Technological Innovation Inputs, Outputs and Performance: the moderating role of Family Involvement in Management

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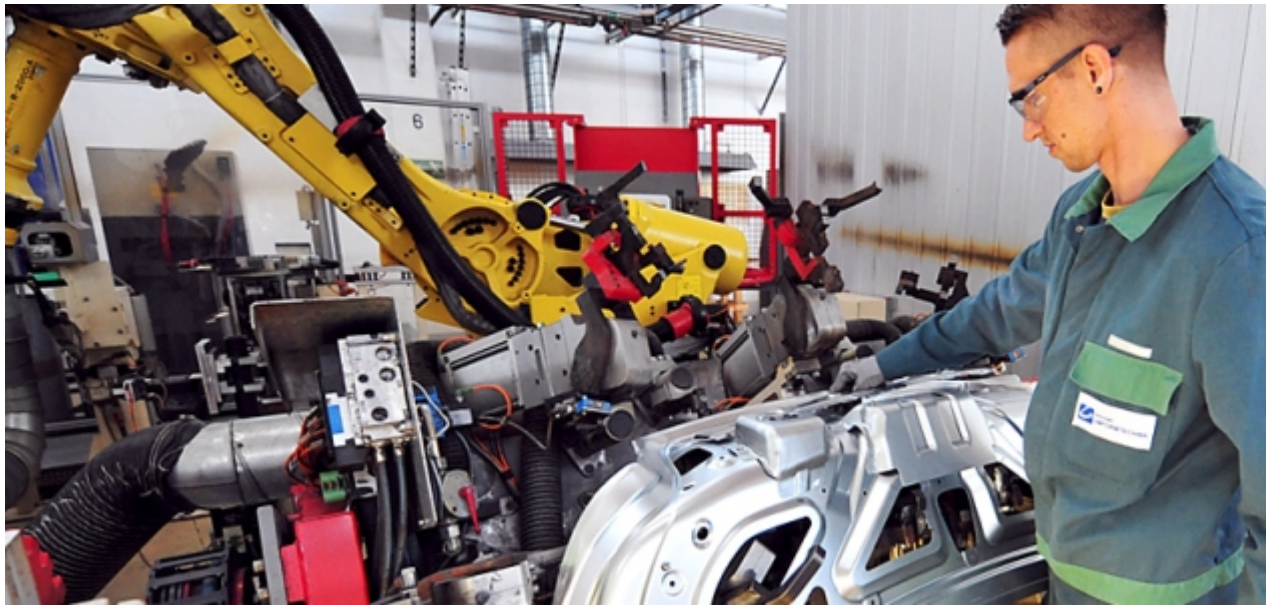
Gestamp strengthens its leading position in Germany's automotive industry with the opening of its new Chassis Innovation Center in Bielefeld



"For us the R & D is a priority. We believe that innovation is a key factor for success through differentiating our products and services.During the process of conception, design and production of a product, we focus on reducing weight and increasing passive safety "(http://www.gestamp.com)

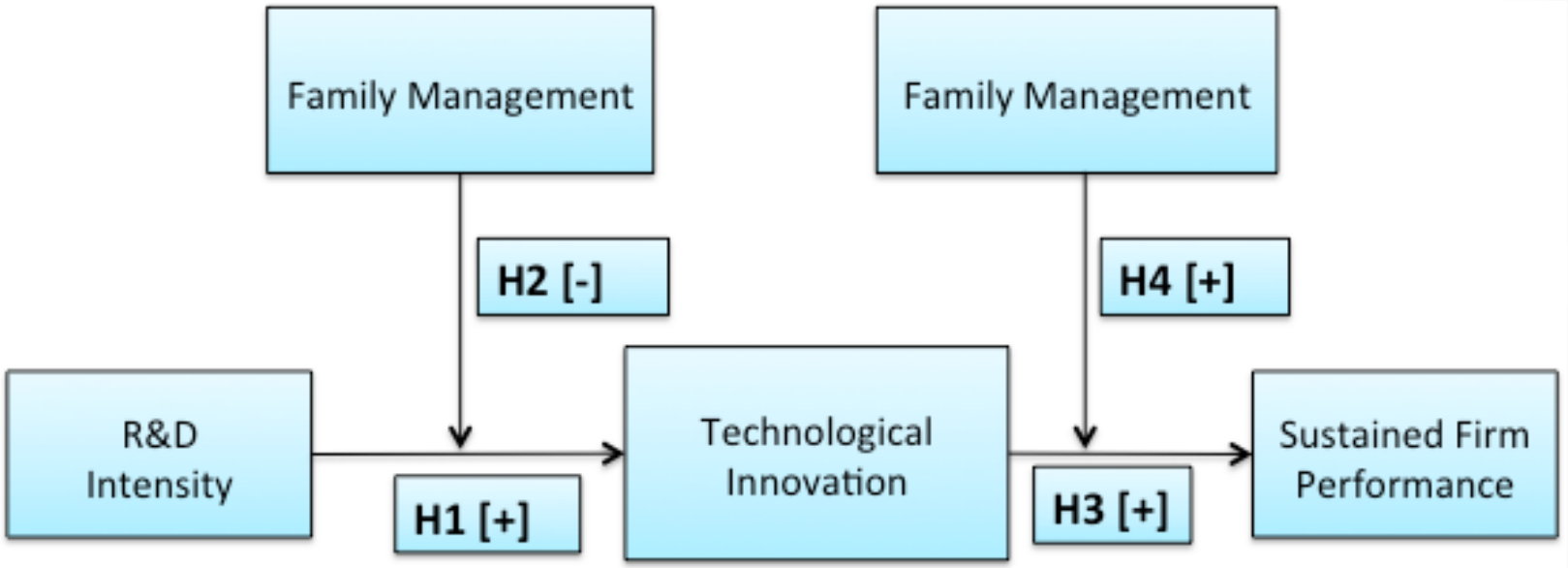
General aims of the study

- To enhance the understanding of existing models of antecedents and effects of technological innovation (TI) in SMEs

- To compare antecedents and effects of TI in family and nonfamily managed firms

Theory development and hypotheses

Figure 1. Proposed theoretical model



R&D intensity and continuous technological innovation outcomes

- The R&D effort -determinant of technological innovation- (Souitaris, 1999)
- + Relationship between R&D intensity and TI (Chu, 2009; Mansfield, 1981).
- Some lag between R&D spending and research outcomes (Chin et al., 2009)
- R&D resources are vital to achieve CTI (Shang et al., 2010) over time (Damanpour & Evan, 1984)

H1: R&D intensity has a positive effect on the occurrence of continuous technological innovation (CTI) outcomes.

R&D intensity, continuous technological innovation outcomes and family management

- Family Ownership is detrimental to R&D intensity (e.g. Block, 2012)
- It is contingent on the economic performance levels below the family's aspirations (Christman & Patel, 2012) or the overlap family wealth/firm equity (Sciascia et al., 2014).
- Concerning the outcomes of innovation activity: inconsistent and inconclusive findings (Nordqvist, 2010; Westhead, 1997).
- RBV have argued for resource orchestration advantages (Sirmon, Hitt, Ireland, & Gilbert, 2011), while BAM have suggested that FBs underinvest in R&D (Chrisman & Patel, 2012; Kotlar et al., 2013).
- Chrisman et al. (2015): superior ability to innovate yet lower willingness to engage in technological innovation (the paradox)
- Duran et al. (2015): that family control undermines innovation input but that these very same attributes translate into superior innovation output

R&D intensity, continuous technological innovation outcomes and family management

- As there has been little research on whether family firms are more efficient than non-family firms in the conversion process of innovation input into output
- and we have very limited insights about whether family firms generate more efficiently economic consequences from technological innovation than non-family firms:

- We propose that the level of family management could act as a driver of the ability and willingness paradox influencing technologic innovation efficiency.
- Family management dimension is more apt to reflect a family`s SEW agenda and its consequences (Gomez-Mejia, Cruz, et al., 2011).
- We expect the pursuit of SEW may affect the relationship between R&D intensity and the existence of continuous technological innovation outputs and between the latest and long-term performance.

R&D intensity, continuous technological innovation outcomes and family management

Family management may limit the conversion of R&D activities into CTI.

Less Willingness

- Invest less intensively, reluctant to jeopardize their discretion (Classen et al., 2012) and their wealth (Zahra, 2005). Resource-constraining SEW agenda. Risk adverse managers/modest innovations.
- Lack of executive talent, limited pool of human capital (Block, et al., 2013). Known for *taking assets out* (Sirmon & Hitt, 2003).

Less ability

- Entrepreneurial spirit and talent not necessarily inherited (Chrisman et al., 2005).

H2: Family management has a negative influence in the relationship between R&D intensity and the occurrence of CTI

Technological innovation outcomes and sustained firm performance

- The significance of the TI outcomes ≠ their specific economic consequences.
- The relevance of TI outcomes will come with their impact on economic growth and firm performance (Hall et al., 2005; He & Wang, 2008; Schumpeter, 1942).
- Previous research supports the view that TI is a major influence on industrial competitiveness and national development (Tidd, 2002).

H3: The existence of technological innovation outcomes have a positive effect on long-term performance.

Theory development and hypotheses

Technological innovation outcomes, sustained performance and family management

Family management may facilitate the conversion of Technological innovation outcomes into firm long-term performance.

More willingness

- Adopt a risky behaviour (Chrisman et al, 2014b) to avoid the loss of socio-emotional wealth (Gómez-Mejia et al., 2007). Extraordinarily competent and sensitive to shape their firms`s strategy in a more muscular way if long-term performance is not appropriate (changing the course if necessary).

More ability

- Greater discretion, low levels of formalization and bureaucracy, interest alignment between owners and managers (Block et al., 2013), the protection of family name and reputation (Dunn, 1996) by the long-term relationships with firm stakeholders (Miller & Le Breton-Miller 2005).

Family management facilitates the conversion of Technological innovation outcomes into firm long-term performance.

More ability

Under the influence of the family management, family firms creates a distinctive social resource and support (Habbershon & Williams, 1999) that contribute to generate a higher long-term performance from the occurrence of TI outcomes.

H4: Family management has a positive influence in the relationship between the occurrence of technological innovation outcomes and long-term performance

Research focus: Does family management affect the antecedents and effects of technological innovation?

- Particularly, does family involvement in management moderate the positive expected influence of R&D intensity (antecedent) on continuous presence of technological innovation (CTI)?

- Does family involvement in management moderate the positive expected influence of technological innovation existence on long-term performance (effect)?

Data and Method

- The data used come from the Survey on Business Strategies (ESEE). This survey is built on information from Spanish manufacturing firms.

- Accounting and innovation data was collected for the years 2000-2012. After removing firms with missing data for the analysed variables, the final sample consisted of 551 SMEs.

Data and Method

Panel B. Variable labels, survey questions and abbreviation			
Item	Survey questions	Variable definition	Abbreviation
Technological innovation outcomes *(Product and/or process innovation)*	*Product innovation* Indicate whether the company obtained product innovations during the year 20XX (completely new products or important changes that make them different from previously manufactured products). Binary Yes/No response format *Process innovation* Indicate whether during 20XX the firm introduced significant changes in production and/or distribution process. Binary Yes/No response format	Tree-point scale: 0 = There isn't any kind of technological innovation 1= There is either product innovation or process innovation 2= There is both product innovation and process innovation	TI
Continuous technological innovation outcomes	Number of years in which there are technological innovation in a period of three years.	Six-point scale: 0 to 6 by accumulation of TI variable for the years t, t+1 and t+2. The sum of three years makes the value of this variable be between 0 and 6.	CTI

Data and Method

Item	Survey questions	Variable definition
R&D intensity	Indicate expenditure on R & D performed by the company in 20XX.	Expenditure on research and development/Total sales
Family firm	Indicate both family ownership and family involvement in top management	Dummy variable which takes value 1 when there is a family with majority ownership in the firm and at least one member of that family is actively involved in top management, and 0 otherwise.
Sustained performance	Mean return on assets in three years	Mean of ROA_t, ROA_{t+1} and ROA_{t+2} (ROA= Income before non cash items, interests and taxes divided by total assets.)
Control variables	Size, Age and subindustry	

Results (H1: Fixed effects)

Effect of R&D intensity on continuous technological innovation outcomes (H1)

Variables	Predicted sign	Model 1.1. OLS	Model 1.2. Random Effects	Model 1.3. Fixed Effects	Model 1.4. Fixed effects with heterogeneity control
RDI	**+**	**2.301**** **(1.19)**	**2.983***** **(0.753)**	**3.133***** **(0.749)**	**3.133**** **(1.872)**
SIZE	**+**	**0.282***** **(0.013)**	**0.183***** **(0.028)**	0.022 (0.046)	0.022 (0.087)
AGE	**-**	**0.004***** **(0.001)**	-0.003 (0.003)	**-0.019***** **(0.005)**	**-0.019**** **(0.009)**
Intercept		**-2.851***** **(0.235)**	**-1.057**** **(0.551)**	**2.005***** **(0.702)**	2.005 (1.335)
Industry effects		Yes	Yes		
Lagrange multiplicator tests		10657.87***			
Hausman test			**61.61*****		
F test		55.30*** [22, 5956]		**11.30***** **[3, 5425]**	2.02 [3, 550]
Wald Chi²			**141.42***** **(22)**		
R2		0.17			
Within			0.0010	0.0062	0.0062
Between			0.2180	0.0304	0.0304
Overall			0.1530	0.0213	0.0213
Modified Wald test for heteroskedasticity				**1.4e+31***** **[551]**	
Number of firms		551	551	551	551

Results(H2: Fixed effects)

Moderating effect of family management on the relationship between R&D intensity and continuous technological innovation outcomes (H2)

Variables	Predicted sign	Model 2.1. OLS	Model 2.2. Random Effects	Model 2.3. Fixed Effects	Model 2.4. Fixed effects with heterogeneity control
RDI	**+**	**5.239*** (2.109)**	**7.808*** (1.358)**	**8.083*** (1.354)**	**8.083*** (2.402)**
RDI*FAMILY	**-**	**-4.297** (2.551)**	**-7.006*** (1.643)**	**-7.184*** (1.638)**	**-7.184*** (2.834)**
SIZE	**+**	**0.282*** (0.013)**	**0.184*** (0.028)**	0.026 (0.046)	0.026 (0.086)
AGE	**-**	**0.004*** (0.002)**	-0.003 (0.002)	**-0.020*** (0.005)**	**-0.020*** (0.009)**
Intercept		**-2.848*** (0.235)**	**-1.064** (0.550)**	**1.963*** (0.700)**	1.963 (1.331)
Industry effects		Yes	Yes		
Lagrange multiplicator tests		10692.41***			
Hausman test			**60.50***		
F test		53.04*** [23, 5955]		**13.31*** [4, 5424]**	**3.91*** [4, 550]**
Wald Chi²			**159.57*** (23)**		
R2		0.17			
Within			0.0037	0.0097	0.0097
Between			0.2165	0.0289	0.0289
Overall			0.1529	0.0187	0.0187
Modified Wald test for heteroskedasticity				**1.4e+31*** [551]**	
Number of firms		551	551	551	551
Number of observations		5979	5979	5979	5979

Results(H3: Fixed effects)

Effect of technological innovation outcomes on long-term performance(H3)

Variables	Predicted sign	Model 3.1. OLS	Model 3.2. Random Effects	Model 3.3. Fixed Effects	Model 3.4. Fixed effects with heterogeneity control
TI	**+**	0.002 (0.001)	**0.004***** **(0.002)**	0.001 (0.001)	0.001 (0.001)
SIZE	**+**	**0.006***** **(0.001)**	**0.009***** **(0.001)**	**0.021***** **(0.002)**	**0.021***** **(0.005)**
AGE	**-**	**-0.001***** **(0.001)**	**-0.002***** **(0.001)**	**-0.008***** **(0.001)**	**-0.008***** **(0.001)**
Intercept		-0.005 (0.011)	-0.009 (0.025)	-0.011 (0.036)	-0.011 (0.079)
Industry effects		Yes	Yes		
Lagrange multiplicator tests		6130.60***			
Hausman test			**985.61*****		
F test		13.43*** [22, 7081]		**417.78***** **[3, 6527]**	**77.05***** **[3, 550]**
Wald Chi²			**317.04***** **(22)**		
R2		0.04			
Within			0.1453	0.1611	0.1611
Between			0.0074	0.0039	0.0039
Overall			0.0121	0.0001	0.0001
Modified Wald test for heteroskedasticity				**3.7e+05***** **(551)**	
Number of firms		551	551	551	551
Number of observations		7081	7081	7081	7081

Results(H4: Fixed effects)

Moderating effect of family management on the relationship between technological innovation outcomes and long-term performance (H4)

Variables	Predicted sign	Model 1 OLS	Model 2 Random Effects	Model 3 Fixed Effects	Model 4 Fixed effects with heterogeneity control
TI	**+**	**0.003** (0.002)**	**0.003** (0.002)**	-0.001 (0.002)	-0.001 (0.002)
TI*FAMILY	+	-0.003 (0.002)	0.001 (0.003)	**0.004** (0.003)**	0.004 (0.003)
SIZE	**+**	**0.005*** (0.001)**	**0.009*** (0.001)**	**0.021*** (0.002)**	**0.021*** (0.005)**
AGE	**-**	-0.001 (0.001)	**-0.002*** (0.001)**	**-0.008*** (0.001)**	**-0.008*** (0.001)**
Intercept		-0.004 (0.011)	-0.009 (0.025)	**-0.009 (0.036)**	-0.009 (0.079)
Industry effects		Yes	Yes		
Lagrange multiplicator tests		6125.94***			
Hausman test			**980.14*****		
F test		12.90*** [23, 7057]		**314.10*** [4, 6526]**	**58.84*** [4, 550]**
Wald Chi²			**317.31*** (23)**		
R2		0.04			
Within			0.1454	0.1614	**0.1614**
Between			0.0073	0.0040	**0.0040**
Overall			0.0121	0.0001	**0.0001**
Modified Wald test for heteroskedasticity				**3.7e+05*** (551)**	
Number of firms		551	551	551	551
Number of observations		7081	7081	7081	7081

Findings and Contributions

- **This article provides new insights into the effect of family management on the conversion of R&D intensity into the continuous ocurrence of innovation outcomes**
- **as well as the productivity of the firm in terms of generating long-term performance from technological innovation outputs.**

- Family management acts as a driver of less ability and willingness to carry out TI outcomes efficiently, exerting a negative influence.

- Less ability and willingness expressed as a constraining SEW agenda, focus in modest innovations, lack of executive talent,…could hinder the efficient conversion of R&D expenditures into the ocurrence of continuous technological innovation outcomes.

Conclusions

- But, our findings also show that once family-managed firms have obtained TI outcomes, they are able to achieve greater long-term performance than non-family firms.

- It seems that they become competent and sensitive to shape their firm´s strategy if long-term performance is not appropriate because it would involve losses in terms of economic and non-economic family-centred goals.

- They put all its social capital into operation to show improvement in the conversion of the existent innovation outcomes into long-term performance.

Thanks for your attention!

Castilla.-La Mancha

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