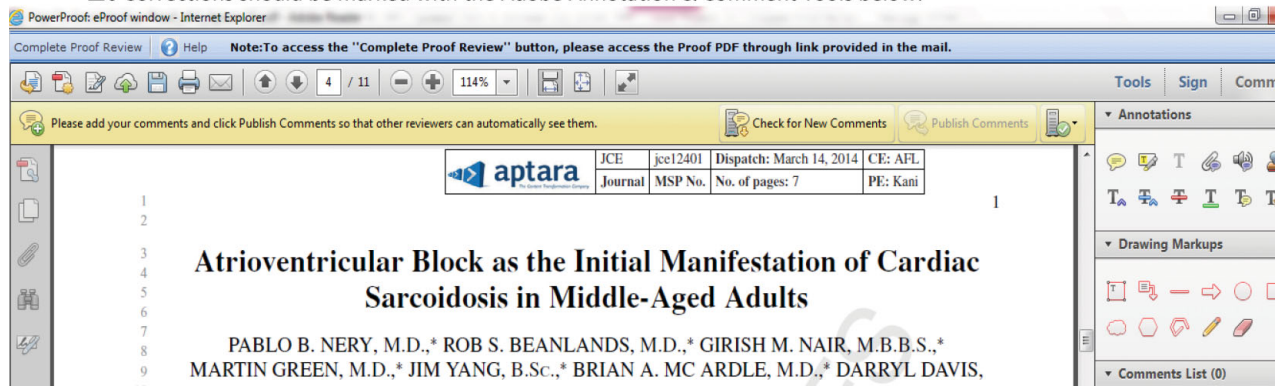


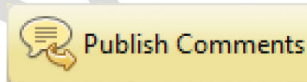
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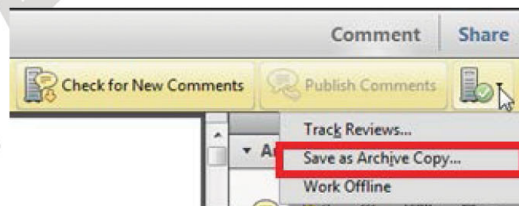
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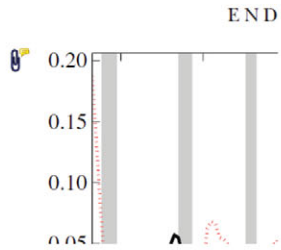
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
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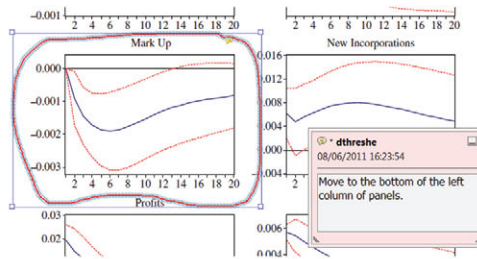


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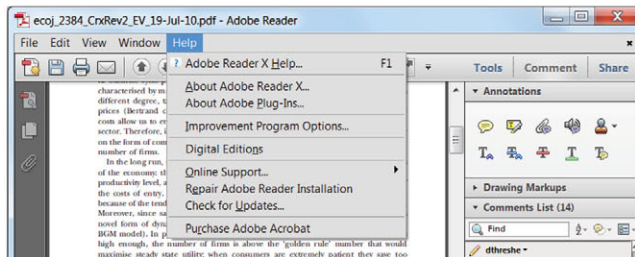
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2 3 4 **Single- and Multiple-Informant Research** 5 6 **Designs to Examine the Human Resource** 7 8 **Management–Performance Relationship** 9 10 11 12

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20 **During the last decades, many empirical studies have analysed the relationship between**
 21 **human resource management and firm performance. Despite the call for multiple-rater**
 22 **designs, a relatively large number of researchers still rely on survey responses provided by**
 23 **a single informant in each organization. Single-informant designs suffer from a number**
 24 **of problems, especially when the responses provided by different types of raters across**
 25 **firms are pooled into a single dataset prior to assessing their equivalence across raters.**
 26 **Using an illustration of the relationship between high performance work systems and**
 27 **firm performance, in this paper we observe that responses provided by managers holding**
 28 **different positions (human resource managers and sales managers) differ significantly and**
 29 **therefore pooling their responses into a single dataset may result in confusing conclusions.**
 30 **Furthermore, we demonstrate that differences arise in the estimated parameters when a**
 31 **multiple-key-informant approach, compared to a single-informant design, is adopted. For**
 32 **these reasons, data collection using multiple key informants is recommended, based on the**
 33 **assumption that some raters in the firm will be more knowledgeable about the variables**
 34 **of interest than others.**

35 **Introduction**

36 A crucial question in the human resource management (HRM) literature is the analysis of the
 37 relationship between the human resource strategy of the firm and organizational performance
 38 (Appelbaum *et al.*, 2000; MacDuffie, 1995; Youndt *et al.*, 1996). Although most of the empirical studies
 39 have found a positive association between the two measures (Combs *et al.*, 2006), the methodological
 40 limitations raised by several authors (e.g. Gerhart, Wright and McMahan, 2000; Gerhart
 41 *et al.*, 2000; Huselid and Becker, 2000) suggest that the conclusions they draw are premature to
 42 say the least. Our study aims to contribute to the methodological debate in the HRM field by
 43 exploring the following research questions.
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54 First, over the past years several studies in the HRM field have used data collected through
 55 questionnaires administered to informants (one informant per firm) whose positions vary across
 56 organizations. For instance, this is the case of studies that use data provided, without distinction,
 57 by HR managers or senior managers (e.g. Park *et al.*, 2003), by various staff members from
 58 CEO to junior managers (Guthrie, 2001), by HR managers, owners and senior managers (Harel
 59 and Tzafrir, 1999), or even by unspecified respondents (Delaney and Huselid, 1996). These studies
 60 then pool responses to create a single dataset for statistical analyses (Rungtusanatham *et al.*, 2008)
 61 so the information about HRM and performance is provided by the HR managers in some cases and
 62 by the senior or other managers in other cases. However, it is important to take into account that
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when there are systematic differences in survey ratings depending on who provides the answers (or, in the words of Huselid and Becker (2000), when the ‘respondents matter’) the rater chosen to respond to the survey becomes a critical issue. Conclusions drawn from studies that pool responses obtained from different types of raters should be analysed with caution when measurement invariance is not examined prior to pooling data (Rungtusanatham *et al.*, 2008). It is not our intention to call into question the results of this research stream but rather, in our first research question, to empirically analyse the consequence of pooling responses provided by different types of informants and to examine whether the proposed relationships between HRM and performance vary depending on the respondent chosen to assess the variables.

Second, the traditional data collection strategy employed in the HRM field assumes that a single person is able to provide accurate information about all the variables that refer to the whole organization (Gerhart, Wright and McMahan, 2000). This approach increases the probability that the relationships between HRM and performance will be affected by common method variance (CMV) (Podsakoff *et al.*, 2003). A recommended strategy in the HRM field to avoid the risk of CMV is to collect data from multiple sources, i.e. using various informants in each organization to provide responses to different questions in the same questionnaire. Multiple-source studies assume that some raters are more knowledgeable than others in assessing the measures of interest (i.e. differential accuracy assumption) (Huselid and Becker, 2000). Consistent with Huselid and Becker (2000) and Wright *et al.* (2001), we believe that more attention should be paid to ensuring that the most knowledgeable informants are used in order to increase the validity of the measures and to reduce the potential CMV. In our second research question we analyse whether the relationship between HRM and performance varies when multiple informants in a single company assess the variables about which they have more information compared to a single-respondent survey design to evaluate the same variables.

An overview of research approaches in the HRM–performance literature

Many of the empirical studies in the HRM field analysing the relationship between HRM and

performance use survey research. According to Rungtusanatham *et al.* (2008), data in these studies are collected through different survey research approaches, including those using either a single or multiple informants. To provide a parsimonious and systematic consideration of how published articles on the HRM–performance relationship rely on single or multiple informants, Appendix 1 shows a classification of 97 studies on this relationship included in Jiang *et al.*'s (2012) meta-analysis, all of which used surveys to collect all or part of the research data. A direct content analysis (Hsieh and Shannon, 2005) was conducted to classify the papers. Inspired by the Weber protocol (Weber, 1990), the coding categories were defined based on Rungtusanatham *et al.*'s (2008) classification approaches, which were refined after coding a sample of the selected articles. The reliability of the allocation of articles in each category was addressed following the two-step procedure used in other content analyses such as Furrer, Thomas and Goussevskaia (2008), Jeung *et al.* (2011) and Clark *et al.* (2014). First, two of the authors of this paper independently reviewed all 97 selected articles and coded them in one of the four categories (based on a detailed examination of the methodology used); the two authors coded 79% of the articles in the same category. The percentage of agreement rose to above 90% when it was considered that some divergences came from papers that shared features from more than one approach, which the coders had allocated in different categories. In a second step, vagueness or discrepancies between the two coders were resolved through research team discussions and assigned to the category considered to be the best fit.

The papers were classified into four distinct approaches. In the first approach (approach 1) a single informant in each organization provides answers to all the questions in the questionnaire, but differs in that the position of the informants varies across the organizations. For example, Audea, Teo and Crawford (2005) used data obtained by aggregating responses from HR managers, labour or union representatives and general managers from different organizations and performed the statistical analyses using information from the pooled dataset.

Approach 2 involves sending a questionnaire to a single informant in each organization but the informants hold a similar recognized position in all the surveyed organizations and provide

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answers to all the questions included in the questionnaire. For instance, Batt and Colvin (2011) administered a questionnaire to the senior managers of a sample of US call centres, who answered questions related to both the independent variable (HR practices) and the dependent variables (quits, dismissals, turnover and customer satisfaction).

The remaining two approaches involve using multiple informants from each organization. Approach 3 corresponds to studies in which all the informants in each organization provide answers to all the questions included in the questionnaire. For instance, Youndt and Snell (2004) distributed a questionnaire containing items related to different HR configurations, the three components of the firm's intellectual capital and firm performance to various managers in each participating firm: the two highest ranking executives (CEO and president) and the vice-president of HR. For 71 firms these authors received responses from two or three respondents who provided information about all the questions included in the survey which was then used to calculate the interrater agreement for each measure.

Approach 4 entails distributing different sections of the questionnaire to different 'key' informants. This is the case of Akhtar, Ding and Ge's (2008) study about the influence of strategic human resource practices on firm performance in a sample of Chinese firms. In this research, the general manager of the surveyed firms responded to questions about company performance, while the HR manager responded to questions related to the HR practices.

From this review, we can conclude that the majority of studies in the HRM field still rely on single-informant data to test their hypotheses. Appendix 1 shows that 60 of the studies we reviewed (62%) collect data from a single informant in the firm. Wall and Wood (2005) drew similar conclusions, observing that 21 of the 25 studies they analysed use single respondents. Of the 60 studies, 32 adopt approach 1 and 28 adopt approach 2 in their research designs. In other words, more than half of the single-informant studies did not know the position held by the person who had answered the questionnaire. In addition, the pre-eminence of single-informant designs in the HRM literature indicates that concerns with CMV are still not properly addressed in this field. Regarding multiple-informant designs, studies in approach 3 are not very common in the HRM literature

(see Appendix 1), probably because, although they improve the reliability of the measures, CMV may still exist and the cost of collecting data from multiple informants does not pay off. Finally, 32 studies (33%) collect data following approach 4. That is, only one-third of the analysed studies have a strategy to deal with CMV. In the following sections, we shall address some of the features of the above-mentioned approaches in more detail.

Research question 1: Does the respondent matter in HRM research?

The overview of the research approaches in the HRM–performance literature suggests that many of the empirical studies pooled data provided by different types of informants (approach 1). Implicit in such a procedure is the 'parallel raters' assumption, which ignores the existence of systematic differences in responses provided by informants holding different positions in the firm. However, Huselid and Becker (2000) highlight the relevance of using informants whose position enables them to provide relevant data, giving support to the 'differential accuracy' assumption. Under this assumption some raters (key informants) will give more reliable descriptions of the measures studied than others, and therefore these types of informants should be preferred 'because they are supposedly knowledgeable about the issues being researched and are willing to communicate about them' (Kumar, Stern and Anderson, 1993, p. 1634). If the differential accuracy assumption is realistic, data collection following approach 1 would lead to biased results that may threaten the validity of conclusions about HRM–performance relationships.

In the HRM–performance field, there are several reasons why pooling data provided by different types of respondents in different firms can lead to confusing conclusions. First, not all managers in the organization have the same knowledge and information about HR practices and performance; for instance, senior managers (particularly in large organizations) may not always know precisely which HR practices are implemented in the organization (Huselid and Becker, 2000), or HR managers may not have detailed information on how line managers implement the practices. If the influence of HRM

on outcome variables is assessed using raters with different knowledge to assess the same issues, results may vary across types of informants.

Second, raters in different positions have certain assumptions about the co-occurrence of rated items, and these assumptions can introduce distortions when the analysis is derived by pooling data from distinct types of raters (Berman and Kenny, 1976). For example, HR managers' implicit theories about the effectiveness of HRM can affect the relationships between HRM and organizational performance when the HR manager is the respondent, as demonstrated by Gardner and Wright (2009). Those authors found that information about previous performance may influence the reported use of certain HR practices and vice versa.

An additional source of bias in raters' responses is social desirability, defined as the 'need for social approval and acceptance' (Crowne and Marlowe, 1964, p. 109). Social desirability derives from individuals' tendency to present themselves, the practices they promote or the results they achieve in a favourable light, regardless of their true feelings on a topic. This may bias raters' responses and distort the assessment of the variables. For example, HR managers would be more willing to emphasize the use of HR practices they are responsible for.

Finally, differences in ratings between types of informants may be due to the respondents' leniency or stringency, i.e. the tendency to provide higher or lower ratings about the constructs of interest (Cheung, 1999). For instance, raters with leniency biases may give a higher rating to individuals they know, or to the practices, activities or results they are responsible for (Guilford, 1954).

For all the above-mentioned reasons, although data collection approach 1 is frequently used in studies about the HRM–firm performance relationship, conclusions based on these studies should be analysed with caution. In the empirical illustration presented in the following sections we focus on data collected through approach 1 to provide answers to our first research question: Are there differences in the proposed HRM–performance relationships depending on the type of respondent? Or, in other words, does the respondent matter?

Research question 2: Common method variance and multiple-key-informant research designs in HRM research

A second inherent problem in studies that use data obtained through a single-informant strategy is that their results may be affected by CMV when a single rater evaluates both the predictor and the criterion variables (Wall and Wood, 2005). According to Podsakoff *et al.* (2003), this type of CMV may result in inflated observed correlations among the variables assessed by the same rater.

CMV can be partly explained by the sources of systematic differences across raters described in the previous section. Other potential sources of CMV should also be taken into account, however. For instance, Podsakoff *et al.* (2003) consider the consistency motif as one of the sources of CMV, defined as the tendency of raters to maintain consistency in their responses to the different questions included in the survey. In addition, acquiescence, or the 'tendency to agree with attitude statements regardless of content' (Winkler, Kanouse and Ware, 1982, p. 555), may lead to higher correlations among the items that are described in similar terms in the survey, even when they are not conceptually related. Finally, respondents' enduring or transient mood states can also produce artifactual covariance in measures, depending on the positive or negative mood of the respondent when he or she answers the survey questions.

A strategy suggested to avoid the problems of CMV consists of collecting data from multiple sources within the same firm (Wall and Wood, 2005), in particular selecting 'key' informants (one or several) who provide responses to questions about which they are more knowledgeable or that are more closely linked to their areas of expertise (Huselid and Becker, 2000) (approach 4). Regardless of the difficulties inherent in multiple-respondent research (e.g. missing data, low survey response rates, higher cost of data collection etc.) the use of a multiple-key-informant strategy to collect data seems a promising approach to advance knowledge about the relationship between HRM and firm performance. Research adopting a multiple-informant strategy should obtain information about HR practices from at least one rater and information about the performance variables from a different rater (or set of different raters).

This approach allows the researcher to deal with the above-mentioned problems associated with the single-informant research design. In our illustration, results obtained through approach 4 will be the baseline model against which we compare the results of single-informant designs. Through this comparison we shall examine our second research question, namely, are there differences in the proposed HRM–performance relationships when a multiple-key-informant design (approach 4) as opposed to a single-informant design is adopted?

Illustration: Influence of high performance work systems on firm performance through HR flexibility

Theoretical model

To illustrate the issues presented in the previous sections, we propose a theoretical model that includes the relationships between high performance work systems (HPWS), human resource flexibility (HRF) and firm performance (FP) (Figure 1). Our analyses are based on the relationships specified in this model.

HRM aims to increase productivity and effectiveness, and relies on conditions that help employees to identify the firm’s goals and to work hard to accomplish them (Whitener, 2001). In recent decades HPWS have predominated in the HR literature. HPWS are made up of four dimensions, namely comprehensive staffing, extensive training, developmental performance appraisal and equitable reward systems (Snell and Dean, 1992). The resource-based view of the firm argues that HPWS can lead to competitive advantages by developing a unique and valuable human capital pool (Delery, 1998).

Over the past decade, the increasing dynamism of competitive environments and the emergence of new principles to manage firms point to HRF as a potential mediator of the relationship between HRM and organizational outcomes (Bhattacharya, Gibson and Doty, 2005). From a resource-based view perspective, HRF is made up of three dimensions: functional flexibility, skill malleability and behaviour flexibility (Beltrán-Martín *et al.*, 2008; Bhattacharya, Gibson and Doty, 2005).

Several studies have demonstrated that HRF significantly affects FP through different paths, such as developing more efficient means of accomplish-

ing task requirements (Boxall, 1999), reducing the number of line managers and costs of administrative levels (Valverde, Tregaskis and Brewster, 2000), contributing to the adoption of innovative solutions in the firm, and increasing productivity (Lado and Wilson, 1994). In addition, HPWS are likely to influence HRF. For instance, training and staffing activities favour the abilities needed to perform a variety of tasks effectively (Friedrich *et al.*, 1998), or the provision of equitable rewards encourages employees’ willingness to move and reallocate as the need arises (Dyer and Shafer, 2002). The above reasoning leads us to propose that a relevant mediating process by which HPWS affect FP is through improvements in the flexibility levels of human resources.

Measures of the variables

The unit of analysis in our illustration is the commercial departments in the companies surveyed as we are interested in the linkages between HPWS, HRF and FP related to salespeople in our sample of firms. Employees in the commercial department are increasingly important to competition in current environments (Slater and Olson, 2000). To measure HPWS, we used Snell and Dean’s (1992) scale, which covers items related to selective staffing, comprehensive training, developmental performance appraisal and equitable reward systems applicable to employees in the commercial department. Due to the small sample sizes used in our illustration, we simplified the model by constructing a single indicator as the mean value of the items corresponding to each HPWS dimension (Bagozzi and Edwards, 1998). The resulting four composite variables were used as observable indicators of a first-order factor corresponding to HPWS. With this procedure we provide an adequate representation of the underlying dimensionality of the HPWS scale (Landis, Beal and Tesluk, 2000) and achieve a reasonable ratio of cases to observed items (Bagozzi and Edwards, 1998).

We measured HRF with the measurement scale developed by Beltrán-Martín *et al.* (2008). The HRF items assess the extent to which employees in the commercial department currently possess the capabilities and attributes listed, on a scale ranging from 1 (applies to very few employees) to 7 (applies to most of the employees). Concerning FP and in accordance with the description of the unit of analysis in our study, we endeavoured to

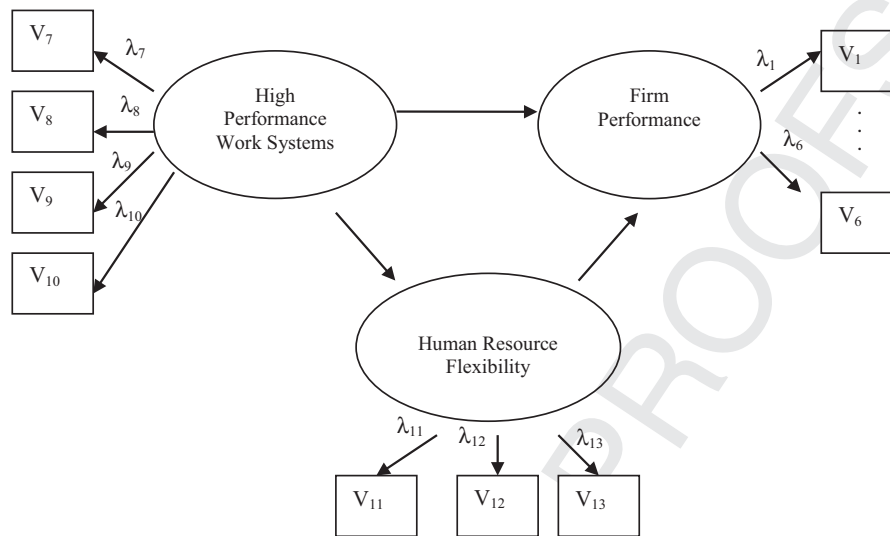


Figure 1. Theoretical model

use measures that are more directly related to the commercial department, rather than FP indicators where other variables (e.g. market trends or competitors' movements) may contaminate the results (Challis, Samson and Lawson, 2005). This measure refers to the extent to which relationships with customers are efficient and customers' needs and expectations are fulfilled, and it has been used in previous studies in the HRM field (e.g. Liao and Chuang, 2004). We used a relative performance measure which asked informants to assess their performance over the past three years compared with that of their competitors (Delaney and Huselid, 1996). Appendix 2 provides a detailed description of the measures used. The fieldwork for this study took place during the period May–October 2005 on a sample of Spanish industrial and service companies with 100 or more employees, using the data collection strategies described below.

Data collection and results for research question 1

For research question 1 we analyse data obtained through a single informant in each organization and we are aware that the positions of the key informants differ across organizations (approach 1). We administered a survey in such a way that a single informant in each firm, either the HR manager or the sales manager, responded to all the questions on HPWS, HRF and FP. Of the usable responses received, for 108 firms the informant was the HR manager and for 49 firms, the sales manager. A key

feature of approach 1 is that the responses from the various groups of informants are pooled into a single dataset. Thus, a total of 157 valid responses (108 + 49) were used in the subsequent analyses.

We estimated the model in Figure 1 for the pooled data group ($n = 157$) and also for the sales manager ($n = 49$) and HR manager ($n = 108$) groups separately. We used the multiple-group structural equation modelling (SEM) approach (see Steenkamp and Baumgartner, 1998; Vandenberg and Lance, 2000) to compare the existence of invariance across groups of informants. Specifically, we conducted an omnibus test of the equality of sample covariance matrices and means across groups, and a series of tests of invariance (e.g. configural, metric, scalar or factor invariance) by constraining sets of specific model parameters in a series of nested models.

Table 1 shows the (robust) goodness-of-fit indices of the models for the pooled data, the sales manager group and the HR manager group. The pooled data show only a marginal fit, with goodness-of-fit indices satisfying the recommended values (see for example Bentler and Bonnett, 1980). In the sales manager group we find an excellent fit to the data with a non-significant chi-squared test and values of fit indices within the recommended values,¹ while in the case of the

¹Due to the small sample size of the sales manager group, the non-significance of the chi-squared statistic might be

Table 1. Goodness-of-fit indices for the single-informant design

	<i>N</i>	χ^2 ^a	df	<i>p</i> value	TLI	CFI	SRMR	RMSEA
Pooled data	157	89.272	62	0.013	0.903	0.923	0.063	0.053
Sales managers	49	62.463	62	0.459	0.992	0.994	0.102	0.012
HR managers	108	101.827	62	0.001	0.835	0.869	0.079	0.077

TLI, Tucker–Lewis index; CFI, comparative fit index; SRMR, standardized root mean square residual; RMSEA, root mean square error of approximation.

^a Satorra–Bentler scaled chi-squared (Satorra and Bentler, 1994).

HR manager group the fit of the model is inadequate².

Table 2 shows standardized item factor loadings and regression coefficients for the three groups. The item factor loadings for the FP scale are high in general and comparable in size across groups. In the case of HPWS and HRF, factor loadings differ across groups, mainly for ‘equitable reward systems’ (λ_{10}), in which the loading is not statistically significant in the sales manager group. Moreover, for items ‘selective staffing’ (V_7) and ‘skill malleability’ (V_{12}) factor loadings are empirically undefined (Rindskopf, 1984), resulting in negative error variance estimates and standardized loadings larger than one.

These results, together with the lack of model fit in the case of the HR manager group, raise

due to the low statistical power to detect model misspecification.

²The significant chi-squared goodness-of-fit points to model misspecifications that may induce inconsistency in parameter estimates. To assess the importance of this issue, we re-specified the measurement models for the HR managers and pooled data groups by introducing successive model modifications (see the procedure suggested by Jöreskog, 1993). Only the parameter with the largest modification index was relaxed in each specification (Jöreskog and Sörbom, 1996). In both models, two FP indicators (V_2 and V_5 in Appendix 2) showed the largest modification indices, pointing to the existence of significant cross-loadings from the HPWS and HRF. Excluding these FP indicators from the FP measurement model (and introducing correlated error terms from ‘comprehensive training’ and ‘developmental performance appraisal’ in the HR managers group) the models showed a good fit to the data ($\chi^2 = 54.51$, $df = 40$, $p = 0.06$ and $\chi^2 = 57.01$, $df = 41$, $p = 0.05$ for the HR manager and pooled data groups, respectively). The parameter estimates (factor loadings and the regression coefficient associated with the direct, indirect and total effects in Table 3) remained roughly the same in the modified models, and the same results and inferences were found, leaving apart changes in the measurement of FP. This result provides further evidence of the robustness of the inferences in Table 3 against possible problems of model specification.

doubts about the adequacy of the proposed model when it is applied to different types of informants, and eventually when data are pooled into a single group. Differences between groups suggest that sales and HR managers do not use equivalent interpretive frames of reference in the evaluating process (Vandenberg, Lance and Taylor, 2005). In particular, differences in factor loadings across groups suggest the existence of possible ‘conceptual’ disagreement (Cheung, 1999) between sales and HR managers. This implies that the two types of informants cannot be considered as equivalent.

The sales manager group and the HR manager group also differ in terms of the relationships between HRM, HRF and FP. Attending to the standardized parameters shown in Table 2, we find that in the pooled data group HPWS has a statistically significant influence on HRF (0.498), HRF positively influences FP (0.285) and HRF partially mediates the HPWS–FP relationship, with significant total and indirect effects (0.382 and 0.142, respectively). In the sales manager group, HRF has a significant influence on FP (0.405), but we find no statistically significant effect of HPWS on HRF or on FP (neither direct nor indirect). A clearly different pattern of relationships is found in the HR manager group. Here the effect of HPWS on HRF is statistically significant (0.636), as is the total effect of HPWS on FP (0.409). However, HRF does not significantly affect FP. These results suggest that the model is not invariant as regards the type of informant and points to ‘psychological’ disagreement (Cheung, 1999) between sales and HR managers. It also suggests that drawing conclusions based on pooled data from sales and HR managers showing distinct response patterns would provide ambiguous interpretations of the relationships between HPWS, HRF and FP.

Additional analyses are needed to more formally test the significance of the differences between types of informants. A series of tests of invariance was performed to assess the equivalence

Table 2. Standardized parameter estimates and robust standard errors (in parentheses) for the single-informant design

	Pooled data (N = 157)	Sales manager (N = 49)	HR manager (N = 108)
Item factor loadings			
FP			
λ_1 (improvements in customer satisfaction)	0.800 (–)	0.825 (–)	0.797 (–)
λ_2 (customer retention)	0.795 (0.091)*	0.704 (0.166)*	0.833 (0.098)*
λ_3 (improvements in communication with customers)	0.813 (0.077)*	0.691 (0.126)*	0.861 (0.089)*
λ_4 (reduction of complaints from customers)	0.731 (0.094)*	0.611 (0.186)*	0.780 (0.106)*
λ_5 (adjusting to customers' behaviour patterns)	0.612 (0.100)*	0.497 (0.181)*	0.700 (0.104)*
λ_6 (approaching customers quickly)	0.606 (0.116)*	0.617 (0.160)*	0.619 (0.129)*
HPWS			
λ_7 (selective staffing)	0.405 (0.285)*	1.555 (4.356)	0.242 (0.299)*
λ_8 (comprehensive training)	0.360 (–)	0.292 (–)	0.310 (–)
λ_9 (developmental performance appraisal)	0.639 (0.381)*	0.306 (0.176)*	0.533 (0.453)*
λ_{10} (equitable reward systems)	0.336 (0.294)*	–0.082 (0.125)	0.559 (0.596)*
HRF			
λ_{11} (functional flexibility)	0.524 (–)	0.627 (–)	0.504 (–)
λ_{12} (skill malleability)	0.993 (0.265)*	0.698 (0.195)*	1.087 (0.350)*
λ_{13} (behaviour flexibility)	0.656 (0.128)*	0.857 (0.158)*	0.626 (0.148)*
Direct effects			
HPWS → HRF	0.498 (0.291)*	–0.010 (0.176)	0.636 (0.629)*
HPWS → FP	0.241 (0.328)	0.038 (0.247)	0.266 (0.548)
HRF → FP	0.285 (0.107)*	0.405 (0.166)*	0.265 (0.145)
Indirect effect			
HPWS → FP	0.142 (0.131)*	–0.004 (0.071)	0.144 (0.282)
Total effect			
HPWS → FP	0.382 (0.334)*	0.035 (0.245)	0.409 (0.536)*

FP, firm performance; HPWS, high performance work systems; HRF, human resource flexibility.

* $p < 0.05$.

Table 3. Goodness-of-fit indices for single-informant designs: sales versus HR managers

	χ^2 ^a	df	p value	$\Delta\chi^2$ ^b	Δ df	p value
Omnibus tests of invariance						
Equality of variance–covariance	141.589	91	<0.05			
Equality of means	22.580	13	0.047			
Equality of variance–covariance and means	166.599	104	<0.05			
Invariance analysis						
Configural invariance	187.450	124	<0.05			
Metric invariance	214.206	134	<0.05	26.493	10	0.003
Scalar invariance	237.326	147	<0.05	23.269	13	0.039
Factor invariance	240.633	150	<0.05	2.938	3	0.401

^a Satorra–Bentler scaled chi-squared (Satorra and Bentler, 1994).

^b Chi-squared scaled difference test statistics were computed using the Satorra and Bentler (2001) procedure.

of the information reported by the two groups of informants. First, we conducted an omnibus test of the equality of sample covariance matrices across groups (Jöreskog and Sörbom, 1989). The goodness-of-fit indices shown in the first row of Table 3 reveal that the null hypothesis is not supported by the data ($\chi^2 = 141.589$,

$df = 91$, $p < 0.05$). Therefore, the two types of informants cannot be considered as subsamples of the same population, since the measurement and the relationships between HPWS, HRF and FP differ between sales and HR managers. A test of equality of sample means reports a chi squared in the vicinity of the critical value ($\chi^2 = 22.580$,

2 df = 13, $p = 0.047$), suggesting that the null
3 hypothesis of equal means across groups may be
4 acceptable. These results provide evidence that the
5 respondent matters in analysing the relationship
6 between the variables included in the model and
7 advise against pooling data from sales and HR
8 managers.

9 Although the rejection of the equality of sam-
10 ple covariance matrices indicates some kind of
11 differences between groups of informants, the
12 omnibus test provides no information on the
13 particular source of invariance (Vandenberg and
14 Lance, 2000) and it is an extremely rigorous
15 test (Cheung and Rensvold, 1999). Following
16 the recommendations of several authors on the
17 procedure to perform analyses of invariance
18 (e.g. Byrne, 1994; Steenkamp and Baumgartner,
19 1998) we estimated a series of nested models with
20 increasingly restrictive tests to determine what
21 kind of invariance exists between the two types
22 of informants. A multiple-group model with no
23 across-group restrictions was taken as a reference
24 (or less restricted) model. This model represents
25 a test of ‘configural’ invariance (i.e. equivalence of
26 factor structure across groups), a hypothesis that
27 is rejected, as the goodness-of-fit indices attest
28 ($\chi^2 = 187.450$, $df = 124$, $p < 0.05$). Note that if
29 the configural invariance test is not satisfied, the
30 subsequent tests of invariance may not make sense
31 from a substantive point of view (Vandenberg,
32 Lance and Taylor, 2005), since an adequate refer-
33 ence model does not exist (Cheung and Rensvold,
34 1999). Nevertheless, in the lower part of Table 3
35 we report the fit indices for additional tests of
36 metric ($\Delta\chi^2 = 26.493$, $\Delta df = 10$, $p = 0.003$), scalar
37 ($\Delta\chi^2 = 23.269$, $\Delta df = 13$, $p = 0.039$) and factor
38 covariance invariance ($\Delta\chi^2 = 2.938$, $\Delta df = 3$,
39 $p = 0.401$). Overall, the invariance analysis sug-
40 gests that there are significant differences between
41 sales managers and HR managers and lends
42 support to the assumption that the respondent
43 matters both in how the constructs of interest are
44 measured and in the analysis of their relationships.
45 In other words, the results are (highly) dependent
46 on the type of respondent and their relative
47 numbers in the pooled dataset.

48 *Data collection and results for research question 2*

49
50
51 For our second research question, we analyse
52 data collected through multiple key informants
53 from each organization who respond to different

55 sections of the survey (approach 4). The question-
56 naire for our study was split into two sections in
57 line with this data collection approach. The first
58 section corresponds to questions about HPWS and
59 the second section includes questions about HRF
60 and FP only. Each of these sub-questionnaires was
61 sent directly to the corresponding key informant.
62 Wright *et al.* (2001) suggest the respondent’s title
63 is a suitable test of accuracy when collecting
64 data, and empirical studies usually choose key in-
65 formants in terms of their formal roles in the or-
66 ganization. We refer to previous empirical studies
67 in the field to identify the key informants for our
68 variables.

69 Regarding the key informant for the HPWS sec-
70 tion of the survey, Arthur and Boyles (2007) state
71 that many of the empirical studies in the HRM
72 field rely on information provided in responses
73 from the HR manager to evaluate HR practices.
74 However, those authors note that such responses
75 may not be as reliable in relatively large and com-
76 plex firms because HR managers may not have
77 enough information about the specific practices
78 used for all the employees and positions in the
79 firm. One of the solutions several authors have sug-
80 gested to improve informant reliability when using
81 the HR manager as the key informant is to focus on
82 a specific ‘core’ group of employees; this reduces
83 ambiguity and the information processing require-
84 ments for this rater (Lepak *et al.*, 2006). Our focus
85 on employees in the commercial department, and
86 therefore on HPWS applicable to these employees,
87 contributes to reducing the risk of low reliability.

88 Regarding the key informant for the HRF ques-
89 tions, in accordance with previous literature assess-
90 ing employee skills and behaviours, we consider
91 that the supervisor is the most appropriate rater
92 of employee flexibility. This section of the survey
93 was therefore addressed to the sales managers of
94 the surveyed companies. Viswesvaran, Ones and
95 Schmidt (1996) state that supervisors’ ratings are
96 the most commonly used measure of employee per-
97 formance (Cascio, 1991). In the HRM literature,
98 a number of empirical studies have used supervi-
99 sors’ ratings to assess several employee outcomes,
100 such as job performance (e.g. Yam, Fehr and
101 Barnes, 2014), creativity (de Stobbeleir, Ashford
102 and Buyens, 2011), customer service behaviours
103 (Liden *et al.*, 2014) and organizational citizenship
104 behaviours (e.g. Bolino *et al.*, 2006), among others.

105 Finally, in our illustration the key informant
106 for the FP scale was the firms’ sales manager.

Several studies have demonstrated that subjective measures of FP provided by managers are positively associated with objective measures of performance (Baer and Frese, 2003). However, Wall *et al.* (2004) point out that when choosing the appropriate manager to assess subjective performance, and in order to avoid the risk of CMV, he or she should not be the same person as the manager assessing HR practices. In addition, given that the performance measure refers to the commercial department, the company's sales manager may have a more proximal knowledge of department performance than higher-level managers. Prior studies analysing the performance in sales and commercial departments have chosen sales managers as the key informants of this department's performance (e.g. Matsuo, 2006).

Regarding the sample size, we received information from 73 firms; 31 companies reported complete information from both key informants (HR manager and sales manager); 42 firms did not respond to both questionnaires, reporting only partial information. Specifically, 23 companies only reported the information from the sales managers, and 19 companies only provided information from the HR managers. To deal with the problem of missing data that arises when only one of the two key informants report survey responses, we use direct (or full information) maximum likelihood (ML) estimation of SEM with missing data (Arbuckle, 1996; Neale, 2000; Newman, 2003). This is a model-based procedure for missing data (Kline, 1998) currently implemented in most standard SEM software (e.g. Mplus, EQS, among others). In contrast to traditional approaches to missing data such as listwise deletion, which would imply a loss of 57% of the final sample, direct ML estimation uses all the available information, even that for firms where only one manager responded. It increases the statistical power of the analysis and provides more efficient and less biased estimates under the missing completely at random or missing at random assumptions (Little and Rubin, 1987). Robust standard errors as well as (robust) scaled chi-squared goodness-of-fit tests (Satorra and Bentler, 1994) were also reported in the multiple-informant analysis. Therefore the sample used in the statistical analyses was made up of a total of 73 companies that reported either total ($n = 31$) or partial ($n = 42$) information about the variables.

To examine research question 2, we first estimated the model in Figure 1 for the multiple-

key-informant group ($n = 73$) and then compared these estimates with those reported for the single-informant analysis in order to test for significant differences between the two research designs in the proposed relationships between HPWS, HRF and FP.

The goodness-of-fit for the model in Figure 1 using data from multiple key informants yields a χ^2 test statistic value of 107.782 with 62 degrees of freedom (other goodness-of-fit indices are Tucker–Lewis index 0.722; comparative fit index 0.779; standardized root mean square residual 0.141, root mean square error of approximation 0.101), indicating a poor fit to the data.³ Standardized parameter estimates are shown in Table 4. Most of the factor item loadings are statistically significant and present reasonably high values (except for λ_6 , which is below 0.5, and λ_{10} , which is not statistically significant) and there are no problems of empirical identification. We find no significant causal relationships between HPWS, HRF and FP, results that clearly depart from those obtained in the single-informant analysis shown in Table 2.

Due to the small sample size using the multiple-key-informant research design, the conflicting results with the single-informant analysis, and the importance of rejecting the existence of significant relationships for a meaningful interpretation of the findings, we assess the statistical power of the analysis to detect significant effects. Using the procedure of Satorra and Saris (1985) and Saris, Satorra and van der Veld (2009), we find low power for all the substantive parameters. The likelihood of detecting an effect, if it truly exists, is 0.208, 0.187 and 0.238 for the effects of HPWS on HRF, HPWS on FP and HRF on FP, respectively. In all cases, these values can be considered as evidence of low statistical power.

³To assess the robustness of the inferences to model misspecification we re-specified the model to fit the data better. As in the case of the single-informant designs, the largest modification indices point to the existence of significant cross-logins for the same FP indicators (V_2 and V_5) and correlated error terms from 'comprehensive training' and 'developmental performance appraisal' indicators. The fit of the re-specified model was $\chi^2 = 50.85$, $df = 40$, $p = 0.12$. No significant changes were encountered in the parameter estimates and the same inferences were obtained in the re-specified models, aside from the differences in the configural invariance across groups.

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Table 4. Standardized parameter estimates and robust standard errors (in parentheses) for the multiple-key-informant design

	Multiple key informant (<i>N</i> = 73)
Item factor loadings	
FP	
λ_1 (improvements in customer satisfaction)	0.666 (–)
λ_2 (customer retention)	0.612 (0.289)*
λ_3 (improvements in communication with customers)	0.869 (0.401)*
λ_4 (reduction of complaints from customers)	0.647 (0.256)*
λ_5 (adjusting to customers' behaviour patterns)	0.624 (0.357)*
λ_6 (approaching customers quickly)	0.415 (0.203)*
HPWS	
λ_7 (selective staffing)	0.672 (0.195)*
λ_8 (comprehensive training)	0.935 (–)
λ_9 (developmental performance appraisal)	0.549 (0.144)*
λ_{10} (equitable reward systems)	0.298 (0.211)
HRF	
λ_{11} (functional flexibility)	0.777 (–)
λ_{12} (skill malleability)	0.882 (0.180)*
λ_{13} (behaviour flexibility)	0.646 (0.175)*
Direct effects	
HPWS → HRF	0.130 (0.164)
HPWS → FP	–0.020 (0.135)
HRF → FP	0.252 (0.139)
Indirect effect	
HPWS → FP	0.033 (0.038)
Total effect	
HPWS → FP	0.013 (0.126)

FP, firm performance; HPWS, high performance work systems; HRF, human resource flexibility.

* $p < 0.05$.

Supplementary analyses. With the aim of examining whether the statistical power of the model would explain the differences between the results using the single- and multiple-key-informant research designs, an additional analysis was carried out to test the existence of possible significant relationships between HPWS, HRF and FP using a multiple-informant design with an extended sample size. In this analysis we merge data used in the multiple-informant analysis with the 'target' information obtained using the single-informant research design. Here, we refer to 'target' information as the responses reported by the selected key (or well-informed) informant. In our illustration this corresponds to using information on the

HRF and FP items reported by sales managers and using the information on the HPWS items reported by HR managers. Using this additional information we extend the sample by including 49 additional cases with information on the HRF and FP items reported by sales managers, and 108 cases with information on the HPWS items reported by HR managers. With the addition of these 157 cases (49 + 180), the extended sample size for the supplementary analysis is 230 cases.⁴

As expected, increasing the sample size does not improve the fit of the model.⁵ The goodness-of-fit indices indicate that the model still does not provide an adequate fit to the data ($\chi^2 = 115.184$, $df = 62$, $p < 0.05$). The factor item loadings are all statistically significant with high values (except for λ_{10}) and slightly smaller standard errors than in the previous analyses. The increased sample size allows us to find a significant relationship between HRF and FP, but no influence of HPWS on HRF or FP. Again, these results are different from those obtained in the single-informant design, providing additional evidence for our research question 2 that there are differences in the proposed relationships between HRM and performance when a multiple-key-informant design is adopted, in comparison with a single-informant design.

Discussion and conclusions

The purpose of this paper is to extend the discussion about the importance of the research design adopted in the HR–performance literature. By evidencing problems associated with single-informant designs, we propose using an alternative approach based on the use of multiple

⁴The composition of the extended sample is 31 firms that report complete information and 199 that report partial information. Regarding companies with partial information, 72 firms report information only from sales managers: 23 responses obtained from a multiple-key-informant approach and 49 responses obtained from the 'target' information in the single-informant research design. For 127 firms we only have information provided from the HR manager: 19 responses obtained from a multiple-key-informant approach and 108 responses obtained from the 'target' information in the single-informant research design.

⁵The same fitted model proposed for the multiple-informant model was also estimated using the extended sample ($\chi^2 = 56.93$, $df = 40$, $p = 0.04$), and the same inferences were obtained in the re-specified model.

1 12

2 key informants. We addressed these issues in the
3 context of the HPWS and FP relationship. In what
4 follows we summarize the main theoretical and
5 practical implications of our study.

6 *Theoretical implications*

7
8 In our illustration, results for the single-informant
9 design show significant measurement differences
10 (i.e. differences in factor structure and factor
11 loadings) and differences in the significance of
12 the relationships between HPWS, HRF and FP
13 depending on whether the respondent was an
14 HR manager or a sales manager, which suggests
15 that the assumption of ‘parallel raters’ should be
16 questioned (i.e. respondent matters). There are
17 several explanations for these differences. Based
18 on social cognition theory (Hastie and Park,
19 1986), Homburg *et al.* (2012) demonstrated that
20 the informants’ position in the organizational
21 hierarchy significantly influences the reliability
22 of their responses. The quantity and quality of
23 the information possessed by HR managers and
24 sales managers may vary, as may their degree
25 of involvement in the questions analysed in our
26 study. For instance, HR managers may be more
27 knowledgeable about the organization’s HR prac-
28 tices than sales managers, while sales managers
29 can provide more accurate information about
30 the flexibility of employees in the commercial de-
31 partment. In addition, implicit theories about the
32 relationship between HRM and performance may
33 be more prevalent when the HR manager is the
34 informant, given the knowledge that he or she may
35 have about the benefits of certain HR practices
36 for FP, but less relevant when the sales manager
37 evaluates the consequences of the HR practices.
38 When systematic differences between raters are
39 present, pooling responses into a single dataset
40 could lead to misinterpretation of the results.

41
42 A related issue is how differences between sales
43 and HR managers should be interpreted. Previous
44 studies in the HRM field (e.g. Wright *et al.*, 2001)
45 considered differences across raters (mainly in
46 assessing HR practices) as measurement error
47 attributed to the lack of rater reliability. They im-
48 plicitly adopt the ‘normative accuracy perspective’
49 (Vandenberg, Lance and Taylor, 2005) in which
50 raters are assumed to be parallel informants.
51 However, this assumption is often particularly
52 restrictive (Murphy and De Shon, 2000) because
53 raters are not equally knowledgeable and may

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observe different aspects of the construct domain
(Lance *et al.*, 2010). In our illustration, we believe
that differences between sales and HR managers
should not be interpreted as measurement error
but measures provided from different perspec-
tives. For instance, recent research lines in HR
management recognize the existence of different
perspectives in measuring HR practices when
a distinction is proposed between exposed and
actual practices (Nishii and Wright, 2008).

Practical implications

Given the methodological nature of this paper, our
practical implications are mostly addressed to re-
searchers in the HRM field. In our illustration,
discrepancies between sales and HR managers are
observed in the significance of the relationships
between HPWS, HRF and FP. A hypothetical
researcher who ignores these differences and as-
sumes that HR managers and sales managers are
parallel raters (i.e. alternative forms of measure-
ment) could consider it appropriate to pool re-
sponses from these two groups of informants and
estimate the research model based on the pooled
dataset. By doing so, the researcher would observe
a significant relationship among all the constructs
in the model, as indicated in the first column of
Table 2, and would therefore draw conclusions
based on these relationships. We suggest caution
is due in the decision to pool data provided by in-
formants occupying diverse positions in the firm.
In this regard, Rungtusanatham *et al.* (2008) sug-
gest analysing the measurement equivalence across
different groups prior to performing the statistical
analyses. If there are differences between the infor-
mation provided by the different types of raters,
then the statistical results should be discussed sep-
arately for each rater group. These authors also
claim that the worst thing to do is to ignore the is-
sue of measurement equivalence and provide a dis-
cussion of the results for the pooled data that fails
to appreciate how the lack of measurement equiv-
alence affects the validity of the results.

The second implication of our illustration refers
to the appropriateness of collecting data from mul-
tiple key informants in order to increase the valid-
ity of the measures. Some shortcomings can arise
in using the single-informant approach when both
criterion and dependent variables are assessed by
the same informant in the same questionnaire,
creating spurious correlations among the variables

of interest and the ubiquitous problem of CMV. In order to avoid the CMV problem, some authors suggest alternative data collection strategies, based on splitting the questionnaire into different sections and addressing each section to the best-informed respondent (Huselid and Becker, 2000). In our illustration we found differences in the results obtained using the single-informant and the multiple-key-informant research designs in terms of the relationships among the constructs of the model. In particular, results from the multiple-key-informant design show no significant relationships between HPWS, HRF and FP but some of these relationships were statistically significant when only one informant provided all the information. We cannot claim that CMV explains the significant relationships in the single-informant design, as we are aware that the small sample size and the low statistical power for detecting significant relationships may affect the results, but nonetheless we recommend researchers collect data from multiple key informants.

Past research on the relationship between HRM and firm performance has shown interest in this question. The work of Gerhart, Wright and McMahan (2000), Huselid and Becker (2000) and Gerhart *et al.* (2000), published in *Personnel Psychology*, deserves particular mention. These papers opened up a debate about the most appropriate data collection strategy. Gerhart, Wright and McMahan (2000), and also Wright *et al.* (2001), implicitly adopting the parallel rater assumption, recommended using several respondents in a firm to assess the HR variables as a way to increase the reliability of the measures and to reduce the 'error' due to raters. However, Huselid and Becker (2000) argue that the validity of the measures does not increase by adding multiple respondents who have insufficient information. Rather, these authors recommend collecting data based on the opinions of respondents that are really key (or well-informed) informants. Based on their own experience, Huselid and Becker (2000) suggest that it is common practice among managers when responding to surveys to assign different sections of the questionnaire to people in the organization who are more knowledgeable about each area. On this issue we agree with Spector and Brannick (2010, p. 403) when they suggest that 'researchers who conduct studies using such methods [self-report surveys answered by a single person] often find themselves subject to editor and/or reviewer

complaints that results are suspect due to the likelihood of common method variance affecting results'. We believe that multi-source data collection studies are more easily accepted in top-tier journals because this methodological design avoids the risk of CMV.

Given our recommendation to collect data from multiple key informants, we agree with Rungtusanatham *et al.* (2008) that researchers' efforts should focus on selecting the key informant before data collection begins. In this endeavour it is also important to select the raters depending on the consistency between the raters' perspectives or frames of reference and the substantive research objectives. Following Wright *et al.*'s (2001) recommendation, in our illustration we chose the best informed raters based on their position in the firm, and also on prior empirical work in the HRM field. However, some improvements could be made in choosing the key informants. A plausible strategy to empirically evaluate the appropriateness of the selected informants is to collect information from several '*a priori* key informants' and then use measures of interrater agreement, such as James, Demaree and Wolf's (1984, 1993) r_{WG} index or other alternative measures of agreement (Le Breton and Senter, 2007). Lack of agreement might indicate that those respondents are not as informed as originally thought.⁶ If this is the case, some additional steps can be followed to select the key informant. For instance, Kumar, Stern and Anderson (1993) suggest two approaches to evaluate informants' competency, namely, using overall evaluations of informant competency (e.g. respondent's tenure in the firm) and/or including specific measures in the survey that assess the level of an informant's knowledge on the issues included in the questionnaire. Similarly, Wright *et al.* (2001) suggest asking the respondent for his or her confidence in rating items. Once the key informant has been identified, we agree with Wright *et al.* (2001), who state that researchers should provide clear instructions indicating who should complete each part of the questionnaire to avoid naïve or ill-informed respondents.

Despite its advantages, analysing data from multiple key informants brings additional difficulties for researchers such as missing data that arise

⁶The authors are grateful to an anonymous reviewer for suggesting this point.

when only one of the key informants in the organization provides responses. In the illustration, we used the full information ML approach to missing data. Other approaches such as multiple-group SEM (Allison, 1987) or multiple imputation (Little and Rubin, 1987), currently available in several commercial software packages, could also be applied to deal with this issue. In particular, a Monte Carlo simulation study would assess which method works best in estimating the population values for different sample sizes and with different amounts of missing data. Future research could usefully explore these issues as a way to provide more convincing empirical evidence on the use of the multiple-key-informant approach.

Finally, the multiple-key-informant design can also be applied when there are many possible key informants for a specific construct. This is the case, for instance, when employees' job satisfaction is the construct of interest and a large number of employees can be considered as key informants. In this case, the approach can be extended to a multilevel analysis in which multiple informants from the same organization are surveyed. Furthermore, multilevel analysis could also be a more efficient way of analysing data coming from multiple-key-informant research designs. In the multilevel analysis the type of informant (e.g. HR director or sales manager) can be taken into account as an individual-level variable, addressing the possible bias associated with particular groups of informants.⁷ In addition, using additional informants would allow their interrater agreement to be assessed.

Limitations and future research

As with all empirical studies our results are not free of limitations. One is the small sample size used in the analysis. The statistical power to detect significant relationships is low, and this reduces the likelihood of detecting significant relationships between HPWS, HRF and FP. We have addressed this point by conducting supplementary analyses using an extended sample size. With a large sample size a significant relationship between HRF and FP is found. This suggests that more research is needed to thoughtfully explore these relationships.

⁷The authors are grateful to an anonymous reviewer for suggesting this point.

A second limitation is that the analysis does not control for the influence of other variables that may explain the differences in the responses provided by the HR and sales managers. Although we have provided arguments to justify why differences are expected to be found between informants who hold different positions (amount of knowledge or information about the constructs, implicit theories, social desirability etc.), in the literature it is well known that other contextual variables and firm characteristics may also explain these differences. For example, firm characteristics such as size and complexity, level of communication and information throughout the organization, degree of centralization, geographical distance, among others, could potentially confound the results and make them less reliable.

Specifically, in our illustration we use information provided by HR and sales managers belonging to different organizations, and therefore results may be caused or explained by our use of different types of respondents from different organizations and by our inability to explicitly control for other alternative explanations. Although in the research design the organizations were randomly assigned to each type of informant (and it is expected that randomization controls for possible systematic differences in the characteristics of the firms assigned to each type of informant) it would be interesting to explicitly test the effect on the data and results of using different types of informant when information is collected using the same questionnaire administered to key informants in the same organization.⁸ Comparing responses from multiple key informants in the same firm would allow unmeasured firm characteristics to be controlled for, ruling out the possible influence of such potential confounding factors. Unfortunately, this information is not available in our study.

In sum, based on the theoretical review in the paper, we suggest that the respondent matters in studies that collect data through surveys. Thus, we recommend researchers interested in analysing the HRM–performance relationship place more emphasis on the careful selection of the key informants in each organization prior to collecting data, and on collecting data through multiple informants to avoid CMV when the research questions require more than one informant per firm.

⁸The authors are grateful to an anonymous reviewer for suggesting this point.

Appendix 1: Survey research approaches in the HRM–performance literature

Research approach	Description of the approach	Studies
Approach 1	Single informant: a single informant with a different position in each unit of analysis provides answers to all questions in the questionnaire, and no differentiation is made between them in the analysis	Audea, Teo and Crawford (2005), Chen and Huang (2009), Delaney and Huselid (1996), De Winne and Sels (2010), Fey and Björkman (2001), Fey, Björkman and Pavlovskaya (2000), Gerhart and Milkovich (1990), Ghebreorgis and Karsten (2007), Gibson <i>et al.</i> (2007), Guest <i>et al.</i> (2003), Guthrie (2000, 2001), Harel and Tzafrir (1999), Iverson and Zatzick (2011), Kalleberg and Moody (1994), Kepes, Delery and Gupta (2009), Kintana, Alonso and Olaverri (2006), Lee and Ghee (1996), Li (2003), Litz and Stewart (2000), McClean and Collins (2011), Miah and Bird (2007), Minbaeva <i>et al.</i> (2003), Park <i>et al.</i> (2003), Perry-Smith and Blum (2000), Rodwell and Teo (2008), Shih, Chiang and Hsu (2006), Skaggs and Youndt (2004), Tzafrir (2005aa, 2005bb), Vlachos (2008), Wood, Holman and Stride (2006) ($N = 32$)
Approach 2	Single informant: a single informant with similar positions in each unit of analysis provides answers to all questions in the questionnaire	Appleyard and Brown (2001), Arthur (1994), Batt (2002), Batt and Colvin (2011), Batt, Colvin and Keefe (2002), Beltrán-Martín <i>et al.</i> (2008), Cabello-Medina, Lopez-Cabrales and Valle-Cabrera (2011), Delery <i>et al.</i> (2000), Faems <i>et al.</i> (2005), Guerrero and Barraud-Didier (2004), Guest, Gonway and Dewe (2004), Hatch and Dyer (2004), Huselid (1995), Katou and Budhwar (2006); Kim and Gong (2009), Liao (2005), Liouville and Bayad (1998), Lopez-Cabrales, Perez-Luno and Valle-Cabrera (2009), Lui, Lau and Ngo (2004), Mavondo, Chimhanzi and Stewart (2005), Ngo <i>et al.</i> (1998), Shaw, Gupta and Delery (2005), Shaw <i>et al.</i> (1998, 2009), Singh (2004), Way (2002), Yang and Lin (2009), Zacharatos, Barling and Iverson (2005) ($N = 28$)
Approach 3	Multiple informants: all the informants in each unit of analysis provide answers to all questions within the same questionnaire to assess measurement reliability	Datta, Guthrie and Wright (2005), Snell and Youndt (1995), Subramony <i>et al.</i> (2008), Veld, Paauwe and Boselie (2010), Youndt and Snell (2004) ($N = 5$)
Approach 4	Multiple informants: different key informants from each unit of analysis provide responses to different sections of the same questionnaire	Ahmad and Schroeder (2003), Akhtar, Ding and Ge (2008), ^{a, a} Chan, Shaffer and Snape (2004), Chandler and McEvoy (2000), ^a Collins and Smith (2006), Delery and Doty (1996), Den Hartog and Verbürg (2004), Gardner, Wright and Moynihan (2011), ^a Gong, Ghang and Gheung (2010), Gong <i>et al.</i> (2009) , Khatri (2000), Kirkman and Rosen (1999), Lee and Miller (1999), ^{a, a} MacDuffie (1995), ^{a, a, a} Paul and Anantharaman (2003), Rogg <i>et al.</i> (2001), ^{a, a, a, a, a, a} Zhu, Ghew and Spangler (2005) ($N = 32$)

Notes: This review was based on empirical studies that use surveys to collect data included in Jiang *et al.*'s (2012) meta-analysis, except for doctoral dissertations, papers presented at academic meetings and working papers. Obviously, in papers where the dependent variable (i.e. organizational performance) is measured by archival data, the common source bias is not a significant issue. Our approaches 1 and 2 correspond to Rungtusanatham *et al.*'s (2008) approaches C and A, respectively. Approaches 3 and 4 correspond to Rungtusanatham *et al.*'s (2008) approach B that involves the use of multiple informants.

^a These papers partially gather some characteristics of approach 3 since they account for measurement reliability by providing multiple informants to some questions within the same questionnaire. For instance, they analyse employee perceptions through multilevel analysis.

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Appendix 2: Questionnaire measurement scales

Firm performance

(Likert type seven-point scale: 1, worse than our competitors; 4, equal to our competitors; 7, much better than our competitors)

V_1 Improvements in customer satisfaction

V_2 Customer retention

V_3 Improvements in the communication with customers

V_4 Reduction in the number of complaints or claims from customers

V_5 Being able to adjust to customers' behaviour patterns

V_6 Approaching customers quickly

High performance work systems

V_7 Selective staffing

- How extensive is the employee selection process for a job in this department? (1, not extensive, i.e. use of few staffing techniques; 7, very extensive, i.e. use of many different techniques)
- How long does it take to select someone for a position in this department once the job becomes open? (1, short, less than one week; 4, medium, about six months; 7, long, more than one year)
- How many people are involved in the selection decision? (1, one person; 7, seven persons)
- How much money is generally spent in selecting people for a job, as a percentage of the firm's profits? (1, very little; 4, moderate amount; 7, great deal)
- How many applicants are screened for each person hired for a job (1, one; 7, 20 or more)

V_8 Comprehensive training

- How formal or structured are the training processes in this department? (1, very unstructured; 7, very structured)
- What percentage of employees in your department have received training this past year? (1, 0%; 4, 50%; 7, 100%)
- On average, how many hours of formal training does a typical member of your department receive per year? (1, 0 h; 7, >60 h)

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- How many different kinds of training does a typical member of your work unit receive per year? (1, very few; 7, wide variety)
- How much money is generally spent on training individuals, as a percentage of the firm's profits? (1, very little; 4, moderate amount; 7, great deal)
- Do you feel training is viewed as a cost or as an investment in your department? (1, viewed as a cost; 7, viewed as an investment)

V_9 Developmental performance appraisal

- What percentage of employees in your department are covered by performance appraisal systems? (1, 10% of employees or less; 4, 40% of employees; 7, 70% of employees or more)
- How would you describe the performance standards in your department? (1, fixed; 7, flexible)
- How much do employees participate in goal setting and appraisal? (1, very little; 4, moderate amount; 7, great deal)
- How often is performance discussed with employees? (1, rarely; 4, occasionally; 7, daily)
- Do discussions focus on present performance or future performance? (1, present; 7, future)
- When performance is discussed with employees in this department, how much emphasis is placed on finding avenues of personal development for an employee? (1, very little; 4, moderate amount; 7, great deal)
- How closely are pay raises, promotions etc. tied to performance appraisal in this department? (1, not closely; 4, moderately; 7, very closely)
- How would you describe the approach used to discuss performance? (1, tell/sell; 4, tell/listen; 7, problem solving)
- How many people provide input to the performance evaluation of each employee in the department? (1, one; 7, seven or more)

V_{10} Equitable reward systems

- How would you rate pay levels in this unit relative to other firms? (1, low; 4, same; 7, high)
- How would you rate the pay levels in this unit relative to past years? (1, lower than past; 4, same; 7, higher than past)
- How wide is the range in pay across members in this department? (1, narrow; 4, moderate; 7, very wide)
- How closely is pay tied to individual performance, in terms of percentage of the salary? (1, <10%; 2, 10%–20%; 3, 20%–30%; 4, >30%)

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30%–40%; 5, 40%–50%; 6, 50%–60%; 7, >60%)

Human resource flexibility

(Likert type seven-point scale: 1, applies to very few employees; 7, applies to most of the employees)

V_{11} Functional flexibility

- Our employees can switch to new jobs with similar responsibilities to their current jobs within a short time
- Our employees can switch to more qualified jobs within a short time
- Employees in our department have multiple skills that can be applied to tasks corresponding to other jobs

V_{12} Skill malleability

- Employees in this department try to constantly update their skills and abilities
- Employees in this department learn new procedures and processes introduced in their jobs within a short period
- Employees in this department anticipate future skill requirements that may be needed to perform their jobs
- When employees in this department are not able to perform a specific task, they quickly learn how to do it

V_{13} Behaviour flexibility

- When employees detect problems in performing their jobs, they voluntarily try to identify the causes of these problems
- Most of the changes that have taken place in this department were introduced by employees
- Employees in this department act efficiently when a problem emerges, even in cases in which they do not have full information about the problem
- Employees in this department act efficiently under uncertain and ambiguous circumstances

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⁹Articles included in the table of Appendix 1 are marked with an asterisk.

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