Development Expenditures towards Firm's Turnover and Firm's Turnover and Firm's Market Valuation: Evidence from Portugal and Spain

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Abstract: Countries and firms became a very heavy spender on R&D and on education and training with an increasingly focus based on innovation. It is associated to changes by introducing new methods, ideas, or products. It also translates the ability to produce and transform knowledge, contributing to potential economic inflows. The current research, in the scope of business enterprise R&D intensity policy and European Union strategy 2020, aims to identify whether development expenditures in business enterprises have a significant impact on Portuguese and Spanish firms' economic returns and firm´s market valuation, as well as to provide an overview on the convergence with European innovation strategy. Based on 68 Iberian non-financial listed companies, all of them with active development projects on innovation, an econometric framework was regressed. Without convergent R&D main funding source and national targeting rates, Portugal and Spain are significantly aligned on the impact of development expenditures on firm's turnover and on firm's market valuation. If managed together, firms can generate high value-added flows, from those innovative intangible resources.

Keywords: innovation; R&D; Europe strategy 2020; development expenditures; Iberian countries

1. Theoretical background and objectives

The last two decades have been driven by a new techno-economic paradigm (Freeman & Louçã, 2001). The old "*Fordist*" style has been replaced by an "*Information and Communication Technology*" (ICT) networking style, driven by information-intensive mechanisms, by computer-added designs, by concurrent engineering, strongly customized, supported by flexible production systems, embedded in distributed intelligence procedures, based on multi-skilling, and supported by government information, coordination and regulation. Countries and firms became a very heavy spender on Research and Development (R&D) and on education and training – its focus has increasingly based on innovation. It embodies an action or process of innovating. It is associated to changes, with a certain level of novelty, by introducing new methods, ideas, or products. It translates the ability to produce knowledge, it contributes to potential inflows, and it is widely recognized as one of the primary driving forces of growth and profitability. Over the last decades, researchers tried to identify the sources that drive individuals and groups to innovate and contribute to value creation and sustainable development across firms and nations (Deschryvere, 2014; Fontana, Nuvolari, Shimizu & Vezzulli, 2012; Chen, Hu & Yang, 2011; Malerba, 2005; Breshi, Malerba & Yang, 2000; Malerba & Orsenigo, 1995, 1996; Pavitt, 1984; Jewkes, Sawers & Stillerman, 1958). In these different approaches towards the identification of innovation drivers, Schumpeterian patterns have been stated as the most robust findings across the literature. Thus, innovative activities differ across industries along several dimensions, in particular the knowledge intensity embedded in those activities, the type of actors and institutions involved in innovative activities and policies, and the economic effects of innovations (Malerba, 2005). Those patterns are structured around four dimensions: 1. Concentration and asymmetries among innovating firms in each particular sector; 2. Size of the innovating firms; 3. Changes over time in the hierarchy of innovators; and 4. Relevance of the entry of new innovators. Fontana et al. (2012) explore the most recent literature about Schumpeterian patterns of innovation and contribute to identify the sources of breakthrough inventions by extracting new outcomes on the base of the mentioned old patterns. Broadly, a turbulent environment rather than a more stable is conducive to a higher probability of the occurrence of breakthrough inventions and creation national and regional ecosystems, understood as the way firms and agencies capture the complex synergies among a variety of collective efforts involved in bringing innovation to market. Thus, at a national level, an innovation ecosystem is made up of a network of local innovation ecosystems, built on: 1. Competencies with attention to regional strengths; 2. The identification of research strategies; 3. Regional environment; 4. Forming regional partnerships; and 5. Funding the machinery, which consists of facilities, people and organizations (NAS, 2007).

R&D is probably the most known and used proxy to measure the innovation intensity across entities and nations. According to *International Accounting Standard 38* (IASB, 2004), "*Research*" relates to the original and planned investigation undertaken with the prospect of gaining new scientific or technical knowledge and understanding while "*Development*" is the application of research findings or other knowledge to a plan or design for the production of new or substantially improved materials, devices, products, processes, systems, or services prior to commencement of commercial production or use. From an accounting point of view, costs incurred in the research phase are expensed immediately while costs incurred in the development phase are capitalized (IASB, 2004). Thus, R&D expenditures could lead entities (public and private) to growth, to increased returns, and subsequently into financial and strategic achievements. These knowledge based expenditures are the basis of innovation, driving companies to potential economic benefits (Tahinakis & Samarinas, 2013). According to Chen et al. (2011), most nations have gradually devoted more efforts to R&D and have tried to create a favorable innovation environment by enforcing intellectual property rights to promote innovations. However, literature does not provide unanimous evidence about the relationship between innovation and turnover (Lopes & Ferraz, 2016; Deschryvere, 2014; Lopes, 2011; Chan et al., 2003; Lev & Sougiannis, 1996). Deschrvere (2014) found that large firms that are continuous innovators have significant positive two-way associations between R&D growth and sales growth; however in small continuous product innovators that association is clearly stronger than for large ones. Furthermore, relating the occasional process and product innovators, he found a positive and significant association between sales growth and subsequent R&D growth. Concerning the effectiveness of R&D intensity, Lopes (2011) did not achieve a significant correlation between those expenditures and turnover. This result seems consistent with evidences achieved by Chan et al. (2003) relating to the stock market valuation derived from these expenditures, not supporting a direct relationship between R&D expenditures and future returns. Different evidences were obtained by Lev and Sougiannis (1996) relating insider gains. These gains in R&D inside intensive companies are significantly higher than insider gains obtained in firms not strongly engaged in innovation expenditures. Although the complex relationships between R&D and subsequent economic benefits, if efficiently and productively used, R&D can serve as a major source of competitive advantage (Chen et al, 2011), According to Akinwale, Dada, Oluwadare, Jesuleye and Siyanbola (2011), it is not enough to increase the expenditures on R&D and innovation when countries have weak institutions and networks, and poor coordination systems. Building a creative high performance R&D culture is required (Skerlavaj, Su & Huang, 2013; Stock, Six & Zacharias, 2013; Newman, 2009; Ambos & Schlegelmilch, 2008). This creative culture combines customer focus, risk tolerance, entrepreneurship, alignment with strategies, innovation, virtual organization and networking, and efficient execution. Thus, building a creative winning R&D culture is embedded on values, expertise, short and long term orientation, and effective policies.

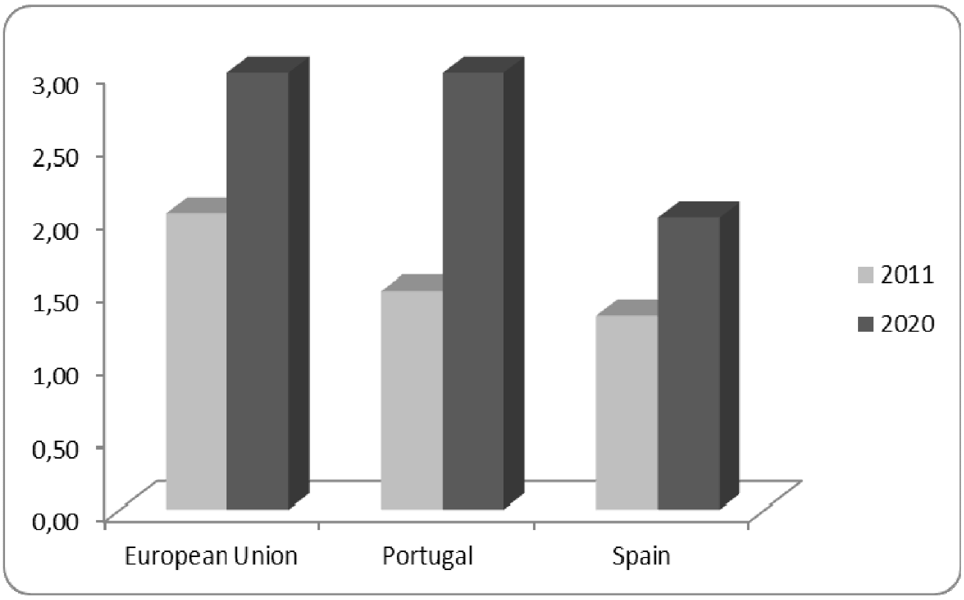
The age of ICT has definitely marking the new ways to transform knowledge. The business to business use of the internet is probably turned out to be the most important source of productivity gains (Freeman & Louçã, 2001). Over the last decade, the efforts on R&D in all funding sources (business enterprise sector; government sector; higher education sector; and private non-profit sector) have increased across European and Non-European countries. These efforts have been settled as a key policy component of the EU strategy 2020 for economic growth (Eurostat, 2016a), despite the intrinsic multicultural differences (Hofstede, Hofstede & Minkov, 2010). Broadly, European Union sets a 3% objective for R&D intensity and most Member States (e.g. Denmark, Germany, Slovenia, Estonia, France, Belgium, and Portugal) have adopted, at a national level commitment, that intensity target. Nordic countries (Finland and Sweden), pursuing its historic and progressive effort over time, set its target on R&D above 3%. Non-European countries, such as United States, Japan, South Korea and China, have settled a R&D intensity target of 3%, 4%, 5%, and 2.5%, respectively, despite in some cases without a defined deadline. Although the desired convergence on European strategy, challenges across European countries on R&D do not require the same intensity effort. Some of them already reached their national targets, others are still on track, and others did not settled ambitious efforts, both in the public and private funding sources. Hence, R&D expenditures are influenced by several economic and social factors, including the funding policies implemented by Member States. According to Eurostat (2016a, 2016b), the policy failures are categorised as follows: 1. Insufficient or inadequate public funding of the science base and higher education system; 2. Inefficient public incentives to stimulate business R&D; 3. Poor match between supply and demand side measures; and 4. The need to identify and address the bottlenecks that restrict the growth of firms in innovative sectors. Although the impact of macroeconomic trends at the firm's level, organizations include in their innovation strategies important R&D efforts towards the achievement of systematic and sustainable profitability and performance standards (Tahinakis & Samarinas, 2013; Lopes, 2011; Freeman & Louçã, 2001; Lev & Sougiannis, 1996).

This research aims to add complimentary evidences to previous researches (Lopes & Ferraz, 2016; Lopes, Ferraz & Martins, 2016; Tahinakis & Samarinas, 2013; Akinwale et al., 2011; Lopes, 2011; Chan et al., 2003; Lev & Sougiannis, 1996) and to identify whether the intangible resource "*Development Expenditures*" has, in the Iberian countries (Portugal and Spain), a significant and positive impact on regional firms' economic returns and market valuation. Furthermore, it also aims to provide an integrated overview about the convergence and alignment of those countries with the EU strategy 2020 on R&D efforts.

2. Overview of R&D policies in Iberian countries

At a macroeconomic level, and relating the Iberian geographic cluster, Portugal is integrated in the Member States group which needs to substantially raise their rate of increase in R&D intensity in order to comply with its target, and whose required efforts exceeds the EU average. As illustrated by graph 1, the national target (2%) of Spain is below the EU strategy 2020 target. Thus, this country is not aligned with EU target, needing additional efforts in order to raise its own national target. Over the period 2000-2011, Portugal observed a negative average annual growth on R&D intensity (-0.2%) while Spain observed an increase of 3.6%. In order to achieve the targeted rates set for both countries, an increase of 8% and 4.6%, respectively for Portugal and Spain, is required for the period 2011-2020.

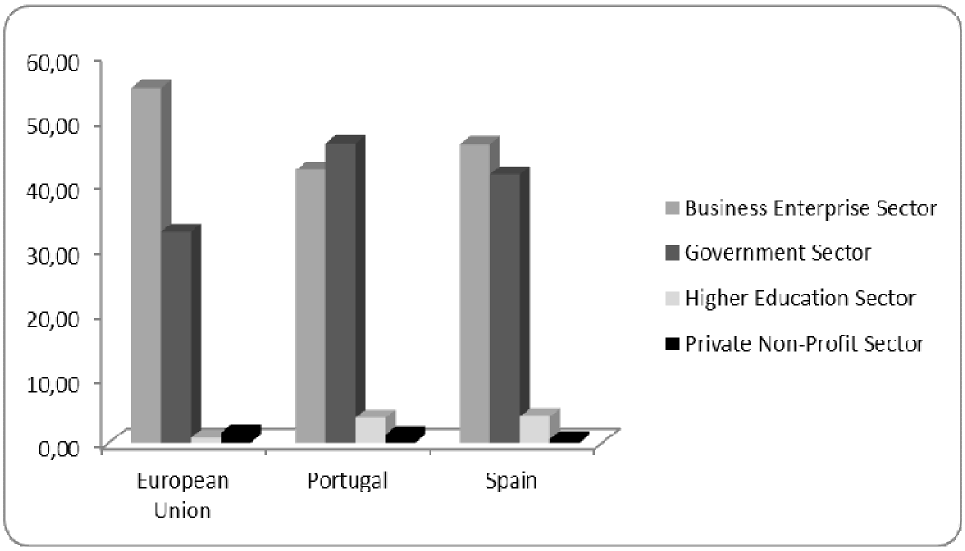
Graph1 – R&D intensity as a % of GDP (2011/2020)



Source: Eurostat (2016a)

In European Union, 55.0% of R&D expenditures are funded by business enterprise sector and 32.7% are funded by government sector. Higher education sector and private non-profit sector, as sources of R&D funding, still evidence a marginal impact (0.8% and 1.6%, respectively). As illustrated by graph 2, Portugal and Spain observe opposite trends: in Portugal, government sector is responsible for funding 46.4% of R&D projects while in Spain 46.3% of similar projects are funded by business enterprise sector.

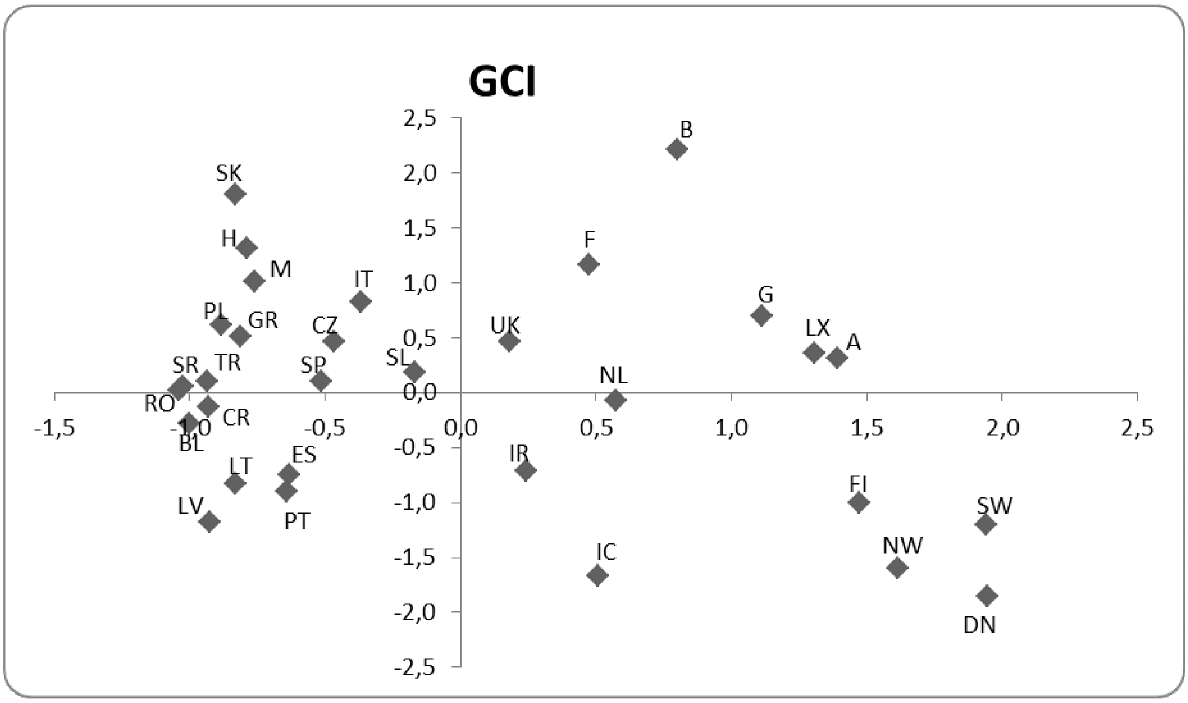
Graph2 – R&D by funding source (2013)



Source: Eurostat (2016b)

Using the cultural dimensions of Hofstede et al. (2010) and the R&D intensity, an overview of European counties can be provided as follows:

Graph 3 – Culture and R&D across Europe



Source: Adapted from Hofstede et al. (2010) and Eurostat (2016a)

At a microeconomic level (firms' level), this research is based on Development Expenditures, capitalized in the statement of financial position (balance sheet), of the non-financial Iberian listed firms (Portugal 24; Spain 44). The 68 firms with active development projects on innovation were categorized according the "*Standard Industries Classification*" (SIC): *Energy* (production and alternative energies) at 10.3%; *Basic materials* (forestry, paper; metals, mining) at 13.2%; *Industrials* (construction, materials; aerospace and defense; electronic and electrical equipment; transportation) at 20.6%; *Consumer goods* (automobiles, parts; beverages, food producers; household goods; residential construction; leisure goods; tobacco) at 17.6%; *Consumer services* (food/drug retailers; media; travel; leisure) at 20.6%; *Telecommunications* (fixed-line, mobile) at 4.4%; *Utilities* (gas, water, electricity, multi-utilities) at 2.9%; and *Technology* (software/ computer services, technology hardware/equipment) at 10.3%. The data relates to economic year 2014 for the dependent variables and to economic year 2013 for the independent variables. Data was extracted from the annual management reports, yearly disseminated to stakeholders as required by the financial markets regulators and taxation authorities.

As previously described, this research, in the scope of business R&D intensity policy, has the objective to identify whether development expenditures funded by business enterprise sector have a significant impact (isolated or aggregated effects) on Portuguese and Spanish firms' economic returns (measured through firm's Turnover) and market valuation (measured through firm's Market Value). Thus, we formulate two econometric models with the following core specifications:

Model 1 *(Isolated effect of Development Expenditures)*

$$Y_{it} = \beta_0 + \beta_1 DEVEXP_{it} + \beta_2 OTHINT_{it} + \beta_3 BOARD_{it} + \beta_4 LEV_{it} + \beta_5 SIZE_{it} + \beta_6 COUNT_{it} + \beta_7 SEC_{it} + \varepsilon_{it} \qquad (i = 1,\ldots,n\ ;\ t = 1,\ldots,m)$$

Model 2 *(Conjoint effect of Development Expenditures)*

$$Y_{it} = \beta_0 + \beta_1 (DEVEXP*OTHINT)_{it} + \beta_2 BOARD_{it} + \beta_3 LEV_{it} + \beta_4 SIZE_{it} + \beta_5 COUNT_{it} + \beta_6 SEC_{it} + \varepsilon_{it} \qquad (i = 1,\ldots,n\ ;\ t = 1,\ldots,m)$$

Where:

- Y_{it} is the logarithm of firm's turnover (*TURN*) at the end of economic year *t*, and average firm's market value (*MVALUE*) per common share over the economic year *t*.
- $DEVEXP_{it}$ is the logarithm of total development expenditures (e.g. patents; software projects, technical design, etc.) capitalized by firm *i* in economic year *t-1*.
- $OTHINT_{it}$ is the logarithm of total other intangible assets (goodwill; brands and trademarks; licenses; alliances; etc.) recognized by firm *i* in economic year *t-1*.
- $BOARD_{it}$ represents the number of members of the board of directors of firms in economic year *t-1*.
- LEV_{it} is the debts to assets ratio (financial leverage) of firm *i* in year *t-1*.
- $SIZE_{it}$ is the logarithm of total assets, evidenced by firm *i* at the end of economic year *t-1*.
- $COUNT_{it}$ expresses the country and stock exchange: Portugal – PSI; Spain – IBEX.
- SEC_{it} represents the activity sector, according "*Standard Industries Classification*".

- ε_{it} is the residual of firm i in period *t* or *t-1*.

Hence, model 1 captures the isolated effect of development expenses and other intangibles on firm´s turnover and on firm's market value while model 2 captures the effect of those resources through an aggregated approach.

MVALUE can also embody all the intangibles (e.g. firm's reputation; stakeholders' satisfaction; strategic alliances; etc.) whose capitalization in the statement of financial position is not supported by accounting rules, or complimentary information is not disclosed in the management reporting notes (Tahinakis & Samarinas, 2013; Akinwale et al., 2011; Chan et al., 2003; Lev & Sougiannis, 1996). Thus, we formulate the model 3 as follows:

Model 3

$$TURN_{it} = \beta_0 + \beta_1(DEVEXP*OTHINT)_{it} + \beta_2 BOARD_{it} + \beta_3 MVALUE_{it} + \beta_4 LEV_{it} + \beta_5 SIZE_{it} + \beta_6 COUNT_{it} + \beta_7 SEC_{it} + \varepsilon_{it}$$

$$(i = 1,\ldots,n \; ; \; t = 1,\ldots,m)$$

Variables were simultaneously introduced in the models in order to identify whether development expenses and intangible assets are predictors of economic returns and firm's valuation (rejection of H_0: $\beta_1=\beta_2=\ldots=\beta_7=0$; $p<\alpha$). Thus, based on the literature theoretical background, we formulate the following four hypotheses:

H_1: Development expenditures have a positive impact on Iberian firm's turnover.
H_2: Development expenditures have a positive impact on Iberian firm's market valuation.
H_3: Development expenditures and other intangibles have a positive aggregated impact on Iberian firm's turnover.
H_4: The impact of development expenses on firm's economic returns and on firm's market valuation is convergent within Portugal and Spain.

The phenomenon under analysis is complex and has multivariate causes and effects. Although the lack of literature on the linkage proposed for analysis, R&D (IASB, 2004) as an intermediate stage of conclusive innovation, has the power to embody a set of skills, abilities, knowledge, expertise, and strategic decisions, towards the dynamic transformation of tacit knowledge into explicit knowledge (e.g. patents, software, alliances, rights, trademarks, technical design, etc.). Thus, our assumption is that only proactive and dynamic institutions, strongly oriented to efficient knowledge transformation mechanisms, can support strong R&D expenditures efforts (Skerlavaj et al., 2013; Stock et al., 2013; Newman, 2009; Ambos & Schlegelmilch, 2008).

The means, standard deviations, and other descriptive measures, for the sample as a whole on the various measures of interest are shown in Table 1. The simple correlations (Pearson's coefficients) between the variables of interest are shown in Table 2.

Table 1: Descriptive measures

Variable	N	Min.	Max.	Mean	Std. Deviation	Skeweness	Kurtosis
TURN	68	16.8394	25.1566	20.8279	2.02110	0.266	-0.428
MVALUE	68	0.0045	98.8500	11.6291	21.0786	2.743	7.361
DEVEXP	68	10.2751	23.3293	16.7073	3.2554	0.181	-0.833
OTHINT	68	10.7579	24.6361	18.9763	2.7583	-0.430	0.438
BOARD	68	3	30	11	4.492	1.156	3.516
LEV	68	0.0732	1.2805	0.6664	0.2238	-0.252	0.929
SIZE	68	16.8093	25.5891	21.3260	2.0902	0.125	-0.412

Table 2: Pearson's correlation coefficients

VAR.	*TURN*	*MVALUE*	*DEVEXP*	*OTHINT*	*BOARD*	*LEV*	*SIZE*	*COUNT*	*SEC*
TURN	1								
MVALUE	0.221	1							
	0.070*								
DEVEXP	0.572***	-0.027	1						
	0.000	0.826							
OTHINT	0.715***	-0.094	0.638***	1					
	0.000	0.444	0.000						
BOARD	0.529***	-0.116	0.489***	0.504***	1				
	0.000	0.344	0.000	0.000					
LEV	0.194	-0.155	0.111	0.088	0.040	1			
	0.114	0.206	0.367	0.474	0.749				
SIZE	0.865***	0.265**	0.510***	0.653***	0.529***	0.123	1		
	0.000	0.029	0.000	0.000	0.000	0.319			
COUNT	0.185	0.290**	-0.032	-0.032	-0.014	-0.085	0.143	1	
	0.130	0.016	0.797	0.796	0.911	0.490	0.244		
SEC	-0.246**	-0.162	0.017	0.011	0.069	0.002	-0.246**	-0.365***	1
	0.043	0.186	0.889	0.929	0.578	0.986	0.043	0.002	

$^{***}p< 0.01$; $^{**}p<0.05$; $^{*}p<0.1$

Based on the bivariate analysis, TURN is significantly correlated with DEVEXP (r=0.572;p=0.000), OTHINT (r=0.715;p=0.000), BOARD (r=0.529;p=0.000), SIZE (r=0.865;p=0.000), and SEC (r=-0.246;p=0.043). These evidences, corroborating the achievements provided by Lopes & Ferraz (2016), are aligned with the assumptions of *International Accounting Standard 38* (IASB, 2004) that intangible assets are associated to expected future benefits, flowing for the owner, over a certain useful life period. However, we didn´t find any significant correlation between MVALUE, and DEVEXP (r=-0.027;p=826) and OTHINT (r=-0.094;p=0.444). Thus, customers seem to incorporate more easily the power of intangibles through turnover instead of adjusting it on firm´s market value. The unexpected negative signal supports the need for additional developments about the information asymmetry between intangible resources recognition and measurement basis, and shareholders perceptions. This result is consistent with outcomes provided by Chan et al. (2003), in respect to stock market valuation derived from R&D expenditures. Those results do not support a direct relationship between development expenditures and firm's market valuation.

Table 3: Regression model equations (Model 1)

	TURN				*MVALUE*			
	β	*t*	*Sig.*	VIF	β	*t*	*Sig.*	VIF
Intercept	3.188	2.227	0.030**		-72.594	-2.525	0.014**	
DEVEXP	0.050	1.086	0.282	1.827	0.337	0.361	0.719	1.827
OTHINT	0.179	2.884	0.005***	2.340	-3.032	-2.433	0.018**	2.340
BOARD	0.025	0.802	0.426	1.610	-1.377	-2.170	0.034**	1.610
LEV	0.871	1.714	0.092*	1.033	-16.940	-1.660	0.102	1.033
SIZE	0.571	7.016	0.000***	2.309	6.768	4.143	0.000***	2.309
COUNT	0.390	1.544	0.128	1.181	8.761	1.727	0.089*	1.181
SEC	-0.063	-1.193	0.238	1.296	0.869	0.822	0.414	1.296
		Adj.R^2=	*0.795*			*Adj.*R^2=	*0.239*	
		F=	*38.008*			*F=*	*3.999*	
		Sig.	*0.000****			*Sig.*	*0.001****	
		DW	*1.849*			*DW*	*1.387*	

*** *p< 0.01;* ** *p<0.05;* * *p<0.1*

The above mentioned remarks are consistent with Model 1 outcomes: 79.5% of variance is explained when regressed against TURN while only 23.9% of variance is explained when regressed against MVALUE. In both cases, DEVEXP is not statistically significant, contradicting the evidences provide in the bilateral correlations analysis. Thus, although the positive expected signal, our hypotheses 1 and 2, are rejected. As expected, other intangible resources can be used to predict TURN and MVALUE, however in this case with an unexpected signal (Lopes & Ferraz, 2016; Lopes & Martins, 2016; Deschryvere, 2014; Lopes, 2011; Chan et al., 2003; Lev & Sougiannis, 1996). The size of the board of directors, as an embodiment of strategic expertise and strategic directions, is not statistically significant (p>0.05) with TURN, however statistically significant with MVALUE (p<0.05). These evidences confirm its indirect impact on turnover and its direct impact on shareholder's perceptions (market approach) as signaled by Lopes et al. (2016). As expected, the control variable SIZE is significant in both cases at 1% significance level.

Table 4: Regression model equations (Model 2)

	TURN				*MVALUE*			
	β	*t*	*Sig.*	VIF	β	*t*	*Sig.*	VIF
Intercept	4.967	3.273	0.002***		-87.620	-2.837	0.006***	
*DEVEXP*OTHINT*	0.005	0.263	0.001***	1.900	-0.044	-1.370	0.176	1.900
BOARD	0.026	0.800	0.427	1.597	-1.398	-2.152	0.035**	1.597
LEV	0.841	1.634	0.107	1.030	-16.191	-1.546	0.127	1.030
SIZE	0.608	7.682	0.000***	2.125	5.675	3.524	0.001***	2.125
COUNT	0.358	1.402	0.166	1.175	9.396	1.807	0.076**	1.175
SEC	-0.058	-1.090	0.280	1.292	0.690	0.636	0.527	1.292
		Adj.R²=	*0.789*			*Adj.R²=*	*0.196*	
		F=	*42.711*			*F=*	*3.716*	
		Sig.	*0.000****			*Sig.*	*0.003****	
		DW	*1.924*			*DW*	*1.328*	

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

This model is globally adherent (Adj.R^2=0.789; F=42.711;p=0.000), and the conjoint effect of DEVEXP and OTHINT is statistically significant (p=0.001) as turnover's predictors. Based on these outcomes, development projects capitalized in financial statements have an aggregated effect on performance, corroborating the evidence provided by Lopes & Ferraz (2016). This evidence is also aligned with the findings achieved by Macerinskiené & Survilaité (2011), which when parts of intellectual capital are managed together, business organisations can generate high value-added flows. This reflects the effect of the synergy between intangibles and their conjoint impact on the turnover of businesses. Thus, when parts of intellectual capital are managed together, its synergetic effects increase the performance and profitability of businesses. Among the research, however, several, incorporating a single typology of intangibles, have found a significant relationship between these intangibles and performance (Lev & Sougiannis, 2003). However, the robustness of the model is not significant, considering the prediction of MVALUE (Adj.R^2=0.196; F=3.716;p=0.003).

In model 3, we aimed to identify the effect of firm's market price (MVALUE) on turnover generation, considering the conjoint effects of development expenditures and other intangible assets. This model is globally adherent (Adj.R^2=0.789; F=36.769;p=0.000), and the key variables (DEVEXP and OTHINT) are statistically significant (p<0.01) as turnover's predictors. Results summary are evidenced in table 5.

Table 5: Regression model equation (Model 3)

	TURN			
	β	*t*	*Sig.*	VIF
Intercept	5.524	3.422	0.009***	
*DEVEXP*OTHINT*	0.006	3.525	0.008***	1.959
BOARD	0.034	1.040	0.303	1.718
MVALUE	0.006	0.011	0.316	1.365
LEV	0.944	1.800	0.077*	1.070
SIZE	0.572	6.588	0.000***	2.557
COUNT	0.299	1.139	0.259	1.238
SEC	-0.062	-1.169	0.247	1.300
		Adj. R^2 =	*0.789*	
		F=	*36.769*	
		Sig.	*0.000****	
		DW	*1.976*	

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

We can conclude, therefore, that intangibles recognised in financial statements have an aggregated effect on turnover, corroborating our hypothesis 3, and also supporting the evidences provided by Lopes & Ferraz (2016). This outcome is also aligned with the findings of Macerinskiené & Survilaité (2011), which when parts of intellectual capital are managed together, business organisations can generate high value-added flows.

Relating the robustness of both models, we run the multicollinearity diagnosis, the residual analysis, and the heteroscedasticity tests. The Variance Inflation Factor (VIF) assesses the degree of multicollinearity in the models. Thus, we found that none of the independent variables of the current research has a VIF value close to 10, concluding that the analysis does not observe a severe problem in multicollinearity. Towards analysis of independence of residuals, we used the Durbin-Watson (DW) test. Based on this statistics, we noted that a null hypothesis is not rejected, which means that residuals describe a normal distribution, confirming that those errors are not auto correlated. Relating heteroscedasticity, we used the test of White, not rejecting the null hypothesis (p>0.05). Thus, the evidences provided by the current econometric model can serve as an important contribution to theory and practice.

Table 6: Comparison between Iberian countries

Variable	Equality of Variances (F)	*Sig.*	Equality of Means (*t*)	*df*	*Sig.*	Mean Dif.
TURN	0.038	0.846	-1.533	66	0.130	-0.7783
MVALUE	16.283	0.000***	-2.463	66	0.016**	-12.7024
DEVEXP	0.366	0.547	0.259	66	0.797	0.2152
OTHINT	2.834	0.097*	0.260	66	0.796	0.1834
BOARD	7.057	0.010**	0.112	66	0.911	0.1290
LEV	1.338	0.252	0.694	66	0.490	0.0396
SIZE	0.286	0.594	-1.174	66	0.244	-0.6212

******Null hypothesis rejected at 1% (p<0.01); ** Null hypothesis rejected at 5% (p<0.05);***

**** Null hypothesis rejected at 10% (p<0.1)***

Null hypothesis states that the distribution between variables is the same across both countries (Portugal and Spain). Relating the equality of means, null hypothesis cannot be rejected for TURN, DEVEXP, OTHINT, BOARD, LEV, and SIZE, which confirms that observations do not differ across countries (H_4 is not rejected). We consider it an expected outcome because firms are integrated in a globalized market, are affected by macroeconomic externalities, such as the European Union common policies (Europe Strategy 2020) and the sovereign debts effects. In respect the equality of variances, the null hypothesis is rejected for MVALUE, OTHINT, and BOARD. These results can be supported on cultural issues (Hofstede et al., 2010), on scale effects, and on differences associated to the national corporate governance codes (Lopes et al., 2016).

3. Concluding remarks and directions

Research and Development, as a key pillar in the micro and macro level innovation policies, are sources of value by fostering markets' development with new innovative products and services. Primarily embodied by individuals and groups, knowledge is transformed and embedded in the innovation cycles, driving companies and nations towards an increased labour productivity, the industrial competitiveness, the development of efficient resources, and the sustainable growth (Eurostat, 2016a). Based on the main objective of this research - to identify a geographic Iberian cluster based on innovation - our analysis can provide some evidences at a macro and microeconomic level, such as:

- Iberian countries are not convergent in terms of R&D targets in the scope of European Union strategy 2020. Portugal needs to substantially raise their rate of increase to reach their target while Spain requires lower efforts, however with a national target below the 3% fixed in EU strategy 2020 on R&D intensity target.
- In Portugal, R&D is mainly funded by government sector while in Spain similar projects are mainly funded by business enterprise sector. Funds from higher education sector and private non-profit sector are still marginal, however in line with EU average trends.
- Development expenditures have a statistically significant conjoint effect as predictors of firm's turnover. Intangibles recognised in the financial statements have an

aggregated effect on firm's turnover. If managed together, firms can generate high value-added flows.

- Although the global adherence of the econometric models, we achieved a weak results for firms' market value variances. In the scope of market valuation, other intangibles seem to be directly perceived by customers with a significant and direct impact on turnover, however negatively correlated. Investors seem to privilege primarily the technical analysis of stocks rather than supporting their decisions on a fundamental analysis.
- In the scope of innovative intangibles, Portugal and Spain are significantly convergent. This evidence is supported on culture, economic and social issues, and on European common directions, such as the European strategy 2020 and the Eurozone convergence commitments and requirements.

Some limitations of the current research are acknowledged, principally the range of time under analysis and the sample size. However, as the current approach is replicable over time, it can be based on other countries and be structured on different metrics and approaches.

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