

Eurasian Business Review

The relationship between types of innovation and SMEs' performance: A multi-dimensional empirical assessment

--Manuscript Draft--

Manuscript Number:	EABR-D-18-00064R1	
Full Title:	The relationship between types of innovation and SMEs' performance: A multi-dimensional empirical assessment	
Article Type:	Research Paper	
Funding Information:	Ministerio de Economía, Industria y Competitividad, Gobierno de España (ECO2014-55745-R)	Dr. Alfonso Expósito
	Generalitat Valenciana (PROMETEO/2009/068)	Dr. Juan A. Sanchis-Llopis
	Agencia de Innovación y Desarrollo de Andalucía (P09-SEJ-4857)	Dr. Alfonso Expósito
Abstract:	<p>This paper examines the impact of different types of innovation on the business performance of small and medium-sized enterprises (SMEs) using a multi-dimensional analytical approach. Based on a wide sample of Spanish SMEs, our results highlight the existence of positive impacts of innovation on financial and operational dimensions of business performance, and the significant differences in these impacts depending on the type of innovation and the performance indicator considered. Our findings are relevant for managers and innovation decision-makers when designing innovation strategies to foster the business performance of SMEs. Additionally, the multi-faceted nature of the link between innovation and business outcomes in SMEs reveals that making the right innovation decision is crucial in securing the desired performance outcomes in a context of limited resources for innovation.</p>	
Corresponding Author:	Alfonso Expósito University of Seville Sevilla, SPAIN	
Corresponding Author Secondary Information:		
Corresponding Author's Institution:	University of Seville	
Corresponding Author's Secondary Institution:		
First Author:	Alfonso Expósito	
First Author Secondary Information:		
Order of Authors:	Alfonso Expósito	
	Juan A. Sanchis-Llopis	
Order of Authors Secondary Information:		
Author Comments:	<p>Dear Editor,</p> <p>We acknowledge to the reviewers all the comments and suggestions, which have significantly contributed to improve the quality of the new version of the manuscript. In restructuring the paper, we have closely followed all suggestions provided by the reviewers. In particular, we have improved the theoretical framing of the paper (following most of the literature recommendations) and have written all our hypotheses separately as suggested by the three of them. Subsequently, we provide replies for all comments received from the three reviewers.</p> <p>Our final manuscript does not exceed 20 pages (including figures, tables, appendices and references).</p> <p>We look forward to hearing from you soon.</p> <p>Yours sincerely,</p>	

	Alfonso Expósito
Response to Reviewers:	<p>Reviewer 1. Answers to Reviewer Report on: "The relationship between types of innovation and SMEs' performance: A multi-dimensional empirical assessment." for Eurasian Business Review.</p> <p>General statement from the authors to the reviewer: We acknowledge to the reviewer all the comments and suggestions, which have contributed to improve the quality of the new version of the manuscript. In this new version of the manuscript the reviewer will find the new incorporations coming from his/her suggestions, jointly with the incorporations suggested by other reviewers.</p> <p>COMMENTS FOR THE AUTHOR:</p> <p>Reviewer #2: Using a sample of Spanish SMEs, the authors investigate the relationship between innovation and SMEs performance. The paper distinguishes three types of innovations: product, process, and organisational; and analyse their impact on four dimensions of business performance: sales increase, cost reduction, productive capacity and quality improvement. Results show that 1) all innovation types have a positive effect on productivity capacity and quality improvement; 2) product innovation affects sales increase; 3) organisational innovation affects cost reduction.</p> <p>The paper deals with an interesting topic which, however, has been studied extensively. The main contribution of the paper is to take into account the multi-dimensional nature of innovation (product, process, and organisational) and its differential impact on four business performance indicators.</p> <p>The scope of the paper is clear, but results are not totally convincing, and it could be published in EABR only after clarifications and improvements. I report my comments and suggestion below. The first remark is crucial to the extent that from my point of view it conditions the future of the paper.</p> <p>Comments.</p> <p>1. In defining variables (see Appendix), it looks like the dependent binary dummies can take value "1" only for firms that introduced an innovation. If this is the case, I doubt that regressions on the whole sample (innovators and non-innovators) make any sense at all. If this is not the case, the authors should provide more information (descriptive statistics) on the values of the dummy across innovators and non-innovators.</p> <p>Reply: We thank the reviewer on pointing us the confusing definition of the dependent variables. Actually, the dependent variable takes on value 1 if the entrepreneur has perceived a better performance (e.g., sales increase) associated to the introduction of innovation(s) within the last three years. Obviously, this variable takes value 0 for those cases in which the entrepreneur does not perceives an increase in sales associated to the introduction of innovation. We have changed the definition of the dependent performance variables in the paper and in the Appendix.</p> <p>2. The main contribution of the paper should consist in the multidimensional treatment of the innovation. However, the authors do not provide a very detailed discussion of the possible different strategies associated with innovation. For example, there are firms that introduce both a process and a product innovation, whereas other firms introduced only product or organisational innovation. I would suggest a more compelling discussion of this point (apart from the multi-collinearity problems that can arise, see page 7.), also providing an econometric specification in which these different strategies are measured with specific dummy variables (see, for a similar approach, Dosi, Grazzi, Moschella, Technology and costs in international competitiveness: From countries and sectors to firms. Research Policy, 44, 2015, pp. 1795-1814.</p> <p>Reply: We appreciate the reviewer's comment, and therefore, the new version of the Introduction has been revised to enhance the discussion on the effects of innovation.</p>

The following paragraph has been added in order to better explain the types of innovation output considered:

"Product innovation refers to the introduction of a new (or significantly improved) product or service in the firm's portfolio offered to the market, thus influencing sales and product quality, among other business performance measures (Rosenbusch et al. 2011). On the other hand, process innovation involves the introduction of new methods of production, which may influence different performance measures (e.g., production costs, product quality, and productive capacity) (Tavassoli and Karlsson 2016). Finally, organisational innovation consists of changes in the management of available resources and routines in the activities carried out by the firm, thus influencing productive capacity, efficiency, and product quality, among other performance measures (Goedhuys and Veugelers 2012; Polder et al. 2010). Therefore, the existing literature offers a wide range of performance indicators in SMEs that are potentially impacted by innovation. Nevertheless, the most commonly used performance measures in empirical studies are single-dimensional indicators (e.g., productivity, sales), thus ignoring the necessarily multi-dimensional approach in the analysis of innovation effects on alternative performance measures (Tavassoli and Karlsson 2016)."

Further, the new version of the Literature review in Section 2 has also been revised and additional references have been added in order to provide a more detailed justification of the proposed research hypotheses. In order to gain clarity, research hypotheses have been rewritten as follows:

"Hypothesis 1: The introduction of innovation (product, process, and/or organisational) by the firm may influence SME financial performance as measured by an increase in the firm's sales and a reduction of its production costs.

Hypothesis 2: The introduction of innovation (product, process, and/or organisational) by the firm positively influences SME operational performance as measured by an increase in the firm's productive capacity and a higher quality of products/services supplied by the firm.

Hypothesis 3: Impacts on financial and operational dimensions of SME performance differ depending on the type of innovation introduced by the firm. Therefore, any type of innovation might not always be suitable for the influence of both dimensions of business performance."

The first hypothesis focuses on assessing the impact of innovation (of any type) on the financial dimension of business performance. The second one focuses on the operational dimension. Finally, the third hypothesis complements the first two research hypotheses since we believe that both business performance dimensions are impacted by innovation (of any type) differently.

Finally, we have not introduced a specification accounting for all possible strategies undertaken by firms as the possibilities are too many, and most of them would lose their statistical significance. However, we have extended the discussion of the results in line with the suggestions of the reviewer in relation to the potential complementarities between strategies

3. In discussing the Hypothesis, the authors consider only the positive effects that innovation can have on business performance. However, the literature has shown that innovation can have also disruptive effects on firm firm performance (see Fernandes and Paunov, The risks of innovation: are innovating firms less likely to die? Review of Economics and Statistics, 97, 2015), and this should be true even more for SMEs. The authors should take into account these possible adverse effects of innovation, and eventually better motivating their hypothesis.

Reply: We totally agree with the reviewer's comment. And, the manuscript has been revised following this comment. We have also incorporated the suggested (as well as additional) literature in order to enrich the literature review and the discussion sections.

4. Minor point. Authors should compare their figures in Table 1 and 2 with other figures, coming for example from statistical national sources.

Reply: The authors appreciate reviewer's comment. Thus, the following paragraph has been incorporated, in order to compare our sample figures to the national ones:

"The sample under study therefore follows a similar distribution to that at national level in 2012, both in terms of sector and size. Following official statistics, 90% of Spanish

SMEs were micro-firms (1-9 employees), of which these were distributed among Industry (7%), Real estate and construction (12%), Commerce (24%), and Services (57%) (Spanish Ministry of Industry, Energy and Tourism 2013)."

5. Minor point. It is not clear to me why you call the effects of your control variable a "moderating" effect, as they are not interacted with your variable of interest.

Reply: We have removed the word "moderating" and simply call them control variables.

Reviewer 2.

Answers to Reviewer Report on: "The relationship between types of innovation and SMEs' performance: A multi-dimensional empirical assessment." for Eurasian Business Review.

General statement from the authors to the reviewer: We acknowledge to the reviewer all the comments and suggestions, which have contributed to improve the quality of the new version of the manuscript. In this new version of the manuscript the reviewer will find the new incorporations coming from his/her suggestions, jointly with the incorporations suggested by other reviewers.

Reviewer #3: This work aims to assess the innovation-performance relationship by adopting a multidimensional approach. While I agree on the relevance of such a multi-faceted approach, this study suffers from many theoretical and empirical shortcomings that need to be addressed to make it publishable.

(i) My main concern is with the theoretical background. The authors offer a quick overview of many streams of literature (sales growth, productivity dynamics, technological and non-technological innovation, etc.) but fail to link them correctly. Consequently, the hypotheses do not make much sense. Hp1: "The introduction of innovation (product, process and/or organisational) by the firm may impact on both dimensions of SME performance (financial and operational)". Why? What are the underlying mechanisms? Hp.2: "The type of innovation implemented by the firm will determine which business performance indicator is influenced and to what extent". Again, why? What type of innovation indicator is associated with a given performance indicator? I would urge the authors to extensively rework their background and formulate meaningful and well-rooted hypotheses (e.g., we expect XXX innovation to have a positive impact on XXX because XXX).

Reply: We thank the reviewer for this main comment. The new version of the Introduction Section has been revised and the following paragraph has been added in order to better explain the types of innovation output considered:

"Product innovation refers to the introduction of a new (or significantly improved) product or service in the firm's portfolio offered to the market, thus influencing sales and product quality, among other business performance measures (Rosenbusch et al. 2011). On the other hand, process innovation involves the introduction of new methods of production, which may influence different performance measures (e.g., production costs, product quality, and productive capacity) (Tavassoli and Karlsson 2016). Finally, organisational innovation consists of changes in the management of available resources and routines in the activities carried out by the firm, thus influencing productive capacity, efficiency, and product quality, among other performance measures (Goedhuys and Veugelers 2012; Polder et al. 2010). Therefore, the existing literature offers a wide range of performance indicators in SMEs that are potentially impacted by innovation. Nevertheless, the most commonly used performance measures in empirical studies are single-dimensional indicators (e.g., productivity, sales), thus ignoring the necessarily multi-dimensional approach in the analysis of innovation effects on alternative performance measures (Tavassoli and Karlsson 2016)."

Further, the Literature review in Section 2 has been revised and additional references have been added in order to provide a more detailed justification of the proposed research hypotheses. In order to gain clarity, research hypotheses have been rewritten:

"Hypothesis 1: The introduction of innovation (product, process, and/or organisational) by the firm may influence SME financial performance as measured by an increase in the firm's sales and a reduction of its production costs.

Hypothesis 2: The introduction of innovation (product, process, and/or organisational) by the firm positively influences SME operational performance as measured by an increase in the firm's productive capacity and a higher quality of products/services supplied by the firm.

Hypothesis 3: Impacts on financial and operational dimensions of SME performance differ depending on the type of innovation introduced by the firm. Therefore, any type of innovation might not always be suitable for the influence of both dimensions of business performance."

The first hypothesis focuses on assessing the impact of innovation (of any type) on the financial dimension of business performance. The second one focuses on the operational dimension. Finally, the third hypothesis complements the first two research hypotheses since we believe that both business performance dimensions are impacted by innovation (of any type) differently.

(ii) In relation to the above comment, there are some missing references on innovation strategies and firm performance that should be included. Recent contributions that are very much in line with this study are:

Bianchini, S., Pellegrino, G., & Tamagni, F. (2018). Innovation complementarities and firm growth. *Industrial and Corporate Change*, 27(4), 657-676.

Goedhuys, M., & Veugelers, R. (2012). Innovation strategies, process and product innovations and growth: Firm-level evidence from Brazil. *Structural change and economic dynamics*, 23(4), 516-529.

Polder, M., Leeuwen, G. V., Mohnen, P., & Raymond, W. (2010). Product, process and organizational innovation: drivers, complementarity and productivity effects.

Tavassoli, S., & Karlsson, C. (2016). Innovation strategies and firm performance: Simple or complex strategies?. *Economics of Innovation and New Technology*, 25(7), 631-650.

Please use these references to enrich the theoretical framing of the paper.

Reply: We appreciate the reviewer's suggestion, and in the new version of the paper we have incorporated the suggested (as well as additional) references in order to enrich the literature review and the discussion sections.

(iii) I cannot understand why the authors use binary indicators as dependent variables. Is it because continuous variables are not available in the data? This would be a serious limitation, with non-trivial consequences for the interpretation of the results. Indeed, it would be impossible to correctly understand and quantify the extent to which performance changes as a result of innovation.

Reply: In relation to the dependent variables, the data set does not contain continuous variables. We only have binary indicators for the firms performance. However, in order to explain this, we have added the following paragraph in Section 3 to explain the appropriability of using these type of variables:

"As in previous studies (Dosi et al. 2015; Griffith et al. 2006; Polder et al. 2010; among others), binary variables for product, process, and organisational innovation are used. These variables take on value 1 if the firm has introduced any type of innovation during the period 2009-2011. On doing so, innovation output variables do not need to be proxied by using other indicators (e.g., patents) and, given the distribution of innovation observed among the firms sampled (Table 1), binary variables enable all information to be adequately captured in the sample studied (Dosi et al. 2015)."

(iv) Descriptive statistics (mean, median, quartile) are missing. They need to be added and discussed in Section 3.

Reply: In the new version of the manuscript we have added Table A.2. in the appendix

with the descriptive statistics (mean, s.d., median and 25 and 75 quartiles). As the main variables of interest are in Tables 1 and 2 in the main text, we have incorporated some discussion of these variables in section 3.

(v) I expected a more elaborate discussion on the implications of the paper, but I found none. More can be added in terms of implications for strategic management and policy makers. For example, what about synergies between innovation practices? What about the time lag between innovation and business performance? What tools can be used by policy makers to promote a particular innovation strategy? The authors should elaborate further these issues in their concluding remarks.

Reply: We agree with this comment and in the new version of the manuscript, the policy implications have been further discussed.

(v) Some obvious limitations of the study should be acknowledged. Here is a non-exhaustive list: cross-sectional nature of the data, only one country and a limited number of sectors/regions, causality problems, etc.

Reply: Following the suggestion of the reviewer, we have discussed about the limitations raised and some other in the Conclusion section of the revised manuscript.

(vi) The abstract should be shortened. Please also remove the numerous e.g. and i.e.

Reply: Corrected.

(vi) The tables in the appendix must be numbered.

Reply: Corrected.

(vii) I can't read the equation on pp.7...

Reply: We apologise for this and we have re-edited this equation in the new version of the manuscript.

The relationship between types of innovation and SMEs' performance: A multi-dimensional empirical assessment.

Alfonso Expósito*. University of Sevilla (Spain). E-mail: aexposito@us.es. Tel: +34656626953. ORCID: 0000-0002-9248-4879

Juan A. Sanchis-Llopis. University of Valencia and ERICES, Valencia (Spain). ORCID: 0000-0001-9664-4668

*Corresponding author.

Acknowledgements. The results of this study were presented in the 25th EBES Conference (23-25th May 2018 in Berlin, Germany). Authors acknowledge the comments received, which contributed to improve this manuscript. This research work has received funding from the Spanish Ministry of Economy, Industry and Competitiveness (project ECO2014-55745-R), Generalitat Valenciana (PROMETEO/2009/068) and Junta de Andalucía (project P09-SEJ-4857).

Abstract

This paper examines the impact of different types of innovation on the business performance of small and medium-sized enterprises (SMEs) using a multi-dimensional analytical approach. Based on a wide sample of Spanish SMEs, our results highlight the existence of positive impacts of innovation on financial and operational dimensions of business performance, and the significant differences in these impacts depending on the type of innovation and the performance indicator considered. Our findings are relevant for managers and innovation decision-makers when designing innovation strategies to foster the business performance of SMEs. Additionally, the multi-faceted nature of the link between innovation and business outcomes in SMEs reveals that making the right innovation decision is crucial in securing the desired performance outcomes in a context of limited resources for innovation.

Keywords: innovation, business performance, multi-dimensional analysis, SMEs.

JEL Classification: M21, L25, O30.

The relationship between types of innovation and SME performance: A multi-dimensional empirical assessment.

Abstract.

This paper examines the impact of different types of innovation on the business performance of small and medium-sized enterprises (SMEs) using a multi-dimensional analytical approach. Based on a wide sample of Spanish SMEs, our results highlight the existence of positive impacts of innovation on financial and operational dimensions of business performance, and the significant differences in these impacts depending on the type of innovation and the performance indicator considered. Our findings are relevant for managers and innovation decision-makers when designing innovation strategies to foster the business performance of SMEs. Additionally, the multi-faceted nature of the link between innovation and business outcomes in SMEs reveals that making the right innovation decision is crucial in securing the desired performance outcomes in a context of limited resources for innovation.

Keywords: innovation, business performance, multi-dimensional analysis, SMEs.

JEL Classification: M21, L25, O30.

1. Introduction.

1
2 Small and medium-sized enterprises (SMEs) are commonly defined as reactive, flexible, and
3 innovative organisations (Terzioski 2010; Lichtenthaler 2016). These types of firms usually operate in very
4 competitive markets, and hence the introduction of innovative products, processes, and/or new
5 organisational business models enables them to stand out from the competition, by improving their results
6 and business performance, both in the short- and medium-term (Máñez Castillejo et al. 2015; Love and
7 Roper 2015). In recent decades, extensive literature has focused on the analysis of the impacts of innovation
8 on SME performance (see Añón Higón et al. 2015; Freel and Robson 2004; Hervás-Oliver et al. 2014;
9 Nemlioglu and Mallick 2017; Van Auken et al. 2008; among others). Nevertheless, other studies have
10 reported mixed and inconclusive findings (see Sok et al. 2016; Terzioski 2010; Vermeulen et al. 2005,
11 among others), based largely on the fact that innovation requires a major amount of resources (e.g.,
12 financial, technological, and human capital), which might constitute a significant limitation for SMEs that
13 aim to innovate (Sok et al. 2016). Moreover, success in introducing innovations may require special
14 organisational capabilities in order to better appropriate its performance benefits (O’Cass and Sok 2013)
15 and/or may imply an increase in uncertainty and risk (Nieto and Santamaría 2010). Consequently, further
16 research into this topic is desirable since more empirical evidence is needed in the case of SMEs (Máñez
17 Castillejo et al. 2015; Rosenbusch et al. 2011).

18
19 This paper aims to provide new empirical evidence on the impact of the various types of innovation
20 on the performance of SMEs through the use of a multi-dimensional approach. The main assumption is that
21 the incorporation of alternative types of innovation by the firm exerts a distinctive impact on the various
22 dimensions of business performance (i.e., financial and operational performance). Following the OCDE
23 (2010) definition of innovation, we analyse three different types of innovation outputs: product, process,
24 and organisational (or managerial) innovation. Product innovation refers to the introduction of a new (or
25 significantly improved) product or service in the firm’s portfolio offered to the market, thus influencing
26 sales and product quality, among other business performance measures (Rosenbusch et al. 2011). On the
27 other hand, process innovation involves the introduction of new methods of production, which may
28 influence different performance measures (e.g., production costs, product quality, and productive capacity)
29 (Tavassoli and Karlsson 2016). Finally, organisational innovation consists of changes in the management
30 of available resources and routines in the activities carried out by the firm, thus influencing productive
31 capacity, efficiency, and product quality, among other performance measures (Goedhuys and Veugelers
32 2012; Polder et al. 2010). Therefore, the existing literature offers a wide range of performance indicators
33 in SMEs that are potentially impacted by innovation. Nevertheless, the most commonly used performance
34 measures in empirical studies are single-dimensional indicators (e.g., productivity, sales), thus ignoring the
35 necessarily multi-dimensional approach in the analysis of innovation effects on alternative performance
36 measures (Tavassoli and Karlsson 2016).

37
38 This study uses a multi-dimensional approach to analyse the relationship between alternative types
39 of innovation and SME business performance. In particular, business performance is measured by four
40 alternative indicators: two financial dimensions (sales increase and cost reduction), and two operational
41 dimensions (augmentation of productive capacity and quality improvement). Therefore, this study aims to
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65

1 extend previous research studies (see Nemlioglu and Mallick 2017; Polder et al. 2010; Rosenbusch et al.
2 2011; Van Auken et al. 2008; among others) with the objective of answering the following general question:
3 Is innovation indeed always an adequate strategy for the improvement of business performance regardless
4 of the performance measure and the type of innovation considered? In order to answer this general question,
5 this study aims to test the research hypotheses presented in the subsequent section.
6

7
8 This paper uses a sizeable and multi-sectoral sample of Spanish SMEs. Manufacturing, real estate
9 & construction, commercial, and service sectors were suitably stratified following the criteria of the Spanish
10 National Statistics Institute, both in terms of sector and size of the firm. Collected in 2012 across six Spanish
11 regions, the data contains retrospective information on the three previous years for a wide spectrum of SME
12 activities, including innovation and performance. Our results indicate that while product innovation
13 positively influences the firm's sales, and organisational innovation reveals a positive effect on cost
14 reduction, all innovation types (product, process, and organisational) show significantly positive effects on
15 both operational outcome measures (productive capacity increase and quality improvement). In this regard,
16 our results clearly show the importance and the role of innovation in influencing certain performance
17 dimensions of SMEs, which might be relevant for SME decision-making related to innovation,
18 entrepreneurship, and business performance. This research is in line with recent studies, such as those by
19 Bianchini et al. (2018), Goedhuys and Veugelers (2012), Polder et al. (2010), and Tavassoli and Karlsson
20 (2016)
21

22 The rest of the paper is organised as follows. The second section offers a brief literature review
23 and presents our research hypotheses. A brief description of the data and the methodology applied in this
24 paper is offered in Section 3. Subsequently, the analytical results are discussed and the last section presents
25 several concluding remarks.
26

27 **2. Brief state-of-the-art review and research hypotheses.**

28 The link between innovation and SME business performance has been extensively analysed, and, in
29 most cases, shows the existence of significant impacts of innovation on alternative business performance
30 indicators. Some research finds positive effects (Añón Higón et al. 2015; Freel and Robson 2004; Foreman-
31 Peck 2013; Hervas-Oliver et al. 2014; Nemlioglu and Mallick 2017; among others) while others reveal
32 negative effects (Fernandes and Paunov 2015; Freel and Robson 2004; Hall 2011; Jaumandreu and
33 Mairesse 2016). Therefore, innovation investments may lead to performance improvements (e.g., higher
34 sales, efficiency gains, and product quality enhancement), but are also costly and risky. However, these
35 studies have usually focused on a specific dimension of SME business performance (mainly sales and
36 productivity growth), thereby eluding a multi-dimensional analytical approach. Moreover, technological
37 innovation (such as product and process innovation) has generally attracted a higher interest in the analysis
38 of its impact on SME business performance (Foreman-Peck 2013; Hervas-Oliver et al. 2014), without
39 considering other types of innovation such as organisational and managerial innovation. Thus, the
40 knowledge regarding the effects of non-technological innovation on SME business performance remains
41 scarce (Nemlioglu and Mallick 2017; Walker et al. 2015).
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65

1 On focusing on the effects of innovation on the financial dimension of business performance, Zahra
2 et al. (2000) and Pérez et al. (2004) show that innovation has a positive impact on sales growth, and
3 increases the survival rates among SMEs. Along these lines, studies such as those by Hall et al. (2009),
4 Foreman-Peck (2013), and Máñez Castillejo et al. (2015), find robust evidence of the positive impact of
5 product and process innovation on sales and internal efficiency (by reducing production costs through
6 productivity gains). Añón Higón et al. (2015) and Hervás-Oliver et al. (2014) show similar results in the
7 case of Spanish SMEs. Specifically, Hervás-Oliver et al. (2014) argue that process and organisational
8 innovation constitute relevant explanatory factors of the SME financial performance. In contrast,
9 Jaumandreu and Mairesse (2016) argue that product innovation may increase production costs, although
10 process innovation may assert the opposite effect. Along similar lines, studies, such as those by Freel and
11 Robson (2004) and Hall (2011), argue that innovation (mainly product and process innovation) may
12 negatively influence sales growth and productivity (or production costs). Regarding non-technological
13 innovation, Lin and Chen (2007) and Gunday et al. (2011) show that the introduction of organisational
14 innovation may have a greater positive impact on SME sales and productivity than that observed in the case
15 of technological innovation. In this area, studies, such as those by Polder et al. (2010) and Tavassoli and
16 Karlsson (2016), highlight the relevance of organisational innovation (and its combination with
17 technological innovation) in maximizing the positive effects of innovation in financial business
18 performance (e.g., sales growth and cost efficiency). Therefore, the existing literature and empirical
19 evidence suggest that that innovation influences the financial performance of SMEs, although the sign and
20 the extent of this impact depends on the type of innovation considered (i.e., technological or non-
21 technological), as well as on the performance indicator analysed (i.e., sales or production costs). This paper
22 aims to contribute to this international literature by studying the effects of various types of innovation on
23 two alternative indicators of financial performance in a sample of Spanish SMEs. Thus, the following
24 hypothesis is tested:

25
26
27
28
29
30
31
32
33
34
35
36
37
38 ***Hypothesis 1:*** *The introduction of innovation (product, process, and/or organisational) by the firm may*
39 *influence SME financial performance as measured by an increase in the firm's sales and a reduction of its*
40 *production costs.*
41

42
43
44 In addition to the effects on the financial performance of SMEs, further impacts of innovation
45 include the capacity to achieve economies of scale by augmentation of the productive capacity, and the
46 ability to set higher quality standards (Prajogo et al. 2013). These impacts usually arise from an improved
47 capability to easily develop and apply new knowledge throughout the business organisation due to
48 innovation (Saunila 2016). Specifically, Edquist (2001) and Zahra and George (2002) show that the firm's
49 innovative capacity constitutes a decisive factor in ensuring a continuous improvement in the quality of
50 products (or services) provided by the firm. Along these lines, Prajogo et al. (2013) show the significant
51 role played by innovation in the improvement of product (and service) quality, since the introduction of
52 innovative management practices and processes (e.g., total quality management) is crucial to guarantee the
53 fulfilment of higher quality standards.
54
55
56
57
58
59
60
61
62
63
64
65

1 Furthermore, empirical evidence shows that innovation increases the firm's productive potential.
2 The augmentation of the productive capacity of the firm might be understood as a pure indicator of business
3 growth (Dobbs and Hamilton 2007). In this respect, the existing literature shows that innovation tends to
4 foster business growth in small firms (Freel and Robson 2004). Furthermore, the firm's capacity to generate
5 employment has received special attention regarding alternative measures, especially in countries such as
6 Spain that suffer from persistent unemployment problems (Triguero et al. 2014; Ciriaci et al. 2016). This
7 latter work states that process innovation fosters employment in Spanish SMEs, while product innovation
8 remains non-significant. However, this study considers the augmentation of the firm's productive capacity
9 as an operational performance indicator, given that a higher production necessarily implies an increase in
10 the productive capacity through a greater use of production factors.
11

12
13
14
15
16 In the light of this review of the literature, this paper aims to highlight the impacts of various types
17 of innovation (i.e., product, process, and organisational) on the firm's operational performance. In our case,
18 two alternative indicators are used: augmentation of the firm's productive capacity and higher quality of
19 products/services provided by the firm. Thus, our second hypothesis is:
20

21
22 ***Hypothesis 2: The introduction of innovation (product, process, and/or organisational) by the firm***
23 ***positively influences SME operational performance as measured by an increase in the firm's productive***
24 ***capacity and a higher quality of products/services supplied by the firm.***
25
26
27
28

29
30 The majority of studies that analyse the impacts of innovation (both technological and non-technological)
31 on business performance have focused on specific (or single) performance measures, mainly financial
32 indicators such as sales, productivity, or production costs, and have therefore failed to adopt a multi-
33 dimensional approach (Nemliogu and Mallick 2017). Consequently, existing literature on innovation offers
34 no clear conclusions on the impacts of alternative types of innovation (product, process, or organisational)
35 on alternative performance indicators of a firm (Rosenbusch et al. 2011). Along these lines, studies such as
36 those by Damanpour et al. (1989), Rosenbusch et al. (2011) and Nemlioglu and Mallick (2017), state that
37 the analysis of the impacts of innovation on SME business performance should be addressed as a multi-
38 faceted phenomenon that takes into account the different types of performance and innovation indicators.
39 In this study, we aim to identify how impacts of product, process and organisational innovation on
40 alternative SME business performance indicators may differ. Consequently, our third and complementary
41 research hypothesis is:
42
43
44
45
46

47
48 ***Hypothesis 3: Impacts on financial and operational dimensions of SME performance differ depending on***
49 ***the type of innovation introduced by the firm. Therefore, any type of innovation might not always be suitable***
50 ***for the influence of both dimensions of business performance.***
51
52
53
54

55
56 Business performance may also be affected by other internal and external determinants. In this
57 respect, Rosenbush et al. (2011) argue that the global effect of innovation in the business performance of
58 SMEs should be described as an aggregation of positive and negative effects (depending on the performance
59 indicator considered), which might also be affected by internal and external factors to the firm. In this
60
61
62
63
64
65

1 regard, characteristics of the firm, such as size and age (Hall et al. 2009), manager's characteristics, such
2 as age and managerial experience (Dobbs and Hamilton 2007; Foreman-Peck 2013, Martínez-Roman and
3 Romero 2017), and other strategical business variables, such as the establishment of R&D cooperation
4 strategies with institutional and market agents, might play a significant role in the firm's capacity to
5 innovate and achieve better performance outcomes (Amoroso 2017; Spithoven et al. 2013). Additionally,
6 regional (or spatial) and sectoral characteristics have attracted the attention of the academic world as control
7 variables for the capture of environmental factors external to the firm (Yang 2016). On the basis of these
8 arguments, this study considers an extensive group of these internal and external determinants.
9

14 3. Data.

16 This paper is based on the assumption that the innovation introduced by the firm in previous years
17 might have significant and different effects on the two alternative dimensions of business performance
18 considered in the analysis. The business performance and innovation variables used in this study are
19 described below. Moreover, a full description of all variables employed is also provided in the Appendix
20 (see Table A.1). The data originates from a survey carried out in 2012 on the innovative capacity and
21 competitiveness of Spanish SMEs in six Spanish regions: Andalusia, the Basque Country, Estremadura, the
22 community of Madrid, Murcia, and Navarre. This data forms part of the project "*Analysing the qualitative
23 aspects shaping the quality of entrepreneurs and SMEs: implications for the economic development of the
24 Spanish Regions*", promoted by the Regional Government of Andalusia (P09-SEJ-4857). The firms
25 included in the sample have fewer than 250 employees and annual sales below 50 million Euros.
26

27 The questionnaire was designed to collect information on the innovation orientation of the firm
28 and the entrepreneur's perceptions regarding the impacts of innovation on alternative performance
29 outcomes during the period 2009-2011. Other data on the firm's characteristics, entrepreneurial and
30 management aspects, as well as with regard to the business environment, were also gathered. The survey
31 was addressed to the person in charge of the principal managerial functions (normally the entrepreneur, but
32 also general managers). Studies, such as those by Ebrahimi and Mirbargkar (2017), Foreman-Peck (2013),
33 Madrid-Guijarro et al. (2013), and Olivari (2016), argue that self-reported answers from SME managers
34 constitutes an adequate source of information regarding performance and innovation indicators, as well as
35 of other strategic decisions.
36

37 The population surveyed was stratified in terms of size and sector (i.e., manufacture, real estate
38 and construction, commercial activities, and services) following the criteria of the Central Directory of
39 Firms (Spanish National Institute of Statistics). The response rate was 20.8% (1,424 valid observations)
40 and no bias between respondents and non-respondents was detected.
41

42 Managers were asked if they had perceived a significant impact on various dimensions of business
43 performance as a result of the innovation introduced in the three years previous to the study. Four alternative
44 performance indicators were provided as possible answers. On the one hand, sales increase and cost
45 reduction were to be acknowledged in the financial performance dimension. On the other hand,
46 augmentation of productive capacity and quality improvement of products/services provided by the firm
47

1 were to be considered in the operational performance dimension. Performance outcomes were measured
2 using binary variables, whereby value 1 was taken if the manager's answer was affirmative.

3
4 Additionally, managers provided information on three alternative types of innovation: product (or
5 service) innovation, process innovation, and organisational innovation. Product and process innovation are
6 generally related to technological changes materialised in the form of new (or significantly transformed)
7 products/services and processes, thus provoking changes in the firm's main activities. However, managerial
8 or organisational innovation is based on changes in business practices and/or in the administrative structure
9 of the company, and is therefore closely related to the managerial organisation of the firm. The
10 questionnaire asked managers whether the firm had introduced any new or significantly improved
11 innovation within the previous three years. If the answer was affirmative, then the manager had to indicate
12 the type/s of innovation introduced by the firm. In this respect, it is worth noting that responses based on
13 manager perceptions regarding innovation are significantly correlated with innovation input measures, such
14 as research expenses and registered patents (Frishammar and Hörte 2005). As in previous studies (Dosi et
15 al. 2015; Griffith et al. 2006; Polder et al. 2010; among others), binary variables for product, process, and
16 organisational innovation are used. These variables take on value 1 if the firm has introduced any type of
17 innovation during the period 2009-2011. On doing so, innovation output variables do not need to be proxied
18 by using other indicators (e.g., patents) and, given the distribution of innovation observed among the firms
19 sampled (Table 1), binary variables enable all information to be adequately captured in the sample studied
20 (Dosi et al. 2015).
21
22
23
24
25
26
27
28

29
30 An extensive set of control variables that have shown significance at explaining business
31 performance of SMEs are also considered in our empirical analysis. Following the literature, these variables
32 can be organised into four groups: characteristics of the firm; business strategies; features of the
33 entrepreneur; and external determinants (sectoral and regional variables). The introduction of these
34 variables is justified by the extensive literature (Dobbs and Hamilton 2007; Love and Roper 2015; Vahter
35 et al. 2013; Zahra et al. 2000; among others). A full description of these control variables is offered in the
36 Appendix (Table A.1).
37
38
39
40

41 Descriptive statistics for the main variables of interest are shown in Tables 1 and 2. Table 1
42 presents the distribution of our sample in terms of the type of innovation introduced by the surveyed firms.
43 As can be observed in Table 1, 62.6% of surveyed firms declare having introduced at least one type of
44 innovation in the period 2009-2011. Additionally, basic information regarding firm and entrepreneur
45 characteristics, as well as other strategic variables, are available in Table 2. As can be verified in this table,
46 approximately 11% of firms operate in the industry sector, 15% in real estate and construction, 27% in
47 commercial businesses and 49% in services. Furthermore, we know that 88% of the SMEs are micro firms,
48 10% small firms, and 1.6% medium-sized firms. The sample under study therefore follows a similar
49 distribution to that at national level in 2012, both in terms of sector and size. Following official statistics,
50 90% of Spanish SMEs were micro-firms (1-9 employees), of which these were distributed among Industry
51 (7%), Real estate and construction (12%), Commerce (24%), and Services (57%) (Spanish Ministry of
52 Industry, Energy and Tourism 2013). Finally, as regards firms' strategic variables, 19% of the SMEs export,
53
54
55
56
57
58
59
60
61
62
63
64
65

25% of them import, 73% attend fairs, 24% are involved in cooperation with business partners in R&D activities, and 15% cooperate with public institutions in R&D activities.

[Table 1 about here]

[Table 2 about here]

Finally, in Table A.2 in the Appendix, descriptive statistics are provided for all variables used in our analysis.

4. Methodology.

In order to test the hypotheses described above, discrete binary outcome (*probit*) models are used. Specifically, these models enable analysis to be carried out as to whether the previous introduction of an innovation (of any type) by the firm results in a higher predicted probability of a current positive performance (e.g., sales increase), under a *ceteris paribus* assumption. In our specific case, three innovation variables (product, process, and managerial innovation) and a set of control variables (such as the business environment, the firm and entrepreneur characteristics, and other variables related to a firm's strategy) are considered as explanatory variables of SME business performance. Consequently, the specification of our model is as follows:

$$Performance_i = \begin{cases} 1 & \text{if } \beta_0 + \beta_1[\text{innovation}]_i + \beta_2[\text{firm characteristics \& strategy}]_i + \\ & \beta_3[\text{entrepreneur characteristics}]_i + \beta_4[\text{business environment}]_i + \varepsilon_i > 0 \\ 0 & \text{otherwise} \end{cases}$$

where the variable *Performance* represents the binary outcome (one out of our four performance indicators), taking a value equal to 0 if the firm has observed no significant improvement in this performance indicator, or a value equal to 1 if it has improved its performance due to innovation introduced by the firm. The error term ε_i is assumed to be $iid \sim N(0, \sigma_\varepsilon)$.

Based on the models specified, the average marginal effects for each explanatory variable are estimated, since the estimated β parameters cannot be directly interpreted. The estimated results show how much the conditional probability of the dependent (performance) variable changes when, *ceteris paribus*, the value of a specific explanatory variable changes. In order to test our four alternative performance measures, this model specification is run separately for each measure. Both estimated β parameters and marginal effects are shown in Tables 3 and 4 in the following section.

Finally, it is worth noting that regression models including multiple dimensions of innovation may lead to multi-collinearity problems. In our tested models, these problems are not detected, since the resulting variance inflation factors for our set of explanatory variables remain below a score of 2.1 (Neter et al. 1990).

5. Results.

1 The estimated results are shown in Tables 3 and 4. With regards to the financial dimension, Table
2 3 shows the estimated β parameters and their associated marginal effects as defined above. The results show
3 a significant and positive impact of product innovation on sales increase. Thus, as indicated by the estimated
4 marginal effect, the introduction of this type of innovation in previous years results in an increment of
5 12.8% in the predicted probability that a sales increase is observed (under a *ceteris paribus* assumption).
6 No significant impacts are detected in the case of process innovation. Regarding the introduction of
7 organisational innovation, this significantly increases the predicted probability of cost reduction by a
8 percentage of 8.2%. Hypothesis 1 is thus partially accepted, since only product and organisational
9 innovation appear to have a significant impact on the financial dimension of business performance. These
10 findings are in line with those obtained by Añón Higón et al. (2015), Gunday et al. (2011), and Hervas-
11 Oliver et al. (2014), among others.

12
13
14
15
16
17 Regarding the operational performance indicators, Table 4 shows that all types of innovation
18 (product, process, and organisational innovation) assert a significant impact on both indicators (an
19 augmentation in the firm's productive capacity and an improvement in product/service quality), as shown
20 by the statistically significant marginal effects. With respect to an increase of productive capacity, the
21 highest impact is observed in the case of process innovation (10.7%), followed by product (8.6%) and
22 organisational innovation (7.3%). Regarding quality improvement, product innovation asserts the highest
23 impact (9.3%), followed by process and organisational innovation. These findings fully confirm our second
24 research hypothesis since innovation (of any type) positively influences both performance indicators of the
25 operational dimension. These findings are in line with other empirical studies, such as those by Prajogo et
26 al. (2013) and Zahra and George (2002). The non-significant effect of process innovation in explaining
27 financial performance and its significant impact on the operational performance indicators, may reflect the
28 notion that processes primarily influence the firm's capacities (to produce both a greater quantity and a
29 better quality) and not directly influence financial measures, such as sales and costs. Additionally, the
30 existence of complementarities between various types of innovation may explain this result. Similar
31 arguments are discussed in Bianchini et al. (2018), Polder et al. (2010) and Tavassoli and Karlsson (2016),
32 among others.

33
34
35
36
37
38
39
40
41
42
43
44 [Table 3 about here]

45
46 [Table 4 about here]

47
48
49
50 In summary, our findings support the hypothesis that innovation increases the probability of
51 achieving better performance outcomes in SMEs. Moreover, these results not only confirm the positive
52 impact of innovation on business performance for SMEs but, in contrast with the findings of Heunks (1998),
53 who found that innovation of any kind fosters business performance, this impact differs depending on the
54 performance indicator selected. Thus, the benefits of innovation in terms of a better business performance
55 achieved by the firm depend on the specific type of innovation, as argued by Damanpour et al. (2011) and
56 confirmed by our estimated results. These findings support our third research hypothesis, since innovation
57
58
59
60
61
62
63
64
65

1 would clearly assert distinctive effects (both in terms of sign and extent) depending not only on the
2 performance dimension considered, but also on the type of innovation introduced by the firm. Therefore,
3 in order to study the multi-faceted effects of innovation decisions by firms, it seems crucial to adopt a multi-
4 dimensional approach based on alternative innovation strategies (e.g., technological and non-technological)
5 and on business performance indicators/outcomes (e.g., sales increase, cost reduction, productive capacity
6 enhancement, and quality improvement).
7

8
9 Regarding the control variables, firm characteristics, such as firm size and age, are not major
10 determinants of business performance.. Only medium-sized firms seem to enjoy a higher probability of
11 better performance in operational measures, since they are 27% higher in the case of productive capacity
12 increase and 13% higher for quality improvement. These results suggest that bigger SMEs would be in a
13 better position to internalize positive effects of innovation than smaller companies (Freel and Robson 2004).
14 Entrepreneur characteristics show low impacts on the business performance indicators. Gender shows a
15 positive effect on the cost reduction and quality improvement indicators, while entrepreneur's age registers
16 a negative impact on both operational performance indicators. These findings would suggest that the
17 positive relationship between innovation and performance in SMEs is stronger for younger entrepreneurs
18 (and thus, their business projects) (Máñez Castillejo et al. 2010; Rosenbusch et al. 2011). The level of
19 qualification reached by the entrepreneur does not seem to be significantly important in determining
20 business performance.
21
22

23
24 With respect to the firm's strategy variables, results show that export activity and the firm's
25 venturing orientation appear to be significant factors in explaining business performance. In this regard,
26 exporting SMEs show significantly better performance in terms of sales increase, cost reduction, and
27 productive capacity augmentation. These results support the existence of a positive link between exporting
28 and business performance, as argued by Golovko and Valentini (2011) and OECD (2010), among other
29 studies. Additionally, SMEs with a clear venturing orientation (and low levels of risk aversion) significantly
30 increase the predicted probability of improving performance by between 2% and 3.6%, depending on the
31 selected performance indicator. These results are in line with those of Rosenbusch et al. (2011), who show
32 positive effects of firm's innovative edge on business growth. Finally, all models incorporate environmental
33 control variables, such as sectoral and regional variables. Nevertheless, estimated parameters are not shown
34 due to their statistical insignificance.
35
36

37
38 Based on the above findings, our hypotheses can be discussed further. Firstly, empirical results for
39 the case of Spanish SMEs have shown that previous innovation incorporated by the firms plays a significant
40 role in explaining current business performance, and point towards innovation decisions as a key
41 determinant for business success. Although these findings are in line with the reviewed literature, our
42 specific analysis shows how the introduction of different types of innovation by the firm (either of a
43 technological nature in the form of product and process innovation, and/or of a non-technological nature in
44 the form of organisational innovation) exerts a distinctive impact on alternative performance dimensions
45 and indicators, thus confirming that a multi-dimensional approach should be used to analyse the impact of
46 innovation decisions on SME business performance. These findings are relevant for managers and
47 innovation decision-makers alike when designing innovation strategies to foster business performance
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65

1 within SMEs, especially when the necessary resources for innovation development and implementation are
2 limited (as is normally the case for these firms). Furthermore, our findings hold significant implications for
3 policymakers involved in innovation policy at national and supranational levels (e.g., the European Union),
4 since innovation constitutes a central factor towards sustaining competitiveness and economic growth in
5 productive sectors and countries. Findings show that the design of innovation strategies by policymakers
6 should consider the distinctive impacts exerted by different types of innovation on SME business
7 performance. Thus, designing and implementing different policy incentives to promote certain types of
8 innovation depending on the desired performance outcome (e.g. production growth, firm's competitiveness
9 through cost reduction and/or better product quality). In particular, this study shows the relevant role played
10 by all types of innovation (both technological and non-technological) in explaining both the financial and
11 operational performance of SMEs. In particular, organisational innovation is revealed as asserting a
12 significant impact on operational performance indicators. Thus, insufficient attention paid to the relevant
13 role played by non-technological innovation may lead to missed opportunities for SMEs (especially when
14 this type of innovation requires no major investment efforts). Additionally, it is relevant for business
15 managers to choose the most effective innovation (since the impacts of innovation differ across alternative
16 performance dimensions) to achieve the desired performance outcomes. In this regard, a correct
17 prioritisation of innovation efforts with respect to the expected performance outcomes becomes an issue of
18 high interest for SME managers and decision-makers.

29 **5. Conclusions.**

30 Most of the existing literature on the impacts of innovation on SMEs' performance has focused on
31 analysing the link between technological innovation (i.e., product innovation and/or process innovation)
32 and business growth measures (i.e., sales, productivity). Meanwhile, the consideration of alternative
33 performance dimensions (i.e., non-financial indicators) and non-technological innovation (i.e.
34 organisational innovation) have traditionally attracted less interest. Our findings show that the introduction
35 of innovation of any type (product, process, and/or organisational) asserts significant and positive effects
36 on both financial and operational dimensions of SME performance. Specifically, while the introduction of
37 product innovation asserts a positive impact on the probability that a sales increase occurs in subsequent
38 years, the implementation of organisational innovation leads to a reduction of production costs. Regarding
39 the operational performance dimension, all innovation types register positive and significant impacts on the
40 probability that both performance indicators (i.e., productive capacity and product/service quality) improve.

41 Innovation decisions can therefore be characterised as a multi-faceted factor, showing distinctive
42 performance benefits depending on the type of innovation introduced by the firm and the performance
43 dimension analysed. Not only does this study contribute to empirical knowledge on the link between
44 innovation and business performance in Spanish SMEs, but it also incorporates a multi-dimensional
45 approach in order to assess the impacts of innovation decisions (of either a technological or non-
46 technological nature) on alternative business performance dimensions and indicators.

47 We are aware that our research has certain limitations due to the reduced sample of Spanish SMEs
48 and the static nature of the data. This implies that only a static model can be implemented, although we do
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65

1 recognize the importance of dynamic effects between innovation and business performance at the firm
2 level. However, the carefulness of the sampling procedure for the collection of the data assures
3 representativeness, which lends support to the empirical research undertaken. Furthermore, having access
4 to retrospective information on firm innovation enables some of the dynamic effects to be captured.
5 Additionally, the comparison of our results with those for other countries reinforces our findings.
6 Nevertheless, we aim to focus our future research on the understanding of dynamic processes between
7 innovation and its impact on the various dimensions of business performance. Bearing this objective in
8 mind, an ambitious project to gather this information from a wide sample of Spanish SMEs is currently
9 being undertaken.

14 **References.**

- 16 Amoroso, S. (2017). Multilevel heterogeneity of R&D cooperation and innovation determinants. *Eurasian Business Review*, 7(1), 93-120.
- 18 Añón Higón, D., Manjón-Antolin, M., Mániz Castillejo, J. A., & Sanchis Llopis, J. A. (2015). Does R&D protect SMEs from the hardness of the cycle? Evidence from Spanish SMEs (1990-2009). *International Entrepreneurship and Management Journal*, 11(2), 361-376.
- 22 Bianchini, S., Pellegrino, G., & Tamagni, F. (2018). Innovation complementarities and firm growth. *Industrial and Corporate Change*, 27(4), 657-676.
- 24 Ciriaci, D., Moncada-Paternó-Castello, P., & Voigt, P. (2016). Innovation and job creation: a sustainable relation. *Eurasian Business Review*, 6(2), 189-213.
- 28 Damanpour, F., Szabat, K. A., & Evan, W. M. (1989). The relationship between types of innovation and organizational performance. *Journal of Management Studies*, 26(6), 587-602.
- 30 Dobbs, M., & Hamilton, R. T. (2007). Small business growth: Recent evidence and new directions. *International Journal of Entrepreneurial Behavior & Research*, 13(5), 296-322.
- 32 Dosi, G., Grazzi, M., Moschella, D. (2015). Technology and costs in international competitiveness: From countries and sectors to firms. *Research Policy*, 44, 1795-1814.
- 34 Ebrahimi, P., & Mirbargkar, S. M. (2017). Green entrepreneurship and green innovation for SME development in market turbulence. *Eurasian Business Review*, 7(2), 203-228.
- 37 Edquist, C. (2001). *Innovation policy: A systemic approach*. Oxford, UK: Oxford University Press.
- 39 Fernandes, A. M., & Paunov, C. (2015). The risks of innovation: Are innovating firms less likely to die? *Review of Economics and Statistics*, 97(3), 638-653.
- 41 Foreman-Peck, J. (2013). Effectiveness and efficiency of SME innovation policy. *Small Business Economics* 41(1): 55-70.
- 44 Freel, M. S., & Robson, P. J. (2004). Small firm innovation, growth and performance. *International Small Business Journal*, 22(6), 561-575.
- 46 Frishammar, J., & Hörte, S. (2005). Managing external information in manufacturing firms: The impact on innovation performance. *Journal of Product Innovation Management*, 22(3), 251-266.
- 49 Goedhuys, M., & Veugelers, R. (2012). Innovation strategies, process and product innovations and growth: Firm-level evidence from Brazil. *Structural Change and Economic Dynamics*, 23, 516-529.
- 52 Golovko, E., & Valentini, G. (2011). Exploring the complementarity between innovation and export for SMEs growth. *Journal of International Business Studies*, 42, 362-380.
- 54 Griffith, R., Huergo, E., Mairesse, J., & Peters, B. (2006). Innovation and productivity across four European countries. *Oxford Review of Economic Policy*, 22(4), 483-498.
- 57 Gunday, G., Ulusoy, G., Kilic, K., & Alpkan, L. (2011). Effects of innovation types on firm performance. *International Journal of Production Economics*, 133(2), 662-676.
- 60 Hall, B. (2011). Innovation and productivity. *Nordic Economic Policy Review*, 2, 167-204.

- 1 Hall, B., Lotti, F., & Mairesse, J. (2009). Innovation and productivity in SMEs: Empirical evidence for
Italy. *Small Business Economics*, 33, 13-33.
- 2
3 Hervas-Oliver, J. L., Sempere-Ripoll, F., & Boronat-Moll, C. (2014). Process innovation strategy in SMEs,
4 organizational innovation and performance: a misleading debate? *Small Business Economics*, 43, 873-886.
- 5 Heunks, F. (1998). Innovation, creativity and success. *Small Business Economics*, 10(3), 263-272.
- 6
7 Jaumandreu, J., & Mairesse, J. (2016). Disentangling the effects of process and product innovation on cost
8 and demand. *Economics of Innovation and New Technology*, 26(1-2), 150-167.
- 9
10 Lichtenthaler, U. (2016). Toward an innovation-based perspective on company performance. *Management
11 Decision*, 54(1), 66-87.
- 12
13 Lin, C. Y., & Chen, M. Y. (2007). Does innovation lead to performance? An empirical study of SMEs in
Taiwan. *Management Research News*, 30(2), 115-132.
- 14
15 Love, J. H., & Roper, S. (2015). SME innovation, exporting and growth: A review of existing evidence.
International Small Business Journal, 33(1), 28-48.
- 16
17 Madrid-Guijarro, A., García-Pérez-de-Lema, D., & Van Auken, H. (2013). An investigation of Spanish
18 SME innovation during different economic conditions. *Journal of Small Business Management*, 51(4), 578-
19 601.
- 20
21 Mániz Castillejo, J. A., Rochina Barrachina, M. E. & Sanchis Llopis, J. A. (2010). Process innovation and
22 firm productivity growth. *Small Business Economics*, 34 (2), 147-166.
- 23
24 Mániz Castillejo, J. A., Rochina Barrachina, M. E. & Sanchis Llopis, J. A. (2015). Markups, exportaciones
e I+D: evidencia para el sector manufacturero en España. *Papeles de Economía Española*, 144, 105-122.
- 25
26 Martínez-Roman, J., & Romero, I. (2017). Determinants of innovativeness in SMEs: disentangling core
27 innovation and technology adoption capabilities. *Review of Managerial Science*, 11(3), 543-569.
- 28
29 Nemlioglu, I., & Mallick, S. K. (2017). Do managerial practices matter in innovation and firm performance
relations? New evidence from the UK. *European Financial Management*, 23(5), 1016-1061.
- 30
31 Neter, J., Wasserman, W., & Kutner, M. H. (1990). *Applied linear statistical models*. Homewood: Richard
32 D. Irwin.
- 33
34 Nieto, J., & Santamaria, L. (2010). Technological collaboration: Bridging the innovation gap between small
and large firms. *Journal of Small Business Management*, 48(1), 44-69.
- 35
36 O’Cass, A., & Sok, P. (2013). The role of intellectual resources, product innovation capability, reputational
37 resources and marketing capability combinations in firm growth. *International Small Business Journal*,
38 32(8), 996-1018.
- 39
40 OECD (2010). *Measuring innovation, a new perspective*. Paris: OECD Publications.
- 41
42 Olivari, J. (2016). Entrepreneurial traits and firm innovation. *Eurasian Business Review*, 6(3), 339-360.
- 43
44 Pérez, S., Llopis, A., & Llopis, J. (2004). The determinants of survival of Spanish manufacturing firms.
Review of Industrial Organization, 25(3), 251-273.
- 45
46 Polder, M., van Leeuwen, G., Mohnen, P., & Raymond W. (2010). Product, process and organizational
47 innovation: drivers, complementarity and productivity effects. Working Paper Series 2010-035, United
Nations University, The Netherlands.
- 48
49 Prajogo, D., McDermott, C., & McDermott, N. (2013). Innovation orientations and their effects on business
50 performance: Contrasting small and medium-sized service firms. *R&D Management*, 43(5), 486-500.
- 51
52 Rosenbusch, N., Brinckmann, J., & Bausch, A. (2011). Is innovation always beneficial? A meta-analysis
53 of the relationship between innovation and performance in SMEs. *Journal of Business Venturing*, 26, 441-
457.
- 54
55 Saunila, M. (2016). Performance measurement approach for innovation capability in SMEs. *Journal of
56 Productivity and Performance*, 65(2), 162-176.
- 57
58 Sok, P., O’Cass, A., & Miles, M. P. (2016). The performance advantages for SMEs of product innovation
59 and marketing resource–capability complementarity in emerging economies. *Journal of Small Business
60 Management*, 54(3), 805-826.
- 61
62
63
64
65

Spanish Ministry of Industry, Energy and Tourism (2013). *SMEs' statistics: evolution and indicators*. Madrid, Spain: Dirección General de Industrial y de la Pequeña y Mediana Empresa.

Spithoven, A., Vanhaverbeje, W., & Roijackers, N. (2013). Open innovation in SMEs and large enterprises. *Small Business Economics*, 41, 537-562.

Tavassoli, S., & Karlsson, C. (2016). Innovation strategies and firm performance: Simple or complex strategies? *Economics of Innovation and New Technology*, 25(7), 631-650.

Terzioski, M. (2010). Research notes and commentaries innovation practice and its performance implications in Small and Medium Enterprises (SMES) in the manufacturing sector: A Resource-based view. *Strategic Management Journal*, 31, 892-902.

Triguero, A., Córcoles, D., & Cuerva, M. C. (2014). Persistence of innovation and firm's growth: evidence from a panel of SME and large Spanish manufacturing firms. *Small Business Economics*, 43, 787-804.

Vahter, P., Love, J. H., & Roper, S. (2013). Openness and innovation performance: are small firms different? Research Paper 12, Enterprise Research Centre.

Van Auken, H., Madrid-Guijarro, A., & García-Pérez-de-Lema, D. (2008). Innovation and SME performance in Spanish Manufacturing Firms. *International Journal of Entrepreneurship and Innovation Management*, 8(1), 36-56.

Vermeulen, P. A. M., De Jong, J. P. J., & O'Shaughnessy, K. C. (2005). Identifying key determinants for new product introductions and firm performance in small service firms. *Service Industry Journal*, 25(5), 625-640.

Walker, R. M., Chen, J., & Aravind, D. (2015). Management innovation and firm performance: An integration of research findings. *European Management Journal*, 33(5), 407-422.

Yang, J. S. (2016). The governance environment and innovative SMEs. *Small Business Economics*, 48(3), 525-541.

Zahra, S., & George, G. (2002). Absorptive capacity: a review, reconceptualization, and extension. *Academy of Management Review*, 27(2), 185-203.

Zahra, S., Ireland, R., & Hitt, M. (2000). International expansion by new venture firms: International diversity, mode of market entry, technology learning, and performance. *Academic of Management Journal*, 43(5), 952-950.

Table 1. Number of observations and frequency per innovation type.

	N	%
Innovators	892	62.60
<i>Innovators by type</i>		
Product innovation	790	55.44
Process innovation	404	28.35
Organisational innovation	464	32.56

Table 2. Frequency distribution of certain categorical variables.

<i>Sector</i>	
Industry	10.81%
Real Estate & Construction	14.88%
Commercial	25.61%
Services	48.70%
<i>Size</i>	
Micro (1-9 employees)	87.93%
Small (10-49 employees)	10.46%

Medium (more than 49 employees)	1.61%
<i>Firm Strategy</i>	
Exporting	19.30%
Importing	25.26%
Attending fairs	73.12%
Market cooperation	23.79%
Institutional cooperation	15.09%

Table 3. Financial performance.

	Sales increase		Cost reduction	
	β	Marginal effects	β	Marginal effects
<i>Innovation</i>				
Product	0.3530 (0.0728)	0.1280*** (0.0257)	0.0693 (0.0730)	0.0261 (0.0274)
Process	0.1146 (0.0851)	0.0415 (0.0308)	0.1174 (0.0834)	0.0442 (0.0313)
Organisational	0.1144 (0.0780)	0.0415 (0.0282)	0.2185 (0.0758)	0.0822*** (0.0282)
<i>Firm characteristics</i>				
Small firms	0.1575 (0.1200)	0.0568 (0.0428)	0.1877 (0.1178)	0.0715 (0.0451)
Medium-sized firms	0.1484 (0.2992)	0.0535 (0.1066)	0.4173 (0.2960)	0.1584 (0.1102)
Age	0.0047 (0.0071)	0.0017 (0.0025)	0.0032 (0.0071)	0.0012 (0.0026)
<i>Business strategy</i>				
Export	0.1728 (0.0950)	0.0627* (0.0343)	0.1960 (0.0919)	0.0737** (0.0344)
Import	0.0418 (0.0906)	0.0151 (0.0329)	-0.1690 (0.0878)	-0.0636* (0.0329)
Fair	0.1425 (0.0804)	0.0517* (0.0290)	-0.0655 (0.0796)	-0.0246 (0.0299)
Market Cooperation	-0.0704 (0.0922)	-0.0255 (0.0334)	0.2222 (0.0909)	0.0836** (0.0340)
Institutional cooperation	0.1291 (0.1110)	0.0468 (0.0402)	-0.0695 (0.1066)	-0.0261 (0.0400)
Venturing orientation	0.0995 (0.0191)	0.0361*** (0.0067)	0.0542 (0.0187)	0.0204** (0.0069)
<i>Entrepreneur characteristics</i>				
Gender	0.0988 (0.0776)	0.0358 (0.0281)	0.1652 (0.0769)	0.0621** (0.0288)
Age	-0.0063 (0.0047)	-0.0023 (0.0027)	-0.0076 (0.0047)	-0.0028 (0.0017)
Experience	-0.0194 (0.0112)	-0.0070* (0.0040)	-0.0039 (0.0113)	-0.0014 (0.0042)
Primary studies	-0.3093 (0.3688)	-0.1098 (0.1262)	-0.5309 (0.3709)	-0.2001 (0.1369)
Secondary studies	-0.3171 (0.3660)	-0.1126 (0.1251)	-0.4641 (0.3680)	-0.1753 (0.1359)

Vocational training	-0.2620 (0.3670)	-0.0925 (0.1254)	-0.4405 (0.3699)	-0.1664 (0.1366)
University degree or higher	-0.2545 (0.3642)	-0.0898 (0.1242)	-0.3601 (0.3663)	-0.1360 (0.1352)
Observations	1424		1424	
Wald Chi ²	145.66***		83.09***	
Pseudo R ²	0.077		0.045	
Correctly classified	63.13%		61.24%	

***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.
Robust standard errors given in parentheses.

Table 4. Operational performance.

	Productive capacity		Quality improvement	
	β	Marginal effects	β	Marginal effects
<i>Innovation</i>				
Product	0.2433 (0.0742)	0.0857*** (0.0258)	0.3540 (0.0802)	0.0934*** (0.0208)
Process	0.3040 (0.0867)	0.1071*** (0.0301)	0.2663 (0.1003)	0.0703*** (0.0262)
Organisational	0.2093 (0.0791)	0.0737*** (0.0277)	0.1817 (0.0899)	0.0479** (0.0236)
<i>Firm characteristics</i>				
Small firms	0.0204 (0.1214)	0.0072 (0.0429)	-0.1051 (0.1387)	-0.0287 (0.0390)
Medium-sized firms	0.9379 (0.3966)	0.2724*** (0.0819)	0.6799 (0.4431)	0.1333** (0.0591)
Age	-0.0056 (0.0071)	-0.0019 (0.0025)	0.0021 (0.0081)	0.0005 (0.0021)
<i>Business strategy</i>				
Export	0.1973 (0.0976)	0.0695** (0.0342)	0.1579 (0.1109)	0.0416 (0.0292)
Import	-0.0626 (0.0912)	-0.0220 (0.0321)	-0.0702 (0.1018)	-0.0185 (0.0269)
Fair	0.0857 (0.0815)	0.0302 (0.0286)	0.1396 (0.0874)	0.0368 (0.0230)
Market Cooperation	0.1471 (0.0943)	0.0518 (0.0331)	0.1626 (0.1106)	0.0429 (0.0291)
Institutional cooperation	-0.0574 (0.1118)	-0.0202 (0.0393)	0.1582 (0.1366)	0.0417 (0.0359)
Venturing orientation	0.0972 (0.0195)	0.0342*** (0.0066)	0.0770 (0.0225)	0.0203*** (0.0058)
<i>Entrepreneur characteristics</i>				
Gender	0.1041 (0.0782)	0.0366 (0.0275)	0.1436 (0.0865)	0.0379* (0.0228)
Age	-0.0173 (0.0048)	-0.0061*** (0.0016)	-0.0111 (0.0053)	-0.0029** (0.0013)
Experience	0.0025 (0.0115)	0.0009 (0.0040)	0.0086 (0.0128)	0.0022 (0.0033)
Primary studies	-0.0305 (0.3655)	-0.0103 (0.1233)	0.2167 (0.3861)	0.0565 (0.1074)

Secondary studies	-0.2096 (0.3615)	-0.0727 (0.1221)	0.1808 (0.3807)	0.0478 (0.1065)
Vocational training	-0.1139 (0.3630)	-0.0390 (0.1225)	0.0677 (0.3818)	0.0186 (0.1071)
University degree or higher	-0.1987 (0.3596)	-0.0689 (0.1213)	0.0381 (0.3774)	0.0105 (0.1061)
Observations	1424		1424	
Wald Chi ²	154.72***		108.51***	
Pseudo R ²	0.086		0.085	
Correctly classified	66.15%		79.21%	

***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.
Robust standard errors given in parentheses.

APPENDIX.

Table A.1. Definition of the variables.

Variable	Definition
<i>Business Performance</i>	
Sales increase	Perceived increase in sales associated to the introduction of innovation within the last three years (coded 1 if sales increase, 0 otherwise).
Cost reduction	Perceived reduction in production costs associated to the introduction of innovation within the last three years (coded 1 if cost reduction, 0 otherwise).
Productive capacity	Perceived increase in productive capacity associated to the introduction of innovation within the last three years (coded 1 if capacity augmentation, 0 otherwise).
Quality improvement	Perceived increase in quality associated to the introduction of innovation within the last three years (coded 1 if quality improvement, 0 otherwise).
<i>Innovation</i>	
Product innovation	Whether the business had introduced any new or significantly improved product/service innovation within the last three years (coded 1).
Process innovation	Whether the business had introduced any new or significantly improved process innovation within the last three years (coded 1).
Managerial innovation	Whether the business had introduced any new or significantly improved managerial innovation within the last three years (coded 1).
<i>Firm Characteristics</i>	
Size	Dummy variable coded 1 if the business belongs to any of the following size categories: Micro (1 to 9 workers), Small (10 to 49 workers), or Medium-sized (50 to 249 workers).
Age	Years since the business was founded.
<i>Business Strategy</i>	
Export	Dummy coded 1 if the business exports abroad.
Import	Dummy coded 1 if the business imports from abroad.
Fair	Dummy coded 1 if the business participates in business fairs.
Market Coop.	Dummy coded 1 if the business cooperates actively with business partners in R&D activities.
Institutional Coop.	Dummy coded 1 if the business cooperates actively with public institutions in R&D activities.
Venturing orientation	Variable measuring the venturing orientation of the firm (=1 for highest risk aversion to enrolling in risky business projects, and =7 for lowest risk aversion).
<i>Entrepreneur Characteristics</i>	
Gender	Dummy coded 1 if the entrepreneur is male (=0 if female).
Age	Age of the entrepreneur.
Experience	Years of managerial experience of the entrepreneur in the business.

Qualification Dummy coded 1 if the entrepreneur attained a certain level of studies (=1 unqualified, =2 primary studies; =3 secondary studies; =4 vocational training; =5 university degree or higher).

<i>Business Environment</i>	
Region	Dummy coded 1 if the business is located in a particular region.
Sector	Dummy coded 1 if the business operates in a particular sector.

Table A.2. Descriptive statistics.

Variable	Mean	Std. Dev.	Median	Percentile 25%	Percentile 75%
<i>Business Performance</i>					
Sales increase	0.550	0.498	1	0	1
Cost reduction	0.447	0.497	0	0	1
Productive capacity	0.591	0.492	1	0	1
Quality improvement	0.790	0.407	1	1	1
<i>Innovation</i>					
Product innovation	0.554	0.497	1	0	1
Process innovation	0.284	0.451	0	0	1
Managerial innovation	0.326	0.469	0	0	1
<i>Firm Characteristics</i>					
Micro firms	0.879	0.326	1	1	1
Small firms	0.105	0.306	0	0	0
Medium-sized firms	0.016	0.126	0	0	0
Age of firm	17.578	13.691	14	8	23
<i>Business Strategy</i>					
Export	0.193	0.395	0	0	0
Import	0.253	0.435	0	0	1
Fair	0.731	0.443	1	0	1
Market Coop.	0.238	0.426	0	0	0
Institutional Coop.	0.151	0.358	0	0	0
Venturing orientation	3.204	1.888	3	1	5
<i>Entrepreneur Characteristics</i>					
Gender	0.699	0.459	1	0	1
Age	46.928	9.765	47	39	54
Experience	16.712	10.182	15	9	23
No studies	0.009	0.095	0	0	0
Primary studies	0.125	0.331	0	0	0
Secondary studies	0.190	0.393	0	0	0
Vocational training	0.180	0.385	0	0	0
University degree or higher	0.495	0.500	0	0	1