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Environmental investments: Too much of a good thing?

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Abstract: Using an original and large database on more than 6000 French firms over a 5 years period we add empirical evidence regarding the effect of environmental investments on economic performance, measured by firms' net profits. We apply a fixed-effects model at the firm year level which controls for unobserved heterogeneity. We show that this effect follows an almost U-inverted curve, implying that there is an optimal level of environmental investment. Too little or too much environmental effort can be detrimental to firms' economic performance. Looking more specifically at the shape of the curve, we found that the effect of green investments on economic performance does not exactly follow a perfectly balanced U-inverted function. The part of the curve where investing more in greenness improves profits is reduced and the optimal point is quickly reached, implying that for most firms in our sample, only 'limited' green investments are profitable. In other words, win-win strategies exist but they are likely to be quickly 'exhausted'. This finding also suggests that 'systematically' encouraging firms to be always greener can be detrimental to economic performance, when the firms are located beyond the turning point. In a dynamic perspective, managing finely the tensions between green commitments in relation with various stakeholders and the pursuit of profitability can become increasingly complex and costly, but this ability can constitute the key determining whether the chosen level of green investments will be conducive or detrimental to economic performance improvement.

Key-words: environmental investment, economic performance, inverted U-shape, panel, fixed effects.

JEL numbers: 031, 032.

Environmental investments: Too much of a good thing?

1. Introduction

Does it pay to be green? The answer to the question has attracted a large managerial and academic attention, aiming at characterizing the relationship between environmental efforts and economic or financial performance under various circumstances (e.g., Bowman and Haire, 1975; Jaffe *et al.*, 1995; Ambec and Lanoie, 2008; Horváthová, 2010; Barnett and Salomon, 2012; Dixon-Fowler *et al.*, 2013). The conventional wisdom is that environmental efforts are an extra and costly burden imposed on firms, likely to reduce their profitability, *ceteris paribus*. Nevertheless, such a paradigm has been challenged by researchers (e.g., Porter and Van Der Linde, 1995) who developed several mechanisms and circumstances under which a company's environmental performance can be associated with better economic performance, for example, by a more efficient use of resources. In their survey, Ambec and Lanoie (2008) listed seven channels through which environmental investments may raise the benefits of firms or cut their costs: 1) better access to markets, 2) possibility for differentiation of products, 3) commercialization of pollution-control technology, 4) savings on regulatory, 5) material, energy and services, 6) capital, and 7) labor costs. Nevertheless, when the firm has exploited all profitable opportunities and inefficiencies related to pollution, further investments can imply the use of cost-ineffective technologies where the marginal abatement cost becomes higher than the marginal benefit from pollution abatement. Several mechanisms can explain these inefficient over-investments such as positional races (e.g., remaining the greenest company), lock-in to suboptimal technologies, first mover disadvantages (Lieberman and Montgomery, 1998), regulatory constraints and so on. In short, the crucial issue is not whether it pays to be green but rather to better understand the conditions under which firms can find it profitable to invest in environmental improvements.

Several reviews and meta-studies regarding the relationship between greenness and economic performance are available (e.g., Salzmann *et al.*, 2005; Ambec and Lanoie, 2008; Horváthová, 2010; Dixon-Fowler *et al.*, 2013). In short, the sizeable previous literature offers mixed and even contradictory results, with anecdotal evidence supporting the two views and empirical evidence of a negative relationship, positive one, and no relationship at all. Interestingly, some papers (e.g., Barnett and Salomon, 2012) suggested a non-linear correlation, which may explain to some extent the inconsistency between several empirical studies (Salzmann *et al.*, 2005). For example, using a very small number of pulp and paper firms, Bowman and Haire (1975) found that measured by return on equity, middle performers with regard to pollution control were more profitable than either low or high performers. Extreme environmental performance in both directions was associated with reduced profitability, but the low-end tail was lower than the high-end tail. Nevertheless, their analysis was ‘rudimentary’ and, similarly to a large part of the literature, did not suppose a causal relationship. More recently, analyzing Japanese manufacturing firms, Fujii *et al.* (2013) also demonstrated that there is a significant inverted U-shaped relationship between return-on assets and environmental performance calculated by aggregated toxic risk.

A better understanding of the relationship between environmental and economic performance is crucial for several reasons notably related to the relevance and design of additional regulations. For sake of exposition, let us suppose that this relation is positive. Documenting that it pays to be green will encourage firms to voluntarily improve their environmental performance and show that increasing environmental regulation is unnecessary. Moreover, even if this positive relationship holds only for some firms in some circumstances, identifying the characteristics will help regulators to concentrate their monitoring efforts on firms for

which the correlation between environmental and economic performance is weak (Telle, 2006). Hence, using an original and large database on more than 6000 French firms over a 5 years period (29719 observations) we investigate the nature of the relationship between environmental investments and economic performance. Interestingly, Grolleau *et al.* (2013) investigated a similar sample of French firms (N=9411) and found that environmental commitment may be related to higher economic performance, especially within firms committed to quality improvement. Nevertheless, their study focused on environmental standards and did not analyze panel data. Our empirically-based paper may allow solving the vexing puzzle raised by mixed evidence regarding the nature of such a relationship.

In line with previous studies suggesting a non-linear relationship, we hypothesize that *the causal relationship between environmental efforts and economic performance follows an inverted U-shaped function*. Win-win situations are possible but only under certain circumstances and not necessarily sustainable. In other words, despite the benefits of environmental investments, an excessive green or misdirected investment could be detrimental for firm performance since those kinds of investments require a large financial investment and also entail important risk (Salzmann *et al.*, 2005). The main originality of our study is to test empirically the U-inverted relationship between environmental effort and economic performance on a large sample of French firms. By using panel data, we add empirical evidence on a possible causal relationship rather than a simple correlation analysis.

Unlike previous papers and given the nature of available data, we consider environmental investments or expenses rather than environmental performance *per se*. Even if the two are undoubtedly interrelated, the former is more immediate and tangible for firms, because it corresponds to environment-related expenses. These expenses will not automatically imply

better environmental performance¹ and they may be driven by other concerns such as raising the budget of the environmental department, benefiting from tax advantages, meeting regulatory constraints or addressing positional issues (e.g., remaining the greenest company). Even if corporate ex post environmental performance seems a natural candidate to investigate the considered relationship, Nakamura (2011) makes a case in favor of using environmental investment or ‘corporate efforts to conserve the environment’. Indeed, he stresses that several studies focused on posterior environmental outputs such as the level of toxic wastes (King and Lenox, 2001) or corporate environmental ratings (Al-Tuwaijri et al., 2004) and subsequently overlook the prior efforts and costs to the firm. “Although these pollution outputs are decided partly by ex ante firm investment in environmental conservation, it does not necessarily reflect the amount of investment itself. The costs needed to achieve the same level of environmental performance differ depending on corporate characteristics and external conditions such as firm technology, management policy, knowledge spillovers in an industry, and so on. This means that, as long as we focus on posterior environmental performance, which is influenced largely by various factors, we cannot answer the question of whether a firm can improve its economic performance by making efforts to conserve the environment”. As Nakamura (2011), we contend that using firm-level environmental investment data allows us to correctly capture firm’s ex ante effort toward sustainable management. Moreover, the (unobserved) motives behind environmental investment (e.g., intrinsic desire to be environmentally conscious, stakeholders’ pressures, positional benefits, tax and other economic advantages) are not necessarily reflected in environmental performance.

¹ The relation between environmental investment and environmental performance is crucial but beyond the scope of this paper. Environmental investment seems necessary to sustain good environmental performances but the relation is not necessarily linear and deserves further attention. As stressed by Dasgupta et al., (1997), corporate environmental performance can be due to factors beyond environmental investment such as plant technology, plant-level management policies, education level of employees, size, regulatory pressure and public scrutiny.

The remainder of the paper is organized as follows. In the next section, we explain the non-linear relationship between environmental and economic performance. Section 3 describes the data and econometric method. Section 4 provides the empirical results and discusses them. In section 5, we draw some policy and managerial implications and conclude.

2. The non-linear relationship between environmental and economic performance

Let us explain the various parts of the inverted U-curve examined in this paper. In line with Porter's arguments, pollution can be considered as a manifestation of economic waste and involves unnecessary and incomplete utilization of resources, which suggests that efforts for pollution reduction may improve the way firms use resources. As asserted by Porter and Van der Linde (1995), "reducing pollution is often coincident with improving the productivity with which resources are used." These efforts correspond to the first portion of the U-inverted curve where the costs of green investments are more than recovered by efficiency gains. For instance, "in the 2001 report by Baxter International, (...) an Illinois medical products maker, the company detailed how reductions in energy and water use and improved waste disposal and recycling over the past seven years cut costs by \$53 million this year. That savings amounted to nearly 10% of its net income".² These green investments allow eliminating inefficiencies, reaping the low-hanging fruits and taking advantage from green-related opportunities until all possibilities of win-win green investments are exhausted.

Beyond this tipping point which corresponds to the optimal level of green investments, investing more in greenness can become counter-productive because the costs of green investments exceed the benefits, leading to the second portion of the U-inverted curve. A

² Roston, E. 2002. New war on waste. *Time* (08-26), A28-A21.

natural objection is that if additional green investments are detrimental to economic performance, then firms will not overinvest, unless we assume they are irrational or misinformed. Nevertheless, detrimental over-investments can be explained by various and non-mutually exclusive mechanisms such as positional races (e.g., remaining the greenest company), lock-in to suboptimal technologies, first mover disadvantages (Lieberman and Montgomery, 1998), inefficient regulatory constraints, or the *deformation professionnelle* bias.

Let us develop some of these to better illustrate our argument. Positional races imply that entities are not interested in improving their environmental outputs *per se* but in getting better environmental output than others from their reference group. Over-investing in greenness can be detrimental to the economic performance but allows maintaining a high rank, such as being the greenest company. Regulatory constraints can be first well aligned with efficiency improvements at the firm level but this synergistic relationship is not infinite and tougher regulations can at some point lead firm to detrimental over-investments. Even at a country level, positional preferences over public goods can influence policy choices and ultimately firm decisions. For instance, an anecdote is reported regarding how Norway expressed positional preferences based on the publication of the Environmental Sustainability Index: “After Norway came in second, the prime minister asked for a meeting to discuss the results. Rather than crowing about Norway’s superb showing, all he wanted to talk about was what his country could do to overtake Finland and become number one.”³

In the same vein, because of the *deformation professionnelle* bias, people have the tendency to analyze things from their specific point of view and overlook a broader perspective.

Environment-related decisions from managers in charge of environmental issues frequently

³ Ayres, I., Nalebuff, B. 2005. Peer Pressure. *Forbes* (11-04), <http://www.forbes.com/forbes/2005/0411/118.html>

involve two sides: an environmental and a business side. Under some plausible circumstances, additional investments in greenness can be perfectly justified from an environmental viewpoint and vigorously recommended by some managers while constituting simultaneously a bad decision from a business viewpoint. If the producer decision is too environment-driven and insufficiently business-conscious, the decision by default can be suboptimal from the profit viewpoint. Additional environmental investments can be beneficial at a given place and time and detrimental at another place and time.

3. Data and econometric method

Data

The data is extracted from two French surveys conducted by the Institute for Statistics and Economic Studies (INSEE). The first survey relates to industry investment in environmental protection (ANTIPOL). It includes information on the total cost and type of analyses carried out, investments (every year) and current expenditure (every three years) related to environmental protection. The second survey is called the Annual Firm Survey (EAE). It is a mandatory survey conducted by INSEE to collect basic data among 8,000 firms.⁴ The variables from this survey are used as controls in the regression analysis. After merging the two databases, our sample consists in 29719 observations covering the period from 2003 to 2007. The firms in our dataset belong to manufacturing sectors including agrifood, consumption goods, cars, equipment, intermediate goods and energy.

Variables

⁴ More details about the ANTIPOL and EAE surveys are respectively available on

<http://www.insee.fr/sessi/enquetes/antipol/antipol.htm> and <http://www.insee.fr/sessi/enquetes/eae/eae.htm>.

In order to test the effect of green investments on economic performance, we used the following variables: our dependent variable, denoted *NET_PROFIT*, corresponds to the company's profit minus cost of goods sold, expenses and taxes for an accounting period. As indicated by Barnett and Salomon (2012) who also used net profit, the use of ratio measures such as return-on-assets (ROA) as dependent variables may exaggerate relations of interest and confound the interpretation of results. Our key independent variable, denoted *INVT*, measures the total amount of green investments in the firm divided by sales, including the purchase of buildings, land, machinery or equipment to treat, measure, and control or restrict the pollution generated by the firm's activities. More precisely, some of these investments are specific and others are integrated. Specific ones are related to equipment dedicated to the environment: filters, drip trays, instruments for measuring pollution, etc. Integrated investments cover the purchase of materials that generate less pollution than others available on the market, such as the purchase of electric vehicles, less-polluting machines that emit less smoke, generate less waste, use less water, make less noise, etc. The advantage of using this variable is that it includes both technical and organizational activities of the firm that are oriented to minimize negative effects on natural environment. In addition, environmental investment generally reflects firm's credible commitment for reducing environmental impacts (Lee *et al.*, 2015). Moreover, in order to account for firm-level heterogeneity, we controlled for the following firm characteristics based on previous studies (e.g., Waddock and Graves, 1997; McWilliams and Siegel, 2000; Bernard *et al.*, 2003; Crifo *et al.*, 2015): the number of employees in the firm (*SIZE*), earnings before interest, taxes, and depreciation (*EBITDA*),⁵ total production (*PRODUCTION*), share of exports in total sales (*EXPORT*) and marketing

⁵ Here, *EBITDA* refers to the French EBE (*Excédent Brut d'Exploitation*) which is almost the same thing, since the major difference concerns amortization which is not referred to in the French EBE. Nevertheless, to avoid misunderstanding by non-French readers we name it *EBITDA* in the manuscript.

expenses (*MARKETING*). Unfortunately, other variables likely to shape economic performance, such as expenses in research and development, were not available in our data. The variables used in estimation and some descriptive statistics are presented in Table 1. Appendix 1 presents the correlation matrix.

[Insert Table 1 around here]

The empirical model

Based on the Hausman test, we compared the difference between the random-effect estimator and the fixed-effect estimator under the null hypothesis that the individual effects are uncorrelated with the other regressors in the model (Hausman, 1978). The test shows that for our model a random effect model produces biased estimators and therefore the fixed-effect model is preferred. Therefore, we rely on a fixed-effects model (Greene, 2003) at the firm year level with clustered standard errors in order to address heteroscedastic disturbance and the correlation among residuals over time. Unlike cross-sectional analyses, panel data analyses capture unobserved heterogeneity effects. Moreover, the fixed-effects model controls for unobserved heterogeneity without having to precisely specify the source of that heterogeneity, which eliminates bias in statistical results (Barnett and Salomon, 2012). It also allows us to estimate the effects of the independent variables on the dependent variable while controlling for unobservable time invariant aspects. In addition to panel data, reverse causality is also controlled using lagged explanatory variables ($t-1$). Noteworthy, doing so reduces our sample to 16088 observations. Moreover, previous research has generally examined inverted U-shaped hypotheses using the significance levels for the squared term of the variable of interest. Formally, if *INVT* is positive and significant and the squared term is negative and

significant, the effect of the variable is considered to exhibit an inverted U-shaped relationship.

Let i, t, Z, α , and ε be the firm, period, vector of the control variables, intercept and error term, respectively. Let also δ_1, δ_2 and δ_3 be the coefficients to be estimated. The fixed-effects panel model is estimated according to the following equation:

$$NET_PROFIT_{it} = \alpha + \delta_1 INVT_{it-1} + \delta_2 INVT_SQUARED_{it-1} + \delta_3 Z_{it-1} + \varepsilon_{it}$$

4. Results and discussion

The results of the fixed-effects model are reported in Table 2. At first glance, the findings support our main hypothesis that the causal relationship between environmental effort and economic performance follows a U-inverted curve. The variable measuring environmental investment (*INVT*) is positive and significant while the squared term is negative and significant. In other words, there is an optimal level of environmental investment beyond which more environmental investments become detrimental to economic performance of firms. Interestingly, several versions of the model have been estimated to investigate the robustness of results to the omission of some variables (successively, *SIZE*, *EBITDA*, *PRODUCTION*, *EXPORT*, and *MARKETING*). The main results (Appendix 2) remain robust.

[Insert Table 2 around here]

Nevertheless, looking more specifically to the form of the curve by using the predicted values obtained after the fixed-effects model (Figure 1), we found that the effect of green investments on economic performance does not exactly follow a perfectly balanced U-

inverted function. Concretely, the space where investing more in greenness improves firms' economic performance is reduced and the optimal point seems quickly reached. In other terms, for the French firms in our sample, only limited green investments will lead to better economic performance. Formally, our findings suggest that the variable *NET_PROFIT* starts to decline when the share of environmental investments exceeds 16.5% of total sales [$F(x) = 155.76 + 3.07^2x = 16.53$]. Beyond this point, investing more in greenness becomes detrimental to economic performance. Nevertheless, firms can decide to over-invest for several reasons such as technological lock-in or commitment escalation in a positional environmental race. Noteworthy, around 20% of the firms in our sample dedicate 16.5% or more of their sales to environmental investments.

[Insert Figure 1 around here]

Of course, one may argue that our analysis is an aggregate one and does not account for sector specificities. However, on one hand, a fixed-effects model does not allow controlling for firms' activities, since the latter do not change over time. On the other hand, examining the effect of green investments on economic performance by sector would drastically reduce our sample. Nevertheless, regarding the latter point, we run additional tests (Appendix 3) regarding the effect of the variable *INVT* on *NET_PROFIT* and the shape of the curves by sector and found that for two sectors, namely cars and intermediate goods, the effect is quite similar to that obtained for the whole sample. Noteworthy, the effect of the variable *INVT* on *NET_PROFIT* in energy sector is almost significant at 11%. Moreover, for the three other sectors, namely agrifood, consumption goods and equipment, the effects were not significant. In other words, the causal relationship between greenness and firms' economic performance does not hold similarly for all sectors. Yet the (contradictory) results of previous studies are

probably what they are partly due to the dominating sectors and their features in the examined samples, which can drive the aggregate pattern in a given direction. Nevertheless, given the reduced sample size for the regressions by sector (e.g., 656 observations in the cars, 8960 in the intermediate goods and 168 in the energy sectors), we remain cautious and suggest to not over-interpret these findings.

5. Conclusion and implications

Thanks to a panel analysis, we found that the causal relationship between environmental efforts and economic performance can be explained by an almost U-inverted function, which may explain, at least to some extent, the quite mixed evidence found in the literature. In short, the ‘dose’ of green investments makes the ‘poison’ (in terms of reduced profitability). This finding suggests that ‘systematically’ encouraging firms to be always greener can be detrimental to economic performance, when the firms are located beyond the turning point. Identifying the turning point for each sector can be very useful for the construction and implementation of finely tuned environmental regulations. This point indicates the space where self-regulation can be enough to encourage green investments without the need of governmental regulations, but also the space where regulators have a role to push firms to go further. Interestingly, regulations *per se* can influence the turning point itself and can be strategically used to reach some socially desirable goals, without ignoring collateral consequences.

Moreover, the optimal level of environmental investments is not exogenous and depends on the balance between the benefits derived from going green (e.g., resource efficiency allocation, improved recruitment, new market opportunities) and the incurred costs. Hence, identifying clearly the benefits and costs associated with various kinds of environmental

investments in different sectors constitutes an important step. Examining the conditions or circumstances under which the benefits outweigh the costs is another step. Of course, such an analysis is not static and fixed but must include a built-in flexibility to adapt to evolving circumstances such as innovations and new regulations. When a firm is located close to the turning point, it may have to manage tensions between its green commitments in relation with various stakeholders (e.g., environmental associations, regulatory agencies, customers, and neighbors) and its pursuit of profitability. Therefore, managing finely these tensions can become increasingly complex and costly, but this ability can constitute the key determining whether the chosen level of green investments will be conducive or detrimental to economic performance improvement. From a firm's viewpoint, our finding provides a potential explanation for why some firms decide not to commit in some environmental innovations. In other words, if a firm considers it has yet 'largely' invested in improving its environmental performance –or, alternatively, it did not invest in the 'right' green expenditure, it may estimate that additional efforts are likely to harm its profit. Moreover, our results also suggest that a race to become the greenest company, which is influenced by several policies and measures (e.g., green rankings), may be costly and even detrimental in terms of economic performance if the company is positioned in a particular portion of the U-inverted curve.

Lastly, our analysis is an aggregate one and emphasizes the need of sectoral studies to identify the turning point for various relevant subgroups of firms. We showed that all kinds of green investments are not good *per se*, but green strategies must be examined at a more detailed level, to avoid an automatic pro-environmental or anti-environmental bias. Unfortunately, as explained above, although our main result (i.e., a quasi U-inverted relationship between green investments and economic performance) has been found to hold more or less for some sectors (cars, goods and energy), we were not in a position to test for sector specificities in a rigorous

way, mainly due to the nature of the model and sample size. Such tests definitely constitute a challenging and insightful issue for future research. In addition, scholars should also consider other parameters that condition firms' overall performance such as the quality of the management and the market structure.

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Table 1: Definition of variables and descriptive statistics (N=29719)

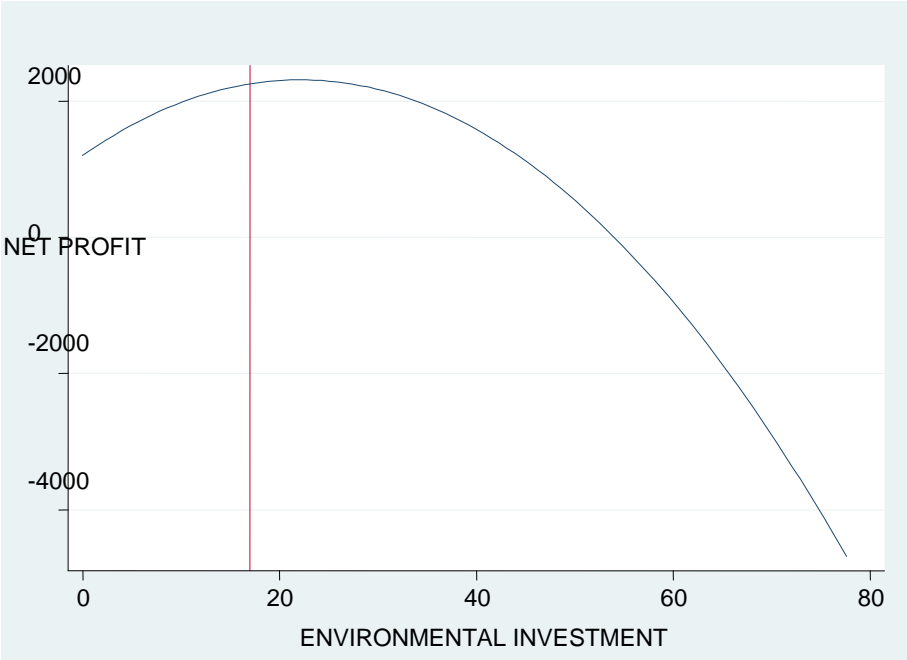
Variables	Definition	Mean	SD
NET_PROFIT	Firm's profit minus cost of goods sold, expenses and taxes for an accounting period (€) (Continuous variable)	968.71	6258.84
INVT	The total amount of green investment divided by sales (Continuous variable)	.2180528	1.351199
SIZE	Number of employees (Continuous variable)	177.5697	249.7592
EBITDA	Earnings before interest, taxes, and depreciation (Continuous variable)	3109.28	14996.12
PRODUCTION	Total production sold (€) (Continuous variable)	35381.96	151107.8
EXPORT	Exports divided by total sales (Continuous variable)	0.24	0.27
MARKETING	Marketing expenses (€) (Continuous variable)	813.8337	8005.002

Table 2: Results of the fixed effects model

Variables	Coefficients and significance
Intercept	978.92
<i>INVT</i>	<i>155.76***</i>
<i>INVT_SQUARED</i>	<i>-3.07***</i>
SIZE	-3.05
EBITDA	0.11*
PRODUCTION	0.01
EXPORT	375.54
MARKETING	0.01
No. of observations	16088
No. of firms	6400
Year fixed effects	YES
Obs. per group (min/avg/max)	1/2.5/4
F(10,6399)	5.83***

***: $p < 0.01$; **: $p < 0.05$; *: $p < 0.1$

Figure 1: Relationship between environmental investment and economic performance



Appendix 1: Pearson correlation coefficients

	1	2	3	4	5	6	7
NET_PROFIT	1.00	-	-	-	-	-	-
INVT	-0.01	1.00	-	-	-	-	-
SIZE	0.26	-0.03	1.00	-	-	-	-
EBITDA	0.50	-0.00	0.43	1.00	-	-	-
PRODUCTION	0.32	-0.02	0.72	0.57	1.00	-	-
EXPORT	0.09	-0.01	0.17	-0.12	0.16	1.00	-
MARKETING	0.22	-0.01	0.17	0.22	0.25	-0.01	1.00

Appendix 2: Check of the robustness of the overall results

Variables	Coefficients and significance				
Intercept	407.79	978.92	923.29	1069.44	975.50
<i>INVT</i>	<i>155.03***</i>	<i>153.09***</i>	<i>155.91***</i>	<i>154.17***</i>	<i>155.87***</i>
<i>INVT_SQUARED</i>	<i>-3.04***</i>	<i>-3.02***</i>	<i>-3.03***</i>	<i>-3.04***</i>	<i>-3.07***</i>
SIZE	-	-2.79	-1.99	-3.03	-3.04
EBITDA	0.11*	-	0.12***	0.12*	0.11*
PRODUCTION	0.01	0.02***	-	0.01	0.01
EXPORT	345.00	413.36	430.10	-	369.70
MARKETING	0.01	0.02	0.02	0.01	-
No. of observations	16088	16088	16088	16088	16088
No. of firms	6400	6400	6400	6400	6400
Year fixed effects	YES	YES	YES	YES	YES
Obs. per group (min/avg/max)	1/2.5/4	1/2.5/4	1/2.5/4	1/2.5/4	1/2.5/4
F	6.45***	5.68***	6.32***	6.49***	6.35***

***: $p < 0.01$; **: $p < 0.05$; *: $p < 0.1$

Appendix 3: Effect of INVT on NET_PROFIT by sector

Coefficients and significance						
Variables	Agrifood	Consumption goods	Cars	Equipment	Intermediate goods	Energy
Intercept	2511.02***	2277.29*	5714.72	2444.84	-726.63	44434.21***
<i>INVT</i>	-93.98	519.78	4375.45***	618.05	140.00 *	1990.19
<i>INVT_SQUARED</i>	6.75	-91.21	-1781.54***	-218.58	-2.43 *	-77.58
SIZE	-2.55	-4.91	-19.54**	-6.47	1.94	-151.21*
EBITDA	0.36	0.15	0.30	0.18	0.19*	0.07
PRODUCTION	-0.01	-0.01	0.07*	0.00	0.01	0.03
EXPORT	-5624.32*	-532.16	-2273.77	568.20	788.01	955.24
MARKETING	0.01	0.02	3.13	-0.41	0.30	-2.91
No. of observations	1331	2377	656	2436	8960	168
No. of firms	629	976	226	985	3527	72
Year fixed effects	YES	YES	YES	YES	YES	YES
Obs. per group (min/avg/max)	1/2.1/4	1/2.4/4	1/2.9/4	1/2.5/4	1/2.5/4	1/2.3/4
F	2.79***	0.93*	3.83***	4.69 ***	5.06 ***	1.54

***: $p < 0.01$; **: $p < 0.05$; *: $p < 0.1$

