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Eco-innovations and Job Satisfaction: A Moderated Mediation Approach

Alice Falchi

ESSCA School of Management, Lyon, France
alice.falchi@essca.fr

Gilles Grolleau

ESSCA School of Management, Lyon, France
grola@gmail.com

Naoufel Mzoughi

INRAE, ECODEVELOPPEMENT, Avignon, France
naoufel.mzoughi@inrae.fr

Sanja Pekovic

University of Montenegro, Podgorica, Montenegro
psanja@ac.me

Abstract: Does adopting eco-innovations lead to more satisfied employees? Eco-innovations have the potential to enhance (and sometimes decrease) the job satisfaction of employees for several reasons, such as their positive effects on performances and wages, contribution to the well-being of others, or increased alignment between employees' and company values. We examine empirically the relationship between eco-innovations and job satisfaction on a large number of observations using a moderated mediation model. We posit that the effect of adopting eco-innovations is mediated by job recognition, while the effect of the latter is moderated by job insecurity. Our structural equation modeling findings based on a sample of 5384 respondents show that (i) eco-innovations do not directly lead to increased job satisfaction, (ii) job recognition mediates positively the relationship between the adoption of eco-innovations and job satisfaction, and (iii) job insecurity moderates negatively the positive mediating effect between the adoption of eco-innovations and job satisfaction.

Keywords: eco-innovations; job satisfaction; moderated mediation; structural equation modeling; well-being.

JEL codes: J28; Q59.

1. Introduction

“Choose a job you love, and you will never have to work a day in your life.” (Confucius)

Companies are considered as an important part of the ecological problems faced by humankind, but also an important part of the solution. As a result, companies are increasingly encouraged by tighter regulations and demands of other stakeholders to adopt eco-innovations (and sometimes to completely transform their business models) in order to address these ecological challenges. This situation has fueled considerable research on how companies can respond to these demands and adopt more proactive and sustainable approaches where economic, social and ecological goals are aligned.

Rather than just considering the effect of eco-innovations on economic and environmental performances (e.g., Yurdakul, Kazan, 2022), we argue that scholars should

devote more attention to the multidimensional effects of a greener path. We propose to take a step ahead, by examining an overlooked dimension, precisely how introducing eco-innovations affects the well-being of workers. Beyond the intuitive interest of understanding the subjective well-being of workers for its own sake, several scholars emphasized that happiness at the workplace can significantly contribute to an organization's performance and success (e.g., Fisher, 2010).¹

We take stock of the growing academic interest in the relationship between innovation and satisfaction or subjective well-being at various levels (e.g., Dolan, Metcalfe, 2012; Aldieri et al., 2021; Martinez, 2022; Grolleau et al., 2022a). This literature suggests a positive relationship that could also be extended to the subgroup of eco-innovations. Interestingly, the literature is almost silent on whether and how eco-innovations affect job satisfaction. This knowledge gap regarding whether companies that adopt eco-innovations have more (or less) satisfied employees deserves further investigation. While several arguments are consistent with a positive relationship between eco-innovations and job satisfaction, some other arguments suggest that the relationship could be negative (see Section 2). Simply said, there is a clear need to empirically examine the existence and valence of this relationship.

We fill this gap by exploring whether eco-innovations aiming to address environment-related issues also impact other dimensions, precisely the satisfaction at the workplace. To our knowledge, only Iranmanesh et al. (2017) examined the relationship between the adoption of eco-innovations and job satisfaction, but they used a small and specific sample (N= 191 respondents from the electronic and electrical sector) from a developing country (Malaysia). We go further by merging two state-sponsored datasets on a sizable sample of French firms (N=5384) that are more and more solicited to contribute to the green transition of the whole economy. One of the datasets provides information on industrial relations and work organization while the other one is related to innovation activities in French companies. In addition to their clear size advantage, these datasets also allow to avoid the idiosyncrasies of a unique sector and consider the relationship across many sectors. We also test a moderated mediation model. Indeed, previous scholars (e.g., Moore et al., 2004; Lanfranchi, Pekovic, 2014; Taskin, 2019) contend that job characteristics, such as job recognition and insecurity, influence job satisfaction but also eco-innovations. Following this line of research, we further explore whether these two variables play underlying roles (mediating effect for job recognition and moderating effect for job insecurity) on the relationship between eco-innovations and job satisfaction using a moderated mediation approach.

Addressing this issue is important for several reasons. First, a better understanding of whether there is a relationship between eco-innovations and subjective well-being can document and refine the multidimensional effects of greening companies. Second, this relationship can enrich the 'does it pay to be green' framework (Ambec, Lanoie, 2008; Farza et al., 2021; see also Iqbal et al., 2022 and Zhang, Walton, 2017), by suggesting a new argument where 'being green' makes employees more satisfied. More satisfied employees are a 'valuable asset' *per se* for concerned companies. Indeed, job satisfaction impacts positively several dimensions such as work attendance, motivation, engagement, productivity, life satisfaction, and health (see, e.g., Böckerman, Ilmakunnas, 2012a). Third, we assess whether findings on the broader set of innovations extend to the subgroup of eco-innovations, given that they are not necessarily driven by the same factors.

Section 2 overviews the relevant literature and proposes a conceptual reasoning on why eco-innovations are likely to be related to job satisfaction. Thanks to this conceptual development, we draw some testable hypotheses on the relationship between eco-innovations and job satisfaction. Section 3 presents the used datasets and explains how they allow to

¹ For sake of presentation, we use interchangeably happiness, subjective well-being and satisfaction, although we are aware that there are overlap and differences between these terms.

address the raised issues. Section 4 gives the main findings of the structural equation modeling and discusses them. Section 5 provides some implications, discusses limitations, suggests extension for further research and concludes.

2. Hypotheses Development

There exists a sizeable and growing literature on the relationship between innovations and happiness (see e.g., Grolleau et al., 2022a and Aldieri et al., 2021 for recent overviews). This literature notably includes conceptual reasoning on the nature of this complex relationship, its valence, its consequences and its moderators to quote a few. At the same time, the subgroup of eco-innovations has not benefited from a similar attention, although some papers scratched the surface (Aldieri et al., 2019; Aldieri, Vinci, 2021; Iranmanesh et al., 2019). One could advance that what is verified for innovations in general also applies to eco-innovations in particular. Nevertheless, we believe that studies that consider all innovations as a homogeneous set can hide important variations between subsets of innovations. Our contribution takes the specific case of eco-innovations and examines empirically whether they are related to happiness at the workplace. In this section, we develop some arguments justifying why eco-innovations are likely to be related to job satisfaction.

2.1. Adoption of Eco-innovations and Job Satisfaction

Definitions of eco-innovations and similar expressions (e.g., sustainable innovations, responsible innovations, green innovations) frequently emphasize that these innovations contribute to the triple bottom line of sustainable development, encompassing human well-being or satisfaction (Le Bas, 2016; see also Dolan, Metcalfe, 2012; Martinez, 2022). Rather than focusing on societal well-being, we pay attention to how the adoption of eco-innovations at the workplace may impact the employees' job satisfaction.²

First, following the win-win perspective, adopting eco-innovations has the potential to lead to higher productivity and profits (Farza et al., 2021; Oswald et al., 2015; Zhang, Walton, 2017) which can result in higher wages. Increased wages can contribute to higher job satisfaction (Dolan, Metcalfe, 2012), even if this relationship is more complex than frequently assumed (Judge et al., 2010), notably because of comparison effects and preference drift (Groot, van den Brink, 1999).

Second, the adoption of eco-innovations can prove that the company is aligned with the employees' values and aspirations (e.g., other-oriented, environment protection), leading to higher job satisfaction (Spanjol et al., 2015). For instance, Grant (2008) and Grant et al. (2007) found convincing evidence that employees who know their work has a meaningful and positive impact on others are happier and substantially more productive than their counterparts who do not. Participating in eco-innovations-related activities has the potential to deliver meaning and benefits to others beyond the company, which can in return, improve satisfaction at the workplace. In the same vein, eco-innovations can provide employees a space to express their skills and match them with challenging and deserving goals that go beyond a profit-driven view (Grolleau et al., 2022b).

² Although beyond the scope of our contribution, it is likely that the relationship is bidirectional (see also Dolan, Metcalfe, 2012; Martinez, 2022), with higher job satisfaction leading to increased adoption of eco-innovations. Indeed, more satisfied employees are more likely to stay focused and enjoy their work, while unsatisfied ones are more likely to think about their future, possibly their next job. The positive feelings of satisfied employees allow them to be more creative and innovative (Amabile et al., 2005; Rasulzada, Dackert, 2009) and there is no reason to exclude eco-innovations from this virtuous relationship.

Third, the adoption of some eco-innovations contributes to a higher environmental quality *per se* which can also benefit employees. For instance, working in a less contaminated environment or with a reduced noise pollution is likely to improve well-being at the workplace (Erro-Garcés, Ferreira, 2019) and beyond. Recent research (Lu et al., 2018) showed that air pollution can increase criminal and unethical behavior by increasing anxiety. As a corollary, a less polluted environment thanks to eco-innovations could lead to more moral decisions, which can ultimately make the employee more satisfied (see, e.g., Vitell, Davis, 1990).

Fourth, eco-innovations can lead to the creation of new jobs (Cecere, Mazzanti, 2017). If individuals are conscious that their jobs have been created and are maintained thanks to eco-innovations, they may feel some satisfaction of working in firms oriented towards eco-innovations.

These arguments do not purport to be exhaustive but are sufficient to justify a probable relationship between eco-innovations and job satisfaction. Consistent with the previous rationales, Aldieri et al. (2019) found a positive correlation between eco-innovations and happiness, using panel data on a few European countries (N=10) over the period 1981-2011. Our study differs from Aldieri et al. (2019) since we consider a micro level (eco-innovations adopted at the firm level) and not a macro one (eco-innovations adopted at the country level).

At the same time, some innovations that are labelled as “ecofriendly” by managers or executives when replying to a survey can hide difficult day-to-day realities at the workplace. For instance, eco-innovations can also cause important changes at the workplace, increase stress and job intensity and ultimately degrade job satisfaction (Iranmanesh et al., 2017; see also Martinez, 2022). Several eco-innovations are characterized by some sacrifice in terms of convenience, which can ultimately lead to a decrease in job satisfaction. For instance, eco-innovations can generate an extra workload or inequality, likely to be stressful for employees. Interestingly, although their study relates to innovations in general, Aldieri et al. (2021) found that the impact of innovation on subjective well-being is mostly negative.

Moreover, in some cases, the eco-innovations are more cosmetic (than real) and deceive both consumers and employees. Working in a company that greenwashes (by talking the talk but not walking the walk) can decrease the employees’ satisfaction (Santos et al., 2021). In short, although there are arguments supporting that a positive relationship between eco-innovations and job satisfaction is likely, a fine-grained analysis can be necessary to fully reveal it.

Following this discussion, we formulate our first hypothesis:

H1. The adoption of eco-innovations is related to higher levels of job satisfaction.

2.2. The Role of Job Recognition

Moreover, an important determinant of job satisfaction is the degree to which employees feel their job is recognized and valued (Sypniewska, 2014). Brun and Dugas (2008) argued this recognition can take several forms, namely “personal recognition, recognition of results, recognition of work practice and recognition of job dedication”. When the employees feel appreciation and recognition, they are both more productive and satisfied at the workplace (Brun, Dugas, 2008). On the contrary, when employees feel abandoned or de-humanized, it has a negative impact on their performance, affective organizational commitment, and job satisfaction (Taskin et al., 2019). In addition, Lanfranchi and Pekovic (2014) found that environmental practices positively impact employees’ reported perception that their jobs are useful, and their work is equitably recognized. Consequently, we argue that the relationship

between adoption of eco-innovations and job satisfaction is mediated by whether the employees perceive that their job is recognized. Thus, we formulate a second hypothesis:

H2. The relationship between the adoption of eco-innovations and job satisfaction is mediated by job recognition.

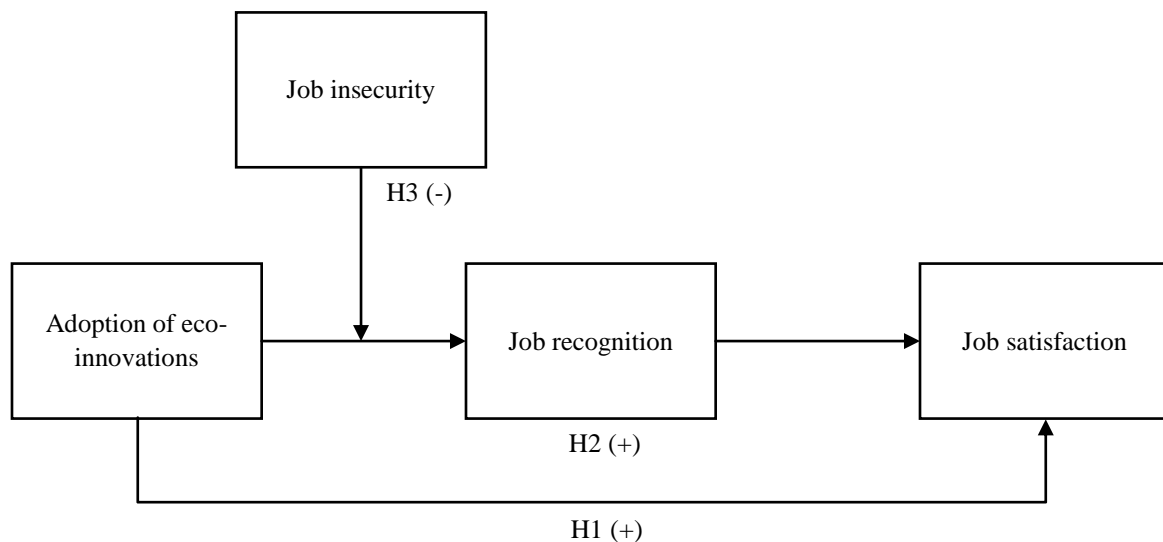
2.3. The Role of Job Insecurity

While we argued that eco-innovations can lead to more satisfied employees, we are aware that many employees have a sword of Damocles hanging over their heads. For instance, layoffs (or rumors of layoffs) can degrade the overall ambiance, performance, and satisfaction at the workplace and eco-innovations cannot be enough to reverse the trend (see, e.g., Vujičić et al., 2015). In a crisis period where the basic necessities related to the job are threatened, the adoption of eco-innovations can seem irrelevant. In other words, when an individual's job is threatened, job recognition may fail to stimulate a positive relationship between the adoption of eco-innovations and job satisfaction. This mediating relationship could be moderated by detrimental workplace conditions such as the fear of losing one's job (see, e.g., Moore et al., 2004). The threat of future layoffs may make employees less likely to feel that their job is really valued. We hence hypothesize that:

H3. The mediating relationship (adoption of eco-innovations → job recognition → job satisfaction) is moderated by job insecurity.

Figure 1 depicts the conceptual model tested in this paper.

Figure 1. Eco-innovations and Job Satisfaction: A conceptual model.



3. Materials and Methods

In order to test our hypotheses, we used two cross-sectional surveys performed in France, namely the Community Innovation Survey (CIS, 2006–2008) and Industrial Relations and Business Negotiation Survey (REPONSE, 2010–2011). These two surveys are state-sponsored

and companies from private sector (except the agricultural one) with more than 11 employees are requested to reply.

In France, the CIS was conducted by the Institute for Statistics and Economic Studies (INSEE) based on the Oslo Manual drawn up by the OECD. The main aim of the survey is to collect information related to innovation activities. The questionnaire was sent to 25,000 firms and brought another very high response rate at 81%. The REPOSE survey is considered as nationally representative survey and it is managed by the Ministry of Labor and presents the main sources of data on industrial relations and work organization in France. The survey contains the responses of more than 11,000 employees from 4,000 firms. More precisely, the response rate is 30%, corresponding to the responses of 11,334 employees. The survey is conducted every six years. While we cannot discard that employees working in the worst working conditions are less likely to respond to the survey, we contend that this bias is unlikely. Indeed, the satisfaction part is only a minor part of the whole survey where other issues are explored. Moreover, because the survey is state-sponsored, employees working in the worst environments may be more likely to express their concerns. Merging these two databases, we obtained a sample of 5,384 observations.

Job satisfaction. In order to operationalize our dependent variable, we used a four-point Likert scale (1 = not at all satisfied; 4 =very satisfied) with the following items: (1) degree of employee’s general level of satisfaction; (2) degree of employee’s level of satisfaction with working conditions; (3) degree of employee’s level of satisfaction with wage; (4) degree of employee’s level of satisfaction with training; and (5) degree of employee’s level of satisfaction with working environment.

Adoption of eco-innovations. In order to measure a firm adoption of proactive environmental innovations, we constructed a variable capturing whether the firm has adopted innovative practices to (1) reduce resource and/or material per unit of production; (2) reduce energy use; (3) reduce firm’s CO2 ‘footprint’ (total CO2 production); (4) replace materials with less polluting or hazardous substitutes; (5) reduce soil, water, noise, or air pollution; (6) recycle waste, water, or materials.

Job recognition. Our mediating variable was measured using a four-point Likert scale (1 = never; 4 = always) indicating if an employee’s work is recognized.

Job insecurity. Our moderating variable is measured using a four-point single-item Likert scale (1 = no risk; 4 =very high risk) indicating an employee’s probability to lose his/her job in the next 12 months. We provide the key information (definition, descriptive statistics) on the variables used in Table 1.

Table 1. Variables and descriptive statistics.

Dependent Variable	Description	Mean	SD
Job Satisfaction	Are you (4) very satisfied; (3) rather satisfied; (2) not really satisfied; (1) not at all satisfied:		
	(1) generally with your job;	2.82	0.66
	(2) with working conditions;	2.82	0.73
	(3) with wage;	2.34	0.79
	(4) with training;	2.60	0.84
	(5) with working environment	2.80	0.83
<hr/>			
Independent Variable			
Adoption of eco-innovations	The firm has adopted innovative practices to reduce resource and/or material per unit of production; reduce energy use; reduce firm’s CO2 ‘footprint’ (total CO2 production); replace materials with less polluting or hazardous	2.61	1.64

	substitutes; reduce soil, water, noise, or air pollution; recycle waste, water, or materials (from 1 to 6 according to the number of covered domains).		
Mediating variable			
Job recognition	Four-point scale (4=always; 3= often; 2= sometimes; 1=never) on the following dimensions:	2.27	0.79
	(1) Employee's work is recognized	2.82	0.83
	(2) Employee is free to organize his/her work	2.47	0.80
	(3) Employee's work allows him/her to learn new things		
Moderating Variable			
Job insecurity	(1) In next 12 months, employees fear a risk to lose his/her job (4=very high; 3=high; 2= weak; 1= no risk).	1.84	0.78

We ran a structural equation modeling (SEM, AMOS Version 21, via maximum likelihood estimates) to test the hypotheses. Hair et al. (2010) indicate that SEM is an appropriate method to deal with the multifaceted structural relationships such as the moderated mediation model tested in this study.

4. Results

In the following, we first present the structural diagnostics of our model. We then present the main findings of our analyses.

4.1 Structural Diagnostics

The overall fit for the model is good. We computed the root mean squared error of approximation (RMSEA), an estimate of the discrepancy between the original and reproduced covariance matrices in the sample (Steiger, 1990). The RMSEA value of 0.06 belongs to an acceptable range (Cudeck, Browne, 1983). Likewise, we got an incremental fit index (IFI) (Bollen, 1989) of 0.95, a Tucker Lewis index (TLI) (Tucker, Lewis, 1973) of 0.94, and a comparative fit index (CFI) (Bentler, Bonett, 1980) of 0.95. These indices are higher than the usual threshold of 0.90, which implies an acceptable fit. In sum, these structural diagnostics indicate a very good relative fit of the theoretical model to the underlying data. The measurement path is presented in Table 2.

Table 2. Measurement paths.

Measurement path	Unstandardized regression weight	S.E.	C.E	Significance
Job satisfaction				
Satisfaction at work	1.11	0.03	37.54	***
Satisfaction with working conditions	1.16	0.03	36.53	***
Satisfaction with wage	1.01	0.03	32.14	***
Satisfaction with training	1 (fixed)			
Satisfaction with environment	1.14	0.03	33.71	***
Job recognition				
Learn new things	1.03	0.03	29.09	***
Free to organize work	1 (fixed)			
Recognized	1.35	0.04	33.81	***

***: $p < 0.01$.

4.2 Estimation Results

The estimation results are presented in Table 3. These results do not support our main hypothesis (H1) regarding the existence of a direct relationship where organizations that adopt eco-innovations have more satisfied employees. This lack of effect can be due to a lack of distinction among various types of eco-innovations and the context of their implementation. However, job recognition mediates positively the relationship between adoption of eco-innovations and job satisfaction, supporting H2. Finally, from the moderated mediation effect, we conclude that job insecurity moderates negatively the positive mediating effect between adoption of eco-innovations and job satisfaction (H3).

Table 3. Results of the structural model.

Antecedent variable → Consequent variable	Regression weight	Standard error	Critical ratio	P-value
Adoption of eco-innovations → Job satisfaction	0.01	0.00	1.47	ns
Adoption of eco-innovations → Job recognition	0.01	0.00	2.18	***
Job recognition → Job satisfaction	0.10	0.04	27.42	***
Job insecurity → Job recognition	-0.20	0.01	-21.66	***
Adoption of eco-innovations*Job insecurity → Job recognition	-0.01	0.01	-1.91	*

*** $p < 0.01$; * $p < 0.1$

5. Discussion and Conclusion

We proposed a new rationale to the win-win literature (Ambec, Lanoie, 2008). Organizations that adopt eco-innovations lead employees to feel that their work is valued and appreciated, which in turn increase their job satisfaction. Even if the route is indirect, it gives promoters of eco-innovations an additional argument to persuade companies about the benefits of going green. Moreover, we believe that a fine-grained analysis of eco-innovations (e.g., by distinguishing cosmetic ones from real ones, those that generate visible green benefits versus those who do not, innovation timing) is necessary to allow a refined empirical testing of this crucial relationship.

Employees who work in eco-innovation-oriented firms are more likely to exhibit higher levels of happiness. Beyond immediate economic benefits associated with a win-win relationship, embracing a culture of eco-innovations can lead to more satisfied employees. Eco-innovations are likely to influence non-monetary outcomes in unexpected ways. These relationships deserve more academic attention and can push policy makers to design and encourage innovation policies that are more environment- and employee-centered.

At a more general level, our study encourages to consider the multidimensional effects of innovations, beyond their usual classification (e.g., eco-innovation or marketing innovation). A better understanding of these various effects can inform policymakers in order to avoid a one-size-fits-all rationale, develop and tailor arguments according to various audiences. Another fruitful avenue is to identify and disentangle the channels by which innovation may influence job satisfaction. Encouraging (eco-)innovations can emphasize the environmental or economic benefits, but also indirect benefits such as an improved satisfaction. Other aspects of eco-innovations can also be considered such as their effect on employee retention (see Fazal- e- Hasan et al., 2022), their ability to deliver meaning or their capacity to lead to optimal experience or flow (Nakamura, Csikszentmihalyi, 2002).

Our study has several limitations that could be addressed in future studies. An important issue is that employees are not randomly assigned into workplaces. Failure to account for sorting of employees could bias estimated effects for the measures of well-being at work. While the size of the bias is not known, it can be addressed by using information on employees' workplace characteristics (Böckerman et al., 2012b). Therefore, each of our

constructs is measured using more than one item in order to account for various workplace characteristics. However, future research should include additional characteristics as well as sickness absence histories as suggested by Böckerman et al. (2012b).

In addition, the extrapolation of our results needs some cautions as employee relations and other factors are different in other countries. Examining the similarities and differences between France and other countries will be an exciting avenue to explore for future research in order to obtain more generalizable conclusions.

Moreover, we used cross-sectional data, and testing rigorously (bi)causality between eco-innovations and job satisfaction thanks to well-crafted experiments will constitute a strong added value. Indeed, these experiments can allow to assess causality, which is of paramount importance. Combining the advantages of experiments and survey data can increase the validity and relevance of findings.

We limited our study to job satisfaction but considering job *and* life satisfaction can enrich the study. Our measure of eco-innovations is somewhat rough and gives the same weight for each environmental domain, but refining it can offer promising avenues. Indeed, all eco-innovations are not created equal.

It also makes sense to test the robustness of our findings by using other samples (other countries), or to test a similar rationale at a cross country level. Testing the eco-innovations-job satisfaction for various countries at different levels of development can give a more accurate picture.

While our contribution is just a stepping stone, it also constitutes a vibrant call to examine these relationships in a rigorous way.

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