			Eriksson (1999)	Pay dispersion	Firm performance (3-year average of profits divided by sales)
			Lallemand et al. (2004)	Pay dispersion	Firm performance (gross operating surplus per worker)
			Heyman (2005)	Pay dispersion	Firm performance (profits per employee)
			Yang and Klaas (2011)	Pay dispersion	Firm performance (ratio of operating profit to assets)

Table 3 (continued)

Impact	Type of measure	Measure	Study(ies)	Independent variable(s)	Dependent variable(s)
	Unconditional	Ratio of the 80th (90th) to 20th (10th) percentiles of wages	Heyman (2005)	Pay dispersion	Firm performance (profits per employee)
			Hunnes (2009)[4]	Dispersion in the fixed part of pay	Firm performance (gross production value per employee; profits per employee)
			Hamann and Ren (2013)[1,3]	Pay dispersion (wage inequality)	Resident's quality of life
		Standard deviation of pay level	Lallemand et al. (2004)	Pay dispersion	Firm performance
			Grund and Westergaard-Nielsen (2008)[1,4,6]	Pay level dispersion; Pay increase dispersion	Firm performance (log of value added per employee; profits)
		Herfindahl-Hirshmann index	---	---	---
Positive		Theil index	---	---	---
	Conditional	Residual/standard error of wage regression (or standard deviation of residual/standard error)	Lallemand et al. (2004)	Pay dispersion	Firm performance
			Heyman (2005)	Pay dispersion	Firm performance (profits per employee)
			Martins (2008)[4]	Pay dispersion	Firm performance (total sales per worker)
			Hunnes (2009)[4]	Dispersion in the fixed part of pay	Firm performance (gross production value per employee; profits per employee)
			Hamann and Ren (2013)[1,3]	Pay dispersion (wage inequality)	Resident's quality of life

Table 3 (continued)

Impact	Type of measure	Measure	Study(ies)	Independent variable(s)	Dependent variable(s)
Positive	Conditional	Ratio of the 90th to 10th percentiles of the residuals of the wage equation	Martins (2008) [4]	Pay dispersion	Firm performance (total sales per worker)
		Gini coefficient	Bloom (1999)	Pay dispersion	Firm performance - On-field performance (winning percentage, fan attendance, and finishing position) - Financial performance (gate receipts, media income, total income, and franchise value, team value at season's end)
			Shaw et al. (2002) [1,2]	Pay dispersion	Workforce performance (labour hours per ton; lost-time accidents; perceptual performance)
			Shaw et al. (2002) [1,2]	Pay dispersion	Workforce performance (labour hours per ton; lost-time accidents; perceptual performance)
			Frick et al. (2003) [1]	Pay dispersion	Team performance (win percentage)
Negative	Unconditional		Bloom (1999)	Pay dispersion	Firm performance - On-field performance (winning percentage, fan attendance, and finishing position) - Financial performance (gate receipts, media income, total income, and franchise value, team value at season's end)
			Hibbs and Locking (2000) [6]	Pay dispersion	Firm performance (real value added; real value added/blue-collar hours)
		Coefficient of Variation	Shaw et al. (2002) [1,2]	Pay dispersion	Workforce performance (accident frequency ratio; out of service percentage; perceptual performance)
			Shaw et al. (2002) [1,2]	Pay dispersion	Workforce performance (labour hours per ton; lost-time accidents; perceptual performance)
			Ding et al. (2009) [2,5]	Pay dispersion among managers Pay dispersion among workers dispersion between managers and workers	Firm performance (sales growth; product/service quality)

Table 3 (continued)

Impact	Type of measure	Measure	Study(ies)	Independent variable(s)	Dependent variable(s)
		Difference (range) between pay levels / maximum and minimum pay	Bloom (1999)	Pay dispersion	Firm performance - On-field performance (winning percentage, fan attendance, and finishing position) - Financial performance (gate receipts, media income, total income, and franchise value, team value at season's end)
			Shaw et al. (2002) [1,2]	Pay dispersion	Workforce performance (accident frequency ratio; out of service percentage; perceptual performance)
			Shaw et al. (2002) [1,2]	Pay dispersion	Workforce performance (labour hours per ton; lost-time accidents; perceptual performance)
			Kepes et al. (2009) [1,2]	Pay dispersion	- Workforce productivity (accident frequency ratio; out-of-service percentage) - Organizational performance (operating ratio; ROE)
Negative	Unconditional		Bloom (1999)	Pay dispersion	Firm performance - On-field performance (winning percentage, fan attendance, and finishing position) - Financial performance (gate receipts, media income, total income, and franchise value, team value at season's end)
		Ratio between pay levels / maximum and minimum pay	Beaumont and Harris (2003) [1]	Pay dispersion	Firm performance (value added per worker)
			Firth et al. (2015)	Pay dispersion	- Total Factor Productivity - Sales to number of employees
			Connelly et al. (2016) [2]	Pay dispersion	- Short-term performance (ROA in the focal year of analysis) - Long-term performance trend (slope of the regression of annual ROA over 5 subsequent years, beginning in the focal year of analysis)
		Ratio of the 80th (90th) to 20th (10th) percentiles of wages	Hamann and Ren (2013) [1,3]	Pay dispersion (wage inequality)	Resident's quality of life

Table 3 (continued)

Impact	Type of measure	Measure	Study(ies)	Inependent variable(s)	Dependent variable(s)
Negative	Unconditional	Standard deviation of pay level	---	---	---
		Herfindahl-Hirshmann index	DeBrock et al. (2004)	Pay dispersion	Team performance (won-lost percentage; attendance at home games)
		Theil index	---	---	---
	Conditional	Residual/standard error of wage regression (or standard deviation of residual/standard error)	Cowherd and Levine (1992)	Hourly pay equity Lower-level exempt pay equity	Product quality
			DeBrock et al. (2004)	Pay dispersion	Team performance (won-lost percentage; attendance at home games)
			Martins (2008)[4]	Pay dispersion	Firm performance (value added per hour worked)
		Ratio of the 90th to 10th percentiles of the residuals of the wage equation	Martins (2008)[4]	Pay dispersion	Firm performance (value added per hour worked)
		Gini coefficient	Grund and Westergaard-Nielsen (2008)[1,4,6]	Pay level dispersion Pay increase dispersion	Firm performance (log of value added per employee; profits)
		Coefficient of Variation	Grund and Westergaard-Nielsen (2008)[1,4,6]	Pay level dispersion Pay increase dispersion	Firm performance (log of value added per employee; profits)
Hump-shaped	Unconditional	Difference (range) between pay levels / maximum and minimum pay	Mahy et al. (2009)	Pay dispersion	Firm performance (value added per hour worked)
		Ratio between pay levels / maximum and minimum pay	---	---	---
		Ratio of the 80th (90th) to 20th (10th) percentiles of wages	---	---	---

Table 3 (continued)

Impact	Type of measure	Measure	Study(ies)	Independent variable(s)	Dependent variable(s)
	Unconditional	Standard deviation of pay level	Grund and Westergaard-Nielsen (2008) [1,4,6]	Pay level dispersion / Pay increase dispersion	Firm performance (log of value added per employee; profits)
			Mahy *et al.* (2009)	Pay dispersion	Firm performance (value added per hour worked)
		Herfindahl-Hirshmann index	---	---	---
Hump-shaped		Theil index	Hunnes (2009) [4]	Dispersion in the fixed part of pay between hierarchical levels	Firm performance (gross production value per employee; profits per employee)
	Conditional	Residual/standard error of wage regression (or standard deviation of residual/standard error)	Winter-Ebmner and Zweimüller (1999) [4]	Pay dispersion	Firm performance (standardised wage levels as a proxy)
			Mahy *et al.* (2009)	Pay dispersion	Firm performance (value added per hour worked)
			Mahy *et al.* (2011)	Pay dispersion	Firm performance (value added per hour worked)
		Ratio of the 90th to 10th percentiles of the residuals of the wage equation	---	---	Firm performance (value added per hour worked)
		Gini coefficient	Grund and Westergaard-Nielsen (2008) [1,4,6]	Pay level dispersion / Pay increase dispersion	Firm performance (log of value added per employee; profits)
		Coefficient of Variation	Grund and Westergaard-Nielsen (2008) [1,4,6]	Pay level dispersion / Pay increase dispersion	Firm performance (log of value added per employee; profits)
			Hunnes (2009) [4]	Dispersion in the fixed part of pay / Dispersion in the variable part of pay	Firm performance (gross production value per employee; profits per employee)
U-shaped	Unconditional	Difference (range) between pay levels / maximum and minimum pay	---	---	---
		Ratio between pay levels / maximum and minimum pay	---	---	---
		Ratio of the 80th (90th) to 20th (10th) percentiles of wages	Grund and Westergaard-Nielsen (2008) [1,4,6]	Pay level dispersion / Pay increase dispersion	Firm performance (log of value added per employee; profits)

Table 3 (continued)

Impact	Type of measure	Measure	Study(ies)	Independent variable(s)	Dependent variable(s)
U-shaped	Unconditional	Standard deviation of pay level	Hunnes (2009)[4]	Dispersion in the variable part of pay	Firm performance (gross production value per employee; profits per employee)
	Conditional	Residual/standard error of wage regression (or standard deviation of residual/standard error)	---	---	---
		Ratio of the 90th to 10th percentiles of the residuals of the wage equation	---	---	---
			Shaw et al. (2002)[1,2]	Pay dispersion	Workforce performance (labour hours per ton; lost-time accidents; perceptual performance)
			Brown et al. (2003)[1,2]	Pay dispersion	Risk-adjusted heart attack mortality rates
		Gini coefficient	Frick et al. (2003)[1]	Pay dispersion	Team performance (win percentage)
			Brown (2006)[1]	Pay dispersion	- Resource efficiency (average length of stay) - Patient care outcomes (adjusted coronary survival rate) - Financial performance (ROA)
None	Unconditional		Shaw et al. (2002)[1,2]	Pay dispersion	Workforce performance (labour hours per ton; lost-time accidents;
		Coefficient of Variation	Ding et al. (2009)[2,5]	Pay dispersion among managers Pay dispersion among workers dispersion between managers and workers	Firm performance (sales growth; product/service quality)
			Hunnes (2009)[4]	Dispersion in the fixed part of pay Dispersion in the variable part of pay	Firm performance (gross production value per employee; profits per employee)
		Difference (range) between pay levels / maximum and minimum pay	Shaw et al. (2002)[1,2]	Pay dispersion	Workforce performance (labour hours per ton; lost-time accidents; perceptual performance)

Table 3 (continued)

Impact	Type of measure	Measure	Study(ies)	Independent variable(s)	Dependent variable(s)
		Difference (range) between pay levels / maximum and minimum pay	Shaw et al. (2002) [1,2]	Pay dispersion	Workforce performance (labour hours per ton; lost-time accidents; perceptual performance)
			Jirjahn and Kraft (2007) [1]	Pay dispersion	Firm performance (log of productivity: value-added per employee)
		Ratio between pay levels / maximum and minimum pay	Kepes et al. (2009) [1,2]	Pay dispersion	- Workforce productivity (accident frequency ratio; out-of-service percentage) - Organizational performance (operating ratio; ROE)
	Unconditional		Hamann and Ren (2013) [1,3]	Pay dispersion (wage inequality)	Resident's quality of life
		Ratio of the 80th (90th) to 20th (10th) percentiles of wages	Hamann and Ren (2013) [1,3]	Pay dispersion (wage inequality)	Resident's quality of life
		Standard deviation of pay level	---	---	---
None		Herfindahl-Hirshmann index	---	---	---
		Theil index	Hunnes (2009) [4,6]	Dispersion in the fixed part of pay between hierarchical levels	Firm performance (gross production value per employee; profits per employee)
		Residual/standard error of wage regression (or standard deviation of residual/standard error)	Hunnes (2009) [4,6]	Dispersion in the fixed part of pay Dispersion in the variable part of pay	Firm performance (gross production value per employee; profits per employee)
	Conditional	Ratio of the 90th to 10th percentiles of the residuals of the wage equation	---	---	---

1   Direction or existence of relationship depends on moderators

2   Direction or existence of relationship depends on the measure of the dependent variable

3   Direction or existence of relationship depends on the measure of the independent variable

4   Direction or existence of relationship depends on the method

5   Direction or existence of relationship depends on the type of dispersion

6   Direction or existence of relationship depends on the independent variable

Appendix B – Industries, countries and theories

Table 4

Industries, countries and theories

Impact	Type of dispersion	Study(ies)	Industry(ies)	Country(ies)	Theory(ies) studied	Theory(ies) verified
Positive	Vertical	Eriksson (1999)	Unspecified	Denmark	- Tournament theory	- Tournament theory
		Hibbs and Lockimg (2000) [2]	Unspecified	Sweden	- Neoclassical theory - Efficiency wage theory - Fair wage-effort hypothesis - Cohesiveness (Levine, 1991) - Industry structure	- Unspecified (tournament theory)
		Brown *et al.* (2003) [1,2]	Health	USA	- Equity theory	- Unspecified (contingency theory)
		Beaumont and Harris (2003) [1]	Pharmaceuticals, Electronic Data Processing, Motor Vehicles and their Engines, Aerospace, Miscellaneous Foods	UK	- Tournament theory - Fair wage-effort hypothesis - Cohesiveness (Levine, 1991) - Contingency theory	- Unspecified (contingency theory)
		Lallemand *et al.* (2004)	Unspecified	Belgium	- Fair wage-effort hypothesis - Cohesiveness (Levine, 1991) - Tournament theory - Theory of organizational politics - Industrial politics and sabotage model (Lazear, 1989, 1995) - Intrinsic motivation	- Unspecified (contingency theory) - Tournament theory
		Heyman (2005)	Unspecified	Sweden	- Tournament theory	- Tournament theory

Table 4 (continued)

Impact	Type of dispersion	Study(ies)	Industry(ies)	Country(ies)	Theory(ies) studied	Theory(ies) verified
		Brown (2006) [1]	Health	USA	- Equity theory - Legitimacy perspective - Social comparison theory	- Unspecified (contingency theory)
		Jirjahn and Kraft (2007) [1]	Manufacturing	Germany	- Tournament theory - Cohesiveness (Levine, 1991) - Intrinsic motivation - Contingency theory - Industrial politics and sabotage model	- Unspecified (contingency theory)
		Martins (2008) [4]	Unspecified	Portugal	- Tournament theory - Fair wage-effort hypothesis	- Fair wage-effort hypothesis
Positive	Vertical	Hunnes (2009) [4,6]	Unspecified	Norway	- Tournament theory - Fair wage-effort hypothesis - Cohesiveness (Levine, 1991) - Industrial politics and sabotage model - Theory of organizational politics - Intrinsic motivation	- None
		Ding et al. (2009) [2,5]	Manufacturing, services	China	- Tournament theory - Equity theory - Fair wage-effort hypothesis - Social comparison theory - Contingency theory - Legitimacy perspective	- Tournament theory
		Connelly et al. (2016) [2]	Unspecified	USA	- Tournament theory	- Unspecified (contingency theory)
		Hamann and Ren (2013) [1,3]	Health	USA	- Tournament theory - Fair wage-effort hypothesis - Cohesiveness (Levine, 1991)	- Unspecified (contingency theory)

Table 4 (continued)

Impact	Type of dispersion	Study(ies)	Industry(ies)	Country(ies)	Theory(ies) studied	Theory(ies) verified
Positive	Horizontal	Shaw et al. (2002) [1,2]	Motor carrier, concrete pipe	USA	- Legitimacy perspective / pay basis approach - Contingency theory - Other theories (expectancy, goal-setting, operant conditioning, organizational justice, institutional theories) - Sociological and economic efficiency theories	- Unspecified (contingency theory) - Legitimacy perspective / pay basis approach - Industrial politics and sabotage model
		Kepes et al. (2009) [1,2]	Motor carrier	USA	- Expectancy theory - Legitimacy perspective - Fair wage-effort hypothesis	- Unspecified (contingency theory)
		Cowherd and Levine (1992)	Several (primarily manufacturers)	North America Europe	- Distributive justice model (based on equity and relative deprivation theories)	- Distributive justice model (based on equity and relative deprivation theories)
		Hibbs and Locking (2000) [6]	Unspecified	Sweden	- Neoclassical theory - Efficiency wage theory - Fair wage-effort hypothesis - Cohesiveness (Levine, 1991) - Industry structure	- Unspecified (tournament theory)
Negative	Vertical	Brown et al. (2003) [1,2]	Health	USA	- Equity theory	- Unspecified (contingency theory)
		Beaumont and Harris (2003) [1]	Pharmaceuticals, Electronic Data Processing, Motor Vehicles and their Engines, Aerospace, Miscellaneous Foods	UK	- Tournament theory - Fair wage-effort hypothesis - Cohesiveness (Levine, 1991) - Contingency theory	- Unspecified (contingency theory)
		Brown (2006) [1]	Health	USA	- Equity theory - Legitimacy perspective	- Unspecified (contingency theory)

Table 4 (continued)

Impact	Type of dispersion	Study(ies)	Industry(ies)	Country(ies)	Theory(ies) studied	Theory(ies) verified
	Vertical	Martins (2008)[4]	Unspecified	Portugal	- Tournament theory - Fair wage-effort hypothesis	- Fair wage-effort hypothesis
		Hamann and Ren (2013)[1,3]	Health	USA	- Tournament theory - Fair wage-effort hypothesis - Cohesiveness (Levine, 1991)	- Unspecified (contingency theory)
		Firth et al. (2015)	Unspecified	China	- Tournament theory - Relative deprivation theory - Social comparison theory - Cohesiveness (Levine, 1991) - Contingency theory	- Unspecified (relative deprivation theory; social comparison theory)
Negative		Connelly et al. (2016)[2]	Unspecified	USA	- Tournament theory	- Unspecified (contingency theory)
	Horizontal	Bloom (1999)	Sports	USA	- Neoclassical theory - Tournament theory - Equity/fairness perspective - Contingency theory - Industrial politics and sabotage model	Unspecified (contingency theory; industrial politics and sabotage model)
		Shaw et al. (2002)[1,2]	Motor carrier, concrete pipe	USA	- Legitimacy perspective / pay basis approach - Industrial politics and sabotage model - Contingency theory - Other theories (expectancy, goal-setting, operant conditioning, organizational justice, institutional theories) - Sociological and economic efficiency theories	- Unspecified (contingency theory) - Legitimacy perspective / pay basis approach - Industrial politics and sabotage model

Table 4 (continued)

Impact	Type of dispersion	Study(ies)	Industry(ies)	Country(ies)	Theory(ies) studied	Theory(ies) verified
Negative	Horizontal	Frick et al. (2003) [1]	Sports	USA	- Cohesiveness (Levine, 1991) - Tournament theory	- None
		DeBrock et al. (2004)	Sports	USA	- Efficiency wage theory - Equity theory - Tournament theory	- Equity theory
		Jewell and Molina (2004)	Sports	USA	- Fair wage-effort hypothesis - Cohesiveness (Levine, 1991)	- Cohesiveness (Levine, 1991)
		Ding et al. (2009) [2,5]	Manufacturing, services	China	- Tournament theory - Equity theory - Fair wage-effort hypothesis - Social comparison theory - Contingency theory - Legitimacy perspective	- Equity theory
		Kepes et al. (2009) [1,2]	Motor carrier	USA	- Expectancy theory - Legitimacy perspective - Fair wage-effort hypothesis - Industrial politics and sabotage model	- Unspecified (contingency theory)
		Winter-Ebmer and Zweimüller (1999) [3]	Unspecified	Austria	- Fair wage-effort hypothesis - Cohesiveness (Levine, 1991) - Tournament theory - Industrial politics and sabotage model - Intrinsic motivation	- Unspecified (contingency) - Industrial politics and sabotage model - Intrinsic motivation
Hump-shaped	Vertical	Grund and Westergaard-Nielsen (2008) [1,4,6]	Unspecified	Denmark	- Tournament theory - Equity theory - Relative deprivation theory - Distributive justice theory - Fair wage-effort hypothesis - Cohesiveness (Levine, 1991) - Intrinsic motivation	- Unspecified (contingency theory; cohesiveness)

Table 4 (continued)

Impact	Type of dispersion	Study(ies)	Industry(ies)	Country(ies)	Theory(ies) studied	Theory(ies) verified
Hump-shaped	Vertical	Mahy et al. (2009)	Unspecified	Belgium	- Tournament theory - Efficiency wage theory - Fair wage-effort hypothesis - Theory of organizational politics - Cohesiveness (Levine, 1991) - Industrial politics and sabotage model	- Unspecified (contingency theory)
	Vertical	Mahy et al. (2011)	Unspecified	Belgium	- Tournament theory - Efficiency wage theory - Theory of organizational politics - Cohesiveness (Levine, 1991) - Industrial politics and sabotage model	- Unspecified (contingency theory)
	Horizontal	Yang and Klaas (2011)	Unspecified	Korea	- Efficiency wage theory - Social comparison theory - Legitimacy perspective / pay basis approach - Contingency theory (culture in South Korea - cultural norms may help to legitimize pay dispersion among those within the same job category)	- Unspecified (contingency theory)
		Grund and Westergaard-Nielsen (2008) [1,4,6]	Unspecified	Denmark	- Tournament theory - Equity theory - Relative deprivation theory - Distributive justice theory - Fair wage-effort hypothesis - Cohesiveness (Levine, 1991) - Intrinsic motivation	- Unspecified (contingency theory; cohesiveness)
U-shaped	Vertical	Humnes (2009) [4,6]	Unspecified	Norway	- Tournament theory - Fair wage-effort hypothesis - Cohesiveness (Levine, 1991) - Industrial politics and sabotage model - Theory of organizational politics - Intrinsic motivation	- None

Table 4 (continued)

Impact	Type of dispersion	Study(ies)	Industry(ies)	Country(ies)	Theory(ies) studied	Theory(ies) verified
		Brown et al. (2003) [1,2]	Health	USA	- Equity theory	- Unspecified (contingency theory)
		Brown (2006) [1]	Health	USA	- Equity theory - Legitimacy perspective	- Unspecified (contingency theory)
		Jirjahn and Kraft (2007) [1]	Manufacturing	Germany	- Tournament theory - Cohesiveness (Levine, 1991) - Intrinsic motivation - Contingency theory - Industrial politics and sabotage model	- Unspecified (contingency theory)
None	Vertical	Kepes et al. (2009) [1,2]	Motor carrier	USA	- Expectancy theory - Legitimacy perspective - Fair wage-effort hypothesis	- Unspecified (contingency theory)
		Hunnes (2009) [4,6]	Unspecified	Norway	- Tournament theory - Fair wage-effort hypothesis - Cohesiveness (Levine, 1991) - Industrial politics and sabotage model - Theory of organizational politics - Intrinsic motivation	- None
		Hamann and Ren (2013) [1,3]	Health	USA	- Tournament theory - Fair wage-effort hypothesis - Cohesiveness (Levine, 1991)	- Unspecified (contingency theory)
None	Horizontal	Shaw et al. (2002) [1,2]	Motor carrier, concrete pipe	USA	- Legitimacy perspective / pay basis approach - Industrial politics and sabotage model - Contingency theory - Other theories (expectancy, goal-setting, operant conditioning, organizational justice, institutional theories) - Sociological and economic efficiency theories	- Unspecified (contingency theory) - Legitimacy perspective / pay basis approach - Industrial politics and sabotage model

Table 4 (continued)

Impact	Type of dispersion	Study(ies)	Industry(ies)	Country(ies)	Theory(ies) studied	Theory(ies) verified
None	Horizontal	Frick *et al.* (2003)[1]	Sports	USA	- Cohesiveness (Levine, 1991) - Tournament theory	- None
		Ding *et al.* (2009)[2,5]	Manufacturing, services	China	- Tournament theory - Equity theory - Fair wage-effort hypothesis - Social comparison theory - Contingency theory - Legitimacy perspective	- Equity theory
		Hunnes (2009)[4,6]	Unspecified	Norway	- Tournament theory - Fair wage-effort hypothesis - Cohesiveness (Levine, 1991) - Industrial politics and sabotage model - Theory of organizational politics - Intrinsic motivation	- None

[1] Direction or existence of relationship depends on moderators

[2] Direction or existence of relationship depends on the measure of the dependent variable

[3] Direction or existence of relationship depends on the measure of the independent variable

[4] Direction or existence of relationship depends on the method

[5] Direction or existence of relationship depends on the type of dispersion

[6] Direction or existence of relationship depends on the independent variable

Appendix C - Moderators

Table 5

Moderators

Type of moderator	Moderator	Effect	Study(ies)	Type of dispersion	Independent variable(s)	Dependent variable(s)
Firm size	Firm size	- Pharmaceutical industry: For large foreign-owned plants, greater pay dispersion led to higher productivity - Other industries: (1) Positive impact of pay dispersion on performance for large foreign plants (smaller for Electronic Data Processing and Motor Vehicles) (2) Firm size doesn't affect the relationship for the Aerospace industry (3) Small impact of pay dispersion on performance for Miscellaneous Foods, with no additional effects related to size	Beaumont and Harris (2003)	Vertical	Pay dispersion (pay compression)	Value added per worker
Country	Country	- Pharmaceutical industry: (1) Negative impact of pay dispersion on performance for UK-owned plants - greater impact for small ones (2) For large foreign-owned plants, greater pay dispersion led to higher productivity - Other industries: (1) Positive impact of pay dispersion on performance for large foreign plants (smaller for Electronic Data Processing and Motor Vehicles) (2) Small impact of pay dispersion on performance for Miscellaneous Foods, with no additional effects related to country	Beaumont and Harris (2003)	Vertical	Pay dispersion (pay compression)	Value added per worker

Table 5 (continued)

Type of moderator	Moderator	Effect	Study(ies)	Type of dispersion	Independent variable(s)	Dependent variable(s)
Industry	Industry	- Pharmaceutical industry: (1) Negative impact of pay dispersion on performance for UK owned plants - greater impact for small ones (2) For large foreign-owned plants, greater pay dispersion led to higher productivity - Other industries: (1) Positive impact of pay dispersion on performance for large foreign plants (smaller for Electronic Data Processing and Motor Vehicles) (2) Firm size doesn't affect the relationship for the Aerospace industry (US and UK) (3) Small impact for Miscellaneous Foods, and no additional effects related to ownership or size	Beaumont and Harris (2003)	Vertical	Pay dispersion (pay compression)	Value added per worker
Pay level		As pay levels increase, hierarchical pay dispersion becomes more positively related to an increase in performance	Brown (2006)	Vertical	Pay dispersion	Risk-adjusted heart attack mortality rates
	Pay level	- For low pay levels, pay dispersion had a positive impact on length of stay and adjusted survival, but virtually no effect at high pay levels - Pay dispersion was best at predicting ROA under an egalitarian pay system lagging the market or a hierarchical pay system leading the market	Brown et al. (2003)	Vertical	Pay dispersion	- Resource efficiency (average length of stay) - Patient care outcomes (adjusted coronary survival rate) - Financial performance (ROA)

Table 5 (continued)

Type of moderator	Moderator	Effect	Study(ies)	Type of dispersion	Independent variable(s)	Dependent variable(s)
Pay structure	Pay structure	- No relationship between hierarchy in the pay structure and performance - Pay dispersion was best at predicting ROA under an egalitarian pay system lagging the market or a hierarchical pay system leading the market	Brown *et al.* (2003)	Vertical	Pay dispersion	- Resource efficiency (average length of stay) - Patient care outcomes (adjusted coronary survival rate)
	Composition of the workforce (white *vs.* blue-collar)	- For both white-collar and blue-collar workers, there is a hump-shaped relationship between pay dispersion and productivity (OLS) - Flatter hump-shaped relationship for white-collar workers, and no significant impact for blue-collar workers (fixed-effects)	Winter-Ebmer and Zweimüller (1999)	Vertical	Pay dispersion	Firm performance (standardised wage levels as a proxy)
Composition of the workforce	Composition of the workforce (white *vs.* blue-collar)	Positive impact of intra-firm wage dispersion on firm performance, lower for firms with a greater proportion of white-collar workers	Lallemand *et al.* (2004)	Vertical	Pay dispersion	Gross operating surplus per worker
	Composition of the workforce (managers *vs.* white-collar)	Positive effect of all measures of wage dispersion (both for white-collar workers and managers) on profits	Heyman (2005)	Vertical	Pay dispersion	Profits per employee

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Table 5 (continued)

Type of moderator	Moderator	Effect	Study(ies)	Type of dispersion	Independent variable(s)	Dependent variable(s)
Composition of the workforce	Composition of the workforce (white vs. blue-collar)	- For blue-collar workers, neither wage dispersion, nor the dispersion of wage increases has a significant effect on value added - No significant association between wage differentials between white-collar workers and blue-collar workers and firm performance - U-shaped association between wage growth dispersion among white-collar workers and firm performance	Grund and Westergaard-Nielsen (2008)	Vertical	Pay level dispersion Pay increase dispersion	Firm performance (log of value added per employee; profits)
Product market competition	Product market competition	The degree of competitiveness within an industry does not affect the impact of relative pay on performance	Firth et al. (2015)	Vertical	Pay dispersion (relative pay)	- Total Factor Productivity - Sales to number of employees
Capital-labour ratio	Capital-labour ratio	Including firms' capital–labour ratio does not change the positive effect of pay dispersion on firm performance	Heyman (2005)	Vertical	Pay dispersion	Profits per employee
Industrial relations	Works council presence	Much lower effect of pay dispersion on productivity in the presence of a works council	Jirjahn and Kraft (2007)	Vertical	Pay dispersion	Gross operating surplus per worker
	Collective bargaining coverage	Much lower effect of wage dispersion on productivity if the establishment is covered by a collective bargaining agreement	Jirjahn and Kraft (2007)	Vertical	Pay dispersion	Gross operating surplus per worker

Table 5 (continued)

Type of moderator	Moderator	Effect	Study(ies)	Type of dispersion	Independent variable(s)	Dependent variable(s)
Industrial relations	Industrial relations regime (unionization)	The hump-shaped relationship between pay dispersion and firm performance is not affected by the industrial relations regime	Mahy et al. (2011)	Vertical	Pay dispersion	Value added per hour worked
Monitoring	Monitoring environment	The positive impact of pay dispersion on firm performance is higher for firms with a high degree of monitoring	Lallemand et al. (2004)	Vertical	Pay dispersion	Gross operating surplus per worker
Incentives	Individual incentives	- Strong negative impact of pay dispersion on accident frequency ratio and out-of-service percentage (better performance) when the use of individual incentives is high, and positive when low (worse performance) - Negative impact on perceptual performance, stronger when the use of incentives is low.	Shaw et al. (2002)	Horizontal	Pay dispersion	Workforce performance (accident frequency ratio; out of service percentage; perceptual performance)
		- Poorer performance (labour hours per ton and lost-time accidents, no significance for perceptual performance) when pay dispersion was high and incentives were low - When interdependence is low, no significant relationship between pay dispersion and labour hours per ton; but positive (poorer performance) when high (attenuated by a higher use of incentives, enhanced with a lower) - When work interdependence is low and in the absence of incentives, positive impact of pay dispersion on accident frequency ratio (poorer performance), negative impact when it is high regardless of the use of incentives				Workforce performance (labour hours per ton; lost-time accidents; perceptual performance)

Table 5 (continued)

Type of moderator	Moderator	Effect	Study(ies)	Type of dispersion	Independent variable(s)	Dependent variable(s)
	Incentives based on relative employee performance	Positive effects of wage dispersion are smaller if the establishments reward relative performance	Jirjahn and Kraft (2007)	Vertical	Pay dispersion	Firm performance (log of productivity: value-added per employee)
	Use of individual piece rates	The use of individual piece rates increases the positive effect of wage dispersion on productivity	Jirjahn and Kraft (2007)	Vertical	Pay dispersion	Firm performance (log of productivity: value-added per employee)
	Use of group piece rates	The use of group piece rates increases the positive effect of wage dispersion on productivity, even stronger then when individual piece rates are used	Jirjahn and Kraft (2007)	Vertical	Pay dispersion	Firm performance (log of productivity: value-added per employee)
Incentives	Pay basis (performance vs. politically-based)	- Negative impact of pay dispersion on accident frequency ratio when performance-based pay was high, and positive when low - No significant association between the interaction of pay dispersion and performance-based pay on financial performance - Positive impact of pay dispersion on accident frequency ratio when politically-based pay was high, and negative when low - Negative impact of the interaction of pay dispersion and politically-based pay on ROE - Positive association of pay dispersion with ROE when politically-based pay is low and none when high	Kepes (2009)	Horizontal	Pay dispersion (pay range)	- Workforce productivity (accident frequency ratio; out-of-service percentage) - Organizational performance (operating ratio; ROE)

Table 5 (continued)

Type of moderator	Moderator	Effect	Study(ies)	Type of dispersion	Independent variable(s)	Dependent variable(s)
	Team interdependence	No differences in the effects of pay dispersion on firm performance between firms with interdependent managerial teams and those in which they are not	Eriksson (1999)	Vertical	Pay dispersion	Firm performance (3-year average of profits divided by sales)
Interdependence	Work interdependence	- Poorest performance (all measures) when both pay dispersion and work interdependence were high - When interdependence is low, no relationship between pay dispersion and labour hours per ton; but positive when high (attenuated by a higher use of incentives, enhanced with a lower) - When interdependence is low and in the absence of incentives, positive impact of pay dispersion on accident frequency ratio, negative impact when it is high regardless of the use of incentives	Shaw et al. (2002)	Horizontal	Pay dispersion	Workforce performance (labour hours per ton; lost-time accidents; perceptual performance)
	Cost structure (cooperation / teamwork)	The negative association between relative compensation and firm performance is more pronounced for firms requiring more teamwork	Firth (2015)	Vertical	Pay dispersion	- Total Factor Productivity - Sales to number of employees
Uncertainty of the economic environment	Uncertainty of the economic environment	Hump-shaped relationship between wage dispersion and firm performance with a greater effect for firms in less uncertain environments	Mahy et al. (2009)	Vertical	Pay dispersion	Firm performance (value added per hour worked)

Table 5 (continued)

Type of moderator	Moderator	Effect	Study(ies)	Type of dispersion	Independent variable(s)	Dependent variable(s)
Skills of the workforce	Skills of the workforce	Hump-shaped relationship between wage dispersion and firm performance, with a greater effect for firms with a highly skilled workforce	Mahy *et al.* (2009)	Vertical	Pay dispersion	Firm performance (value added per hour worked)
	Ownership (non-profit, for-profit, government)	- 80th/20th wage differential positively related to resident quality of life (negatively for non-profit firms)	Hamann and Ren (2013)	Vertical	Pay dispersion	Resident's quality of life
Ownership	Ownership (private vs. state)	Negative association between relative pay and both total factor productivity and sales to number of employees for both private and publicly owned firms	Firth *et al.* (2015)	Vertical	Pay dispersion	- Total Factor Productivity - Sales to number of employees
Pay competitiveness	Pay competitiveness	- Hump-shaped relationship between pay dispersion and firm performance - The positive slope of the curve inverts at higher levels of dispersion as pay competitiveness increases	Yang and Klaas (2011)	Horizontal	Pay dispersion	Firm performance (ratio of operating profit to assets)
Managerial size	Managerial size	- Hump-shaped relationship between pay dispersion and firm performance - The positive slope of the curve inverts at higher levels of dispersion as managerial size increases	Yang and Klaas (2011)	Horizontal	Pay dispersion	Firm performance (ratio of operating profit to assets)

Table 5 (continued)

Type of moderator	Moderator	Effect	Study(ies)	Type of dispersion	Independent variable(s)	Dependent variable(s)
Performance evaluation	Performance evaluation	- Hump-shaped relationship between pay dispersion and firm performance - The positive slope of the curve inverts at higher levels of dispersion as the extensiveness of performance evaluation increases	Yang and Klaas (2011)	Horizontal	Pay dispersion	Firm performance (ratio of operating profit to assets)