

In Spain, is the expenditure on R&D a determining factor in its external competitiveness?¹

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Abstract

This article has as its fundamental objective the study of the growth in Spanish exports—a fruit of better competitiveness—despite the low investment in Research and Development (R&D) in Spain.

Between 2010 and 2016 in Spain, the investment in R&D with respect to the GDP maintains a negative tendency, farther away from the average investment in R&D of the EU-28 that, in that same period, grows year over year.

However, this work reflects that Spain is an exception. One can affirm that Spanish competitiveness doesn't adjust to its investments in R&D. It's demonstrated that in recent years, the most developed countries have achieved a high level of competition thanks to technological development due to a bigger and better investment in innovation. Despite of its low investment in R&D, the exports of Spanish companies have been increasing progressively from 2010 to 2016, which has increased its percentage of all global exports.

The causes of this imbalance between low investment in R&D and more competitiveness are, principally: the reduction of production cost, the fall of sales of Spanish companies in the national market and the development of factors such as infrastructure, health, education, and technological maturity that improve productivity and stimulate exports.

This study concludes with a series of propositions to maintain this pattern of economic growth in Spain, by way of its competitiveness, and highlights the necessity of policies, that have promoted an increase in its exports and to incentivize a larger investment in innovation, following the example of other developed countries.

Key words

R&D, exports, competitiveness, innovation, technological development, productivity.

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Spain holds 42nd place in the world ranking of innovation, while it occupies a better position (34th) in competitiveness

1. Introduction

It is generally recognized that greater investment in R&D (research and development) in a country, both public and private, represents an improvement in its competitiveness as compared to the rest of the world. However, Spain, despite having a low level of expenditure in R&D and, at the same time, an inadequate composition, given that the public sector spends a larger percentage than other countries in the surrounding area, has managed to increase its share in world exports of goods and services in recent years at a rate greater than that of nearby countries.

In this work, we will show the data illustrating this situation and indicate the reasons for the increased competitiveness (reflected by increased exports) and the economic measures that can be applied so that Spanish sales abroad continue to grow over the long-term.

To do this, we will focus on the Spanish R&D data, we will analyze the competitiveness of Spain in recent years through different studies and its exports, and we will conclude by indicating the causes and possible economic improvements.

In times like the present, in which the country is emerging from an economic crisis, it is appropriate to engage in an in-depth study of the path that must be taken to continue to improve the economy and, with it, reduce unemployment. This work intends to contribute to a better understanding of something that directly affects the wellbeing of Spanish citizens; namely, economic growth, which has been led by the increase in exports.

2. Fundamental ideas and concepts

Investment in R&D permits countries to increase the technological level they need to improve the productivity of their workers, and with it, their competitiveness abroad. In the economic literature, there is a “consensus on the relevance of obtaining new technologies (innovation) for long-term growth” (Maroto Sánchez & Cuadrado Roura, 2006). This is due to the fact that the technological progress is, along with the improvement in professional training, a fundamental factor in increased labor productivity and the economic growth of a country.

Competitiveness is frequently defined as “conditions that make the birth, development and consolidation of companies possible that are capable of generating wealth, satisfying national consumers, exporting and creating employment” (Rubio & Baz, 2005). To analyze this competitiveness among countries, the World Economic Forum (WEF) uses the following twelve criteria:

1. Solidity of institutions.
2. Provision of infrastructures.
3. Macroeconomic stability.
4. Health and primary education.
5. Higher education.
6. Goods market efficiency.
7. Labor market's good performance.
8. Financial market sophistication.
9. Technological development.
10. Market size.
11. Good business management.
12. Innovation capability.

From 2010 to 2016, both companies and the Public Administrations made important cuts in R&D expenditures: R&D expenditure as a percentage of the GDP recorded decreases for six consecutive years

It is precisely this last factor, innovation, where the importance of R&D comes into play. With regard to this criterion, Spain ranks 42nd in the world², below the 34th place it holds in terms of its competitiveness. This difference in the positions of R&D and competitiveness is, in part, the subject of this work (Schwab & Sala-i-Martin, 2017).

Innovation is not simply another factor that affects competitiveness, rather it is a determining factor, “as shown by different economists of recognized prestige, such as Freeman (1987), Porter (1990) and Nelson (1993), who indicate that obtaining new and advanced technologies is an important determining factor for the competitive position of a country or region. Therefore, innovation would be a vital factor for a country to be able to generate, over the long term, a better competitive position and sustainable economic growth” (Gutiérrez Roja, Heijs, Buesa Blanco & Baumert, 2016).

The Organization for Economic Cooperation and Development (OECD), in turn, defines competitiveness as the advantage or disadvantage a country has in the sale of its products in international markets (OECD, 2014), and it does so through two different systems:

1. The difference between the unit labor costs of a country and that of its competitors.
2. The difference, also among countries, in both industrial prices and those of consumer goods.

Therefore, even though there are different indicators, indexes and studies of how positive or negative the competitiveness is of a country, it seems that exports (or the export capacity) are a good indicator. In this sense, some authors refer to competitiveness as “the ability of companies to gain access to foreign markets and maintain or increase their shares in said markets” (Bougrine, 2001).

For these reasons, we are going to study how the growth of Spanish exports is a reflection of an improvement in their competitiveness and we will analyze how it is possible that, in spite of a low level of investment in R&D, the exports by Spanish companies continue to increase. We must take into account the fact that the investment in R&D produces long-term results, which means guaranteed future economic growth.

Finally, it is well known that the exchange rate between the national currency and that of the country to which the export is being made can affect competitiveness. However, the main importers of Spanish goods and services use the same currency as Spain (the euro), so it can be determined that it is not a decisive factor for most Spanish exports (O’Kean, 2010).

3. Situation of R&D in Spain

As can be seen in Table 1, in Spain, the R&D expense as compared to the gross domestic product (GDP) has increased during the period 2005-2010, but after 2010, it begins to decrease as the result of the economic crisis. In this manner, during 2016, Spain dedicated a total of €13,260 million to R&D, a much smaller figure than the €14,588 million invested in 2010, when it reached its maximum historical level. The R&D expenditure in 2016 continues to be very low, representing only 1.19% of the GDP, which is lower than the 1.22% in 2015 and much lower than the 1.4% in 2010. As a percentage of the GDP, the R&D expenditure has recorded declines for six straight years (see Table 1).

² In addition, within the chapter on innovation, according to the WEF, Spain is in 53rd place in the world in terms of investment in R&D by companies, 67th place in terms of collaboration between businesses and universities and in 86th place, also in the world, in obtaining advanced technology products by the Spanish Public Administrations.

Table 1
R&D expenditure in Spain

Year	R&D Expenditure (millions of euros)	R&D Expenditure (percent of GDP)	Annual variation in R&D expenditure as a percent of the GDP
2005	10,197	1.12%	6%
2006	11,815	1.20%	7%
2007	13,342	1.27%	6%
2008	14,701	1.35%	6%
2009	14,582	1.39%	3%
2010	14,588	1.40%	1%
2011	14,184	1.36%	-3%
2012	13,392	1.30%	-4%
2013	13,012	1.26%	-3%
2014	12,821	1.23%	-2%
2015	13,172	1.22%	-1%
2016	13,260	1.19%	-2.5%

Source: INE (2017).

These continuous declines are the result of the budget cuts that the companies and the Public Administrations made in recent years in response to the economic crisis, an unfortunate situation that will become evident over the medium-term in the form of the lesser capacity of our economy to produce innovations. It should be remembered that R&D, foreign technology and improved human capital are the main sources of improvement in the levels of productivity of the Spanish business fabric.

International comparison

But is the expenditure in R&D in line with that of our surrounding countries?

If we compare the situation of Spain to that of other countries, the result is not very favorable. The latest figures published by the OECD show that the R&D expenditure in Spain, measured as a percentage of the GDP (1.2%), is quite a bit less than that of other developed economies, such as France (2.2%), Germany (2.9%), Austria (3.1%), United States (3%), South Korea (4%), Japan (3.5%), Sweden (3.25%) and Finland (2.75%). On average, the countries of the OECD spend 2% of their GDP. Countries with lower incomes per inhabitant than Spain, such as Portugal (1.3%) and China (2.1%), for example, spend a greater percentage of their GDP than Spain. Table 2 shows the mean investment in R&D of the 28 countries in the European Union (EU) and compares it to the Spanish investment.

While the European trend in recent years (from 2010 to 2016) has been to increase investments in R&D, in Spain, they have been decreasing, which reveals the imbalance that Spain has in terms of R&D, as compared to the rest of the European Union. While in the last year, Spain invested 1.19% of its GDP in R&D, in Europe, the investment was greater than 2%. In other words, the amount spend by Spain on R&D represents only 58.6% of the European average (see Table 2).

By analyzing the data on the Spanish investment in R&D and comparing them to the equivalents of the average of the European Union, it is revealed that the case of Spain does not form part of the increasing trend experienced by the investment in R&D in the EU-28.

During
the period 2003-
2016, Spain
gained
a share in world
goods exports

Table 2

R&D expenditure/GDP in Spain in relation to the average of the European Union

	R&D Expenditure/GDP (percentage)		
	Spain (X)	EU-28 (Y)	X/Y
2008	1.35	1.85	72.8
2009	1.39	1.94	71.6
2010	1.40	1.93	72.5
2011	1.36	1.97	69.0
2012	1.30	2.01	64.7
2013	1.26	2.03	62.1
2014	1.23	2.04	60.3
2015	1.22	2.03	60.1
2016	1.19	2.03	58.6

Source: Eustat (2017) and INE (2017).

Whereas after 2010, during the worst moments of the latest economic crisis, the European countries reacted by increasing investment in R&D in proportion to the GDP, Spain began to gradually reduce this percentage, both by the public sector, seeking a reduction in the public expenditure, and by the private sector, to reduce their costs and survive the crisis.

In summary, it is observed that investment in R&D as compared to the Spanish GDP between 2010 and 2016 remains low and increasingly further away from the average for the EU-28, which shows an upward trend.

4. Competitiveness and the exports of goods and services

Competitiveness, as defined in section 2, is the result of the effort of business owners to reduce production costs, increase their technological level and improve the level of their human capital. The consequence is that for “a nation to be successful in world trade, its companies must achieve competitive advantages, i.e., they must gain shares in both the national and international market” (Buendía Rice, 2013).

Competitiveness can be measured according to different criteria. The results of the twelve criteria used by the WEF (see section 2) are shown in Table 3.

Table 3

Ranking of competitiveness

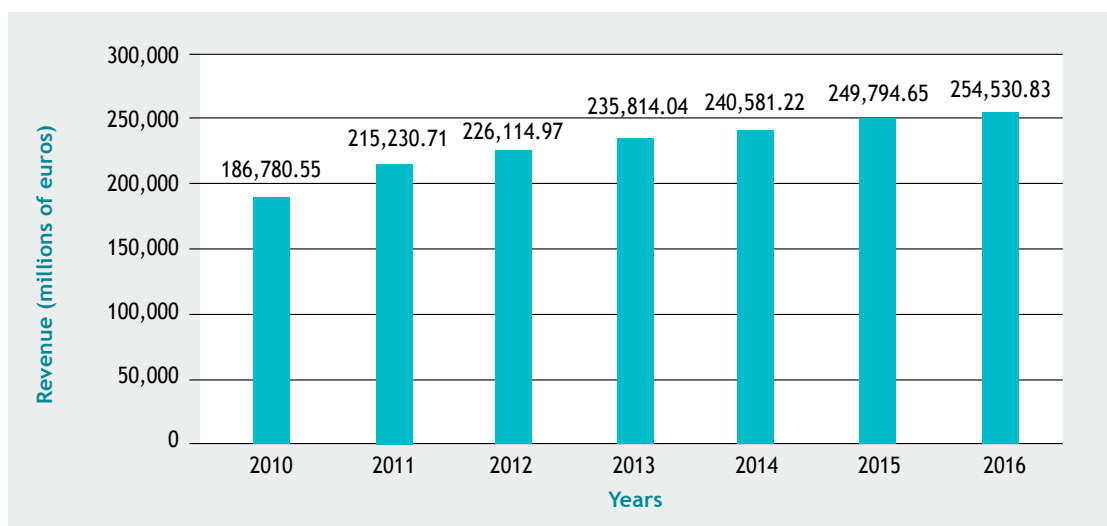
	2002	2007	2015	2017
United States	1	1	3	2
Germany	14	7	4	5
France	30	16	22	22
United Kingdom	11	12	10	8
Spain	22	29	33	34
Portugal	28	34	38	42
Italy	39	49	43	43

Source: Schwab & Sala-i-Martin (2017).

These data indicate that, over the last decade, the relative competitiveness of the Spanish economy has declined and is below that of other important countries in the European Union (such as France and Germany), although it remains above that of countries like Portugal and Italy, whose investment in R&D (1.3% and 1.33%, respectively) is greater than the investment made by Spain (1.19%) during that same year (Eustat, 2017).

After analyzing the competitiveness according to the ranking created by the WEF, we proceed to observe how this competitiveness is related to the export of goods and services. There is a close relationship between competitiveness and exports, since the latter and any improvement in them are the direct result of the competitive evolution of a country. As we can see in Table 4, between 2010 and 2016, the exports of goods have increased year after year, favoring the path towards economic growth and economic recovery that occurred in late 2013.

Table 4
Exports of Spanish goods



Source: ICEX (2017).

The result of the increase in exports is the growth of the Spanish share of world goods exports (see Table 5), since as we have indicated before, both are directly related.

Table 5
Share (percentage) of world goods exports

	2003	2012	2014	2015	2016	Difference 2003-2016
China	5.9	11.4	12.4	14.0	13.1	7.2
United States	9.8	8.6	8.6	9.1	9.1	-0.7
Germany	10.2	7.8	8.0	8.1	8.4	-1.8
Japan	6.4	4.5	3.6	3.4	4.0	-2.4
France	5.3	3.2	3.1	3.1	3.1	-2.2
Spain	1.6	1.6	1.7	1.7	1.8	0.2

Source: WTO (2017).

Spain is very competitive, thanks to its good global position in infrastructures, health, higher education, business management and the capacity to obtain patents

It can be seen that Spain and China are the only two countries, of those shown on the table, that increased their share in the world goods exports during the 2003-2016 period. On the other hand, the rest of the countries (United States, Germany, Japan and France) reduced their share.

In recent years, there has been a trend in emerging countries to increase their share in world exports. However, as can be seen in Table 5, between 2003 and 2016, the developed countries tended to show losses in this share. In the cases of Germany and the United States, which have a technologically very advanced industry, it can be observed that since 2012, they increase their share in world exports after an initial decrease. This is due to a large extent to the investment made in innovation by these two countries. According to the World Intellectual Property Organization (WIPO), on the 2016 World Innovation Index, both countries improved their position in terms of innovation with regard to previous years and rank in the top 10 of the world list. In addition, the WIPO highlights from these data that the German and US economies stand out for “the quality of innovation, a high-level indicator that takes into account the quality of the universities, the number of scientific publications and the number of international patent applications” (Cornell University, INSEAD & WIPO, 2016). This shows that, since 2012, the growth in competitiveness and exports from the most developed countries is linked to greater investment in R&D.

On the other hand, in Spain, investment in R&D is very small, in part because small companies represent more than 90% of the productive fabric, which is reflected in the decreased capacity for training of its workforce and R&D expenditure. In theory, in order to increase the productivity of the Spanish economy over the long term, it would be necessary to modernize the productive structure, giving greater weight to sectors that are more intensive in capital, achieving a more qualified workforce, larger companies, and of course, greater expenditure in R&D (Mingorance-Arnáiz & Pampillón, 2016).

In summary, it can be said that Spanish competitiveness does not match its R&D expenditure. Proof of this is that there are less competitive countries than Spain that are making a greater investment in innovation.

We insist: exports from Spanish companies have progressively increased from 2010 to 2016, which is very positive and has allowed them to increase their share in world goods exports.

Although this work focuses on the behavior of Spanish goods exports in recent years, foreign tourism and non-tourism related service exports have also had spectacular growth. An indicator of this is the growth at impressive annual rates of 8% of the non-tourism related service exports, showing that the process of outsourcing of the Spanish economy has been accompanied by a profound technological change. Therefore, a good part of the presence of Spanish companies abroad is not just in the manufacturing sector, but also in non-tourism related services, such as banking, commercial distribution, engineering, infrastructure management (airports, highways, etc.), water and waste management, energy distribution, renewable energy technology, telecommunications, etc.

5. Why is Spain competitive?

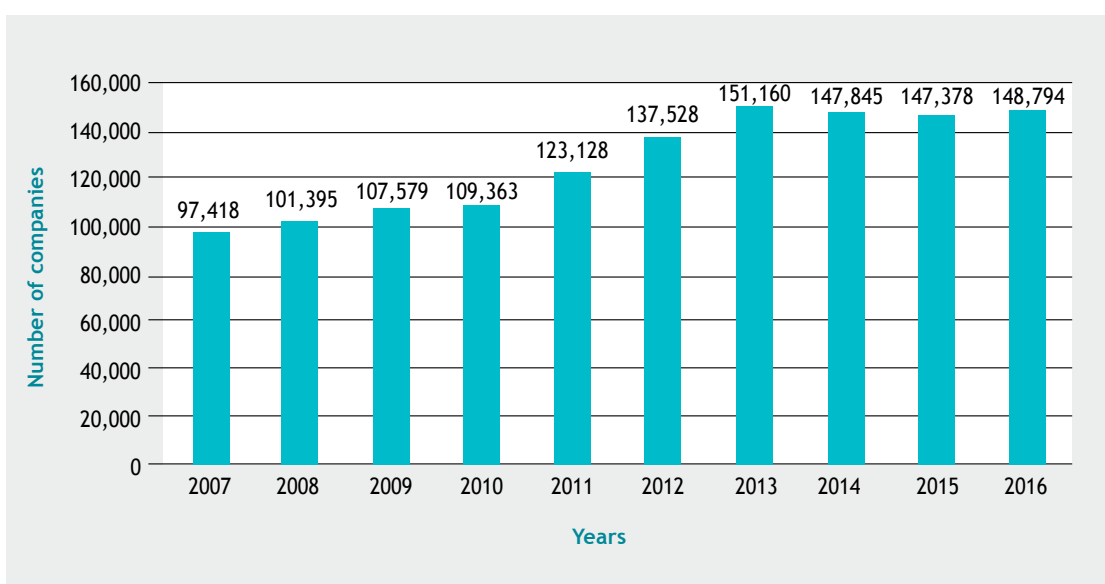
As we have seen throughout this work, Spain, in spite of a low expenditure in R&D, has a high level of competitiveness, as measured by the spectacular growth of goods and services exports. What factors are permitting Spanish companies to be so competitive?

Spain holds 42nd place in the world for the low investment in R&D made by its companies, the low level of collaboration between companies and universities and the negligible production of advanced technological products by the public research sector

First of all, the reduction of labor and non-labor costs should be emphasized. According to the OECD, “in the five years between 2011 and 2016, unit relative labor costs (for Spain) have reached 1998 levels. In this sense, 60% of the improvement in competitiveness is the product of a slower growth in labor costs than of its commercial partners” (Fernández, 2016). The reduction in these costs has led to a relative cheapening of national products that has favored Spanish exports and discouraged imports (Linde, 2015).

Secondly, the fact that during the economic crisis that began in 2008, Spanish companies suffered a decline in domestic sales is also of great importance, since they were forced to turn to international markets in order to survive. Proof of this is that, according data from the ICEX (see Table 6), before the crisis, in 2007, there were 97,418 exporting companies and in 2016, there were 148,794 companies, for an increase of more than 50%.

Table 6
Number of Spanish exporters



Source: ICEX (2017).

Thirdly, we must also consider the factors that the WEF indicates as important for the competitiveness of Spain: infrastructures, health, higher education, technological maturity and the granting of patents. These foundations supporting our competitiveness compensate for the low level of innovation.

Spanish infrastructures also enjoy a high level of development (roads, airports, high-speed trains, etc.), which facilitates and reduces the price of goods transport, promoting exports. The good health and high level of education are related, as both seek to improve the quality of life, the physical conditions and professional preparation of the workers (Mankiw, 2012). The technological maturity indicates the capacity of the companies and Spanish workers to adapt quickly to technological advances, which along with the capacity to generate patents, increases competitiveness. All these factors are enabling the level of competitiveness of the Spanish economy to increase considerably.

In Spain in 2007, there were 97,418 exporting companies and in 2016, this figure ascended to 148,794 companies, an increase of more than 50%

In summary, in spite of the low level of investment in R&D, the Spanish economy is increasing its exports, among other things, thanks to the reduction of costs, the decline of the Spanish domestic market during the economic crisis and its international position in factors such as infrastructure, health, education and technological maturity.

6. Final reflections

Twenty-five years ago, the OECD defined competitiveness as “the degree to which a country is capable, under free market conditions, of producing goods and services that pass the test of international markets, while maintaining and increasing the per capita income of its population over the long term” (OECD, 1992). Spain complies with the test of selling increasingly more abroad and since 2014, its per capita income has been increasing, as seen in Table 7. However, the OECD (see section 2 of this work) has recently opted to define the competitiveness as the advantage or disadvantage a country has in the sale of its products in international markets (OECD, 2014).

In any case, an increase in competitiveness means an increase in productivity, which will lead to economic growth, and therefore higher income levels (Cann, 2016).

Table 7
Annual variation in per capita GDP

Year	Per capita GDP	Annual variation in per capita GDP
2017 (forecast)	€24,900	3.30%
2016	€24,100	3.40%
2015	€23,300	2.30%
2014	€22,780	1.20%
2013	€22,518	-0.20%
2012	€22,562	-1.50%
2011	€22,900	-1.30%
2010	€23,200	-0.40%
2009	€23,300	-4.10%
2008	€24,300	1.70%
2007	€23,900	5.30%
2006	€22,700	6.60%
2005	€21,300	6.00%

Source: INE (2017).

Since the beginning of the crisis in 2008 until 2016, Spain has achieved continuous growth in its exports. This growth in exports is the product of the continuous struggle to improve competitiveness. These numbers, in spite of being very positive, conflict with the low level of investment our country makes in R&D. For this reason, Spanish companies must not be content with the improvement of recent years and must seek continuity in the improvement of its competitiveness.

The examples of the United States and Germany, whose competitiveness and world export shares have increased in recent years, thanks to the improved quality and quantity of technological innovation, must serve to illuminate the path that Spanish companies must follow to achieve greater economic growth over the next few years. The future of our competitiveness must be marked by investment in innovation. Therefore, only those companies whose

production is accompanied by a highly technological component have a future. The era of competitiveness based on low prices should be a thing of the past.

In this sense, “the growing investments in computer equipment, or investments in R&D or technical training reveal the increasing importance of knowledge and information management in the economic development of countries” (González, 2016).

Therefore, in spite of the positive results in exports, Spanish companies must make a larger investment in R&D, an effort that will be compensated over the long term, as it will make it possible to improve competitiveness and continue with the growth of exports.

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