Is there a relationship between workplace atmosphere and innovation activities? An empirical analysis among french firms

Gilles Grolleau, Naoufel Mzoughi, Sanja Pekovic

Is there a Relation between Workplace Atmosphere and Innovation Activities? An Empirical Analysis among French Firms[1]

Gilles Grolleau

Supagro, UMR 1135 LAMETA, F-34060 Montpellier

Burgundy School of Business – LESSAC, F-21000 Dijon

grolleau@supagro.inra.fr

Naoufel Mzoughi (Corresponding author)

INRA, UR 767 Ecodéveloppement

Domaine Saint-Paul – Site Agroparc, 84914 Avignon Cedex 9, France

Tel: + 33 4 32 72 25 94 - Fax: + 33 4 32 72 25 62

nmzoughi@avignon.inra.fr

Sanja Pekovic

Université Paris-Dauphine

sanja.pekovic@dauphine.fr

[1] We are grateful to Ludivine Martin for her comments and suggestions. We are also thankful to three anonymous referees and the editor of EINT for their detailed comments that helped us to improve our manuscript. Finally, Sanja Pekovic gratefully acknowledges the financial support for this work from the AFNOR "*Performance des Organisations*" endowment in collaboration with the Paris-Dauphine Foundation.

Is there a Relation between Workplace Atmosphere and Innovation Activities? An Empirical Analysis among French Firms

Abstract: We examine empirically the relationship between workplace atmosphere and innovation activities. A Generalized Method of Moments (GMM) estimator of Poisson regression is applied to a set of 5,574 observations in French firms. Our estimation results show that firms in which employees report good workplace atmosphere are more likely to engage in innovation activities. Nevertheless, while a positive relation is found between workplace atmosphere and product/service innovation, other types of innovation activities, namely process, organizational and marketing, are not related to better workplace atmosphere.

Key words: innovation activities, workplace atmosphere.

JEL codes: D20; O31.

Is there a Relation between Workplace Atmosphere and Innovation Activities? An Empirical Analysis among French Firms

1. Introduction

Innovation is frequently considered as a key factor of economic success at both the firm and country levels. According to Kevin Hassett, director of economic policy studies at American Enterprise Institute, "economic growth comes from innovation" and "innovation drives U.S. economy".[2] Innovation is crucial for firms in order to have and maintain a competitive advantage (Brown and Eisenhardt, 1995; Porter and Van Der Linde, 1995). Consequently, there is a considerable literature devoted to a better understanding of what factors drive innovation activities (e.g., Scott and Bruce, 1994; Crépon et al., 1998; Encaoua et al., 2000; Kleinknecht and Mohnen, 2002; Salomon and Shaver, 2005). The most frequently examined factors are firm size, activity, group membership, technological opportunities, information source, market share, exports, degree of competition, and the capacity of appropriation of the innovation benefit.

Without neglecting the influence of traditional determinants/antecedents of innovations activities at the firm level, we investigate the relationship between workplace atmosphere and innovation activities. Workplace atmosphere can impact innovation activities in various ways that are not mutually exclusive, but which frequently interact. Indeed, workplace environment is likely to affect the costs of innovation either positively or negatively. For sake of exposition, we tentatively propose two rationales by which workplace atmosphere can influence innovation activities. First, difficult human relationships are mind and time-consuming, which implies that less emotional and cognitive resources are available to other activities. In an experimental setting, Porath and Erez (2009) found that participants have more than 30% fewer creative ideas in simple brainstorming tasks when subjected to incivility. More recently, Porath and Pearson (2010) stressed that bad atmosphere (captured through behaviors such as incivility or rudeness) at workplace can cost companies by reducing work effort, performance creativity, commitment to cite just a few. In other words, resources devoted to cope with difficult human relationships are diverted from more productive uses, such as innovation activities. Second, helping each other, a key feature of workplace atmosphere, may be required in innovation activities. Cialdini (2005; see also Porath and Pearson, 2010) indicates at least two reasons why cooperation outperforms the lone innovator: "First, the lone problem-solver cannot match the diversity of knowledge and perspectives of a multiperson unit that includes him or her. Second, the solution-seeker who goes it alone loses a significant information processing advantage — the power of parallel processing". Perlow and Weeks (2002) also point that "the help of others is

[2] http://www.aei.org/article/24721.

needed by individuals to make progress on their own work; helping is needed within groups to ensure that outputs produced by one person are consistent with inputs required by another; and helping is needed within organizations for efficiency, flexibility, learning, and *innovation"* (emphasis added). Moreover, being helped can activate the universal norm of reciprocity that is, rewarding kind actions. Brandts et al. (2010) emphasizes that benefiting from the help of a high ability worker can generate gratefulness for the employee being helped who is more likely to exert additional effort level that goes beyond the one that corresponds to the more favorable incentives. This gift exchange can initiate a virtuous circle between workers. In the same vein, Leslie Caccamese, an interim program director at *Great Place to Work Institute*, has put emphasis on collaboration as a major ingredient for innovation.[3] She argues that "many companies, regardless of size, have instituted social media tools that allow employees to have real-time conversations with each other, a practice that has helped employees find solutions from colleagues outside of their department and initiate informal brainstorms. And yes, some of these conversations have even yielded outputs that could be considered "innovations".

Nevertheless, these arguments must not occult the existence of counter arguments supporting a negative effect of workplace atmosphere on innovation activities. For instance, what is perceived as a "(too) good atmosphere" can imply difficulties or delay to reach a decision, over-familiarity, misunderstandings, distraction and additional costs due to cooperation which can ultimately dampen innovation activities. In some cases, a too informal atmosphere can lead workers to feel they do not need to go beyond the minimum effort.[4]

Despite its interest, workplace atmosphere has been often neglected in the literature devoted to innovation activities, maybe due to its diffuse nature and measurement issues. At the same time, this insight nicely fits the way many people think about some very innovative companies like Google, Patagonia and Zappos (Ransom, 2011). Thus, the objective of this exploratory paper is to fill this gap, using large scale data about French firms and appropriate econometric tools. We test whether *workplace atmosphere is positively related to innovation activities, ceteris paribus*. The remainder of the paper is organized as follows. In the next section, we present data and methods. Section 3 is devoted to estimation results and their discussion. Section 4 provides some tentative implications and concludes.

---

[3] http://www.greatplacetowork.com/publications-and-events/blogs-and-news/649-ingredients-for-innovation-collaboration.

[4] It is possible that the relationship between workplace atmosphere and innovation activities is not linear but follows a U-inverted curve.

2. Data and methods

The data is extracted from two cross-sectional French surveys, namely the Organizational Changes and Computerization's (COI) 2006 survey and Community Innovation's (CIS) 2006-2008 Survey. The COI survey is a matched employer/employee survey on organizational changes and computerization conducted between November 2005 and April 2006 by researchers and statisticians from the French national institute for statistics and economic studies, the Ministry of labor and the center for labor studies. 17,000 private firms with 10 or more employees from all industries except agriculture, forestry and fishing were surveyed. The questionnaire is self-administrated and describes work organizational practices in 2006 and changes that have occurred since 2003. The CIS survey was also conducted by the national institute for statistics and economic studies over the period 2006-2008 and is based on the Oslo Manual drawn up by the OECD. Firms with at least 20 employees were asked to answer questions about the type of innovation introduced over the three years period, specific innovation activities carried out in the same period, expenditures and human resources allocated to such activities, and a set of more qualitative information about the sources of information, objectives pursued and hampering factors associated to the innovation process.[5] In this paper, the two surveys were merged. After the deletion of firms that did not answer all the relevant questions for our study, we are left with 5,574 observations. Noteworthy, the questionnaires were not originally designed to investigate our question, but they offer an unexpected opportunity to investigate on a large number of firms the relationship between working atmosphere and innovation activities.

The dependent variable, denoted *INNOVATION*, is computed as follows: since firms were asked to indicate whether they innovate or not with regards to four areas, that is, product/services, process, organization, and marketing, we created the variable *INNOVATION* as the sum of four binary variables. Thus, *INNOVATION* takes values between 0 (if the firm did not innovate in none of the four considered areas) and 4 (if it has innovated in all areas). Unfortunately, the way innovation activities are estimated leads to a loss of information. Indeed, the number of innovations per domain is not available, but just whether there is at least one innovation in a considered domain.[6]

To measure the importance of workplace atmosphere, we use the variable denoted *WORKAT*, computed as follows: surveyed employees were asked to indicate whether they are helped by

[5] More details about the design and scope of these surveys are available on www.enquetecoi.net (Survey COI-TIC 2006-INSEE-CEE/Treatments CEE) and http://www.insee.fr/fr/methodes/default.asp?page=sources/sou-enq-communaut-innovation-cis.htm.

[6] For instance, even if two firms introduce 1, 2 or more innovations in the product/service innovation, they will get the same indicator. Given this limitation, our results and their implications are only tentative and must be considered with caution.

supervisor(s) or close colleagues or colleagues from other departments when overloaded with work or have problems with a complicate task (three questions with binary responses each). Respondents were also asked to indicate whether they think that working atmosphere with colleagues and in the firm considered more generally is rather good, rather bad or neither one. The responses to the two latter questions were codified in a categorical way that is, taking the value of 0, 1 or 2, depending on whether workplace atmosphere is rather bad, neither good nor bad or rather good, respectively. Then, the variable *WORKAT* has been computed as the sum of responses to the preceding questions. Thus, *WORKAT* takes values between 0 (if the employee is not helped by supervisor or close colleagues or colleagues from other departments, and thinks that workplace atmosphere among colleagues and in the firm in general is rather bad) and 7 (if the employee is helped by all supervisor, close colleagues and colleagues from other departments, and if he/she thinks that workplace atmosphere among colleagues and in the firm in general is rather good).

Several other variables likely to influence innovation activities are used as controls. We present hereafter these control variables and theoretical and/or empirical justifications for their inclusion in the model:

- ✓ Main activity of the firm (*SECTOR*): it seems obvious that innovation activities matter differently among sectors. We include sectoral dummy variables based on the N36 sector classification created by the French national institute for statistics and economic studies. We use eleven dummy variables to represent the following sectors: agrifood, consumption goods, cars and equipment, intermediate goods, energy, construction, commercial, transport, financial and real-estate activities, business services and individual services. However, we cannot predict which sectors are more likely to innovate. For instance, it is frequently admitted that information and communication technology sector is among the most innovative sectors while mining is among the least innovative sector (e.g., Hollanders and Arundel, 2005). Indeed, the sector-related data are not available at a sufficiently detailed level to make sense.
- ✓ Firm size (*SIZE*): since innovation generally requires significant costs, we expect that big firms with high financial and human resources are more likely to engage in innovation activities, compared to smaller ones. Noteworthy, after reviewing numerous studies, Hornbach (2008) concludes that the effect of the firm size on its innovation activities is undetermined from a theoretical perspective. The author argues that, on one hand, large firms may gain more from scale economies associated with innovations. On the other hand, large firms may have less incentives to innovate, whereas small firms in competitive markets are forced to "be better" than their competitors by engaging themselves in innovation activities. Firm size is measured using the number of employees.

- ✓ Firms belonging to a holding group (*HOLDING*) usually benefit from a higher degree of technological and human competencies which plays a substantial role in innovation activities (Del Río González, 2009; Pekovic, 2010).
- ✓ Belonging to a network (*NETWORK*) is also an important mean for the creation of technological competencies and practical solution to the problem of resources and capabilities not always being available within a firm and difficult to obtain efficiently in the market (Tsai, 2009).
- ✓ Export (*EXPORT*): as noted by Smolny (2003), there is a very strong effect of export activities on innovation since firms operating on international markets have more incentives to engage in quality competition. Moreover, Salomon and Shaver (2005) showed that exporting is associated with innovation and found evidence of 'learning by exporting'.
- ✓ Profit level (*PROFIT*): it is now established in the economic literature that financial resources support innovation activities (e.g., Damanpour, 1991; Camison-Zornoza et al., 2004). Hence, we expect that more profitable firms are more likely to be innovative.[7]
- ✓ Market conditions: these conditions refer to the characteristics of the market under which the firm operates and it is captured through three variables, namely, market growth, uncertainty and competition. While, as far as we know, previous literature did not find evidence to the relationship between innovation and market's growth (e.g., Botazzi et al., 2001), it seems theoretically plausible that firms are more likely to innovate when the market of their main activity is growing (*GROWTH*). Moreover, the uncertainty (*UNCERTAINTY*) associated with the returns from investments may be prohibitive. In this sense, van Soest and Bulte (2001) argue that when future technological advances are inherently uncertain and investments in new technology are, at least partly, irreversible, it may "pay" to postpone investments in innovative activities and wait for the arrival of improved varieties. Furthermore, the entry of new competitors (*COMPETITION*) may affect innovation activities. Hornbach (2008) argues that competitors always try to destroy the monopolistic situation, and that such creative destruction can be seen as the driving force of innovation.
- ✓ Quality (*QUASTAND*) and environmental-related standards (*ENVISTAND*) registration: previous empirical findings (e.g., Pekovic and Galia, 2009) support the idea that quality practices positively influence innovation since quality practices, in both their human and technological dimensions, help to create an environment and culture that support innovation. Requate and Unold (2003) identify environmental policies as the instrument providing the

[7] One may argue that firms might engage in innovation activities to increase profits, which in turn may have an impact on innovation, leading to a bi-directional causality. To address this issue, at least partly, we use in our estimation the profit reported in 2006, while innovation activities are measured in 2006-2008.

significant innovation incentives. Previous registration according to a quality standard is measured by the adoption of the well-known ISO 9000 standard, while registration to an environmental-related standard is captured through the adoption of the ISO 14001 standard, organic labeling, fair trade, etc. Unfortunately, we cannot distinguish between those standards, since they were put together in the survey under the same label.

Econometric model

Given that workplace atmosphere is likely to be endogenous (i.e., correlation between innovation and workplace atmosphere might be attributed to the observed and unobserved characteristics), we apply a Generalized Method of Moments (GMM) estimator of Poisson regression which allows endogenous variables to be instrumented by excluded exogenous variables (the instruments) (Windmeijer and Silva, 1997). Let y_i (i=1,…,N) be the dependent variable, which represents innovation level inside the firm. Assume that y_i is independently Poisson distributed, with the conditional mean specified as:

$$E(y_i|x_i) = \exp(x_i' \beta) \qquad (1)$$

where x_i is a k-vector of explanatory variables and β is a k-vector of parameters. When some elements of x_i are endogenous, implying that $E(\mu_i|x_i) \neq 0$, the Poisson ML estimator will be inconsistent. In this case, we need z_i to be a set of instruments which satisfy $E(\mu_i|x_i) = 1$. Then, an instrumental variable estimator can be based on the residual $\mu_i - 1$. The moment condition is:

$$Z'\left(\frac{y - \exp(x'\beta)}{\exp(x'\beta)}\right) = Z'(y \exp(-x'\beta) - 1) = 0 \qquad (2)$$

where x represents the variables *WORKAT*, *SECTOR*, *SIZE*, *HOLDING*, *NETWORK*, *EXPORT*, *PROFIT*, *GROWTH*, *UNCERTAINTY*, *COMPETITION*, *QUASTAND* and *ENVISTAND*. Z represents the vector of the instrumental variables which guaranties the identification of the model and helps to estimate correlation coefficients (Maddala, 1983). Due to data limitations, it is difficult to find an appropriate instrument which has to explain well the workplace atmosphere (relevance) but has to be independent of the error term (validity). In what follows, we discuss the quality of the instruments providing both qualitative arguments and formal test of relevance and validity of the suggested instruments. We use two variables: the first one is denoted *TU* (i.e., the pronoun "you") and corresponds to the famous French way to talk to people in a familiar way. The use of "*Tu*" in French at the workplace is frequently perceived as an indicator of workplace culture. It corresponds to the wish of more harmonious, equal and close relationships between co-workers and staff, whereas the use of "*Vous*" stresses the distance between people and the importance of hierarchical relationships. It is well-known in France that the most creative sectors or departments (e.g., marketing, new technologies) are more prone to use "*Tu*" than traditional sectors or departments (e.g., production) (Fauconnier, 2006). Delmas and Pekovic (2013) found that a familiar relation with his/her superior is a

significant determinant of interpersonal contacts improvement within the firm. The second instrumental variable denoted *RELOCATION* captures whether a firm relocates a part of its business or implements new sites abroad. It seems obvious that relocation and implementation of new sites in foreign countries are frequently considered as a stressful event by leading to a job transfer (Brett, 1980) and may therefore have a negative effect on workplace atmosphere. We believe that these two variables do not influence *a priori* the potential of firms to innovate. We are aware that these instruments are not perfect, but are suitable ones. As it is common with such models, we judge the quality of instrumental variables using the Hansen's J statistics.

The variables used in estimation, their definitions and sample statistics are presented in Table 1. No problem of multicollinearity has been detected (Appendix 1).

[Insert Table 1 around here]

3. Results and discussion

Estimation results are presented in Table 2. Hansen's J test fails to reject the null of validity of instruments (p value = 0.67).

[Insert Table 2 around here]

The main hypothesis of the paper, that is, workplace atmosphere is positively related to innovation activities, is confirmed ($p < 0.05$). This result suggests that good workplace atmosphere may be a key feature for innovation activities, in line with previous literature which has recognized that a considerable amount of employees work is accomplished through interpersonal interaction and that the nature of interpersonal relationships between employees can determine their efficiency outcomes (Delmas and Pekovic, 2013). This result is also consistent with the management literature stressing how a degraded atmosphere at the workplace is likely to affect negatively many aspects such as work time, work effort, creativity, team performance and so on (Porath and Pearson, 2010; see also Martínez-Sánchez et al., 2011). In short, a good workplace atmosphere captures several conditions which facilitate innovative activities (Scott and Bruce, 1994).

As for control variables, estimation results show that *SIZE, HOLDING* and *EXPORT* are important determinants of innovation.[8] In addition, some sectors (cars and equipment, construction, commercial,

[8] As appropriately suggested by an anonymous referee, several specifications have been tested for the variable *SIZE*. The results (not reported but available upon request) show that innovation activities increase with firm size, but up to a certain level. In other words, big firms (more than 250 employees) are more likely to innovate, compared to small ones (less than 50 employees), but when the number of employees becomes very high (> 3000), the variable *SIZE* turns to be not significant. Noteworthy, for all the specifications we have tested, the main other findings remain similar to what is reported when the size is continuous.

transport and services for firms) are less likely to innovate, compared to the sector of intermediate goods used as a reference. Our results do not mean that the above mentioned sectors are not innovative *per se* but just less innovative than the sector of intermediate goods which includes some highly innovative subsectors such as the sectors of textile, chemicals and electronic components. Firms belonging to a network are also less likely to innovate, since the variable *NETWORK* is significant but its sign is negative. Moreover, innovation activities are negatively related to the profit of the firm, since the variable *PROFIT* is significant but its sign is negative. In other words, as profit increases firms may think that innovation is less crucial and allocates its resources to other areas. Nevertheless, this result is consistent with some previous research suggesting that financial constraints may facilitate innovation. For instance, Katila and Shane (2005) have analyzed the influence of resource scarcity on innovation performance and found that firms with limited financial resources show a higher rate of innovation. Regarding the variables measuring market conditions, only *COMPETITION* is significant. This result is consistent with the findings of existing literature where growth and uncertainty do not influence innovative activities. Indeed, if the market is growing, firms do not need to innovate to find new customers. If the future is uncertain, firms may prefer to wait and see, *i.e.*, postpone investments related to innovative activities. Furthermore, while firms registered according to a quality standard are more likely to engage in innovation activities, registration according to an environmental-related standard does not have the same effect, since *ENVISTAND* is not significant. One possible explanation for this finding is that despite the implementation of environmental-related standards, critical contingencies that complement the innovations are not in place.

As a by-product, we present in Table 3 the estimation results of a GMM probit model to investigate the effect of workplace atmosphere on different types of innovations, namely, product/service, process, organization and marketing innovation activities. The findings are somewhat surprising and constitute a call for further research regarding the impact of workplace atmosphere on different types of innovations in different sectors. While a positive relation is found between workplace atmosphere and product/service innovation, workplace atmosphere does not influence other types of innovation activities, which are, process innovation, organizational and marketing innovations. These results suggest that the impact of workplace atmosphere on innovation varies according to the type of innovation examined. Unfortunately, our data does not allow us to provide clear cut explanations for this finding. The results from Table 3 also suggest that the impact of sectors on innovation varies according to the type of innovation examined, when compared to the sector of intermediate goods. However, the French classification of sectors available for this study does not allow us to investigate this point at a sufficiently detailed level. For instance, when considering the cars and equipment sector, the relationship between product or process innovation and workplace atmosphere is negative while it is positive for organizational innovation and non-significant for marketing innovation. The variable *SIZE* is significant for all innovation categories, but the sign is negative for process innovation.

HOLDING is only significant in the case of process innovation. *NETWORK* is also significant for only one type of innovation, that is, product/service innovation. In addition, while the findings in Table 2 show a positive effect of the variable *EXPORT*, results for Table 3 suggest that the sign is negative when considering organizational and marketing innovations. Similarly, the variable *PROFIT* has a negative effect on organizational and marketing innovation. Nevertheless, the results concerning market conditions are close to what is reported in Table 2, since *GROWTH* and *UNCERTAINTY* are not significant while *COMPETETION* is significant for organizational and marketing innovations. Finally, while quality standards (*QUASTAND*) play the same way as in Table 2, the presence of an environmental standard (*ENVISTAND*) increases the probability that the firm engages in a process innovation.

4. Conclusion and policy implications

We have shown empirically that workplace atmosphere is positively related to innovation activities, but this effect is weak. Given some data limitations, this result is tentative and should be interpreted with caution. More refined data is needed to reach clear-cut conclusions. Having this in mind, our contribution suggests a new and neglected factor by which innovation activities may be enhanced. In addition to several antecedents of innovation found in the economic and managerial literature, our paper suggests that improving workplace atmosphere could be a potential leverage for innovation. In other words, firms may have vested interest in encouraging employees to work together and find ways to make them perceive workplace atmosphere as good. Our findings may also be linked to several studies arguing that workplace atmosphere generally enhances firm's performance (e.g., Hofstede et al., 1990) and employees' attitudes at work (e.g., Koh and Boo, 2001). Better workplace atmosphere might establish the work environment that supports creativity and innovation. In other words, improved workplace atmosphere may benefit not only employees, but also primary stakeholders, by contributing to an organization conducive to innovation.

Investments in workplace atmosphere can lead to better returns than alternative opportunities to increase innovation activities. To go a step further, let us suggest some ways by which decision-makers can improve workplace atmosphere. Several authors argue that *recognition* and *appreciation* are low-cost, powerful motivators and high-return ingredients that can contribute to a better workplace atmosphere (Sarvadi, 2005) and even to more innovativeness (Mason, 2001). As a practical example, Google supports an atmosphere considered as supportive of innovation by fostering collaboration, friendliness, encouragement and commitment. A common maxim in business is 'what gets measured gets managed'. Managers and policy makers need reliable information and feedback about the effects and impacts of interventions or policies related to workplace atmosphere. In other words, finding good and multidimensional indicators of workplace atmosphere are needed.

Moreover, our results show that the effect of workplace atmosphere also depends on the type of innovation. This finding suggests that using workplace atmosphere as a leverage to increase innovation would not be fruitful for firms in all cases. To some extent, this finding also questions the results of some previous studies using an aggregated measure for innovation activities. In other words, previous works may have put inappropriately emphasis on some antecedents of innovations while those determinants are likely to play differently according to the type of innovation. Unfortunately, our results do not allow us to draw clear cut recommendations and must be considered as a way to attract more academic attention to this issue.

Furthermore, our analysis was achieved among French firms. Future research should explore similar questions in an international setting. For instance, compared to Anglo-Saxons countries, work structure in France is somewhat specific, notably due to relatively more state intervention, protectionism, rigid hierarchy in firms, intuitive management, limited flexibility, less autonomy of workers, centralized collective bargaining and strict employment contracts (e.g., Caroli et al., 2010). In addition, given the data design, reverse causality cannot be completely avoided since we do not have information on precise year of innovation implementation because it covers period from 2006 to 2008 and our workplace atmosphere variable is constructed using the information from 2006. Using longitudinal analysis could overcome this issue. Finally, a natural extension of our contribution is to examine how workplace atmosphere may impact differently on different indicators of innovation activities. Providing such detailed analysis could enable policy-makers and managers to better formulate and effectively apply regulations governing innovation improvement within firms.

References

Bottazzi, G., G. Dosi, M. Lippi, F. Pammolli, and M. Riccaboni. 2001. Innovation and corporate growth in the evolution of the drug industry. *International Journal of Industrial Organization* 19(7): 1161-1187.

Brandts, J., D. Cooper, and E. Fata. 2010. Stand by me. Help, heterogeneity and commitment in experimental coordination games. Available at http://www.asr.uab.cat/asr/docs/StandByMeNew.pdf.

Brett, J.M. 1980. The effect of transfer on employees and their families. In Cooper, C., and R. Payne (Eds). *Current concerns in occupational stress*, Wiley, London: 99-136.

Brown, S.L., and K.M. Eisenhardt. 1995. Product development: Past research, present findings, and future directions. *Academy of Management Review* 20(2): 343-378.

Camison-Zornoza, C., R. Lapiedra-Alcami, M. Segarra-Cipres, and M. Boronat-Navarro. 2004. A meta analysis of innovation and organizational size. *Organization Studies* 25(3): 331-362.

Caroli, E., J. Gautié, S. James, A. Lamanthe, and C. Lloyd. 2010. Delivering flexibility: Contrasting patterns in the French and the UK food processing industry. *British Journal of Industrial Relations* 48(2): 284-309.

Cialdini, R. 2005. Basic social influence is underestimated. *Psychological Inquiry* 16(4): 158-161.

Crépon, B., E. Duguet, and J. Mairesse. 1998. Research, innovation and productivity: An econometric analysis at the firm level. *Economics of Innovation and New Technology* 7(2): 115-158.

Damanpour, F. 1991. Organizational innovation: A meta-analysis of effects of determinants and moderators. *Academy of Management Journal* 34(3): 555-590.

Del Rio Gonzalez, P. 2009. The empirical analysis of the determinants for environmental technological change: A research agenda. *Ecological Economics* 68(3): 861-878.

Delmas, M., and S. Pekovic. 2013. Environmental standards and labor productivity: Understanding the mechanisms that sustain sustainability. *Journal of Organizational Behavior* 34(2): 230-252.

Encaoua, D., B. Hall, F. Laisney, and J. Mairesse. 2000. *The economics and econometrics of innovation*. Kluwer, Boston.

Fauconnier, F. 2006. Tutoyer ou vouvoyer, comment choisir. *Journal du Net* (08/02). Available at http://www.journaldunet.com/management/0608/0608146-tutoiement-vouvoiement.shtml.

Hofstede, G., B. Neuijen, D.D. Ohayv, and G. Sanders. 1990. Measuring organizational cultures: A qualitative and quantitative study across twenty cases. *Administrative Science Quarterly* 35(2): 286-316.

Hollanders, H., and A. Arundel. 2005. European section innovation scoreboards. Available at http://arno.unimaas.nl/show.cgi?fid=15502.

Hornbach, J. 2008. Determinants of environmental innovation – New evidence from German panel data sources. *Research Policy* 37(1): 163-173.

Katila, R., and S. Shane. 2005. When does lack of resources make new firms innovative? *Academy of Management Journal* 48**(**5): 814-829.

Kleinknecht, A., and P. Mohnen. 2002. *Innovation and firm performance: Econometric explorations of survey data*. Palgrave, New York.

Koh, H.C., and E.H.Y. Boo. 2001. The link between organizational ethics and job satisfaction: A study of managers in Singapore. *Journal of Business Ethics* 29(4): 309-24.

Maddala, G.S. 1983. *Limited-dependent and qualitative variables in econometrics*. Cambridge University Press, New York.

Martínez-Sánchez, A., M.J., Vela, M., Pérez, and P. De Luis. 2011. The dynamics of labour flexibility: Relationships between employment type and innovativeness. *Journal of Management Studies* 48 (4): 715-736.

Mason, L.J. 2001. Retaining key personnel. Plus: Top 10 retention tips. Available at www.dstress.com.

Pekovic, S. 2010. The determinants of ISO 9000 certification: A comparison of the manufacturing and service sectors. *Journal of Economic Issues* 44(4): 895-914.

Pekovic, S., and F. Galia. 2009. From quality to innovation: Evidence from two French employer surveys. *Technovation* 29(12): 829-842.

Perlow, L., and J. Weeks. 2002. Who's helping whom? Layers of culture and workplace behavior. *Journal of Organizational Behavior* 23(4): 345-361.

Porath, C.L., and A. Erez. 2009. Overlooked but not untouched: How rudeness reduces onlookers' performance on routine and creative tasks. *Organizational Behavior and Human Decision Processes* 109(1): 29-44

Porath, C.L., and C.M. Pearson. 2010. The cost of bad behavior. *Organizational Dynamics* 39(1): 64-71.

Porter, M.E., and C. van der Linde. 1995. Toward a new conception of the environment-competitiveness relationship. *Journal of Economic Perspectives* 9(4): 97-118.

Ransom, D. 2011. Finding success by putting company culture first. Available at http://www.entrepreneur.com/article/219509.

Requate, T., and W. Unold. 2003. Environmental policy incentives to adopt advanced abatement technology: Will the true ranking please stand up? *European Economic Review* 47(1): 125-146.

Salomon, R., and J.M. Shaver. 2005. Learning by exporting: New insights from examining firm innovation. *Journal of Economics and Management Strategy* 14(2): 431-460.

Sarvadi, P. 2005. The best way to reward employees. Solutions for growing business. Available at www.entrepreneur.com.

Scott, S.G., and R.A. Bruce. 1994. Determinates of innovative behavior: A path model of individual innovation in the workplace. *Academy of Management Journal* 37(3): 580-607.

Smolny, W. 2003. Determinants of innovation behaviour and investment estimates for West-German manufacturing firms. *Economics of Innovation and New Technology* 12(5): 449-463.

Tsai, K.H. 2009. Collaborative networks and product innovation performance: Toward a contingency perspective. *Research Policy* 38(5): 765-778.

Van Soest, D.P., and E.H. Bulte. 2001. Does the energy-efficiency paradox exist? Technological progress and uncertainty. *Environmental and Resource Economics* 18(1): 101-112.

Windmeijer, F.A.G., and J.M.C. Santos Silva. 1997. Endogeneity in count data models: An application to demand for health care. *Journal of Applied Econometrics* 12(3): 281-294.

Table 1: Definition of variables and sample statistics

Variable	Description	Mean	SD	Min	Max
Dependent variable					
INNOVATION	The firm innovates (or not) in four areas: product/service, process, organization, and marketing.	1.04	0.96	0.00	4.00
Main explanatory variable					
WORKAT	The employee is helped (or not) by supervisor(s)/colleagues/colleagues from other departments when overloaded with work or have problems with a complicate task, and, thinks that working atmosphere with colleagues/in the firm considered more generally is rather good, rather bad or neither one.	4.81	1.47	0.00	7.00
Control variables					
SECTOR	Main activity of the firm. 11 dummy variables (=1 if agrifood, consumption goods, cars and equipments, intermediate goods, energy, construction, commercial, transport, financial and real-estate activities, business services and individual services, respectively).	*Because of the table's length we do not report sample statistics for sectoral variables*			
SIZE	Number of employees. (Continuous variable)	2775.161	10012.84	20.00	111956
HOLDING	Belong to a holding group. Dummy variable (=1 if yes)	0.83	0.38	0.00	1.00
NETWORK	Belong to a network. Dummy variable (=1 if yes)	0.09	0.29	0.00	1.00
EXPORT	The share of exports of total sales (€) (Continuous variable)	0.20	0.27	0.00	1.00
PROFIT	The profit (€). (Continuous variable)	44034.86	352872	-571691	6619330
GROWTH	How the market of the main activity of the firm has evolved since 2003: DOWN (=1 if yes) STEADY (=2 if yes) GROWING (=3 if yes)	1.90	0.72	1.00	3.00
UNCERTAINTY	Since 2003, the firm has been affected by uncertainty on the market. Dummy variable (=1 if yes)	2.76	0.79	0.00	1.00
COMPETITION	Since 2003, the firm been affected by new competitors on the market. Dummy variable (=1 if yes)	2.36	0.80	0.00	1.00
ENVISTAND	Registration for an environmental-related standard. Dummy variable (=1 if registered in 2003)	0.33	0.47	0.00	1.00
QUASTAND	Registration for a quality standard. Dummy variable (=1 if certified in 2003)	0.69	0.46	0.00	1.00
TU (*Instrument*)	Using the familiar "*Tu*" when talking the superior. Dummy variable (=1 if yes)	0.67	0.47	0.00	1.00
RELOCATION (*Instrument*)	Relocation of a part of the business or implementation of new sites abroad since 2003. Dummy variable (=1 if yes)	0.30	0.46	0.00	1.00

Table 2: GMM with IV Poisson model

	INNOVATION	
	Estimate	z value
Intercept	-1.48***	(-2.24)
WORKAT	0.25**	(2.13)
AGRIFOOD	-0.01	(-0.28)
CONSUMPTION GOODS	0.03	(0.47)
CARS AND EQUIPMENTS	-0.12***	(-3.25)
ENERGY	-0.02	(-0.21)
CONSTRUCTION	-0.23***	(-3.01)
COMMERCIAL	-0.27***	(-4.51)
TRANSPORT	-0.11*	(-1.72)
FINANCIAL AND REAL ESTATE	0.15	(1.50)
SERVICES FOR FIRMS	-0.21***	(-4.38)
SERVICES FOR INDIVIDUALS	0.11	(1.14)
SIZE	0.00***	(3.96)
HOLDING	0.11***	(2.65)
NETWORK	-0.14**	(-2.12)
EXPORT	0.30***	(5.95)
PROFIT	-0.00***	(-3.53)
GROWTH	-0.02	(-0.66)
UNCERTAINTY	-0.02	(-1.01)
COMPETITION	0.04***	(2.37)
ENVISTAND	0.02	(0.54)
QUASTAND	0.22***	(5.71)
Number of observations	5, 574	
Hansen's J chi2(1)	0.18 (p = 0.67)	

(*), (**), (***) indicate parameter significance at the 10, 5 and 1 per cent level, respectively.

Table 3: GMM with IV Probit model estimates of the relation between workplace atmosphere and innovation types

	PRODUCT/SERVICE INNOVATION	PROCESS INNOVATION	ORGANIZATIONAL INNOVATION	MARKETING INNOVATION
Intercept	-3.38***	-2.08**	-0.47	-1.90***
	(-2.60)	(-2.16)	(-0.67)	(-2.20)
WORKAT	0.64***	0.29	-0.15	0.03
	(2.55)	(1.59)	(-1.06)	(0.19)
AGRIFOOD	-0.23***	-0.06	-0.01	0.37***
	(-2.08)	(-0.76)	(-0.12)	(3.99)
CONSUMPTION GOODS	-0.10	0.03	0.12	0.25***
	(-0.87)	(0.39)	(1.18)	(2.23)
CARS AND EQUIPMENTS	-0.17*	-0.54***	0.36***	-0.03
	(-1.80)	(-6.84)	(4.83)	(-0.33)
ENERGY	-0.18	0.25*	-0.19	0.03
	(-0.91)	(1.80)	(1.09)	(0.15)
CONSTRUCTION	-0.72***	-0.12	0.03	0.04
	(-3.71)	(-0.98)	(0.21)	(0.28)
COMMERCIAL	-1.01***	-0.53***	0.45***	0.42***
	(-5.78)	(-5.46)	(5.06)	(4.60)
TRANSPORT	-0.46***	-0.43***	0.24***	0.53***
	(-3.47)	(-4.33)	(2.47)	(5.13)
FINANCIAL AND REAL ESTATE	-0.02	0.06	0.50***	-0.23
	(-0.13)	(0.38)	(3.57)	(-1.00)
SERVICES FOR FIRMS	-0.39***	-0.38***	0.08	0.08
	(-3.56)	(-4.80)	(0.95)	(0.84)
SERVICES FOR INDIVIDUALS	-0.45***	-0.08	0.61***	0.58***
	(-2.60)	(-0.62)	(4.75)	(4.47)
SIZE	0.00***	-0.00**	0.00***	0.00***
	(3.63)	(-2.10)	(3.86)	(2.97)
HOLDING	0.08	0.12**	0.05	0.10
	(1.09)	(2.16)	(0.87)	(1.55)
NETWORK	-0.29***	-0.12	-0.12	0.10
	(-2.60)	(-1.37)	(-1.56)	(1.21)
EXPORT	1.24***	0.48***	-0.50***	-0.40***
	(6.10)	(5.16)	(-4.54)	(-3.39)
PROFIT	-0.00	-0.00	-0.00***	-0.00***
	(-0.22)	(-1.40)	(-4.68)	(-4.59)
GROWTH	-0.01	-0.00	-0.05	0.01
	(-0.13)	(-0.08)	(-1.29)	(0.16)
UNCERTAINTY	-0.04	0.02	-0.05	-0.02
	(-1.19)	(0.89)	(-1.72)	(0.74)
COMPETITION	0.03	-0.03	0.11***	0.08***
	(0.91)	(-1.15)	(4.15)	(2.52)
ENVISTAND	0.01	0.10***	-0.06	-0.05
	(0.15)	(2.19)	(-1.28)	(-0.83)
QUASTAND	0.25***	0.28***	0.18***	0.22***
	(2.71)	(4.01)	(2.82)	(3.21)
Number of observations	5, 574	5, 574	5, 574	5, 574
Hansen's J chi2(1)	0.30 (p = 0.58)	0.00 (p = 0.97)	2.03 (p = 0.15)	1.08 (p = 0.30)

(*), (**), (***) indicate parameter significance at the 10, 5 and 1 per cent level, respectively.

Appendix 1: Pearson correlation coefficients (As for Table 1, we do not report results concerning the variable SECTOR)

	INNOVATION	WORKAT	TU	RELOCATION	SIZE	HOLDING	NETWORK	EXPORT	PROFIT	ENVISTAND	QUASTAND	GROWTH	UNCERTAINTY	COMPETITION
INNOVATION	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-
WORKAT	-0.01	1.00	-	-	-	-	-	-	-	-	-	-	-	-
TU	0.06	0.09	1.00	-	-	-	-	-	-	-	-	-	-	-
RELOCATION	0.07	0.04	0.07	1.00	-	-	-	-	-	-	-	-	-	-
SIZE	0.05	0.02	0.00	0.15	1.00	-	-	-	-	-	-	-	-	-
HOLDING	0.09	0.02	0.08	0.05	0.04	1.00	-	-	-	-	-	-	-	-
NETWORK	-0.09	0.03	-0.07	-0.04	0.02	-0.13	1.00	-	-	-	-	-	-	-
EXPORT	0.17	-0.02	0.10	0.24	0.01	0.15	-0.19	1.00	-	-	-	-	-	-
PROFIT	-0.00	0.00	0.02	0.10	0.60	0.01	-0.02	-0.02	1.00	-	-	-	-	-
ENVISTAND	0.11	0.02	0.07	0.17	0.15	0.16	-0.09	0.29	0.08	1.00	-	-	-	-
QUASTAND	0.16	0.00	0.11	0.12	0.10	0.20	-0.20	0.31	0.06	0.39	1.00	-	-	-
GROWTH	-0.07	-0.07	-0.06	-0.11	-0.06	-0.01	0.08	-0.10	-0.10	-0.02	-0.12	1.00	-	-
UNCERTAINTY	0.01	-0.02	0.05	0.05	0.06	0.02	-0.01	0.12	0.03	0.08	0.07	0.25	1.00	-
COMPETITION	0.03	-0.01	0.01	0.08	0.05	0.03	0.05	0.05	0.05	0.02	0.02	0.00	0.27	1.00