Employee involvement or employer involvement? An analysis on Italian plant-level data

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Abstract

Significant increases in productivity have often been associated with the adoption of High Performance Work Practices (HPWPs). However, the successful adoption and diffusion of HPWPs depends on the coherence between the specific subset of HPWPs implemented at a workplace (i.e., the specific bundle of HPWPs) and the characteristics of the workplace and the business environment. In order to provide evidence on the contingent nature of the relationship between HPWPs and workplace features, this paper identifies different bundles of HPWPs and assesses their impact on wage level and wage dispersion across core employees. The empirical evidence supports the hypothesis that when adoption patterns do not reflect clear managerial strategies, HPWPs are associated with lower wages and higher earnings dispersion. The empirical tests base on an original dataset of over 1,800 interviews with the HR managers of a stratified sample of Italian manufacturing plants.

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1. Introduction

The decline of the Fordist-Taylorist model has triggered the diffusion of a wide range of management techniques focused on organisational decentralisation, delayering, employees' polyvalence, and teamwork (Piva *et al.*, 2005). All the proposed approaches share a common emphasis on employees as the key resource to meet the demand for continuous adaptation to an ever-evolving competitive environment. Not surprisingly, those managerial techniques have been soon labelled as High Performance Work Practices (HPWPs) (Appelbaum and Batt, 1994; Osterman, 1994), Employee Involvement (Hendel and Levine, 2004), High Performance Work Organisation (Osterman, 2006) or Alternative Work Practices (Godard, 2010).

Several authors have reported evidence about a positive relationship between the use of HPWPs and different measures of performance at firm or plant level (Ichniowski *et al.*, 1997; Appelbaum *et al.*, 2000; Batt, 2001; Cappelli and Neumark, 2001; Greenan, 2003; Laursen and Foss, 2003; Black *et al.*, 2004; Osterman, 2006; Rizov and Croucher, 2009; Godard, 2010). Stronger effects have been reported when firms implement set of practices, rather than single practices, suggesting non-negligible complementarity among tools which affect different dimensions of the workflow organisation and the employment relationship (Ichniowski *et al.*, 1997; Bertschek and Kaiser, 2004; Osterman, 2006).

Despite the remarkable advantages prospected by HPWPs, their diffusion is still limited (Lynch, 2007; Blasi and Kruse, 2006; Cristini and Pozzoli, 2008; Godard, 2010). If some authors attribute firm resistance to HPWPs to the time lag which separates the adoption of "soft" organisational innovation from the deployment of their effects (Blasi and Kruse, 2006), Pfeffer (2007) underlines that "in spite of the fact that much of what is required to build engaged and successfully organizations is at once well known and not always costly to implement, many, maybe most, organizations have failed to take appropriate actions, thereby, in some sense, 'leaving money on the table' " (p.115). In addition, insider econometrics (Ichniowski and Shaw, 2009) has been providing growing evidence that the stimuli or, vice versa, the obstacles to the diffusion of HPWPs often lie in workplace-specific reasons such as the relative complexity of prod-

ucts and processes, the skill level of workforce or the social relationships among workmates, which are typically hard to identify and measure.

Some authors underline also the ambiguous effects of HPWPs on working conditions. The empirical analysis provided by Ramsay *et al.* (2000) assesses not only the positive impact of bundles of HPWPs on labour productivity, product quality, and firm financial performance, but also the parallel increase of individual effort and perceived stress. The authors point out that the improvement in firm performance after the introduction of HPWPs may follow not only from an increase in the skills of employees, but also from a more "traditional" intensification of work. Also the works by Godard (2004 and 2010) and the case studies from the textile US industry described by Taplin (2006) support a more ambiguous reading of the comprehensive effects of HPWPs. In particular, Taplin argues that firm performance depends on the coherence between strategic goals and organisational and technological tools rather than on the adoption of HPWPs and ICTs. *Ceteris paribus*, management choices play a key-role in explaining the mechanisms by which productivity increases are enacted.

By acknowledging that the use of HPWPs is not automatically associated with benefits for employers and employees, the focus shifts to the interactions between specific bundles of HPWPs and the managerial strategies behind their choice. Osterman (2006) underlines that, despite the significant role played by technology and workforce skills, the impact of HPWPs on wages is probably mediated by the wage policies of the firm, as argued by the institutionalist approach. Critics to the universalist approach to HPWPs have been expressed also by scholars in the field of human resources (Truss, 2001). Becker and Huselid (2006) include the articulation of the relationship between a firm's HR architecture and performance among the most urging theoretical challenges facing strategic human resource management and underline the contingent nature of HR practices. Godard (2010) claims that "the implications of workplace and HR practices for the quality of working life are historically and institutionally contingent and hence […] there is need to adopt a historical/institutionalist perspective when conducting research in this area" (p.486).

Based on the stimuli from institutionalist literature and strategic human resource management, we argue that the successful adoption and diffusion of HPWPs depend on the coherence between the specific subset of HPWPs implemented at a workplace (i.e., the specific bundle of HPWPs) and the characteristics of the workplace and the business environment. In other words, the outcome of employees' involvement strictly depends on the nature of the employer's involvement. The mere adoption of HPWPs without their adaptation to the idiosyncrasy of a specific production site looks at best randomly connected with better performance.

In order to provide evidence about the contingent relationship between HPWP bundles and workplace features, this paper assesses the impact of different bundles of HPWPs on distinct measures of performance at the plant level, namely wage level and wage dispersion for core employees at manufacturing plants. The proposed empirical tests base on an original dataset developed by ISFOL, the Italian institute for vocational training, in spring 2008. The archive collects 1,822 interviews with the entrepreneurs or the HR managers of a stratified sample of Italian manufacturing plants. The available information allows to appreciate the adoption and the diffusion of HPWPs, as well as the characteristics of the effort provided by the members of the prevailing occupational profile at the observed plants. Our empirical results show that when adoption patterns do not reflect clear managerial perspectives, HPWPs are associated with worst outcomes in terms of wage levels and wage dispersion.

After framing the research topic and surveying the background literature in the present section, the next section outlines the research hypotheses and describes the database used in the empirical analysis. Section three depicts the empirical strategy adopted to test the research hypotheses and presents the empirical variables. Section four reports the results of the empirical analysis and Section five presents our concluding remarks.

2. The research hypotheses and the ISFOL archive

In the attempt to characterise the nature of different bundles of HPWPs, several authors contrast opposite solutions. Taplin (2006) opposes a managerial orientation towards effectiveness, i.e. HPWPs aimed at increasing workplace flexibility and adaptability, to an orientation towards efficiency, according to which HPWPs are a means to intensify work pace and physical productivity. Godard (2010) contrasts new HR practices, focused on the development of a high commitment culture, to traditional HR practices "directed at maintaining a qualified and stable workforce and at eliciting worker 'consent' rather than commitment" (p.469). Based on Gooderham *et al.* (1999), Rizov and Croucher (2009) oppose collaborative HRM, which emphasises mutuality, consensus and trust, to calculative HRM, defined as a set of efficiency-oriented practices based on individual assessment and reward.

In partial contrast with the above approaches, we argue that not all implementations of HPWPs reflect clear managerial views and many intermediate solutions lie between opposing visions. Fuzzy approaches and non-coherent models also exist and their impact on measurable outcomes is not negligible. HPWP systems resulting from opposite managerial orientation target specific measures of performance and place a different emphasis on improvement in labour productivity, financial performance, workforce polyvalence or commitment. However, nebulous or incoherent approaches could result

in a disappointing performance across several measures. Consequently, we argue that coherence between strategic approach and HPWP use is a preliminary requirement for any measure of success.

In the following empirical analysis the performance of productive sites is proxied by the mean wage they pay to their core employees and by wage dispersion. The mean wage paid to POP members, which reflects the employer's ability to pay and the productivity of labour, provides an indirect assessment of performance at the plant level. In addition, wage dispersion further qualifies the impact of HPWPs on core employees. The uneven diffusion of HPWPs could increase wage dispersion, with more involved employees gaining additional skills and consequently receiving higher rewards. At the same time, HPWPs focused on teams and polyvalence stimulate cohesion among team members and the equalisation of skill distribution among POP members (Osterman, 2006). In addition, strong managerial commitment in implementing the new HRM techniques is expected to reduce room for managerial discretion in wage setting. More in detail, our research hypothesis can be specified as follows.

Hp: Bundles of HPWPs that reflect clearly defined plant-level strategies are associated with higher ability to pay and lower dispersion of wages among employees also after controlling for the nature of the tasks performed by employees and for their skill level.

The empirical test of the above proposition bases on a set of direct interviews with the human resource manager or the higher manager of a representative sample of 1,822 Italian privately owned manufacturing plants[1]. The interviews were collected by ISFOL in spring 2008. The sample is stratified by industry according to a four-group Pavitt classification, by geographical area, and by plant size. The resulting database, named OAC-Employers[2], provides information about workplace organisation, workforce education, and skill development for core employees. The interviewed managers were asked questions concerning their plant, the existing facilities and equipment and their business model. In order to characterise the tasks performed by employees, their skills and their learning and training patterns, the questionnaire focuses on the most numerous occupational profile at each plant, i.e. the Prevailing Occupational Profile (POP) as defined by ISCO-08. In particular, the POPs examined in the OAC-Employers archive include professional occupations, administrative and clerical occupations, sales occupations, skilled trade occupations, elementary occupations and other non qualified occupa-

[1] Compared to the most frequent approach based on telephone interviews, the use of face-to-face interviews held with a computer assisted personal interview technique increases the reliability of the collected data (see, e.g., Osterman, 2006).

[2] OAC stays for *Organizzazione, Apprendimento, Competenze* (Organisation, Learning, Competencies).

tions. The availability of data on employee skills and HPWP use for POP members, rather than for all employees including technical and administrative staff, represents an advantage over most of existing analysis, as shop floor HPWPs are expected to exert distinct impacts on different occupational profiles (Osterman, 2006; Bayo-Moriones *et al.*, 2010).

Excluding plant general data and the description of the main tasks performed by POP members, all questions to plant managers involved closed answers in the form of binary options (yes/no) or Likert scales. Table 1, which reports the main statistics for the observed universe, outlines that in over 90% of cases plants correspond to firms. Coherently with the large preponderance of plants in low-tech manufacturing sectors, POPs mainly consist of skilled trade occupations (60%) and plant and machine occupations (30%). Certificate of compulsory education is the most diffused qualification among the core employees of the surveyed plants (61.6%), followed by high school diploma (held by 23% of POP members).

In order to increase the homogeneity of the analysis, the following empirical tests exclude the cases where the prevailing occupational profile is represented by sales executives and other non qualified occupations. This choice is justified both by the low frequency of those POPs among manufacturing plants (0.6% and 0.5% of the examined universe, respectively) and by the peculiar skills which characterise their members. The sample used in the empirical analysis consequently amounts to 1,797 plants.

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Table 1 about here

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3. The empirical methodology

The research hypothesis is validated by testing the impact of different bundles of HPWPs on two different dependent variables that qualify the workplace of POP members, namely wage level and wage dispersion, also controlling for the nature of performed tasks and the level of provided skills. A crucial step is consequently represented by the identification of the bundles of HPWPs implemented at the examined plants. Preliminary to this stage, the selection of relevant HPWP techniques and the proper measurement of their use represent additional obstacles[3]. The first part of this section discusses the problems posed by the identification of HPWP bundles, while the econome-

[3] As underlined by Osterman (2006), the variety of measures used in literature to identify bundles of HPWPs and to assess their impact is the main source of problems in comparing the results of different studies.

ric models used to test the research hypothesis are presented in the subsequent paragraph.

3.1. Identification of HPWP bundles

Our selection of a significant set of HPWPs bases on the classification proposed by Forth and Millward (2004), who identify three groups of employee involvement techniques[4]. The first group consists of task practices, i.e. those techniques that directly affect the production of output and include teams, quality systems, off-the-job and on-the-job training and tools to increase the employee polyvalence. The second group consists of individual supports, i.e. tools to provide employees with the skills and the information to implement task practices. Individual supports include briefing groups, business information disclosure, and human relations training. The third group, named organisational supports, concerns the organisational solutions to elicit employees' commitment towards task practices and includes employment security policies, internal promotions and participative or performance-based pay systems.

As regards the problem of quantifying the degree of implementation of HPWPs, a growing body of literature suggests that the focus on sole adoption could be misleading as diffusion, rather than mere adoption, activates those change processes that eventually result in better individual skills and enhanced organisational performance (Handel and Levine, 2004; Cristini and Pozzoli, 2008). Literature provides some attempts to measure both adoption and diffusion of HPWPs through synthetic indexes (see, e.g., Helper *et al.*, 2002; Osterman, 2006). However, despite appealing, synthetic indexes suffer from high aggregation and cannot fully capture the existence of varied strategic approaches to HPWPs. In addition, synthetic indexes are usually built up in the form of additive scales (Osterman, 2006) or combinatory scales (Helper *et al.*, 2002). In both cases, the higher the number of adopted practices and the intensity of their use, the higher the index. However, the first approach implicitly assumes perfect substitutability among different practices, thus denying complementarity effects. On the contrary, the most critical aspect of combinatory scales is represented by the aggregation algorithm, always subject to at least partially arbitrary choices by researchers.

The approaches to the identification of complementary bundles of HPWPs can be classified in two main groups: ex-ante identification, based on practice or on the suggestions from prior literature (e.g., Ichiowski *et al.*, 1997), and ex-post identification, based on the analysis of empirical data (e.g., Laursen and Foss, 2003). Both approaches suffer from non-negligible limitations. Ex-ante identification is affected by arbitrariness of the researchers' choice, while ex-post identification suffers from the contingency imposed

[4] Similar classifications are proposed also by Applebaum *et al.* (2000) and Horgan and Muhlau (2006).

by the data under examination. In addition, the specific technique adopted to identify bundles of HPWPs has significant impact on research outcomes. More precisely, not all techniques ensure bi-unique correspondence between bundles and workplaces, as in the case of principal component analysis. If different bundles are simultaneously in use in the same workplace, interaction among bundles should also be tested, yet this possibility undermines the concept of bundles of practices as coherent systems.

In order to identify different approaches to the use of HPWPs by Italian manufacturing plants, we run a cluster analysis based on variables that measure both the adoption and the intensity of use of employee involvement techniques reflecting task practices, individual supports and organisational supports (Table 2). Due to the simultaneous presence of sequential categorical variables, binary variables and continuous variables, a two-step clustering procedure with log-likelihood distance was adopted (Chiu *et al.*, 2001). Cluster analysis represents an ex-post identification technique that allows for bi-unique correspondence between HPWP bundles and workplaces and consequently allows for testing the relationship between the use of specific bundles of practices and workplace performance.

The two-step clustering procedure has identified three sets of plants which adopt different approaches towards HPWPs[5] (Table 3). The first cluster, labelled as Commitment, is characterised by selective implementation of most demanding HPWPs. Average values are significantly higher than for the whole sample for variables assessing team working and team autonomy, continuous learning and training, performance assessment and performance-based rewards. Plants in the Commitment cluster show also a significant diffusion of certified quality systems, present at over 80% of workplaces. On the contrary, the cluster labelled as Consent is characterised by parsimonious adoption and diffusion of HPWPs, particularly apparent in the area of training. Nevertheless, over 50% of POP members are declared to be polyvalent and about 20% participate in teamwork, despite with reduced autonomy. Plant belonging to the Consent cluster also manifest interest towards quality systems (adopted by over 50% of examined plants) and non negligible use of bonuses and incentive systems. The cluster labelled as Fuzzy occupies an intermediate and puzzling position between the other two. The emphasis on polyvalence, continuous learning and training for new entrants contrasts with the short duration of recent training given to POP members. In a similar way, the claim for frequent performance assessment contrasts with the virtual absence of performance-based reward. The analysis of Table 3 suggests that the members of the Fuzzy cluster are par-

[5] Due to some missing values in the variables entered in the two-step clustering procedure, cluster membership is defined for 1,765 plants out of the 1,797 initial ones.

ticularly prone to adopt and extensively use those HPWPs whose application requires less financial and organisational efforts.

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Table 3 about here

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Membership to all the three identified clusters is distributed across the examined prevailing professional profile, despite clerical occupations and, above all, professional occupations are over-represented in the cluster Commitment. On the contrary, plants whose POP is Plant and machine occupations are not present in the cluster Fuzzy (Table 4). The correspondence between the bundles of HPWPs identified by the cluster analysis and the strategy pursued at the plant level is highlighted by crossing cluster membership with the importance attached to different competitive factors (Table 5). Clusters Commitment and Consent present similar patterns, yet the former give more emphasis to technology-based competition, while the latter attach more importance to price-based competition. On the contrary, the answers provided by the managers of plant classified in the cluster Fuzzy display a completely different pattern. They consistently attach importance to all listed competitive factors, despite contrasting. In line with our expectations, confusion in the strategic approach to HPWPs seems to reflect confusion in the strategy at the overall plant level.

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3.2. Empirical models

The empirical models used to test the research hypothesis consist of two wage regressions at the plant level where the dependent variables are, respectively, the logarithm of the mean wage earned by POP members at each sampled plant and a measure of wage dispersion across core employees, defined as the ratio of the difference between the

highest and the lowest wage to the lowest wage earned by POP members. Two binary variables flag the membership to the clusters of Commitment and Consent and allow to outline differences in wage policies compared to the reference category of plants in the Fuzzy cluster. As clearly defined strategic orientations are expected to result in better performance and higher ability to pay, the coefficients of Commitment and Consent are expected to play a significant and positive role in explaining the mean wage earned by core employees. On the contrary, the coefficients of Commitment and Consent are expected to be significant and negative in the regression for wage dispersion across POP members because clearly defined strategic orientations limit the autonomy of managers in setting the wage of the employees they supervise.

The control variables which moderate the impact of cluster membership on workplace conditions concern the nature of the tasks performed by core employees, proxied by the type of POP, and the level of skills provided by POP members. Two measures have been introduced in order to assess the latter dimension. The first measure is the weighted educational attainment of POP members expressed in years. The second measure exploit the available information about the percentage of POP members asked to provide a range of competences listed in the OAC-Employer archive. The share of core employees required to provide each skill is measured along an 8-point scale, from 0 (no POP members required to master that specific skill) to 7 (the examined skill is required to over 90% of POP members). Rated competences include taking initiatives, time management, task and time planning, execution of calculations, provision of training, provision of consulting, document writing, provision of joint effort, use of PC, document reading, physical resistance, reliability and dexterity. A rotated factor analysis on those 13 competences allowed to outline three factors, which respectively represent the level of management skills, intellectual skills and physical skills exerted by POP members (Table 6). The three factors jointly explain 61.4% of the observed variance in data. The reliability of the three factors is confirmed by the acceptable values assumed by the Cronbach's alpha.

Additional controls, which include also the variables used to stratify the surveyed sample, include firm size, employer location, and industry. The descriptive statistics on dependent and independent variables used in the econometric estimates are reported in Table 7.

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4. The empirical analysis

The results of the econometric estimates are reported in Tables 8 and 9. The initial sample shrinks to 1,653 observations for the determinants of mean wage and to 1,590 observations for the determinants of wage dispersion, due to missing information on POP wages. T-tests for independent samples confirm that those sub-sample still represent the reference universe along the stratification variables of industry, geographical area and plant size. Also when significant, the correlation coefficients among explanatory variables are always low enough to exclude biases due to multicollinearity, as confirmed by the values calculated for Variance Inflation Factors.

The econometric estimates basically confirm our research hypothesis: the core employees at plants where the adopted bundle of HPWPs reflects a clear managerial orientation, be it directed at eliciting either commitment or just consent, enjoy higher mean wages and lower dispersion of rewards among work mates than core employees at plants that adopt a fuzzy approach to HPWPs. The comparison between the results in Tables 8 and 9 also suggests that bundles of HPWPs targeting a committed participation by core employees result in lower mean wages than those enjoyed by POP at efficiency-oriented plants. However, the mean wage penalisation (3.5%) goes along with significantly lower wage dispersion among the members of the same occupational group (-6.3%).

Also after controlling for the nature of performed tasks by introducing POP-based dummies, the return of managerial and cognitive skills to mean wages is significant and positive. On the contrary, only managerial skills increase wage dispersion across POP members. This result reflects the expectation that firms are willing to reward the higher responsibilities corresponding to superior managerial skills, yet less predictable tasks also involve higher reward variability.

The educational qualification of POP members significantly increases both wage level and wage dispersion across POP members. However, the impact of educational attainments is considerably smaller that the effect due to membership to a specific occupational profile. The results in Tables 8 and 9 clearly display the existence of a hierarchy of wage levels and wage dispersion from professional occupations to clerical and administrative occupations, to skilled trades occupations, to plant and machine occupations.

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5. Concluding remarks

This paper provides additional evidence on the relationship between bundles of HPWPs and firm performance. Persuaded that synthetic indexes or analyses of separate practices do not take into account the complementarities between different HPWPs, we propose an approach based on cluster analysis to outline combinations of HPWPs that correspond to different strategic approaches at the plant level. More precisely, the cluster analysis has identified three bundles of HPWPs. Two bundles correspond to a clear managerial orientation, respectively characterised by an emphasis on improved effectiveness through employee involvement and commitment and on increased efficiency through the parsimonious adoption of a reduced set of HPWPs. On the contrary, the third bundle is characterised by a seemingly uncritical and intense adoption of a large set of HPWPs, focused on those practices which require the lowest financial and organisational investment.

The empirical analysis on a representative sample of Italian manufacturing plants has confirmed the research hypothesis. Bundles of HPWPs corresponding to the implementation of clearly defined plant-level strategies are associated with higher ability to pay and lower dispersion of wages among core employees. Our findings also question the hypothesis that, when management orientation is missing, the implementation of employee involvement techniques may still reflect the employees' willingness to improve the quality of their workplace, as argued by Freeman and Kleiner (2000).

The empirical data also show that after controlling for POP type, education level, industry and location, the level of physical skills is not a significant determinant of wage level or wage dispersion. On the contrary, managerial skills are associated with both higher wages and accentuated wage dispersion.

Future research should validate the causal direction of the observed relationship between the nature of implemented HPWP bundles and the wage policy for core employees. The main limitation of our study consists indeed in the longitudinal nature of the OAC-Employer archive, which does not permit to assess whether focused HPWPs leads to higher ability to pay, or vice versa.

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Table 1. The OAC sample – Descriptive statistics

		# obs.	Min	Max	μ	σ
	Plant employees end 2007	65,863	2	3,425	44.353	98.277
	Firm age	65,870	4	148	25.165	13.850
	Multi-plant firm [%]	65,870	0	1	0.096	0.295
	Group [%]	65,863	0	1	0.099	0.299
				[%]		
Industry	Supplier dominated	65,870		0.421		
	Scale intensive	65,870		0.383		
	Specialised supplier	65,870		0.151		
	Science based	65,870		0.043		
Region	North-West Italy	65,870		0.361		
	North-East Italy	65,870		0.307		
	Centre Italy	65,870		0.179		
	South Italy	65,870		0.153		
POP type	Professionals	65,870		0.037		
	Clerical occupations	65,870		0.051		
	Skilled trade occupations	65,870		0.600		
	Sales occupations	65,870		0.006		
	Plant and machine occupations	65,870		0.301		
	Elementary occupations	65,870		0.005		
POP Education	College	64,017		0.042		
	High school	63,767		0.230		
	Vocational school	63,734		0.111		
	Compulsory education	63,669		0.616		

Weighted data

Table 2. Descriptive statistics of variables used to identify clusters of HPWPs

	Min	Max	μ	σ
% of polyvalent POP members	0	100	54,329	37,071
Participation in teamwork	0	5	2,007	1,881
Diffusion of autonomous teams	0	2	1,052	0,810
Formal tools in recruitment	0	1	0,380	0,485
Standard training off-the-job for new employees	0	1	0,436	0,496
Duration of initial training on-the-job	0	7	3,860	1,768
Continuous learning	0	1	0,451	0,498
Recent training	0	5	2,045	1,885
Duration of recent training	0	7	0,997	1,050
Certified quality system	0	1	0,506	0,500
Diffusion of communication channels	0	2	1,234	0,817
Job security policy	0	6	4,407	0,966
Periodical performance assessment	0	5	2,105	1,949
Adoption of bonuses/incentives	0	1	0,371	0,483
Share of variable pay on total earnings	0	6	0,663	1,318

1,765 obs.

Table 3. Clusters of HPWPs

	Commitment		Fuzzy		Consent		Total	
	N	670	N	478	N	617	N	1,765
	μ	σ	μ	σ	μ	σ	μ	σ
% of polyvalent POP members	38.863	34.688	77.343	14.375	53.295	42.384	54.329	37.071
Participation in teamwork	2.967	1.485	0.513	0.567	2.126	2.183	2.008	1.884
Diffusion of autonomous teams	1.318	0.615	1.182	0.983	0.682	0.707	1.059	0.812
Formal tools in recruitment	0.270	0.444	0.996	0.065	0.032	0.177	0.384	0.486
Standard training off-the-job for new employees	0.369	0.483	1.000	0.000	0.079	0.271	0.439	0.496
Duration of initial training on-the-job	3.531	1.931	4.839	1.010	3.509	1.757	3.878	1.764
Continuous learning	0.537	0.499	0.642	0.480	0.211	0.408	0.452	0.498
Recent training	3.146	1.298	2.100	1.929	0.794	1.617	2.041	1.889
Duration of recent training	1.766	0.889	0.682	0.771	0.395	0.864	0.993	1.048
Certified quality system	0.819	0.385	0.004	0.065	0.545	0.498	0.503	0.500
Diffusion of communication channels	1.155	0.820	1.456	0.668	1.164	0.879	1.240	0.814
Job security policy	4.437	0.970	4.368	0.496	4.407	1.207	4.408	0.965
Periodical performance assessment	2.678	1.894	2.741	1.387	1.016	1.919	2.114	1.953
Adoption of bonuses/incentives	0.646	0.478	0.008	0.091	0.348	0.477	0.369	0.483
Share of variable pay on total earnings	1.504	1.733	0.000	0.000	0.280	0.712	0.669	1.325

Table 4. Importance attached to different competitive factors by cluster

[% of responses, by cluster]

Competitive factor		Cluster			
		Commitment	Fuzzy	Consent	Total
Price	Not at all important	2.69	0.00	2.43	1.87
	Unimportant	2.69	0.00	1.62	1.59
	Neither important nor unimportant	18.81	0.42	9.24	10.48
	Important	54.78	74.90	48.95	58.19
	Very important	17.61	24.69	35.82	25.89
Design	Not at all important	21.64	0.00	32.25	19.49
	Unimportant	8.96	0.00	7.13	5.89
	Neither important nor unimportant	18.36	1.26	11.83	11.44
	Important	29.25	91.42	26.09	44.99
	Very important	15.82	7.32	17.50	14.11
Technology	Not at all important	3.28	0.00	10.21	4.82
	Unimportant	1.04	0.00	3.40	1.59
	Neither important nor unimportant	18.36	0.42	15.24	12.41
	Important	41.19	67.99	40.19	48.10
	Very important	34.18	31.59	27.23	31.05
Customisation	Not at all important	10.90	0.00	17.18	10.14
	Unimportant	3.88	0.00	3.40	2.66
	Neither important nor unimportant	17.91	0.42	12.97	11.44
	Important	39.85	66.11	31.28	43.97
	Very important	24.48	33.47	29.82	28.78

Table 5. Clusters of HPWPs by POP

		Clusters of HPWPs			
		Commitment	Fuzzy	Consent	Total
POPs	Professionals	85	2	7	94
	Clerical occs.	72	37	12	121
	Skilled trade occs.	320	439	313	1,072
	Plant and machine occs.	193	0	285	478
	Total	670	478	617	1,765

Table 6. Factor analysis on POP skills

	Component			
	Managerial skills	Cognitive skills	Physical skills	Cronbach's α
Initiative by POP members	0.682	0.196	0.344	0,838
Time management by POP members	0.491	0.383	0.310	
Task/time planning by POP members	0.823	0.164	-0.052	
POP members execute calculations	0.614	0.495	-0.049	
POP members provide training	0.740	0.105	0.075	
POP members provide consulting	0.866	0.098	0.019	
POP members write docs	0.406	0.626	-0.125	0,705
POP members provide joint effort	-0.156	0.650	0.347	
POP members use PCs	0.237	0.739	-0.046	
POP members read docs	0.336	0.713	0.040	
POP members provide physical resistance	0.095	0.037	0.748	0,650
POP members provide reliability	0.014	0.323	0.686	
POP members provide dexterity	0.077	-0.271	0.789	

1,822 observations. Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.Rotation converged in 4 iterations.
Cumulative variance explained: 61.36%

Table 7. Variables in econometric estimates

	Variable	Description	# obs.	Min	Max	μ	σ
Dependent variables	ln(mean wage)	Logarithm of mean gross yearly wage of POP members	1,686	9.048	10.820	9.811	0.245
	Wage dispersion	(MaxW-MinW)/MinW	1,616	0	4	0.711	0.644
Regressors	Ln_plant_size	Logarithm of plant size	1,797	1.099	8.139	3.585	1.086
	POP education	Weighted education of POP members	1,739	8	19	10.242	2.052
	Managerial skills	Load factor managerial skills	1,797	-2.109	4.367	0	1
	Cognitive skills	Load factor cognitive skills	1,797	-2.311	3.570	0	1
	Physical skills	Load factor physical skills	1,797	-3.054	1.970	0	1
					[%]		
	Commitment	Membership to cluster Commitment	1,765		37.96		
	Consent	Membership to cluster Consent	1,765		34.96		
	Fuzzy	Membership to cluster Fuzzy	1,765		27.08		
	Professionals	Membership to POP Professionals	1,797		5.23		
	Clerical occs.	Membership to POP Clerical occs.	1,797		7.01		
	Skilled trade occs.	Membership to POP Skilled trade occs.	1,797		60.32		
	Plant and machine occs.	Membership to POP Plant and machine occs.	1,797		27.43		
	Supplier dominated	Membership to industry Supplier dominated	1,797		31.61		
	Specialised suppliers	Membership to industry Specialised suppliers	1,797		31.78		
	Science based	Membership to industry Science based	1,797		20.92		
	Scale intensive	Membership to industry Scale intensive	1,797		15.69		
	North-West	Location in North-West Italy	1,797		26.27		
	North-East	North-East Italy	1,797		24.76		
	Centre	Centre Italy	1,797		26.93		
	South	South Italy	1,797		22.04		

Table 8. The determinants of POP mean wage

		β	Std. Error		t
	Constant	9.461	0.048	***	198.577
Ref. category:	Commitment	0.033	0.015	**	2.196
Fuzzy	Consent	0.068	0.016	***	4.331
	Managerial skills	0.012	0.006	**	1.960
	Cognitive skills	0.016	0.007	**	2.310
	Physical skills	-0.009	0.006		-1.577
	POP education	0.009	0.004	**	2.194
Ref. category:	Professionals	0.430	0.034	***	12.637
Plant and machine occs.	Clerical occs.	0.176	0.029	***	6.177
	Skilled trades occs.	0.113	0.014	***	8.265
Ref. category:	Supplier dominated	-0.069	0.012	***	-5.682
Scale intensive industry	Specialised suppliers	-0.003	0.014		-0.239
	Science based	-0.011	0.015		-0.729
Ref. category:	North-West	0.116	0.016	***	7.426
South Italy	North-East	-0.018	0.015		-1.150
	Centre	-0.066	0.015	***	-4.355
	Ln_plant_size	0.038	0.005	***	7.800
F-test = 61.462 ***	Adjusted R^2 = 0.369		1,653 obs.		

OLS estimates. Dependent variable: ln(mean wage)
**** p < 1%, ** p < 5%, * p < 10%*

Table 9. The determinants of wage dispersion among POP members

		β	Std. Error		t
	Constant	-0.080	0.130		-0.616
Ref. category:	Commitment	-0.231	0.041	***	-5.640
Fuzzy	Consent	-0.168	0.042	***	-4.033
	Managerial skills	0.072	0.016	***	4.355
	Cognitive skills	-0.019	0.019		-1.026
	Physical skills	-0.126	0.016	***	-7.869
	POP education	0.026	0.011	***	2.377
Ref. category:	Professionals	0.824	0.093	***	8.883
Plant and machine occs.	Clerical occs.	0.211	0.078	***	2.705
	Skilled trades occs.	0.074	0.037	**	2.003
Ref. category:	Supplier dominated	-0.015	0.032		-0.474
Scale intensive industry	Specialised suppliers	0.039	0.037		1.050
	Science based	-0.025	0.042		-0.600
Ref. category:	North-West	-0.033	0.042		-0.790
South Italy	North-East	0.079	0.042	*	1.887
	Centre	0.264	0.040	***	6.598
	Ln(plant size)	0.132	0.013	***	10.126
F-test = 62.405 ***	Adjusted R^2 = 0.382		1,590 obs.		

OLS estimates. Dependent variable: Wage dispersion
**** p < 1%, ** p < 5%, * p < 10%*