ICTs and Job Design. Evidence from Europe

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Abstract

Purpose – The purpose of this paper is to analyze the specific relationship between Information and Communication Technologies [ICT] and New Work Practices [NWP] at employee level, both generally and per job category.

Design/methodology/approach – Data from 31 European countries using the Fourth European Working Conditions Survey (EWCS). Ordered Probit models.

Findings – This paper reveals a general positive effect of ICT use on NWP participation by workers but different results when ICT and NWP variables are analyzed separately. Autonomy of the worker and participation in autonomous teams are favored by ICT use but it is not so clear in the case of job rotation and task variety. Additionally, we find how the occupation of the worker matters moderating that link and we find divergences between high- and low-skills-demanding positions.

Research limitations/implications – Cross-sectional nature of our data does not allow us to report interesting causal relations.

Practical implications – Our results suggest that depending on the work practices aimed to be boosted, as well as the job category, some ICT are more suitable than others.

Originality/value – There are two main features making this paper novel. First, previous studies on the link between ICT and NWP made use of indexes making no possible to find assorted results. Thus, we study how diverse ICT variables are related to different NWP at employee level. Second, we test whether the employee category is a moderator in that mentioned relationship.

Keywords – New Work Practices, Information and Communication Technologies, Occupation

Paper Type Research Paper

JEL Classification: J81, O15, O33.

1. Introduction

In the shifting context for companies of the last decades, both internal and external, some of the most important changes they have faced are the introduction of Information and Communication Technologies (ICT) and the implementation of New Work Practices (NWP), both seeking to achieve better performance. Empirical literature generally shows a positive relationship between those two clusters and productivity of the firm.

The idea behind NWP is a management style different to traditional Tayloristic work systems. It includes any action that leads to higher involvement of workers, giving them more decisional power to achieve commitment and performance (Boxall and Macky, 2009), such as discretion in performing their tasks (e.g. job autonomy and participation in autonomous teams) or changing their tasks temporarily (e.g. job rotation and multitasking). Positive outcomes are generally found when these practices are implemented (Appelbaum *et al.*, 2000; Handel and Levine, 2004; Datta *et al.*, 2005; Mohr and Zoghi, 2008) and with a higher effect when they are jointly put in place (Laursen and Foss, 2003). Similarly, ICT, defined as technologies handling information or aiding communication, have been shown to have an impact in the firm, commonly increasing labor productivity (Lichtenberg, 1995; Hitt and Brynjolfsson, 1997).

Furthermore, researchers have also come to realize, under the complementarities perspective (Milgrom and Roberts, 1990), how the combined use of ICT and organizational changes generates a super-additive effect on performance (Brynjolfsson and Hitt, 2000; Black and Lynch, 2001, 2004; Brynjolfsson *et al.*, 2002; Dedrick *et al.*, 2003; Bertschek and Kaiser, 2004; Aral *et al.*, 2009; Lytras *et al.*, 2010).

In this vein, there is a general finding on empirical literature that ICT go together with NWP (Brynjolfsson and Hitt, 1998; Arnal *et al.*, 2001; Bresnahan *et al.*, 2002), or implicitly, that ICT and NWP need each other. However, this result being true, it may be incomplete, even

more when we do the analysis not at firm but at employee level. To our knowledge, previous studies have made use of general composite indexes (Pil and McDuffie, 1996; Bresnahan *et al.*, 2002) making impossible to find assorted results. That is, at employee level, it can occur that not all the technologies classified as ICT have a positive relationship with the NWP the workers are taking part of.

Additionally, research hitherto has only analyzed this link as a whole in the firm but forgetting employee categories, where differences may be found. It is reasonable to state that for the participation in NWP or the use of ICT certain level of capabilities and skills are required (Voudouris, 2007). To ensure the benefits of ICT and NWP implementation workers must use it properly. Then, intuitively, one can think that high-skills demanding positions and lower ones may not show the same results when the ICT-NWP relationship is analyzed at the employee level.

Thus, the aim of this paper is twofold. First, we want to go further in the analysis of the ICT-NWP link, analyzing how diverse ICT variables are related to different NWP measurements. Second, we want to test whether the occupation of the worker plays a moderating role in that relationship. As far as we know, this is the first time that occupation level is included to analyze the influence of ICT on NWP adoption. Particularly, we study the impact of Internet use, PC use and Teleworking on job autonomy, participation on autonomous teams, job rotations and task variety. A wide dataset from 31 European countries [the Fourth European Working Conditions Survey], including almost 30,000 observations, is used in the empirical part of this study.

The rest of the article is structured as follows. In Section 2 we will explore the literature studying NWP and ICT, as well as the role of the profession affecting that relationship. In

Section 3 the dataset, the variables and the methodology will be explained. Section 4 reports the main results. And finally, we conclude with a short discussion in Section 5.

2. Literature Review

2.1. ICT and NWP

The introduction of ICT in the firm enables new ways to create, modify, transmit and storage information and widens the possibilities to communicate between company members. This fact has made that vast amount of researchers have studied the impact of ICT on firms' costs or, similarly, on performance. ICT implementation has been found to increase productivity (Lichtenberg, 1995; Hitt and Brynjolfsson, 1997) or, together with job re-design, to enhance firm performance (Bertschek and Kaiser, 2004). However, the effects of ICT on job organization or even the relationship with this variable has been paid less attention in the literature. As coordination technologies, ICT may impact on internal organization of firms (Dedrick *et al.*, 2003), leading to changes in authority relationships, restructuration of the hierarchy or modifications in the coordination of the decision-making process (Arnal *et al.*, 2001; Dewett and Jones, 2001; Grimshaw *et al.*, 2002).

Since early studies appeared, attention was regularly focused on the centralization/decentralization debate, generally exerting the effects of ICT introduction in favor of one of them. In terms of centralization, the fall in internal communication costs enables managers to have a better control over the activities of their subordinates. Initial investigations, generally based on case studies, were more in this stream showing as a trend that firms ended up in a more centralized structure after computerization (George and King, 1991). Some recent studies have also presented ICT as a tool for power concentration, facilitating more highly integrated firms and concentration of decision making process

(Ichniowski and Shaw, 2003; Bloom *et al.*, 2009a). Or simply, no relation between workers participation and computers' use (Black and Lynch, 2001).

In contrast, decentralization obtained thank to better information through ICT use allows a major autonomy of each part in the decision making. It reduces the need of hierarchy by reducing the cost of coordination within the firm and decentralization is presented as an outcome of ICT adoption, making the firm more flexible (Hempell and Zwick, 2008; Galve-Górriz and Gargallo, 2010). Hitt and Brynjolfsson (1997), using correlation analysis, find that IT is related to a higher degree of authority decentralization (measured as self-autonomous work teams and employee involvement groups) in US firms. Similarly, Bresnahan *et al.* (2002) and Brynjolfsson *et al.* (2002) find that higher ICT levels go along with higher degrees of teamwork, employee involvement groups, job autonomy and breadth of jobs. Arnal *et al.* (2001), in a descriptive analysis for OECD countries, show that the improved flows of information between managers and workers derived from ICT adoption demands the introduction of some NWP (e.g. decentralization of decision-making, teamwork, etc.).

A third stream is sometimes exerted where no direct organizational outcome is found after ICT introduction, or it partly depends on industry standards or level of technological change (Sahaym *et al.*, 2007). Čudanov *et al.* (2009) conclude that ICT implementation does not point firms to any type of organization but it widen the possibilities for decentralization. Additionally, some authors have presented the distinct effects of communication technologies and information technologies, which facilitate higher control of managers (centralization) and more agility to make autonomous decisions (decentralization), respectively (Bloom *et al.*, 2009b).

Computerization and the use of networks, mainly Internet, have been positively related to the implementation of NWP. As it was suggested above, it has been a general finding that

NWP go hand in hand with ICT use (Arvanitis and Loukis, 2009), they seem to need each other in a feedback process, they complement themselves. NWP usually require updated information and, in the other way, ICT are better spent when they are used in a NWP environment. Aubert *et al.* (2005), among others, show a gradual relationship between these ICT and NWP, this is, firms with a higher number of flexible practices in place have also a higher average use of Internet and computers. As information and coordination technologies, network connections and computers help workers to have both a better knowledge of the tasks to be done and a higher interaction with co-workers. That framework could help in enhancing the decisional power at their job, increasing the job autonomy (as found by Bresnahan *et al.*, 2002, among others), and also the appearance of self-managing teams.

But that relationship might be not always so obvious when the analysis is done with some other practices. While ICT giving faster information and continuous interaction (horizontal communication) makes workers to be more versatile and adaptable widening the possibilities to job rotation and multitasking (Lindbeck and Snower, 2000), this effect could be different in some cases. For instance, higher knowledge of the tasks may perhaps lead to specialization of the workers, which will end up in a lower multitasking and job rotation. If we think about workers carrying out specialized or complex tasks, where they need ICT aid, it is intuitively easy to state that those two mentioned practices are not suitable.

Working with ICT from a remote location, the so-called Teleworking, is relatively new since it usually requires strong use of telecommunications to be implemented successfully, this is, the portable nature of the task is based on ICT use. Its adoption has long attracted the attention of scholars in the last years but this implementation has been slower than expected due to different factors, such as cultural, organizational due to the absence of direct supervision (Clear and Dickson, 2005) or even the primitive regulation. Teleworking can be considered a

flexible practice itself as many studies do, but it is also a measure of ICT use since it needs strong exploitation of these technologies to make it possible. Aside positive effects on workers life (time savings, work-life balance or perceived satisfaction), the effects on the job organization seem substantial since it necessarily implies that the employee is not physically at the workplace.

An important aspect about Teleworking is that it entails bidirectional trust from both managers and employees, meaning by the side of managers to give more autonomy on job planning to the workers while hoping they are doing their tasks well. Some recent research has already found this positive relationship between Teleworking and job autonomy. Clear and Dickson (2005) come to realize about the importance of workers' autonomy for successful development of Teleworking. They find how mainly managers from higher levels in the hierarchy and high-skilled workers, who have more discretionary power about their tasks, are more willing (or sometimes allowed) to work remotely. Martínez-Sánchez *et al.* (2007) argue the importance of helping teleworkers with some specific HR flexible practices to create a commitment climate while developing Teleworking. They include job rotation, multi-skilled teams, total quality management, task variety and problem-solving teams, finding them to be related with the adoption of Teleworking. Thus, the effect of Teleworking seems straight on job autonomy and also in the appearance of autonomous teams when the task is developed by a team. As well, higher-skills generally required for teleworkers can make possible for these employees to perform a wider range of duties, which can be understood as multitasking. However, the consequences on job rotation appear ambiguous. No presence at the workplace makes unfeasible rotation in physical tasks but still possible in those virtual being made with ICT.

2.2. The Occupation of the worker

Vast amount of researchers have studied the effect of ICT on workplace skills. The skill-biased technological change framework has been used by authors to show that the introduction of new ICT in the firm is related to upskilling of workers, since new abilities are demanded (Autor *et al.*, 2003, Bayo-Moriones *et al.*, 2008). The use of ICT in the firm is expected to require some adaptation of workers such as new analytical and interactive skills, this is, cognitive tasks (Spitz-Oener, 2006, among others). This general finding also implies that new ICTs are better assimilated by higher-skilled employees since they have a comparative advantage in making a better use of them. Spitz-Oener (2006) shows that not all job categories (ranked by level of skills) are equally affected by the introduction of new technologies. For instance, computerization affects more to the skills of well-educated workers in high-skills demanding positions. Additionally, those workers in high-skills demanding positions use computers more intensely than low-skilled ones (Ben-Ner and Urtasun, 2010).

This previous idea has been recently highlighted by some other authors under the principle of job polarization, noteworthy at this point (Autor *et al.*, 2003). This proposition argues that occupations requiring low skills do not change or become even less skills-demanding when computers are introduced, whereas those occupations demanding high skills increase their requirements after these technologies are implemented. It results in a divergence effect depending on the occupation.

In a parallel way, as regards NWP participation, it seems to be easier for higher-skilled workers to take part of them. In comparison to low skilled ones, workers from high-skills demanding positions have *a priori* more abilities to take advantage from their NWP involvement. An empirical work from Voudouris (2007) find how higher educational levels of

workers are positively related to their level of functional flexibility, being this variable defined in terms of training and high performance work organization practices participation.

Thus, taking all together it may be possible that ICT introduction has different impacts on skills depending on the job category considered, and workers in higher-skills demanding positions have higher involvement in NWP, as well as a higher ICT exploitation. Then, it is reasonable to expect that the occupation, defined in terms of skills requirements, might have a moderating effect on the relationship between ICT use and NWP participation. Moreover, being important the level of skills required, the features of the occupation itself will surely affect the impact that ICT assimilation can cause.

3. Data and methodology

3.1. The Dataset and methodology

Data used for our empirical analyses come from the Fourth European Working Conditions Survey [EWCS], carried out in 2005 by the European Foundation for Living and Working Conditions in 31 European countries. EWCS is an employee-level sample which provides cross-sectional information about workers, working conditions and workplace characteristics, to monitor the quality of work and employment in Europe. The questionnaire covers a wide range of characteristics related to work conditions such as time, organization of work, management, communication structures, work-life balance, payments or impact of work on health in a large variety of job positions and sectors, for both private and public works. A total sample of 29,680 observations were actually obtained, all based in face-to-face random interviews at household of respondents, distributed almost equally among 31 countries and exclusively limited to active population over 15 years (receiving money for a work at least a week before the interview was carried out).

The dataset included both employed and self-employed workers but we are only interested in the former, since we are analyzing working conditions generally depending on a superior. Thus, the final data used for the analysis was approximately an 83% of the original sample and because of missing values in different variables, fewer observations are used in the models eventually.

3.2. The Variables

For the empirical analysis of the influence of using ICT on NWP participation four different dependent variables were built, to construct different models as will be explained below. These variables were the *Job Autonomy* of the worker, the existence of autonomous *Teams*, the *Job Rotation* and the *Task Variety*.

To measure *Job Autonomy* of a worker an index was created making use of five original binary variables in the dataset. These variables describe the autonomy of the employee deciding the quality of his/her work, the solution for problems, the order of tasks, the methods and the speed of work. Higher values represent higher levels of autonomy at workplace, since the new index will take the value equal 0 if none of those decisions can be taken by the worker and a value of 5 if all of them can be decided. *Teams* is also a categorical variable taking the value 0 if the job of the workers does not involve working in a team or, in case of teamwork, that existing team is not self-managed. For those taking part in a team, a follow-up question measures their decisional power about head of the team and division of tasks. The variable will take values 1 and 2 if the team decides about one or both issues, respectively. *Job Rotation* at work is measured categorically as well. We ascribe a 0 value when no rotation is experienced by the surveyed worker, 1 in the case of rotation but not differences in the abilities to face it and 2 in case of rotation and different skills needed. Finally, *Task Variety* is measured, as

previous ones, using a categorical variable ranging from 0 to 2. The minimum value is assigned to those workers who do short repetitive tasks very often, so it can be understood that the task variety is not high. 1 is given in the case of repetitive tasks but with a longer duration and 2 for those stating not to do repetitive tasks. Given the ordered categorical nature of all the dependent variables used, ordered probit models will be developed in our analyses.

The independent variables were referred to the use of ICT by the worker at his/her job position. In a Likert scale response of seven stages from "never" to "all of the time", interviewees had to answer whether the job involves three different competences (variable name in parenthesis): i) Teleworking at home with a PC (*Teleworking*), ii) Working with computers: PCs, network, mainframe (*Use of PC*) and iii) Using Internet / email for professional purposes (*Internet*). Table 1 summarizes the descriptive statistics for both dependent and independent variables.

[INSERT TABLE 1 AROUND HERE]

Table 1 also reports the definition and statistics for control variables used in our models, at both employee and firm level. Firstly, with respect to the employee, aiming to capture the effects we used *Gender*, *Age* (plus *Age-Squared*), level of *Education* (positive relationship expected based in Black *et al.*, 2004; while non-significant link according to Hempell and Zwick, 2008, for Greek and Swiss firms). Also, *Seniority* (number of years in the firm), type of *Contract* (temporary or permanent) and *Working Day* (full-time or part-time). Related to the firm, we controlled by *Type of Ownership* (Caroli and Van Reenen, 2001; Bryson *et al.*, 2007), *Sector* of activity based on NACE-11 (Ordiz-Fuertes and Fernández-Sánchez, 2003; Bryson *et al.*, 2007) and *Size* of the company (Gittleman *et al.*, 1998; Acemoglu *et al.*, 2007; Bloom and Van Reenen, 2010). Lastly, country dummies were included detecting origin differences (Caroli and Van Reenen, 2001; Acemoglu *et al.*, 2007; Ollo-López *et al.*, 2010).

A relevant variable for this study at the employee level was the occupation of the worker. Being originally measured in multiple categories and allowing 2-digits distribution according to International Standard Classification of Occupations (ISCO-88) here, with a simplification purpose, it was reduced to first level of aggregation (1-digit): Managers, Professionals, Technicians, Clerks, Service Workers, Craft Workers, Operators, Elementary Workers and Armed Forces. ISCO-88 organizes occupations in a hierarchical framework. Jobs are sorted in accordance with the degree of similarities in their duties using the level of skills demand of the job to discriminate. Managers category was not considered since we were interested in non-managerial workers depending on a superior, and armed forces due to the scarce number of observations. Firstly, dummy variable will be used as a control one and secondly different models will be created for each occupation. Table 2 displays the skill level ascribed to each occupation by ISCO-88, as well as a short definition for each one.

[INSERT TABLE 2 AROUND HERE]

4. Results

In this fourth section, results for the study will be provided. As we able to see in Table 1, job autonomy and multitasking were the most spread NWP among European workers, while participation in autonomous teams and job rotation are not so well extended. With regard to ICT use, computers and Internet deployment are considerably more exploited than Teleworking (vast amount of interviewees stated not to use this tool). In general terms, we find evidence of a connection between the use of ICT and NWP participation. Both globally and per occupation, it is shown that workers making higher use of these technologies are also more likely to be involved in flexible practices. However, as expected, some differences appear analyzing specific relationship.

As slight comment for the control variables included in all the analyses, we can say that results were as expected based in the literature review. Male, medium-aged (with an inverted U-shape), more educated, working full time and from public firms have more active participation in NWP. As well, firm size offer significant but divergent results for each case and, the country of origin allows identifying clear clusters (results not included in the tables).

Table 3 reports the results for ordered probit analysis for NWP on ICT. As expected, the participation of workers in NWP is positively influenced by their use of ICT. It goes in line with prior findings as Hitt and Brynjolfsson (1997), Arnal *et al.* (2001) or Bresnahan *et al.* (2002). Nonetheless, differences appear according to the NWP analyzed, finding diverse effects of ICT use. While in the case of job autonomy empirical results clearly show the association with any ICT used, the other three NWP modeled present divergent outcomes depending on the ICT introduced. Implications are relevant as for specific cases ICT employment could be detrimental for NWP partaking at employee levels, and managers should be aware of it.

Teleworking affects positive and significantly to job autonomy and participation in autonomous teams. Considering the conception of Teleworking in this survey which specifically means working from home with a PC, results are sensible since workers will surely enjoy high levels of autonomy. At the same time, coordination with co-workers may be necessary for that practice and autonomous teams effectively looks a suitable tool. However, no effect is found on job rotation and task variety. Perhaps, type of jobs involving Teleworking have a high specific knowledge, that is what allows giving them more autonomy, while making more difficult rotation and multitasking. Precisely, in a deeper analysis, workers developing Teleworking mostly come from high-skills demanding positions and their specific knowledge is expected to be superior.

Using PC and Internet also affects positively to job autonomy, being stronger the second one, and it points out that workers using these devices enjoy more decisional power at work. Participation on autonomous teams is also positively affected by the use of Internet, perhaps because coordination of teams becomes easier with this type of tool (surprisingly no effect is found for the use of PC). Task variety is very high and positively affected by Internet use, as well. However, there are two noteworthy and significant results that make us to think again on specificity of some tasks. First, Internet use, while facilitating multitasking and autonomy, seem to lead to lower rotation. Second, PC use favors autonomy and rotation but it ends up with a lower task variety in that position. In both cases we can intuitively think that Internet and PC use entails specialization since, by definition, they are likely to be used for higher-skill demanding duties. So rotation and multitasking (in mentioned cases) for those workers are harder to be developed, as compared to more routine activities.

[INSERT TABLE 3 AROUND HERE]

Table 4 shows the ordered probit model analyzing the relationship between Job Autonomy and ICT adoption, differentiating by type of workers/occupation.. First thing attracting our attention is the always positive and highly significant effect of Internet use on job autonomy for all professions, making clear how this tool boosts employees' independence at workplace. Teleworking also affects positively to job autonomy but only for professionals, technicians and service workers. Using a PC presents a clear and significant divergence depending on the skills demanded in the occupation. This is, while for low-skills demanding jobs it positively affects the autonomy, for professionals, who present the highest level of skills, the effect is the opposite. This means that the dependence on a superior is stronger for workers in high-skills demanding positions if they use a PC. Perhaps, this type of use of a PC implies earlier defined tasks where worker's criteria is not relevant. Moreover, we have evidence again

that clerks, even when they extensively use ICT, may be focused on strictly controlled jobs that limit autonomy, since Teleworking and PC are not significant. In this case thus, empirical evidence shows that the job category moderates the ICT-NWP relationship.

Table 5 shows the model about the impact of ICT on autonomous Teams adoption by the different occupations. In this case, the use of Internet reduces its relevance and only professionals and services workers significantly benefit from its use in teams participation. Teleworking is only significant for professionals and operators, affecting to both positively. However, in the case of operators where approximately only 40 of them stated to participate in this action sometimes, these results must be taken cautiously. Once more, we observe how the use of PC offers divergent results according to skill level the position demands. As in the case of job autonomy, low-skills demanding positions benefit from PC use but high-skills ones (professionals and technicians) reduce their participation in team works when they increase the use of a PC. Similar comments can be extracted, stating that this type of use of a PC involves earlier programmed tasks and, in this case, autonomous teams' participation does not hold.

Results for job rotation are reported in Table 6. Neither Internet use nor Teleworking have any significant effect on job rotation analysis among job categories. The use of PC, however, present opposite results. Reminding the general model in Table 3 for this variable, we saw a general positive effect of this variable on job rotation but, when analyses are carried out for different job occupations, workers in high-skills demanding positions as technicians present the contrary effect. In high-skilled occupations, the relationship is negative while for services and elementary workers the use of PC promotes job rotation. So we have again evidence of the moderating effect of the work position.

Finally, we report the findings for task variety in Table 7. Likewise job rotation, Teleworking does not affect task variety for any occupation, as in the general model. Using a

PC is only relevant for professionals, technicians and operators, presenting always a negative coefficient. It seems like the use of a PC involves very specific and repetitive tasks as suggested in the general model (Table 3) and higher-skilled workers are more affected. In contrast, using Internet enhance task variety of workers generally.

[INSERT TABLE 4 AROUND HERE]

[INSERT TABLE 5 AROUND HERE]

[INSERT TABLE 6 AROUND HERE]

[INSERT TABLE 7 AROUND HERE]

Shortly, we have found empirical evidence that the job category of the worker affects to ICT-NWP participation relationship, moderating the effects. Teleworking and Internet use have for all occupation categories and for all the NWP under analysis a positive connection, being stronger in the case of job autonomy and also in multitasking for the case of Internet. However, when we observe the use of PC, occupation strongly moderates the influence of ICT adoption with each NWP. The main finding is how workers from high-skills demanding positions (mainly Professionals and Technicians) generally present a lower participation in NWP when they are using a PC. It lead us to think that for this type of employees computers become a control tool, making them to be constantly traced and available and they can feel their autonomy eventually decreased. In the same vein, given their specific and high skills for the position they hold, rotations and multitasking might be worthless.

5. Discussion and Conclusions

We aimed in this paper to provide a better understanding on the relationship between the use of ICT and the participation in NWP at employee level, both in general and per

occupation of workers. It was our intention to contribute to the literature on the factors affecting the participation in NWP but focusing mainly on ICT use by workers.

Results show in general terms a positive effect of ICT use on participating in NWP. All ICTs analyzed have a positive and significant effect on job autonomy and participation in autonomous teams. However, it is also true that differences come out for job rotation and task variety and the effect of ICT is not so clear in this case. An evident result is that the use of Internet considerably favors the participation in NWP, except for job rotation which is less developed by employees using this tool. Also Teleworking certainly enhances autonomy, both individual and in teams, as it was expected. The effect of PC use is less clear particularly to explain autonomous team adoption.

When we analyzed occupations independently we observed important variations in the ICT-NWP relationship depending on the skills level the position demands. For instance, professionals and technicians (with the highest levels of skills required) benefit from Teleworking and Internet to gain more autonomy and teams participation, but using a PC is detrimental for the same goal. Clerk, that were told to have the highest use of ICT, do not present any benefit of using ICT on participation in NWP. So it can be understood that this group develop strongly programmed duties. Services workers are with no doubt the group where the use of ICT has the higher impact on participation in NWP, more when related with Internet tools. It comes to show the importance of these technologies in professions related with the tertiary sector where the use of ICT has less studied than in manufacturing sector but it shows high opportunities of development with significant impact on NWP adoption. And finally, handicrafts, operators and elementary workers, who represent lower levels of skills, take advantage of ICT to gain autonomy and team membership but no special effect is observed on job rotation and task variety.

Summing up, the most surprising results obtained in this occupation disaggregation is how using a PC makes workers in high-skills demanding positions to participate less in NWP. Then, we are able to state that job category actually plays a moderating role and it must be taken into account when the effect of ICT use on NWP participation at employee level is analyzed.

As commented, if we understand job autonomy and autonomous teams as a proxy of decentralization measures, we can understand after our results that the use of ICT strongly favors these structures. That is, we can conclude that employees who make a higher use of ICT generally take part in more flexible structures, where the decision making process is delegated. This reinforces the theory followed by Arnal *et al.* (2001), Bresnahan *et al.* (2002), Dewett and Jones (2001) and Grimshaw *et al.* (2002), among others. That is, we could say that the use of ICT favors for decentralization of decision making process, giving generally workers a higher autonomy at their work (as regarding the commented exceptions of some PC users).

The implications of our results seem clear at managerial level. The higher the use of ICT the higher the participation in NWP, generally, and in particular in job autonomy, autonomous teams and task variety. After all the benefits found in the empirical literature about the use of NWP at the firm, and knowing that ICT use favors for the development of these practices, it looks sensible to recommend the implementation of ICT at firms as a way to improve in many directions. Internet deployment should be strongly recommended in any case while the use of PC seems not to be positively related with the participation in NWP.

Additionally, relevant implications can be drawn as regarding different occupations. For instance, in the case of clerks, where we observed that ICT is widely adopted but it does not have any effect on taking part of NWP, we strongly encourage managers to include this group on these practices. Boosting the motivation of this group would probably help to decrease

bureaucratic problems suffered in some firms where office tasks are blocked. In the case of high-skills demanding positions, where the use of a PC for a different purpose than Internet hampers the participation in NWP, it is also suggested to be prevented. If this result is due to the use of PCs as tools for mechanic and programmed tasks, our proposition is to expand it as a communication instrument. Lower-skills demanding works, which generally benefit from ICT use, would be better off if managers would enable them a higher use of these devices, since this group still present a low rate of ICT use. In addition, among lower skilled workers, the use of PC seems to have a positive relationship with decentralization (job autonomy and autonomous teams) and with job rotation.

Nonetheless, we are aware about some limitations in our work. First, there are important limitations trying to establish causal effects of ICT use on NWP participation. Hence, the findings should be viewed more as establishing the empirical associations between those clusters rather than as providing causal relations, since causality generally requires longitudinal data. Additionally, due to the nature of our data at employee-level we cannot make wider comments and say that firms which use more ICT are more likely to adopt NWP, as other studies did. We can only make those statements at employee level.

We propose some future research in this field assessing the inter-temporal effect of ICT on NWP. Moreover, this procedure would allow researchers to contrast the proposition by Ben-Ner and Urtasun (2010), who state that new computer based technologies in the firm make high-skill positions to upskill the tasks associated whereas low-skill jobs end up in lower skills demand, this is, a polarization process. Also, the inclusion of higher number measures of ICT and NWP use would enable to reach a more complete knowledge differentiating information and communication technologies as separated groups.

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Table 1. *Descriptive Statistics for Variables in the analyses*

	Variable	Mean	Std. Dev.	N
Dependent variables				
	JOB AUTONOMY	3.465	1.505	21,940
	AUTONOMOUS TEAMS	0.507	0.723	23,019
	JOB ROTATION	0.864	0.938	23,024
	TASK VARIETY	1.300	0.845	22,583
Independent variables				
	TELEWORK	1.307	0.925	22,995
	PC USE	3.041	2.409	23,022
	INTERNET USE	2.509	2.154	23,018
Control Variables				
Gender	Female	0.536		12,417
	Male	0.463		10,728
Age		40.25	11.75	23,087
Level of Education	No Education	0.006		154
	Primary	0.057		1,325
	Secondary	0.682		15,744
	University	0.253		5,851
Occupation	Professional	0.154		3,550
	Technician	0.166		3,839
	Clerk	0.153		3,536
	Service Worker	0.135		3,124
	Craft Worker	0.149		3,429
	Operator	0.085		1,957
	Elementary Worker	0.155		3,575
Seniority		9.33	9.5	22,857
Type of Contract	Fixed Contract	0.8471		17,538
	Temporary Contract	0.152		3,166
Type of Working Day	Full-Time	0.830		19,128
	Part-Time	0.169		3,905
Ownership	Public	0.398		9,064
	Private	0.601		13,659
Sector	Agriculture	0.024		554
	Industry	0.219		4,601
	Construction	0.069		1,457
	Services	0.685		14,377
Firm Size	Less than 10 workers	0.295		6,512
	10-49 workers	0.340		7,496
	50-249 workers	0.222		4,907
	More than 250	0.140		3,101

Table 2. *ISCO-88 Job classification*

ISCO Code	Group	ISCO skill level	Specifications
2	Professional	4th	High level of professional knowledge and experience in physical sciences, social sciences or humanities and contribution to increase the existing stock of knowledge investigating and teaching.
3	Technician	3rd	Technical knowledge and experience in physical sciences, social sciences or humanities and development of technical work and operational methods.
4	Clerk	2nd	Knowledge and experience organizing, storing, computing and retrieving information. It involves some secretarial tasks and any customer-oriented clerical duty.
5	Service worker	2nd	Knowledge and experience in personal and protective services and to sell goods in shops or at markets.
7	Craft worker	2nd	Knowledge and experience of skilled trades involving understanding of materials, stages, processes and use of products. In this group skilled agricultural was included, that represents market-oriented agricultural activities requiring specific knowledge.
8	Operators	2nd	Knowledge and experience to operate and monitor industrial machinery and equipment. Generally associated to assembly lines jobs.
9	Elementary worker	1st	Knowledge and experience to perform mostly simple and routine tasks with limited personal initiative and judgment.

Source: ISCO-88. Geneva 1990. For a further definition visit (last accessed in August 2010). *http://www.ilo.org/public/english/bureau/stat/isco/isco88/publ4.htm*

Note: nº6 corresponding to "Skilled agricultural" was joined to "Craft worker" due to similarities. Additionally, nº0, containing "Armed Forces and nº1 "Legislators/managers" were excluded.

Table 3. *Ordered Probit models explaining relationship between ICTs and NWPs*

	JOB AUTONOMY	TEAMS	JOB ROTATION	TASK VARIETY
Teleworking	0.056***	0.039***	0.007	0.003
	(0.000)	*(0.000)*	*(0.493)*	*(0.760)*
Use of PC	0.011*	-0.006	0.013*	-0.019***
	(0.068)	*(0.358)*	*(0.055)*	*(0.004)*
Internet	0.070***	0.015**	-0.013*	0.026***
	(0.000)	*(0.031)*	*(0.060)*	*(0.000)*
Male	0.143***	0.002	0.033	0.171***
	(0.000)	*(0.921)*	*(0.124)*	*(0.000)*
Age	0.016***	0.000	-0.002	0.018***
	(0.002)	*(0.975)*	*(0.723)*	*(0.002)*
Age squared [a]	-0.016***	-0.005	-0.008	-0.013*
	(0.008)	*(0.435)*	*(0.200)*	*(0.056)*
Primary	0.119	0.057	0.235	0.226
	(0.364)	*(0.713)*	*(0.133)*	*(0.113)*
Secondary	0.288**	0.023	0.339**	0.434***
	(0.023)	*(0.878)*	*(0.024)*	*(0.002)*
University	0.500***	0.100	0.253*	0.611***
	(0.000)	*(0.511)*	*(0.097)*	*(0.000)*
Technician	-0.182***	0.027	0.100***	-0.076**
	(0.000)	*(0.413)*	*(0.003)*	*(0.027)*
Clerk	-0.410***	-0.252***	-0.180***	-0.185***
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*
Services worker	-0.404***	-0.050	0.037	-0.207***
	(0.000)	*(0.208)*	*(0.356)*	*(0.000)*
Handicraft	-0.318***	0.024	0.186***	-0.338***
	(0.000)	*(0.566)*	*(0.000)*	*(0.000)*
Operator	-0.732***	-0.256***	-0.064	-0.376***
	(0.000)	*(0.000)*	*(0.172)*	*(0.000)*
Elementary worker	-0.468***	-0.155***	-0.038	-0.256***
	(0.000)	*(0.000)*	*(0.366)*	*(0.000)*
Seniority	0.009***	0.001	0.007**	-0.001
	(0.006)	*(0.714)*	*(0.035)*	*(0.861)*
Seniority squared	0.000*	0.000	0.000	0.000
	(0.056)	*(0.911)*	*(0.276)*	*(0.689)*
Temporary worker	-0.097***	-0.024	0.089***	0.013
	(0.000)	*(0.412)*	*(0.002)*	*(0.645)*
Part time	-0.041	-0.047*	-0.001	-0.041
	(0.115)	*(0.098)*	*(0.982)*	*(0.147)*
Private sector	-0.064***	-0.179***	-0.089***	-0.066***
	(0.002)	*(0.000)*	*(0.000)*	*(0.003)*
Industry	-0.092	-0.174**	0.048	-0.115*
	(0.136)	*(0.013)*	*(0.488)*	*(0.097)*
Construction	0.044	0.115	0.079	-0.083
	(0.516)	*(0.131)*	*(0.305)*	*(0.272)*
Services	-0.001	-0.114*	0.034	-0.038
	(0.983)	*(0.095)*	*(0.617)*	*(0.573)*
Size less 10 workers	0.133***	-0.103***	-0.282***	0.077**
	(0.000)	*(0.001)*	*(0.000)*	*(0.015)*
Size 10-49 workers	0.101***	-0.024	-0.123***	0.060***
	(0.000)	*(0.408)*	*(0.000)*	*(0.040)*
Size 50-250 workers	0.005	-0.034	-0.125***	0.037
	(0.844)	*(0.270)*	*(0.000)*	*(0.223)*
Country dummies	*Included*	*Included*	*Included*	*Included*
Pseudo-R^2	0.0674	0.0427	0.0394	0.0382
Log-likelihood	-24,640.5	-15,233.5	-15,506.1	-16,157.7
N	16.481	17,209	17,196	16,938

*Notes: *** p<0.01; ** p<0.05; * p<0.1. (P-value in brackets).*

The correspondent reference groups are "No education" for the case of education, "Professionals" for occupation, "Agriculture" for the sector of activity and "More than 250 workers" for size of the firm.

[a] *Coefficients multiplied by 100*

Table 4. *Ordered Probit models explaining relationship between ICT's and JOB AUTONOMY per Occupation*

	Professional	Technician	Clerk	Services workers	Handicraft	Operator	Elementary
Teleworking	0.052***	0.103***	0.031	0.091***	0.047	0.045	0.033
	(0.006)	*(0.000)*	*(0.174)*	*(0.008)*	*(0.240)*	*(0.333)*	*(0.502)*
Use of PC	-0.045***	-0.006	0.009	0.009	0.070***	0.031	0.042**
	(0.002)	*(0.640)*	*(0.479)*	*(0.587)*	*(0.001)*	*(0.207)*	*(0.034)*
Internet	0.074***	0.065***	0.070***	0.096***	0.072***	0.104***	0.073***
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.009)*	*(0.003)*	*(0.007)*
Male	0.060	0.191***	0.074	0.075	0.367***	0.348***	0.106**
	(0.228)	*(0.000)*	*(0.142)*	*(0.172)*	*(0.000)*	*(0.000)*	*(0.045)*
Age	-0.016	0.020	0.016	0.035**	0.023*	-0.007	0.028**
	(0.352)	*(0.151)*	*(0.193)*	*(0.011)*	*(0.073)*	*(0.711)*	*(0.034)*
Age squared [a]	0.021	-0.019	0.018	-0.038**	-0.020	0.008	-0.030*
	(0.276)	*(0.239)*	*(0.192)*	*(0.025)*	*(0.190)*	*(0.707)*	*(0.060)*
Primary	0.198	-0.277	0.035	0.484	-0.513	0.448	0.030
	(0.852)	*(0.692)*	*(0.943)*	*(0.219)*	*(0.144)*	*(0.125)*	*(0.888)*
Secondary	0.787	-0.063	0.162	0.725*	-0.317	0.380	0.140
	(0.441)	*(0.926)*	*(0.733)*	*(0.056)*	*(0.356)*	*(0.174)*	*(0.499)*
University	1.047	0.132	0.473	0.768**	-0.292	0.259	0.469**
	(0.305)	*(0.846)*	*(0.322)*	*(0.045)*	*(0.413)*	*(0.405)*	*(0.042)*
Seniority	0.025***	-0.001	0.003	0.005	0.004	0.018*	0.002
	(0.004)	*(0.886)*	*(0.733)*	*(0.632)*	*(0.597)*	*(0.094)*	*(0.845)*
Seniority squared	-0.001***	0.000	0.000	0.000	0.000	0.000	0.000
	(0.002)	*(0.946)*	*(0.876)*	*(0.608)*	*(0.549)*	*(0.685)*	*(0.966)*
Temporary worker	-0.021	-0.061	-0.091	-0.029	-0.206***	-0.175*	-0.094
	(0.768)	*(0.367)*	*(0.181)*	*(0.671)*	*(0.001)*	*(0.051)*	*(0.142)*
Part time	-0.145**	0.035	-0.107*	-0.111*	0.082	0.221	-0.003
	(0.037)	*(0.555)*	*(0.075)*	*(0.081)*	*(0.444)*	*(0.108)*	*(0.962)*
Private sector	-0.147***	-0.096**	-0.096**	0.019	-0.067	0.188**	-0.038
	(0.010)	*(0.045)*	*(0.043)*	*(0.739)*	*(0.266)*	*(0.011)*	*(0.503)*
Industry	0.673***	0.057	0.262	0.365	-0.288**	-0.461***	-0.109
	(0.007)	*(0.831)*	*(0.369)*	*(0.375)*	*(0.012)*	*(0.003)*	*(0.343)*
Construction	0.714***	0.065	0.606*	0.566	-0.148	-0.363*	0.010
	(0.010)	*(0.818)*	*(0.054)*	*(0.287)*	*(0.219)*	*(0.052)*	*(0.944)*
Services	0.522**	0.063	0.150	0.412	-0.167	-0.355**	0.195*
	(0.029)	*(0.808)*	*(0.600)*	*(0.307)*	*(0.169)*	*(0.021)*	*(0.069)*
Less 10 workers	-0.016	0.062	0.012	-0.059	0.312***	0.157	0.258***
	(0.848)	*(0.377)*	*(0.860)*	*(0.518)*	*(0.000)*	*(0.105)*	*(0.002)*
10-49 workers	0.060	0.107*	0.065	-0.103	0.167**	0.125	0.122
	(0.393)	*(0.084)*	*(0.328)*	*(0.250)*	*(0.015)*	*(0.130)*	*(0.132)*
50-250 workers	-0.035	-0.024	0.007	-0.193**	0.029	0.095	0.098
	(0.622)	*(0.711)*	*(0.919)*	*(0.045)*	*(0.687)*	*(0.240)*	*(0.243)*
Country dummies	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*
Pseudo-R^2	0.0437	0.0472	0.0441	0.0581	0.0602	0.0576	0.0425
Log-likelihood	-3,405.6	-3,999.1	-3,940.8	-3,264.7	-3,916.8	-2,405.1	-3,378.2
N	2,878	2,952	2,598	2,073	2,497	1,447	2,045

*Notes: *** p<0.01; ** p<0.05; * p<0.1. (P-value in brackets).*

The correspondent reference groups are "No education" for the case of education, "Professionals" for occupation, "Agriculture" for the sector of activity and "More than 250 workers" for size of the firm.

[a] *Coefficients multiplied by 100*

Table 5. *Ordered Probit models explaining relationship between ICT's and TEAMS per Occupation*

	Professional	Technician	Clerk	Services Workers	Handicraft	Operator	Elementary
Teleworking	0.063***	-0.003	0.033	0.039	0.025	0.115**	0.036
	(0.001)	*(0.881)*	*(0.191)*	*(0.244)*	*(0.556)*	*(0.036)*	*(0.495)*
Use of PC	-0.031**	-0.035**	0.012	0.009	0.005	0.048*	0.017
	(0.050)	*(0.014)*	*(0.395)*	*(0.602)*	*(0.838)*	*(0.091)*	*(0.443)*
Internet	0.037**	0.011	0.007	0.048**	0.001	0.048	0.016
	(0.021)	*(0.432)*	*(0.595)*	*(0.028)*	*(0.985)*	*(0.222)*	*(0.583)*
Male	0.039	-0.122**	0.058	-0.042	0.142**	0.137	0.082
	(0.445)	*(0.012)*	*(0.307)*	*(0.489)*	*(0.026)*	*(0.129)*	*(0.188)*
Age	0.003	0.013	-0.014	0.032**	0.010	-0.037*	-0.002
	(0.865)	*(0.385)*	*(0.299)*	*(0.044)*	*(0.477)*	*(0.092)*	*(0.898)*
Age squared [a]	-0.011	-0.016	0.015	-0.042*	-0.021	0.041	-0.003
	(0.571)	*(0.362)*	*(0.331)*	*(0.029)*	*(0.209)*	*(0.120)*	*(0.863)*
Primary	-0.398	0.394	-0.164	-0.119	0.369	1.025*	-0.297
	(0.645)	*(0.519)*	*(0.775)*	*(0.798)*	*(0.387)*	*(0.063)*	*(0.229)*
Secondary	-0.201	0.331	-0.334	-0.033	0.410	0.840	-0.450*
	(0.801)	*(0.572)*	*(0.545)*	*(0.941)*	*(0.329)*	*(0.123)*	*(0.059)*
University	-0.177	0.389	-0.255	0.182	0.398	0.824	-0.313
	(0.824)	*(0.506)*	*(0.646)*	*(0.688)*	*(0.359)*	*(0.147)*	*(0.234)*
Seniority	0.008	-0.006	-0.004	0.001	-0.005	0.008	0.005
	(0.355)	*(0.436)*	*(0.664)*	*(0.952)*	*(0.518)*	*(0.534)*	*(0.630)*
Seniority squared	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.754)	*(0.473)*	*(0.922)*	*(0.827)*	*(0.400)*	*(0.449)*	*(0.644)*
Temporary worker	-0.027	-0.015	-0.050	-0.045	-0.057	-0.014	-0.018
	(0.710)	*(0.836)*	*(0.529)*	*(0.572)*	*(0.432)*	*(0.901)*	*(0.806)*
Part time	0.000	-0.127**	-0.063	0.023	0.120	-0.183	-0.028
	(0.999)	*(0.039)*	*(0.361)*	*(0.744)*	*(0.307)*	*(0.298)*	*(0.728)*
Private sector	-0.195***	-0.233***	-0.113**	-0.214***	-0.120*	-0.208**	-0.050
	(0.001)	*(0.000)*	*(0.036)*	*(0.001)*	*(0.070)*	*(0.020)*	*(0.450)*
Industry	-0.100	-0.342	-0.442	-0.356	-0.132	-0.208	-0.155
	(0.715)	*(0.228)*	*(0.152)*	*(0.463)*	*(0.299)*	*(0.256)*	*(0.249)*
Construction	0.237	-0.254	-0.414	-0.627	0.195	-0.230	0.311**
	(0.422)	*(0.404)*	*(0.222)*	*(0.319)*	*(0.139)*	*(0.301)*	*(0.049)*
Services	0.010	-0.227	-0.467	-0.141	-0.097	-0.502***	-0.007
	(0.970)	*(0.414)*	*(0.123)*	*(0.766)*	*(0.464)*	*(0.006)*	*(0.957)*
Less 10 workers	-0.122	-0.144*	-0.150*	-0.245**	0.065	-0.249**	-0.017
	(0.155)	*(0.052)*	*(0.065)*	*(0.012)*	*(0.435)*	*(0.037)*	*(0.862)*
10-49 workers	-0.151**	0.024	-0.038	-0.099	0.029	-0.046	0.079
	(0.032)	*(0.714)*	*(0.616)*	*(0.294)*	*(0.712)*	*(0.643)*	*(0.412)*
50-250 workers	-0.003	-0.064	0.057	-0.292***	-0.002	-0.091	0.014
	(0.970)	*(0.344)*	*(0.467)*	*(0.005)*	*(0.984)*	*(0.356)*	*(0.887)*
Country dummies	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*
Pseudo-R^2	0.0395	0.0523	0.0417	0.0589	0.0403	0.0628	0.0389
Log-likelihood	-2,863.3	-2,909,9	-2,169.1	-1,902.1	-2,340.2	-1,102.9	-1,172.9
N	2,976	3,067	2,706	2,173	2,61	1,503	2,174

*Notes: *** p<0.01; ** p<0.05; * p<0.1. (P-value in brackets).*
The correspondent reference groups are "No education" for the case of education, "Professionals" for occupation, "Agriculture" for the sector of activity and "More than 250 workers" for size of the firm.

[a] *Coefficients multiplied by 100*

Table 6. *Ordered Probit models explaining relationship between ICT's and JOB ROTATION per Occupation*

	Professional	Technician	Clerk	Services Workers	Handicraft	Operator	Elementary
Teleworking	0.026	-0.021	0.012	-0.014	0.035	0.065	-0.071
	(0.198)	*(0.345)*	*(0.645)*	*(0.690)*	*(0.421)*	*(0.239)*	*(0.193)*
Use of PC	0.015	-0.032**	-0.002	0.061***	0.016	0.038	0.049**
	(0.375)	*(0.030)*	*(0.896)*	*(0.001)*	*(0.496)*	*(0.174)*	*(0.029)*
Internet	-0.017	-0.013	0.006	-0.013	-0.037	0.044	0.002
	(0.315)	*(0.397)*	*(0.680)*	*(0.563)*	*(0.223)*	*(0.270)*	*(0.934)*
Male	0.048	-0.022	0.076	0.054	0.065	0.009	0.088
	(0.373)	*(0.662)*	*(0.180)*	*(0.373)*	*(0.303)*	*(0.911)*	*(0.142)*
Age	0.009	0.016	-0.055***	0.002	0.036**	0.006	-0.003
	(0.644)	*(0.289)*	*(0.000)*	*(0.897)*	*(0.014)*	*(0.764)*	*(0.845)*
Age squared [a]	-0.023	-0.031*	0.055***	-0.011	-0.050***	-0.018	-0.010
	(0.275)	*(0.086)*	*(0.001)*	*(0.553)*	*(0.005)*	*(0.467)*	*(0.587)*
Primary	-0.727	0.407	0.177	-0.029	-0.014	0.024	0.815***
	(0.397)	*(0.520)*	*(0.789)*	*(0.949)*	*(0.974)*	*(0.945)*	*(0.005)*
Secondary	-0.693	0.281	0.185	0.077	0.257	0.152	0.850***
	(0.384)	*(0.643)*	*(0.772)*	*(0.860)*	*(0.541)*	*(0.648)*	*(0.002)*
University	-0.913	0.212	0.191	-0.002	-0.018	0.089	0.869***
	(0.251)	*(0.726)*	*(0.766)*	*(0.997)*	*(0.966)*	*(0.811)*	*(0.004)*
Seniority	0.019**	0.006	0.014	-0.012	-0.013	0.005	0.014
	(0.042)	*(0.445)*	*(0.124)*	*(0.267)*	*(0.119)*	*(0.674)*	*(0.150)*
Seniority squared	0.000	0.000	0.000*	0.000	0.000*	0.000	0.000
	(0.140)	*(0.842)*	*(0.057)*	*(0.246)*	*(0.066)*	*(0.673)*	*(0.316)*
Temporary worker	0.069	0.090	0.009	0.014	0.194***	0.068	0.170**
	(0.355)	*(0.229)*	*(0.901)*	*(0.853)*	*(0.009)*	*(0.506)*	*(0.017)*
Part time	-0.099	0.068	0.057	0.084	0.069	-0.188	-0.120
	(0.186)	*(0.296)*	*(0.400)*	*(0.233)*	*(0.575)*	*(0.249)*	*(0.122)*
Private sector	-0.048	-0.153***	-0.119**	-0.142**	0.075	-0.076	-0.038
	(0.429)	*(0.004)*	*(0.026)*	*(0.025)*	*(0.268)*	*(0.370)*	*(0.556)*
Industry	0.047	-0.241	0.386	-0.620	-0.005	0.128	0.100
	(0.867)	*(0.441)*	*(0.254)*	*(0.231)*	*(0.970)*	*(0.471)*	*(0.447)*
Construction	0.314	-0.491	-0.021	-0.658	0.045	0.046	0.397**
	(0.306)	*(0.141)*	*(0.954)*	*(0.307)*	*(0.735)*	*(0.833)*	*(0.012)*
Services	0.105	-0.146	0.293	-0.443	0.107	-0.055	-0.055
	(0.699)	*(0.636)*	*(0.378)*	*(0.385)*	*(0.424)*	*(0.754)*	*(0.652)*
Less 10 workers	-0.232**	-0.231***	-0.238***	-0.559***	-0.168**	-0.307***	-0.302***
	(0.011)	*(0.003)*	*(0.003)*	*(0.000)*	*(0.045)*	*(0.006)*	*(0.001)*
10-49 workers	-0.220***	-0.181***	-0.031	-0.302***	-0.054	-0.127	-0.077
	(0.003)	*(0.008)*	*(0.673)*	*(0.002)*	*(0.493)*	*(0.178)*	*(0.399)*
50-250 workers	-0.232***	-0.121*	-0.084	-0.424***	0.044	-0.084	-0.076
	(0.002)	*(0.088)*	*(0.285)*	*(0.000)*	*(0.586)*	*(0.359)*	*(0.423)*
Country dummies	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*
Pseudo-R^2	0.0513	0.0568	0.0458	0.0629	0.0431	0.0431	0.0620
Log-likelihood	-2,446.6	-2,675.2	-2,350.2	-2,026.3	-2,300.7	-1.385.4	-1,950.1
N	2,978	3,074	2,706	2,166	2,602	1,504	2,166

*Notes: *** p<0.01; ** p<0.05; * p<0.1. (P-value in brackets).*
The correspondent reference groups are "No education" for the case of education, "Professionals" for occupation, "Agriculture" for the sector of activity and "More than 250 workers" for size of the firm.

[a] *Coefficients multiplied by 100*

Table 7. *Ordered Probit models explaining relationship between ICT's and TASK VARIETY per Occupation*

	Professional[b]	Technician	Clerk	Services Workers	Handicraft	Operator	Elementary
Teleworking	0.005	0.017	0.008	-0.019	-0.025	-0.003	-0.038
	(0.859)	*(0.438)*	*(0.742)*	*(0.574)*	*(0.552)*	*(0.948)*	*(0.432)*
Use of PC	-0.062***	-0.026*	-0.011	-0.028	0.021	-0.055**	0.001
	(0.002)	*(0.072)*	*(0.429)3*	*(0.129)*	*(0.342)*	*(0.042)*	*(0.972)*
Internet	0.046**	0,029**	0.016	0.038*	0.061**	0.037	0.010
	(0.023)	*(0.049)*	*(0.217)*	*(0.084)*	*(0.039)*	*(0.340)*	*(0.720)*
Male	-0.020	0.119**	0.153***	0.124**	0.309***	0.381***	0.101*
	(0.762)	*(0.019)*	*(0.006)*	*(0.039)*	*(0.000)*	*(0.000)*	*(0.084)*
Age	0.001	0.030**	0.031**	0.006	0.004	-0.001	0.012
	(0.973)	*(0.046)*	*(0.033)*	*(0.675)*	*(0.777)*	*(0.975)*	*(0.393)*
Age squared [a]	-0.018	-0.025	-0.030*	-0.006	-0.002	0.014	-0.003
	(0.741)	*(0.154)*	*(0.085)*	*(0.743)*	*(0.889)*	*(0.577)*	*(0.862)*
Primary	-5.108***	0.471	-0.598	1.345***	0.429	0.379	0.059
	(0.000)	*(0.449)*	*(0.293)*	*(0.007)*	*(0.248)*	*(0.258)*	*(0.801)*
Secondary	-4.976***	0.937	-0.062	1.203**	0.600*	0.578*	0.214
	(0.000)	*(0.116)*	*(0.910)*	*(0.013)*	*(0.099)*	*(0.072)*	*(0.348)*
University	-4.767***	1.115*	0.169	1.433***	0.674*	0.868**	0.236
	(0.000)	*(0.062)*	*(0.758)*	*(0.003)*	*(0.075)*	*(0.016)*	*(0.350)*
Seniority	0.009	-0.007	-0.007	0.014	0.004	-0.004	-0.002
	(0.409)	*(0.429)*	*(0.445)*	*(0.176)*	*(0.614)*	*(0.740)*	*(0.849)*
Seniority squared	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.187)	*(0.371)*	*(0.294)*	*(0.510)*	*(0.788)*	*(0.759)*	*(0.782)*
Temporary worker	0.099	0.103	-0.096	0.082	-0.071	0.079	-0.038
	(0.288)	*(0.166)*	*(0.195)*	*(0.278)*	*(0.314)*	*(0.438)*	*(0.587)*
Part time	-0.020	-0.104	-0.041	-0.058	-0.233**	0.092	0.127*
	(0.824)	*(0.103)*	*(0.536)*	*(0.402)*	*(0.045)*	*(0.572)*	*(0.087)*
Private sector	0.035	0.079	-0.030	-0.214***	-0.283***	-0.140	-0.031
	(0.639)	*(0.133)*	*(0.565)*	*(0.001)*	*(0.000)*	*(0.102)*	*(0.621)*
Industry	-0.127	0.259	0.107	0.047	-0.162	-0.289	-0.118
	(0.723)	*(0.374)*	*(0.741)*	*(0.918)*	*(0.196)*	*(0.121)*	*(0.364)*
Construction	-0.216	0.353	-0.143	-0.077	-0.127	-0.218	-0.064
	(0.575)	*(0.262)*	*(0.680)*	*(0.898)*	*(0.335)*	*(0.323)*	*(0.681)*
Services	-0.017	0.244	-0.016	0.020	-0.131	0.016	-0.020
	(0.962)	*(0.394)*	*(0.961)*	*(0.965)*	*(0.319)*	*(0.932)*	*(0.869)*
Less 10 workers	-0.217*	0.142*	-0.009	0.128	0.127	0.129	0.152*
	(0.056)	*(0.062)*	*(0.907)*	*(0.188)*	*(0.114)*	*(0.236)*	*(0.098)*
10-49 workers	-0.208**	0.160**	-0.031	0.013	0.247***	0.030	0.092
	(0.030)	*(0.017)*	*(0.676)*	*(0.892)*	*(0.001)*	*(0.747)*	*(0.298)*
50-250 workers	-0.095	0.077	0.003	0.047	0.112	0.030	0.016
	(0.329)	*(0.272)*	*(0.971)*	*(0.648)*	*(0.150)*	*(0.739)*	*(0.865)*
Country dummies	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*
Pseudo-R^2	0.0678	0.0342	0.0527	0.0382	0.0436	0.0824	0.0380
Log-likelihood	-1,216.5	-2,769.1	-2,515.1	-2,081.7	-2,587.5	-1,419.3	-2,117
N	2,930	3,052	2,664	2,135	2,565	1,466	2,116

*Notes: *** p<0.01; ** p<0.05; * p<0.1. (P-value in brackets).*

The correspondent reference groups are "No education" for the case of education, "Professionals" for occupation, "Agriculture" for the sector of activity and "More than 250 workers" for size of the firm.

[a] *Coefficients multiplied by 100*

[b] *This category was assessed with a Probit due to convergence problems in the Ordered Probit.*