



# Open Innovation Revealed: The Spanish Evidence

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# Agenda

- **Background.**
- **What's going on in Spain.**
- **The “Spanish” evidence.**

# Background

UCM Living Lab

Open Innovation  
and Open Business  
Model Network

National Plan of  
Open Innovation

Innoget

Opinno

# What's going on in Spain?

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Licensing, research centers, technology companies and startups interested in public research

OPEN INNOVATION MARKETPLACE  
INNOVATION BOXES | CHALLENGES | SOLUTIONS

ubuntu!  
usuario: [input] contraseña: [input] Entrar

Hay 58 ideas públicas:

Frenos más eficaces para cochecitos de bebé  
De: [avatar] [name]  
1 0 0

Cita para...  
De: [avatar] [name]  
2 0 1

bankinter Labs

Proyectos en proceso

Futuros proyectos

Proyectos cerrados

INNOCASH  
OFECYT Plan 2

Listado de proyectos

Valorización y desarrollo tecnológico de un microtrón para radioterapia intraoperatoria  
Disponible

Estudio de la viabilidad del uso de metabolitos de melatonina frente a mucositis y radiodermatitis asociadas a la radioterapia  
En revisión

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driving mobility

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Ver vídeo hiriko

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Open Public Extended Network Meeting

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OPEN meter: The second workshop

movistar

matorre

Zona personal

OPEN DATA EUSKADI  
INSTITUTO DE DATOS PÚBLICOS

¿Qué es Open Data Euskadi?

¿Cómo utilizar los datos?

Conjuntos de datos destacados

unience  
La comunidad de inversores reales

Los artículos de los usuarios

Área multimedia

# The Spanish Evidence

- **Open Innovation has been tackled from a theoretical perspective or, in some cases, through selected case studies.**
- **Still some mixed evidence on the relationship between open innovation and some firm or industry variables.**

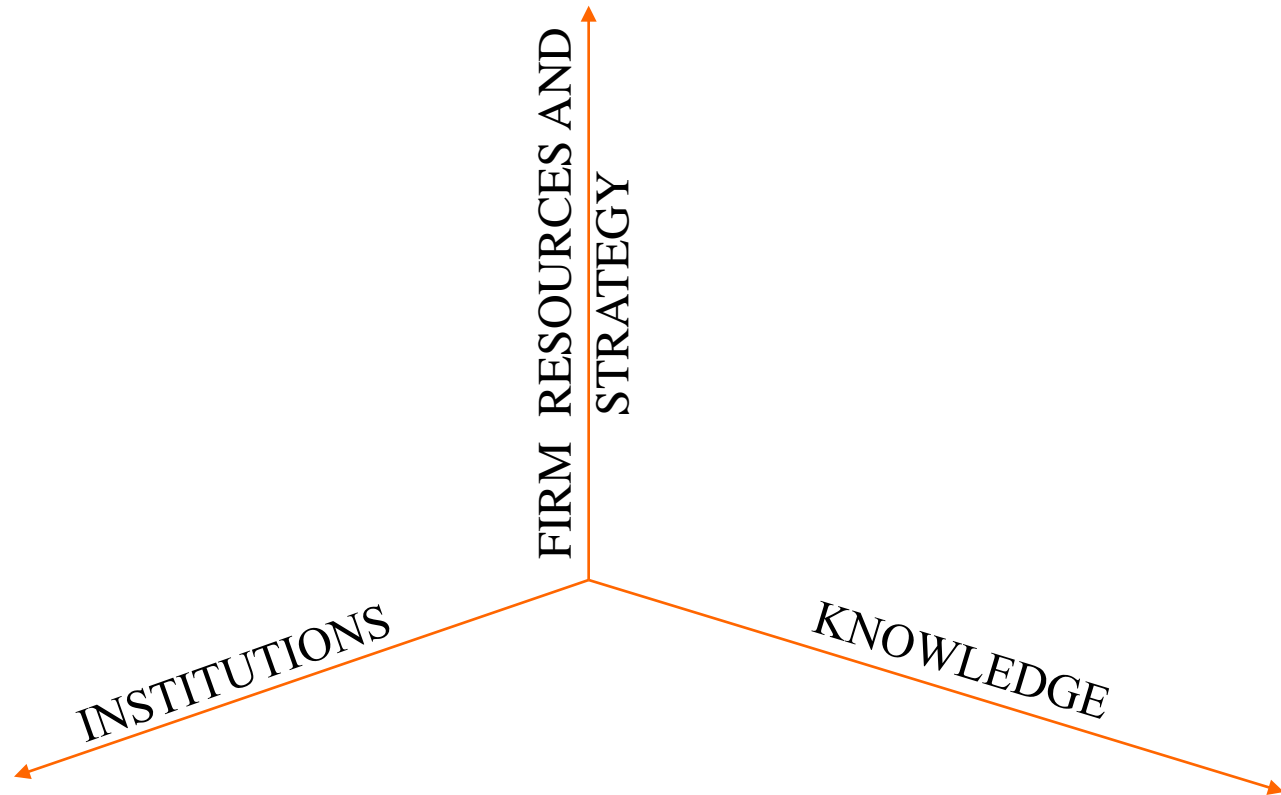
# The Spanish Evidence

- **To open or not to open...**



# The Spanish Evidence

## OPENNESS DIMENSIONS



# The Spanish Evidence

## OPENNESS FORMS

	<b>Inbound Innovation: locus of knowledge creation does not necessarily equal the locus of innovation</b>	<b>Outbound Innovation: that the locus of invention and innovation need not necessarily equal the locus of exploitation</b>
Pecuniary	<b>Acquiring</b>	<b>Selling</b>
Non Pecuniary	<b>Sourcing</b>	<b>Revealing</b>

**Source: Dahlander and Gann (2010)**

# The Spanish Evidence

- **Institutions**
  - **Appropriation Regime**
  - **Industry Structure:**
    - **Concentration**
    - **Stage of technological/market life cycle**
    - **R&D Intensity**
    - **Technological Trajectories**
  - **National Culture**

# The Spanish Evidence

- **Appropriation Regime:**

- The appropriation regime governs an innovator's ability to capture the profits generated by an innovation (Teece, 1986).
- Inbound Innovation:
  - **Formal IPR reduces transaction costs: Firms often require that knowledge suppliers have formal IPR in place before they work together (Dahlander and Gann, 2010).**
  - **Firms shy away from external innovation when they need strong IPR regimes to protect their knowledge (Gooroochurn and Hanley, 2007).**
- Outbound Innovation:
  - **Firms that rely highly on trade secrets, formal agreements such as patents, copyright and trademarks and lead time to protect their innovation are less likely to engage in external innovation and prefer to retain idea generation in-house (Van Cuijck et al., 2009).**
  - **The absence of strong IPR, in some cases there are greater chances of cumulative advancements (Levin et al., 1987). Being open and focusing less on ownership increases the opportunities to gain interest from other parties and help setting a standard (West and Gallagher, 2006).**
  - **Business Architecture (Modular vs Integral) influences the optimal Appropriation Regime.**

# The Spanish Evidence

- **Industry Concentration:**

- Industry concentration fosters outbound innovation, as market leaders try to shape the innovation routines of the industry (Turner et al., 2010).
- In concentrated industries, modular business architectures are more likely to produce open innovation strategies based on platforms or standards (e.g. Intel, Apple,...). Companies with highly modular products, e.g., in the elevator industry like Otis or Schindler, gain advantage by choosing inbound innovation (Gassman and Enkel, 2006).

# The Spanish Evidence

- **R&D Intensity**

- Companies that decide on the inbound process are mainly from low tech industries, and expect spillovers from higher tech/research driven industries where outbound innovation is more common (Gassman and Enkel, 2006; Lichtenthaler, 2008).

# The Spanish Evidence

- **Stage of the technological/market lifecycle:**
  - In emerging industries while there may be an initial positive effect on openness, firms can over-search or come to rely too heavily on external sources of innovation (Laursen and Salter, 2006).
  - On the other hand, fast-growing industries can make it difficult for internally innovative firms to keep pace with technology (Gooroochurn and Hanley, 2007).
  - Early in the life of a system, closed development leads to more successful innovation, and later, when complexity lessens, open development is generally more successful (Almirall and Casadessus, 2010), Boudreau (2006).

# The Spanish Evidence

Regime	Example	R&D Intensity	New Product Intensity	Appropriation Regimes	Open Innovation Form
Science Based	Pharmaceuticals, IT, Aerospace	High	High	Strong	Outbound
Specialised Suppliers	Machinery Manufacturing	Medium	High	Medium	Outbound
Scale Intensive	Food, Construction, Motor Vehicles	Low	Medium	Weak	Inbound
Supplier Dominated	Textile, Furniture,	Low	Low	Weak	Inbound
Information Intensive	Financial Services, Retail, Travel,	Medium	Medium	Weak	Inbound
Service Specialized Suppliers	Consulting, Advertising Education	Medium	Low	Weak	Outbound

# The Spanish Evidence

- **National Culture:**

- National culture influences R&D intensity (Varsakelis, 2001; Jones and Teege, 2001).
- National culture influences the likelihood of starting cooperative relationships (Nakamura et al., 1997; Li, 2003).
- National culture influences the degree of internationalization of innovation systems (Niosi and Bellon, 1994 and 1996).

# The Spanish Evidence

- **Firm's Resources and Capabilities:**

- **Size:**

- Larger firms with larger cospecialized resources will be more successful in adopting inbound innovation (Veugelers, 1998; Lichenthaler, 2008; Sandulli and Chesbrough, 2009).
- Financially, small and medium sized enterprises (SMEs) are more affected by the uncertainty of innovation projects because the failure of a project could compromise the future of the entire firm; thus, they prefer to share this uncertainty adopting outbound innovation (Freel, 2000; van de Vrande et al., 2009).
- Smaller companies typically lack the capabilities to structure the process of searching and selecting external innovation, especially regarding decisions whether to file patents or disclose (Dahlander and Gann, 2010) or anticipating the potential value of inbound innovation (Chesbrough and Rosenbloom, 2002).

# The Spanish Evidence

- **Firm's Resources and Capabilities:**
  - **R&D Intensity:**
    - Acquiring external know-how is found to significantly increase innovative performance only when the firm at the same time is engaged in internal R&D activities (Cassiman and Veugelers, 2006).
    - From the transaction cost literature, firms that incur heavy sunk costs in R&D expenditure (Love and Roper, 2002; Piga and Vivarelli, 2004) may need to amortize these costs by producing innovation internally.
    - On the other hand, there is also an argument based on the “need effect” that applies to small firms, which is that due to their shortage of internal R&D resources small firms have a greater need to collaborate with other entities to develop innovation activities, and to cope with certain projects (Bayona et al., 2001; Tether, 2002; Mazzanti et al., 2008).
    - For strategic reasons, a firm with low R&D intensity may choose to conduct inbound innovation to raise its absorptive capacity and hence benefit from collaboration with a partner firm (Gooroochurn and Hanley, 2007).
    - R&D expenses are not a good proxy for absorptive capacity, since these cover only 50% of R&D related activities (Spithoven et al., 2010).

# The Spanish Evidence

- **Firm's Resources and Capabilities:**

- **Market Share:**

- Hertog and Thurik (1993) posit that ex ante market power makes it financially less necessary for firms to engage in inbound innovation.
- Industry leaders will prefer to keep stable a favorable industry structure by controlling the innovation routines of the industry favoring knowledge spillovers through external innovation (Turner et al., 2010).

- **Internationalization:**

- Inbound innovation is favored by the degrees of internationalization of the firm, since global sensing activities are more efficiently conducted if the company possess previous experience in internationalization (Gupta and Govindarajan, 2000; Zahra et al., 2000). Moreover international firms will benefit from entering into innovation cooperation with local partners because allows them to particularly well absorb technological knowledge and innovative ideas that weaker local firms are unable to exploit by themselves Frost (2001).
- International firms will prefer to exploit by themselves their knowledge in foreign markets, making little use of outbound innovation. Besides, different regulations/cultures and information asymmetries with local partners increase the risk of opportunistic behavior.

# The Spanish Evidence

- **Knowledge:**
  - **Ease of knowledge access:** Ease of knowledge access, rather than breadth of knowledge, appears to drive the success of R&D collaborations for product innovation (Un et al., 2010).
  - **Partner knowledge relatedness:** Collaborations with suppliers appears to have a larger positive impact on product innovation than the wider knowledge base provided by collaborations with universities (Un et al., 2010).
  - **Knowledge novelty:** Open search depth is positively related to the innovating firm's incremental innovation performance and that open search breadth is positively related to radical innovation performance (Chiang and Hung, 2010). Firms are more likely to look for inbound innovation when they are moving away from their knowledge domain (Sakakibara, 2001). On the other hand, uncertainty on performance measures related to the novelty of a product creates a higher incentive for opportunistic behavior of partners, making outbound innovation less likely (Robertson and Gatignon, 1998).

# The Spanish Evidence

<b>Variable</b>	<b>Description</b>
<b>INNOVATION PROJECT VARIABLES:</b>	
<b>Innovation type</b>	<b>Good/service</b>
<b>Product Novelty to the Market</b>	<b>Yes/No</b>
<b>Patent, utility model involved in the project</b>	<b>Yes/No</b>
<b>Inbound innovation: Product developed by the firm with the help of other firms, institutions</b>	<b>Yes/No</b>
<b>Outbound innovation: Product developed by other firm with the help of the firm</b>	<b>Yes/No</b>

# The Spanish Evidence

Variable	Description
<b>FIRM VARIABLES:</b>	
Size	Number of Employees
Internationalization	Local, National, European, Extraeuropean
R&D Intensity	R&D Investment/Net Revenue R&D Personnel/Size
Market Share	Firm Net Revenue/Industry Net Revenue
<b>INNOVATION BARRIERS</b>	
Lack of Financial Resources	Likert 1-4
High R&D Costs	Likert 1-4
Lack of R&D Personnel	Likert 1-4
Technological Uncertainty	Likert 1-4
Market Uncertainty	Likert 1-4
Lack of market power	Likert 1-4
Difficulties in finding proper partners	Likert 1-4
Weak demand for new products	Likert 1-4

# The Spanish Evidence

Variable	Description
<b>INDUSTRY VARIABLES</b>	
Industry Maturity	Dummy variable: Emerging, Mature, Declining (from McGahan and Silverman, 2002)
Industry R&D Intensity	Industry R&D Revenue/
Market Concentration	CR5
Industry Technological Trajectory	Dummy variables for: Science Based, Supplier Dominated, Specialized Supplier, Scale Intensive, Information Intensive Services, Service Specialized Suppliers.
<b>CULTURE VARIABLES</b>	
Hofstede's Cultural Dimensions	Power Distance, Individualism, Masculinity, Uncertainty Avoidance

# The Spanish Evidence

- **The Statistics:**
  - 6,119 new goods or services developed in Spain between 2002 and 2007.
  - 1,603 never reached the market.
  - 1,020 products were co-developed by the surveyed firm with the participation in the development team of external partners: Outside-in form of Open Innovation.
  - 205 products were co-developed by third parties with the effective participation of the surveyed firm in the development team: Inside-out form fo Open Innovation.
  - 5,242 products were developed by Spanish firms, the rest by foreign firms.
  - 1,496 involved IPR protection.
  - 1,947 cases of both goods and services innovation.
  - 3,252 cases of goods innovation.
  - 920 cases of services innovation.
  - Method: Logit regressions/Balanced Sample/Proper goodness of fit (available upon request).

# The Spanish Evidence

- **The Statistics:**

<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
Revenue	86,800,000	416,000,000	1623	1,190,000,000
Market Share	0.0044	0.0318153	0	0.84543
Employees	313.2178	1282.08	1	41,509
Product Innovation	0.8498	0.3572847	0	1
Service Innovation	0.4683	0.4990398	0	1
R&D as percentage of revenues	0.3384	10.63488	0	806.0604
R&D employees	12.8454	35.80032	0	713

# The Spanish Evidence

- **The results – Outbound Innovation**

- Innovation Project Effects:
  - Not significantly influential of Appropriation Regime or the Product type.
  - Knowledge Novelty is inversely correlated to outbound innovation.
- Industry Effects:
  - Firms in Specialized Providers based industries are less likely to adopt outbound innovation.
  - Firms in concentrated and mature markets are more likely to adopt outbound innovation.
- Firm Effects:
  - The R&D Intensity is inversely correlated to outbound innovation.
  - Market share in concentrated markets is inversely correlated to outbound innovation.
  - Geographical diversification is inversely correlated to outbound innovation.
  - Lack of financial resources is positively correlated to outbound innovation.
  - Demand certainty is positively correlated to outbound innovation.
- Culture:
  - Not significant effects.

# The Spanish Evidence

- **The results – Inbound Innovation**

- Innovation Project Effects:
  - Service innovation is positively correlated to inbound innovation.
- Industry Effects:
  - Firms in Specialized Providers based industries are less likely to adopt inbound innovation, while firms in Scale Intensive Industries and in Information Intensive Services are more likely to adopt inbound innovation.
  - Firms in concentrated markets are more likely to adopt inbound innovation.
  - Highly R&D intensive industries are more likely to adopt inbound innovation.
- Firm Effects:
  - Larger firms are more likely to adopt inbound innovation.
  - The R&D Intensity is positively correlated to inbound innovation.
  - Market share in concentrated markets is inversely correlated to outbound innovation.
  - Market uncertainty is inversely correlated to inbound innovation.
  - Ease of finding partners is positively correlated to inbound innovation.
  - Low demand for own innovations is positively correlated to inbound innovation.
- Culture Effects:
  - Risk averse cultures are more likely to adopt inbound innovation.

# Insights

- **Outbound Innovation:**

- The lack of availability of R&D and complementary resources drives outbound innovation.
- Ancillary firms feed knowledge to market leaders in concentrated markets, probably under modular architectures.
- Novel and Radical knowledge is preferred to be kept in-house.
- Outbound innovation is more likely to happen with known partners, in international settings adverse selection hazards are high.

# Insights

- **Inbound Innovation:**

- Knowledge sensing drives inbound innovation. In Intensive R&D industries the locus of novel knowledge creation is widely distributed.
- Weak appropriation regimes are positively associated to inbound innovation as maximizes knowledge exploitation by acquiring companies.
- Large firms in concentrated markets are more likely to adopt inbound innovation: the flip side of the coin.
- Firms with strong absorptive capacity and strong partner search capabilities are more likely to adopt inbound innovation.
- Risk averse companies prefer inbound innovation, as they don't want to take the risk of internal development.
- Firms adopt inbound innovation when their own innovation cannot fulfill a certain demand.

# Concluding Remarks

- Open Innovation is the result of two phenomena:
  - Complementarity: Outbound and inbound innovation are different sides of the same coin in mature markets, the trade-offs between innovation and complementary resources.
  - Supplemmentarity: Inbound innovation reflects also sensing activities when internal innovation is not successful.
- Weak appropriation regimes do not influence outbound innovation, but foster inbound innovation.
- Both open innovation forms are more likely under market certainty.
- Limits of Open Innovation:
  - Open innovation seems to be hampered by transactions with low knowledge relatedness (e.g. international contexts).
  - Open innovation is used by flagships to maintain the status quo of an industry.
  - Open innovation is not likely to be adopted in emerging technologies and radical innovation contexts: does it worsen the modularity trap?



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