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# Characterisation of innovation adoption in Europe

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**Abstract**

The main aim of the present study is to provide a descriptive statistical analysis of the diffusion process at the EU level using indicators of innovation adoption that can be obtained from the information available in the Community Innovation Survey (CIS). In particular, we examine innovation adoption at the country level using the information contained in the CIS3, CIS4, CIS2006 and CIS2008. This way, we will highlight the dynamics of innovation adoption across EU member states for the different time spans of the CIS. Although we are also interested in knowing which is the innovation adoption process in the European Neighbouring Countries (ENCs) compared to that of the EU countries, the statistical information in CIS does not cover any of the ENCs. Therefore, since this task can not be tackled with the statistical information available, we will try to proxy for it doing a comparison between the innovation adoption processes followed in the core countries compared to that of the new member states.

**Keywords:** Innovation adoption, Innovation diffusion, Community Innovation Survey, Process innovation, Product innovation.

**JEL:** O31, O33

# 1. Introduction and objectives

In the Europe 2020 Strategy, the Member States and the European Commission recognised that increasing innovation is a key to respond to the challenge offered by globalisation and more specifically by the crisis. According to the Strategy, "The crisis has wiped out years of economic and social progress and exposed structural weaknesses in Europe's economy. … We need a strategy to help us come out stronger from the crisis and turn the EU into a smart, sustainable and inclusive economy delivering high levels of employment, productivity and social cohesion." In order to get a smart growth, Europe 2020 puts forward a priority on developing an economy based on knowledge and innovation.

Innovation is widely regarded in the economic literature as an essential force for starting and fuelling the engine of growth (Romer, 1986). Such force crucially depends on the process of creation, accumulation and diffusion/adoption of knowledge which is often strongly localized into clusters of innovative firms, sometimes in close cooperation with public institutions such as research centres and universities. This implies that local growth depends on the amount of technological activity which is carried out locally and on the ability to exploit external technological achievements through the diffusion/adoption of such technologies (Martin and Ottaviano, 2001, Grossman and Helpman, 1991, Coe and Helpman, 1995).

In this context, the main aim of the present study is to provide a descriptive statistical analysis of the diffusion process at the EU level using indicators of innovation adoption that can be obtained from the information available in the Community Innovation Survey (CIS). In particular, we examine innovation adoption at the country level using the information contained in the CIS3, CIS4, CIS2006 and CIS2008. This way, we will highlight the dynamics of innovation adoption across EU member states for the different time spans of the CIS.

Although we are also interested in knowing which is the innovation adoption process in the European Neighbouring Countries (ENCs) compared to that of the EU countries, the statistical information in CIS does not cover any of the ENCs. Therefore, since this task can not be tackled with the statistical information available, we will try to proxy for it doing a comparison between the innovation adoption processes followed in the core countries

compared to that of the EU New Member states. The new member states that entered recently the EU resemble more closely the ENCs, so that the lessons obtained from this comparison between EU core and EU New Members can be useful for the design of innovation policies.

## 2. Literature Review

When studying the innovation process, part of the literature understands the technological change process into three distinct phases: the invention process (whereby new ideas are conceived), the innovation process (whereby those new ideas are developed into marketable products or processes), and the diffusion/adoption process (whereby the new products spread across the potential market). This latter stage is where the impact of the technological change on the economy takes place.

Previous empirical studies on innovation diffusion are mainly based on monographic studies which quantify innovation diffusion by looking at the adoption of a specific technology (ICT, seed, medical technologies for instance). However, our aim is to provide a general picture of innovation diffusion/adoption in EU. Therefore, databases covering all EU countries and a wide range of sectors have to be used. Regarding innovation, global dataset allowing international comparisons are not numerous. Countries started only recently to collect systematically information on this topic, and the issues covered by the surveys remain restricted. Most empirical studies rely on three main data sets: R&D surveys, data on patents and innovation surveys. Only the latter can be used to address the issue of innovation diffusion.

In the EU countries under the coordination of Eurostat, a common core questionnaire was agreed upon and surveys were launched under the acronym of CIS (Community Innovation Surveys). These surveys have been repeated every four years. Up to now there exist six waves of CIS (CIS 1 for 1990-1992, CIS 2 for 1994-1996, CIS 3 for 1998-2000, CIS 4 for 2002-2004, CIS2006 for 2004-2006 and CIS2008 for 2006-2008). The coverage of countries in the first 3 waves was not so wide as afterwards, and the questionnaire was modified along them in order to include more issues related to innovation that had not been considered so far. Additionally, since CIS2006 and CIS2008 appeared recently, very few papers using them

have been published. This is why in this section we review the papers that analyse innovation issues using CIS, which in many cases refer to CIS4.

We review now the studies that more recently have used data from CIS to figure out which are the topics that have been covered. The bulk of the literature has used the information provided by CIS for just one specific country. In relation with papers analysing patterns of innovation, for instance, the paper by Castellacci (2008) uses data coming from the CIS4 and investigates the one in Norway. Even if the analysis is mainly focusing on the Norwegian case, some interesting comparisons are drawn at the European level. On the one hand, Norwegian sectoral systems appear to be very innovative, often above the European average. Schmidt and Rammer (2006) examined German data, plotting technological (product and process) innovation against organisational change. A substantial number of studies analyse the determinants of innovation. Exploiting the data coming from the CIS database for the case of firms in the UK we find those of Criscuolo et al (2009) and d'Este et al (2009). The first one explores how patterns of innovation differ between start-ups and more established firms, through the combination of descriptive analysis and an econometric matching estimator approach. The second one, by d'Este et al (2009), looks at the factors that represent the most important barriers to innovation and that define the groups of innovators and of non-innovators.

Following with the use of the CIS for the UK case, we find several papers focused on the analysis of the complementarities between different innovation strategies such as those of Battisti and Stoneman (2009) and Tether (2009) whereas Mol and Birkinshaw (2009) explores how management innovation affects performance as well as the determinants of management innovation using CIS3 and CIS4. Additionally, the work by Swann (2009), through the use of simple statistical analysis, uses CIS to explore some different questions about the ways in which companies collaborate with the research base and use it as a source of information, presenting some exploratory analysis. Even with a narrower geographical scope, Freel and Harrison (2007) detail the innovative performance of the 1,270 Scottish firms that provided useable responses to UK CIS4.

Several papers focused on just one country analyse the impact of innovation on different economic performance measures. For the case of France, we find the paper by Mairesse and Robin (2009) which investigates the effect of innovation on labour productivity through the estimation of a three stages econometric model, where the estimated output at a given stage is used as an input in the next stage. With the same objective, although with a restricted geographical scope, the work by Segarra-Blasco (2008) analyzes the effect of intramural and external R&D on the productivity level in a sample of 3,267 Catalan firms. Also, Masso and Vahter (2008) analyse whether there is a significant relationship between technological innovation and productivity in the manufacturing sector of Estonia with firm-level data from CIS3 and CIS4.

All these works focus only on firms for just one country and, even if of much interest, the conclusions are restricted to the specific national cases. Few studies consider different countries covered by CIS probably due to the lack of homogeneity found in the data available (some sectors missing in some countries, different classification of sectors in the different countries, among other problems). One step forward in the harmonisation of the information provided by CIS is the "Sectoral Innovation Database (SID)" recently developed at the University of Urbino. This major database based on CIS has been created through cooperation agreements with national data providers -either national statistical institutes or research groups with access to CIS data and authorisation to exchange the data (CIS2 and 3). For the case of CIS4 data are taken from Eurostat, except for the UK, whose data are obtained from the national data provider. The assembling of the database has been carried out using common data protocols and statistical procedures on data integration and standardisation.

The sectoral dimension has also been analysed using CIS. The research by Kanerva et al (2006) offers a cross-section analysis examining services and using CIS4 data in depth. Also, with the aim of comparing manufacturing and services, Castellaci (2008) puts forward a new taxonomy of sectoral patterns of innovation that combines manufacturing and service industries within the same framework.

Apart for the academic papers using CIS, it is important to signal that seven of the 25 indicators analysed in the European Innovation Scoreboard (EIS), a statistical instrument

developed by the European Commission to evaluate the innovation efforts undertaken by the EU Member States and to make them comparable, are based on data from the CIS. As presented in Parvan (2007), the seven EIS 2006 indicators from the CIS4 are the following: Share of enterprises receiving public funding for innovation; Small and medium sized enterprises innovation in-house; Innovative SMEs cooperating with others; Innovation expenditure; SMEs using organisational innovation; Sales of new-to-market products; Sales of new-to-firm products.

The first indicator proxies for knowledge creation, the last two for application and the remaining ones for "innovation and entrepreneurship". Therefore, the CIS questionnaire produces a wide range of raw data which are partly used for the European Innovation Scoreboard. However, as indicated in Parvan (2007) "the current EIS indicators look closely at the input and output of innovation, but other aspects could be included, such as the successful use of new technologies". This would be the concern of the indicators related to innovation diffusion as the ones we analyse in this project.

As a result of the review of papers using CIS (see Table 1 for a summary) we can conclude that most of the available CIS indicators are simply frequency indicators based on one CIS survey question. Complex indicators based on the response to more than one question are the exception albeit can be more revealing of firm strategies than simple ones. As commented in Arundel (2006) "with data available for several consecutive CIS surveys, one would think that the European policy community would be actively using CIS indicators to assess the ability of national innovation systems to respond to the challenges of the knowledge economy. Unfortunately, this hasn't happened to anywhere near the extent that one would have expected in 1996." "… the European policy community still relies on long-established indicators for R&D and patents". Therefore, although more complex indicators on innovation can be constructed with the information provided by CIS, this has not been the case. Among the main reasons raised by the author we find that of a continued focus on a science-push or linear model of innovation based on R&D, although no one refers to it anymore by its name. This could have led to a lack of demand of policy makers for a wider range of CIS indicators and a lack of supply from academics. Another reason can be found in the missing information

for some countries in some specific sectors, which leads to uneven coverage so that not all the countries/sectors can be included when analysing certain topics.

**Table 1. Review of papers using CIS**

| | TOPICS | MAIN RESULT | PAPER |
|---|---|---|---|
| ONE COUNTRY | **Patterns of innovation** | ➢ **Norway**: the highly innovative high-tech sectors are small<br>➢ **Germany**: complementarity between innovation and organisational innovation | ➢ Castellacci (2008)<br>➢ Schmidt and Rammer (2006) |
| | **Determinants of innovation** | ➢ **UK**: being a new firm increases the likelihood of being innovative in services and decreases in manufactures<br>➢ **UK**: environment influence firms to be innovative or not | ➢ Criscuolo et al (2009)<br>➢ D'Este et al (2009) |
| | **Complementarities between innovation strategies** | ➢ **UK**: wider innovations (marketing, organizational, management and strategic) and traditional ones (process/product( are complements)<br>➢ **UK**: Few innovative firms engage design activities although some time do without recognising these as design activites<br>➢ **UK**: management innovation is more likely to occur when firms encounter problems of rapid growth or severe decline<br>➢ **UK**: Explore the ways in which firms collaborate<br>➢ **Scotland**: observes growth in cooperative innovation and of knowledge intensive and financial services | ➢ Batisti and Stoneman (2009)<br>➢ Tether (2009)<br>➢ Mol and Birkinshwa (2009)<br>➢ Swann (2009)<br>➢ Freel and Harrison (2007) |
| | **Impact of innovation on economic performance** | ➢ **France**: Labour productivity was driven by process innovation between 1998-2002 and by product innovation between 2002-2004<br>➢ **Catalonia**: the impact of intramural R&D on productivity decreased in the case of high productivity levels<br>➢ **Estonia**: during 1998-2000 only product innovation increase productivity whereas in 2002-04 only process innovation did | ➢ Mairesse and Robin (2009)<br>➢ Segarra-Blasco (2008)<br>➢ Masso and Vahter (2008) |
| SID | **Sectoral Innovation Database:**<br>➢ 8 countries<br>➢ 94-96; 98-00; 02-04<br>➢ 21 manuf & 17 serv<br>➢ + STAN dababase | ➢ Analysis of the two parallel strategies of technological and cost competitiveness<br>➢ Increasing wages found in industries characterized by product innovation while process innovation is associated to reductions<br>➢ Higher wage polarisation in industries with product innovation; wage compression with process technologies | ➢ Bogliciano and Pianta (2009)<br>➢ Bogliciano (2009)<br>➢ Croci et al (2009) |
| SECTORIAL | **Comparison between manufacturing and services** | ➢ Services are less engaged in innovative activity than manufactures<br>➢ Manufactures tend more to combine product and process innovation<br>➢ Great variation across services: Knowledge intensive business and financial services resemble more manufactures wrt innovation | ➢ Kanerva et al (2006) |
| | | ➢ It is the interaction between technologically advanced manufacturing and service industries that sustains the dynamics of national systems<br>➢ Peculiarities in the creation of knowledge in services:<br>➢ Importance of customization<br>➢ Relevance of human resources (training, organisational changes)<br>➢ Lower reliance on formal means of appropriability (patents) | ➢ Castellaci (2008) |

An important issue that remains relatively unexplored with the information provided by CIS is innovation diffusion/adoption. To our knowledge, nothing has been done to derive an analysis of innovation diffusion/adoption on the basis of this survey. This latter provides statistical data on the modality of innovation and the effects of innovation on economic performance. Therefore, innovation survey can be used to address the question of innovation adoption. However, we should be careful in building indicators of innovation adoption from the CIS since innovation adoption is not assessed directly. There is no specific item to account for it. We have to deduce it from several items. A previous working paper of the SEARCH

project, as well as this one, can thus be seen as a first attempt to quantify these phenomena at the EU level.

# 3. Measuring innovation adoption versus innovation production

## 3.1 Data: The Community Innovation Survey (CIS) in its macroeconomic version

The main descriptive work in this paper is based on the macro information from the EUROSTAT webpage for CIS4, CIS2006 and CIS2008. Although the micro data can also be used, the coverage of countries is bigger in the macro one.[1] This way, the data at the macro level would be available for "all 25 EU Member States, Iceland and Norway as well as Bulgaria and Romania". However, when analysing the availability of data more carefully, many missing observations are present for some of the relevant countries to our research which, de facto, constraints some cross-country comparisons and a full exploitation of the data. As an example, the innovation adoption items are not available for Iceland, Latvia, Malta and Slovenia in the CIS4 version. Additionally, many missings appear: for Bulgaria only the sector of Trade is available, whereas in the cases of Romania, Denmark and Estonia only two sectors are available (Manufacturing and Trade in the first two countries and Manufacturing and Transport for Estonia). This is something to be taken into account, since the national averages we compute in those Member States for the descriptive analyses can be driven by this sector data availability. Since the problem of missing data is even more severe for the CIS3 database, we discarded its use and went on with our analysis with the information available (CIS4, CIS2006 and CIS2008), which are, at the same time, the waves that share more similarities in the design of their questionnaire. Therefore, there is a greater homogeneity in the information provided in these three waves and will be the one used for the descriptive in this paper.

[1] For instance, for the CIS4 micro dataset there are 104717 firms belonging to 16 different European countries and several different NACE2 sectors. The macro-aggregated dataset covers 25 EU member state countries as well as Iceland and Norway. Malta and UK appear in the webpage but the information on innovation is missing. When we compare the micro CIS4 data with the macro ones some important "core countries" are notably missing in the micro database: Austria, Denmark, France, Finland, Sweden and Netherlands. It is important to stress that these countries are probably the most important ones when the analysis focuses on the adoption of innovation, as they are those with a higher level of innovative activity.

### 3.2 Indicators of innovation adoption

After the discussion in the previous Working Paper of this SEARCH project on the pros and cons of different alternative measures of innovation adoption, we chose the following indicator:

Number of adopting enterprises / Number of enterprises with process and/or product innovation or with ongoing or abandoned innovation activities

To construct such indicator, firms are considered as adoptive ones if they declare that their process or product innovations have been developed "Mainly together with other enterprises or institutions" or "Mainly by other enterprises or institutions".

However, when working with data at the macro level (downloadable from the EUROSTAT webpage), we have a double-counting problem if a global adoption rate is computed. Briefly, due to the way the Eurostat web-site provides the data at a macro level, we can obtain the number of firms for which innovation has been developed "Mainly together with other enterprises or institutions" and "Mainly by other enterprises or institutions" in terms of product, on the one hand, and in terms of process, on the other hand. But, this information about product and process innovations cannot be crossed. So, firms for which both product and process innovations have been developed in cooperation with others or mainly by others, are double counted. Because micro aggregated data allows the crossing of different items, an exact count of the number of adopting firms is possible. This is not the case with macro data, for which double counting of product and process innovation occurs. However, in order to have the widest coverage possible, we decided to use the macro information and not using a general indicator of innovation adoption but disaggregated ones, as specified as follows, in order to avoid the double counting problem.

Therefore, the nature of innovation is firstly taken into account by looking at the distinction between **product and process innovation**. The indicator of innovation adoption presented above can be different according to the nature of innovation (product and process):

Number of firms identified as actors of innovation adoption *and* introducing **product** innovation / Number of **product** innovative firms.

Number of firms identified as actors of innovation adoption *and* introducing **process** innovation / Number of **process** innovative firms.

The second kind of characteristics related to the nature of the adoption process refers to the **channels it relies on**. In particular, adoption may result from acquisition of external technologies. But it also relies often on the joint production of innovation. Two indicators can be derived from this information:

Number of firms declaring that their **process or product innovation** has been developed "mainly **together** with other enterprises or institutions"/ Number of innovative firms.

Number of firms declaring that their **process or product innovation** has been developed "mainly by **other** enterprises or institutions"/ Number of innovative firms.

# 4. Description of innovation adoption vs innovation production

Based on the definition and measures of innovation adoption given in the previous section, this section will characterize innovation adoption in Europe. We put the stress on two kinds of comparisons:

- Nature innovation-based comparisons: A distinction will be made according to the nature of innovation: in particular, product vs process innovation and collaboration (or jointly production of innovation) vs acquisition of external technologies will be analysed.
- Geographic comparisons: Comparison across European countries in relation to the main variables characterizing innovation adoption. Special emphasis will be made in the comparison between the behaviour of core European countries and Eastern countries.

First, we turn to analyse the general pattern of the use of adoption made by firms that are product innovators and those that are process innovators, to study whether their adoption intensity varies (Figures 1 and 2).

Overall, our empirical evidence shows that the percentage of process adoptive firms as an average of all the EU countries under consideration in the period 2000-2002 is equal to 43%, and it keeps around this value through the first decade of the 2000s. That it, 43% of the European firms that innovate rely on the development of innovation through collaborations with other enterprises/institutions or by acquiring the technology directly from other firms. However, for the case of product innovation, the adoption rate is much lower, equal to 29%, a value almost identical in all the period under consideration. The other face of the coin tells us that 57% of the firms innovating in process, do their innovation by their own, whereas this rates increases to 71% for the case of product innovators.

It seems therefore that the adoption rate is higher in the case of process innovation (43%) than for product innovation (29%). So, innovation adoption is more process-oriented, a result stable along time. It is not surprising that process innovations appear highly adopting. Indeed, there is a close relationship between process innovation and machinery investment (Conte and Vivarelli, 2005). In turn, such embodied technology represents a very tradable component compared to i.e. intangible assets. Our results seem to suggest that process innovations need interactions between the firm and its suppliers and/or clients to be successful and are often the results of supplier or client needs. This would encourage cooperation or outsourcing strategies to develop this type of innovation. This result on innovation adoption being more process oriented is obtained in line with the pattern of innovation on its own which is also more process-oriented, around 28 % of EU firms make process innovations vs. 23% which perform product innovations.

Next, we consider the way innovation is adopted. In this sense, we distinguish two modalities of adoption. The firms can:

- either develop their innovation mainly in cooperation with other enterprises or institutions (joint production of innovation)
- or rely on innovation developed mainly by other enterprises or institutions (acquisition of external technologies).

As for this nature of the adoption of innovation carried out by European firms, we obtain that joint production activities are driving innovation adoption at the EU level while the acquisition of technologies from external innovators is a less important source of adoption of innovation (both process and product). This result is reproduced throughout the whole period (2000-2008).

In Figures 3 to 6 we reproduce the same analysis separately for two groups of countries: those in the core of the EU and the New Entrants. As it can be observed, there are not differences worth to be commented. Thus, along the 2000s, innovation adoption seems to be more important for process innovations than product innovations, and cooperation activities are driving innovation adoption at the EU level while the acquisition of technologies from external innovators is a less important source of adoption (both process and product). A conclusion equally valid for both groups of countries in Europe.

We turn now to the geographical comparison across countries, with an analysis of the heterogeneity of adoption rates across EU countries. We will organize the description by firstly analysing the heterogeneity of adoption rates across EU countries, and then present the main correlations of innovation adoption vs. the total innovative effort with the idea of understanding whether differences can be actually observed among countries which "produce" innovation and those which, instead "adopt" this innovation. This task will be carried out, also, by disaggregating innovation adoption by its main "characteristics", that is of being product or process innovation or of being performed jointly with other innovative firms or as a result of a direct acquisition from another (external) firm.

Despite the average percentage of process adoptive firms being equal to 43%, this rate varies considerable according to countries (Figures 7 and 8). The highest values are observed for Cyprus and the Netherlands (62%, although Cyprus decreases considerably four years later) and then for Slovakia, Hungary and Czech Republic (slightly above 55 %, in both periods). For the case of product adoption (Figures 9 and 10), the order of countries is very similar although with lowest rates of adoption.

Also, we observe that countries with higher level of innovative activities seem to be also those more dynamic in the context of innovation adoption. It seems that fostering innovation

activities may also be associated to some extent to spillover effects (which take place through "adoption mechanisms") leading to higher levels of adoption of innovation (in this respect, we should take into account that the adopting rates are calculated over innovative firms, whereas innovative firms are calculated over total number of firms).

Generally, countries with low innovation rates also record a low adoption rate, no matter whether it is in product or process. This concerns Romania, Bulgaria and Spain. On the opposite, countries with high innovation rates have higher adoption rates (like Cyprus, Germany and Austria). Some countries have specific positions against this general rule of high innovation and high adoption rates:

- Luxembourg has a high rate of innovation but the adoption rate is very low for all types of innovation.
- Slovakia, Hungary, Latvia, and to a lesser extent Poland, have very important adoption rates together with very low innovation rates. That is, firms in these countries rely less than in others on innovation made in the own firm, and more importantly in that made together with other firms or acquired directly from others.

With respect to the evolution of this relationship between 2004 and 2008, we maintain the same conclusion of a positive correlation between innovation and adoption.
When looking at Figures 11 to 14, we can comment on the differences in the nature of adoption. As commented above, both the rates of joint production of innovation as well as the acquisition of external technologies are higher for process innovation than for product innovation. As a consequence, in terms of level, differences between countries are lower for product innovation than for process innovation. Indeed, the gap between minimum and maximum rates is larger for process innovation.

For process innovation, the Netherlands strongly appear to be the country with highest level of adoption based both on cooperation and acquiring from others. Some countries seem more cooperation oriented like Finland, Sweden, Denmark, Norway and Czech Republic contrary to Hungary, Spain and Estonia where the rate of acquisition of external technologies is higher. The profiles observed for product innovation, even if country differences are smaller, are often the same as those for process innovation. Countries that strongly rely on cooperation for product adoption also strongly rely on cooperation for process adoption.

We turn now to shed some light on the time evolution of adoption in EU countries according to the data recorded in the CIS4 over the period 2002-2004 and the adoption rates recorded in the CIS2008 over the period 2006-2008 for the countries for which such information is available in the two waves. The two periods are not very distant but they may help us to observe some changes over time. In addition to a global evolution of adoption, these two waves of survey may provide some information about potential changes in the way adoption occurs, by confronting the evolution of cooperation-based adoption to the one of acquisition of external technologies.

Figures 15 and 16 show that, both for product and process innovations, firms tend to rely less on the joint production of innovation without changing the rate of acquisition of external innovation. The percentage of cooperation based adoption decreases by 2 percentage point between 2004 and 2008, which is really a small change.

For the case of process innovation, four countries present the highest increases in the acquisition of external technologies together with the highest decreases of joint production of innovation: Poland, Estonia, Czech Republic and Bulgaria.

For the case of product innovation, only Belgium, Sweden and France present a positive change in the joint production of innovation, with the rest of countries showing negative changes (Luxembourg, Austria and Sweden with the highest decreases together with increase in the acquisition of external technologies). Therefore, we can conclude that product and process innovations did not face the same exact evolution in the way adoption is conducted.

# 5. Conclusion

The objective of this paper was to analyse the innovation adoption process in Europe. Although we were interested in knowing which is the innovation adoption process in the European Neighbouring Countries (ENCs) compared to that of the EU countries, the statistical information in CIS does not cover any of the ENCs. Therefore, since this task can not be tackled with the statistical information available, we will try to proxy for it doing a comparison between the innovation adoption processes followed in the core countries

compared to that of the New Member states. The new member states that entered recently the EU resemble more closely the ENCs, so that the lessons obtained from this comparison between EU core and EU New Members can be useful for the design of innovation policies.

For all the countries, the adoption rate is higher for process innovation (43% on average) than for product innovation (29% on average). This goes in line with innovation rate which is more process oriented: 28 % of EU firms make process innovations whereas 24% perform product innovations. Such a result suggests that process innovations need interactions between the firm and its suppliers and/or clients to be successful. Moreover, process innovations are often the results of supplier or client needs. This would encourage cooperation or outsourcing strategies to develop this type of innovation.

The nature of innovation adoption can differ according to the way adoption occurs. In particular, adoption may result from adoption of external technologies but it also relies often on the joint production of innovation. This last pattern is more frequent than the first one. Cooperation activities are driving innovation adoption at the EU level while the acquisition of innovations from external innovators is a less important source of adoption of innovation (both process and product)

Generally speaking, countries which display the highest level of innovation are also those which show the highest adoption rate and conversely countries with weak capacity to innovate are also weak adopters. Thus, the complementary dynamics linking innovation and adoption seems to be at work. However exceptions exist which are certainly not to neglect if we are to understand how countries can react to European incentives. These exceptions are Luxemburg which displays low level of adoption compared to their innovative capacities, and Slovakia, Hungary and Latvia which have a very high rate of adoption compared to its rate of innovation.

The comparison between two waves of the CIS (2002-2004 and 2006-2008) shows that both process and product adoption based on cooperation decreases by 2 points of %. On the opposite, the acquisition of external technologies remains stable.

Mostly important for our purpose is the conclusion that the general patterns of the level of innovation adoption do not present substantial differences between EU core countries and

New Entrants for product and process innovations and they tend to follow the general rule of similar relative rates of adoption and innovation. However, some countries that have a specific position against this general rule include New Entrants such as Slovakia, Hungary and Latvia, with important adoption rates together with very low innovation rates. This is so because, as said before, the adoption levels do not seem to be very different among the two groups whereas the innovation levels are lower in the case of these New Entrants.

Accordingly, we could say that New Entrants in general tend to innovate less than core EU countries, but once they decide to do it, there is a high heterogeneity across countries in the level of adoption as well as in the way they adopt. In fact, among the countries that display high level of adoption compared to their innovative capacities we find mainly New Entrants.

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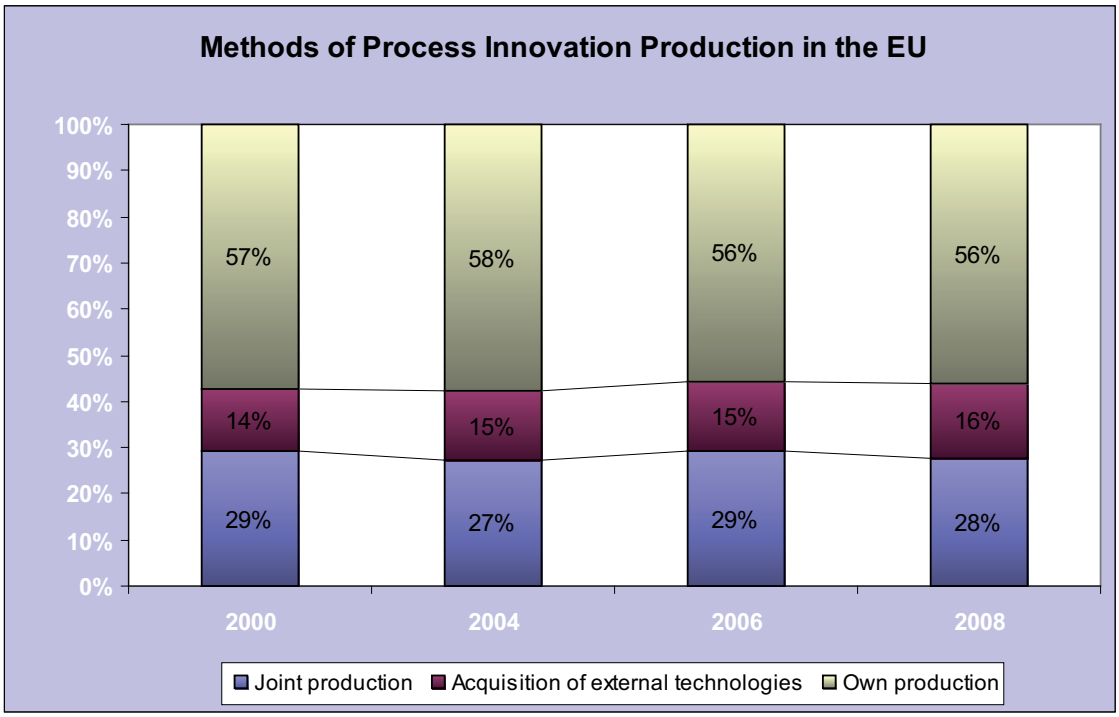



Figure 1.Methods of process innovation production in the EU

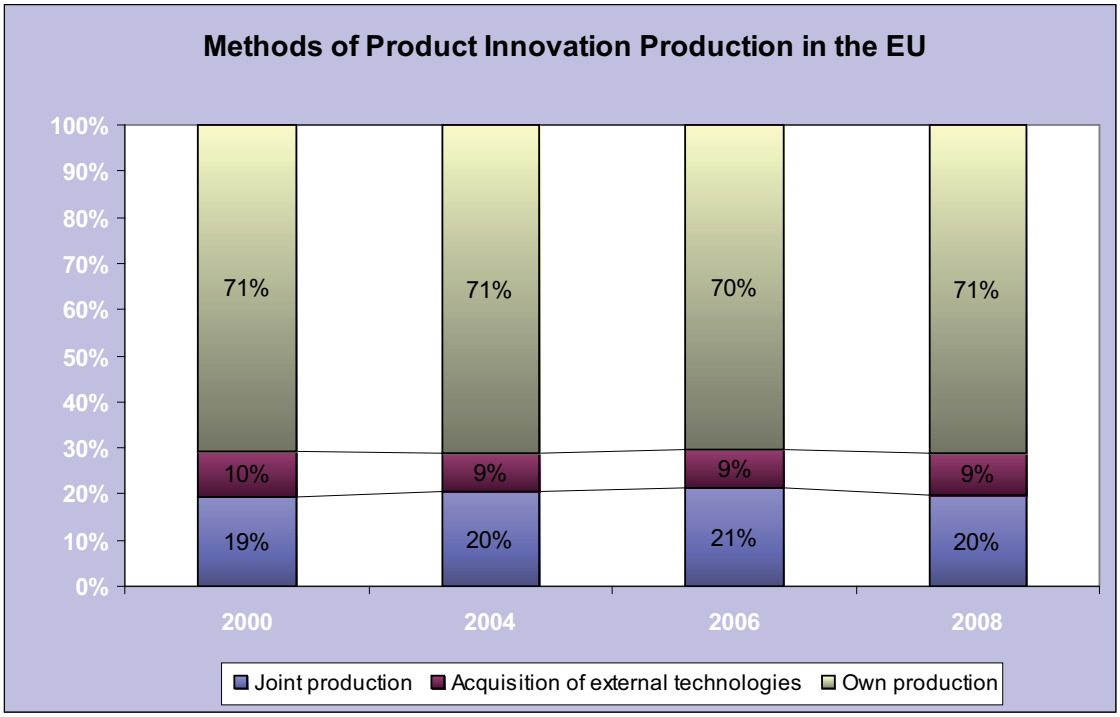



Figure 2. Methods of product innovation production in the EU

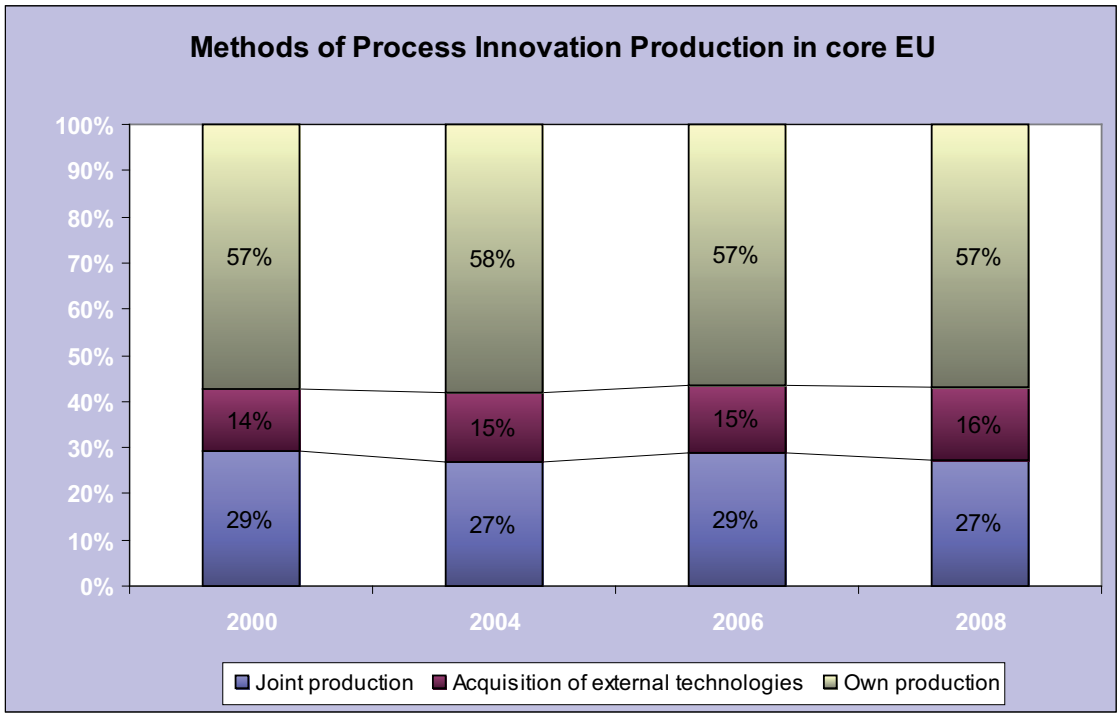



Figure 3. Methods of process innovation production in the core EU countries

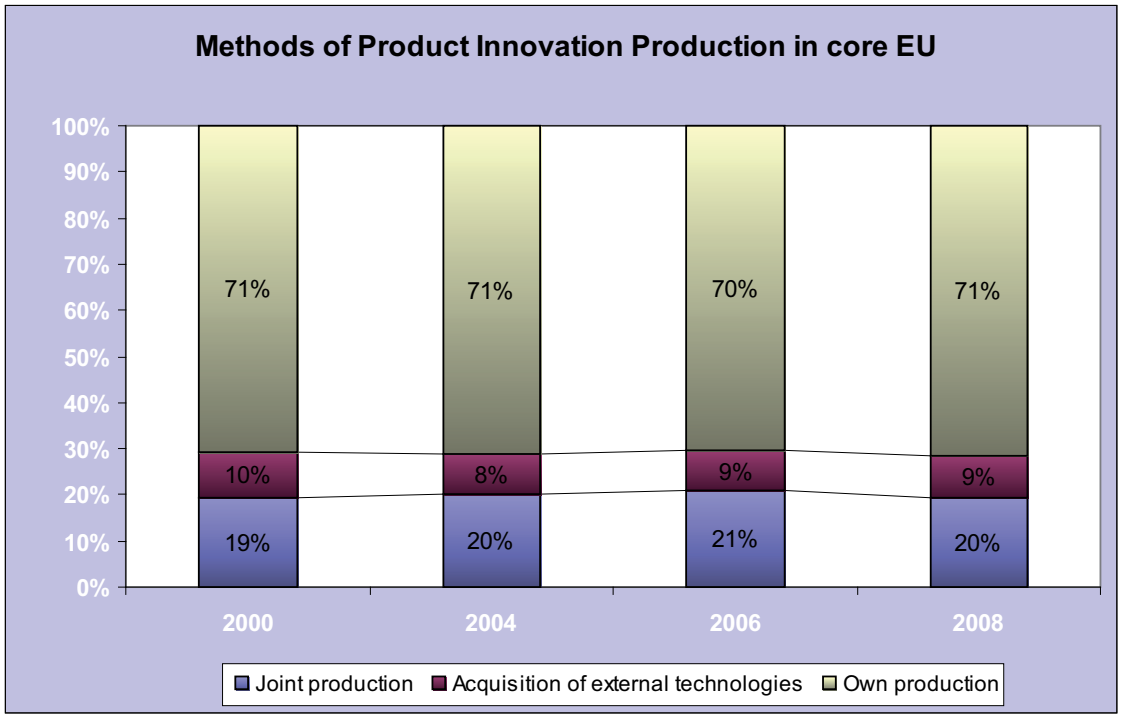



Figure 4. Methods of product innovation production in the core EU countries

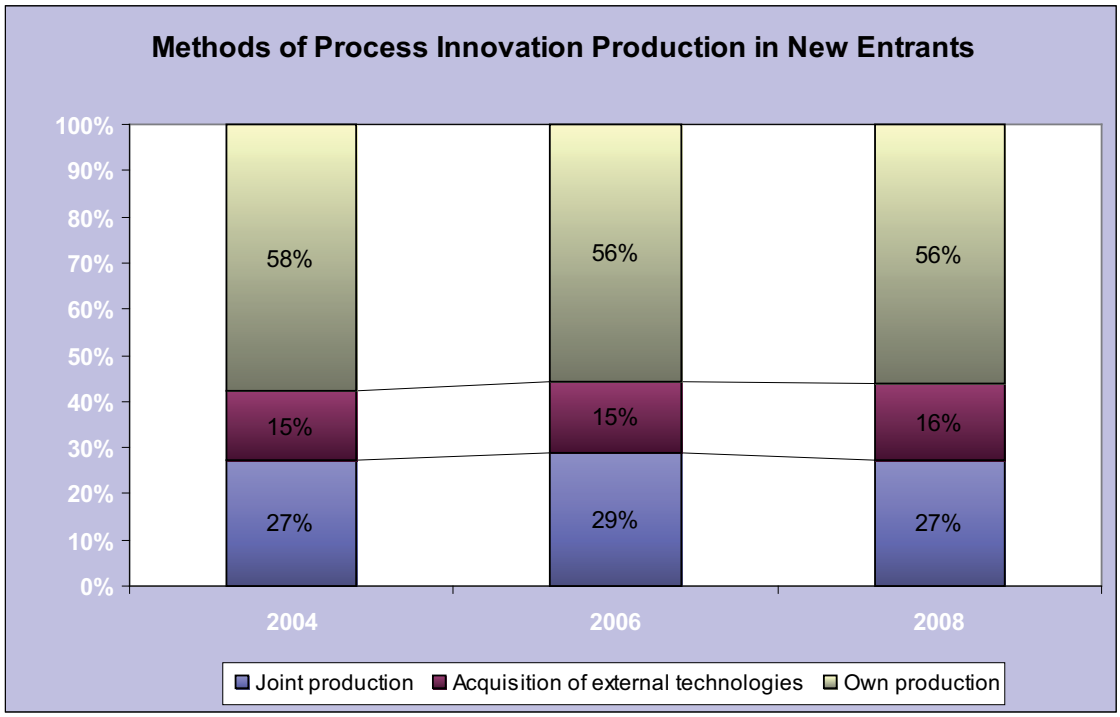



Figure 5. Methods of process innovation production in the New Entrants

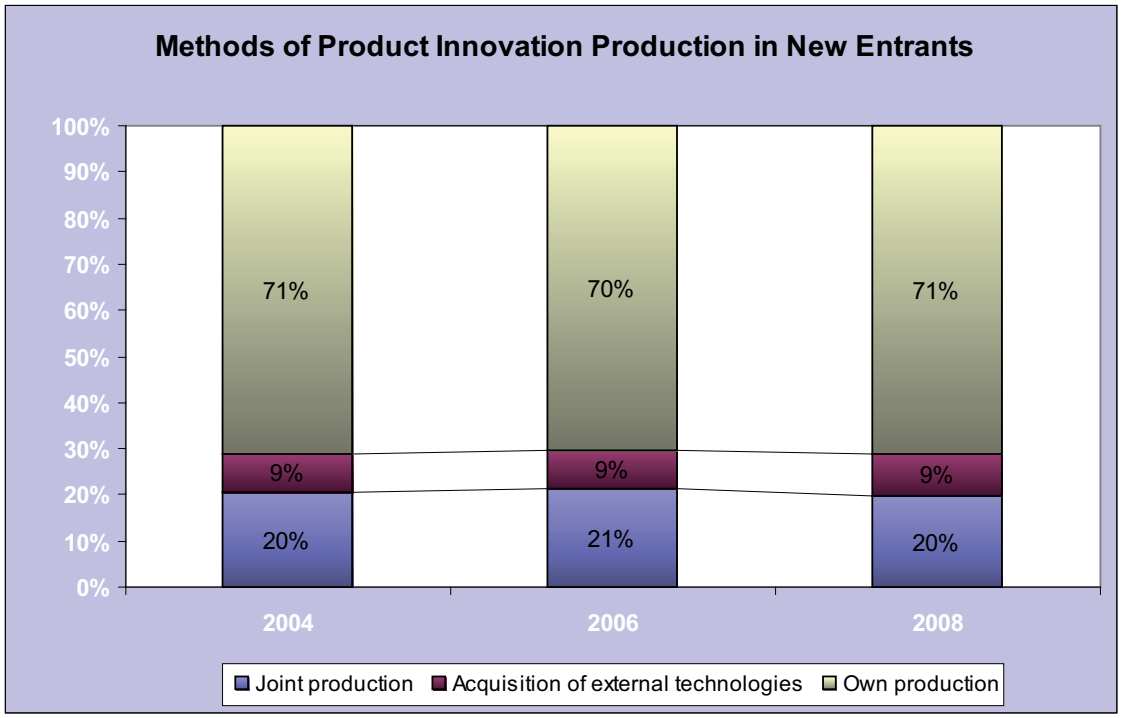



Figure 6. Methods of product innovation production in the New Entrants

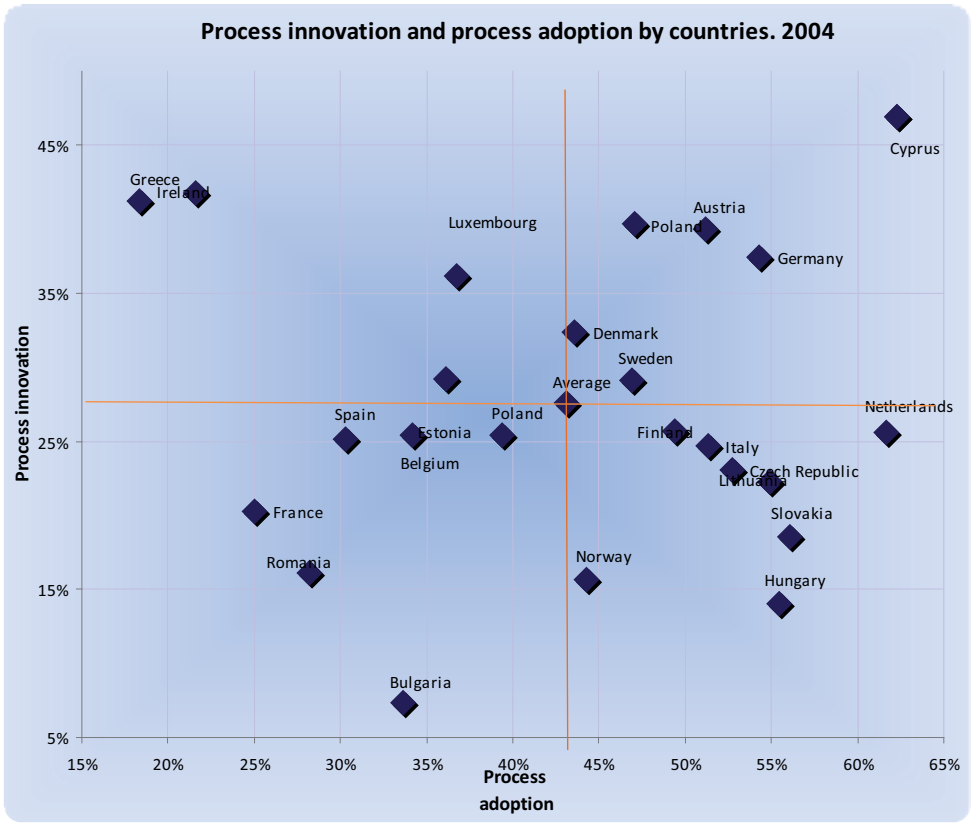


Figure 7. Process innovation and process adoption by countries. 2004

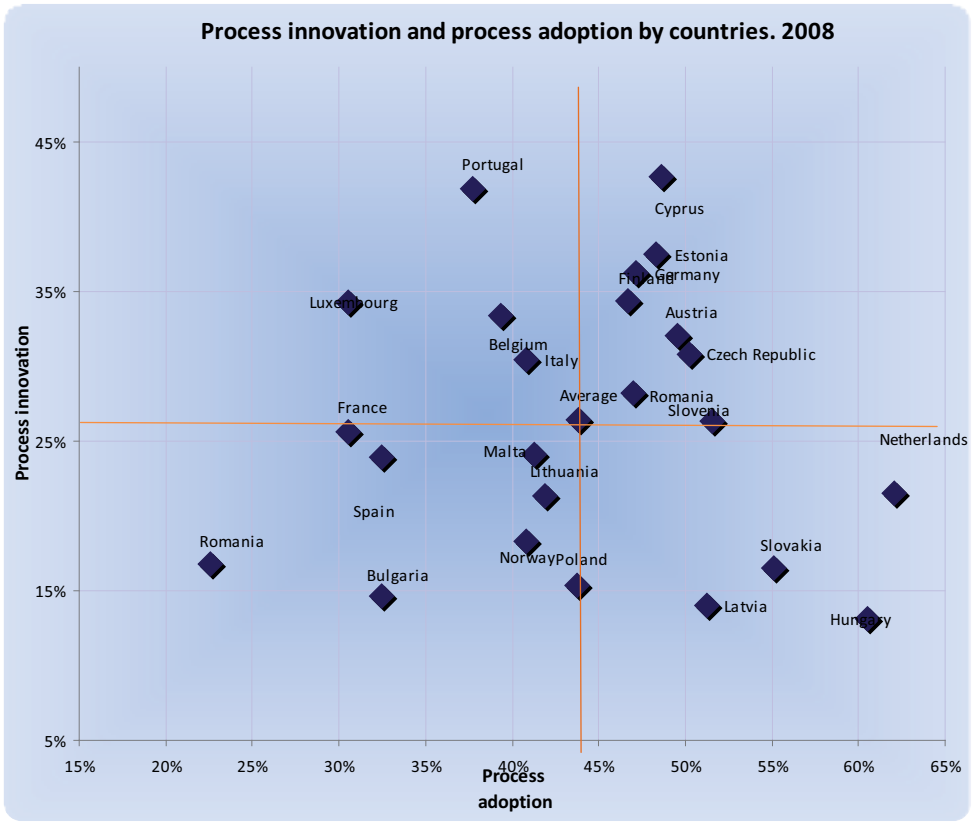


Figure 8. Process innovation and process adoption by countries. 2008

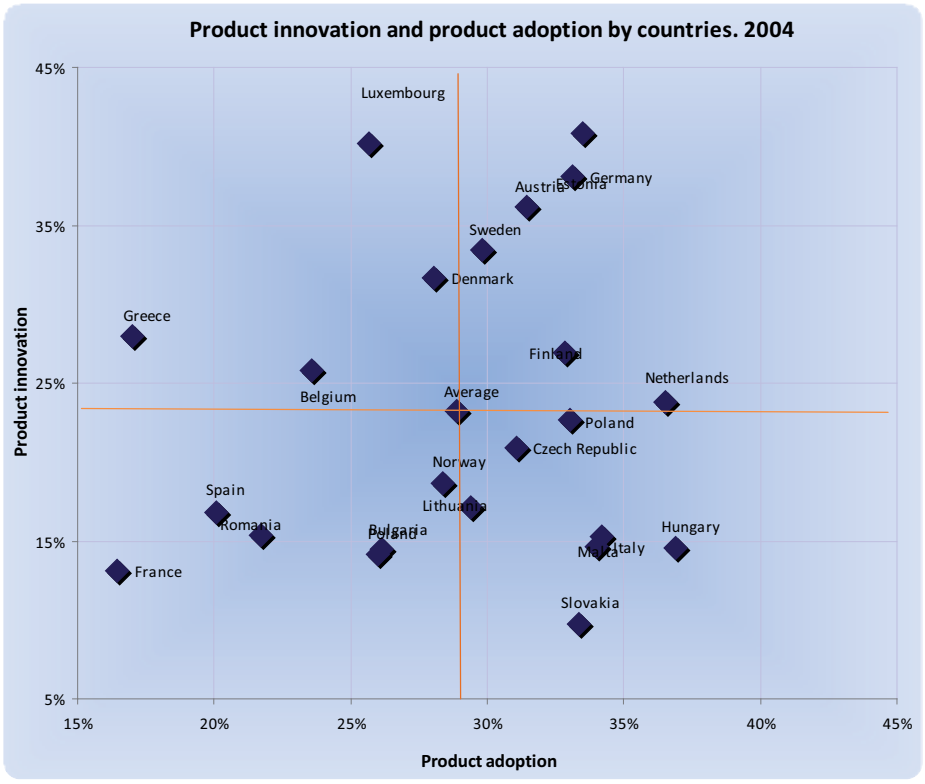



Figure 9. Product innovation and product adoption by countries. 2004

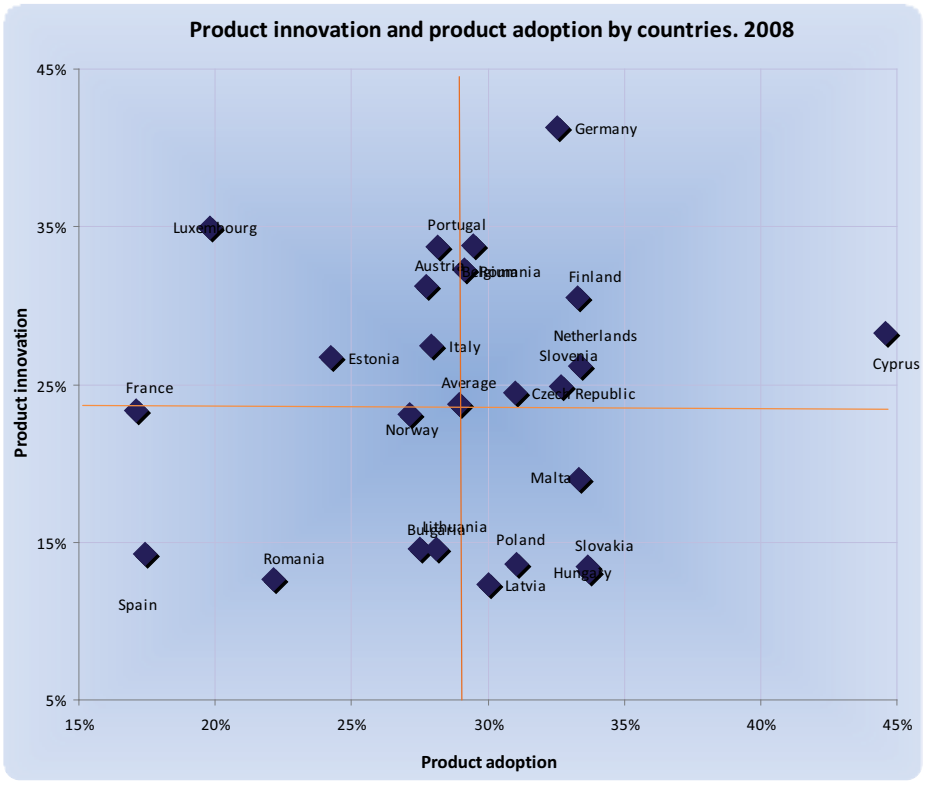
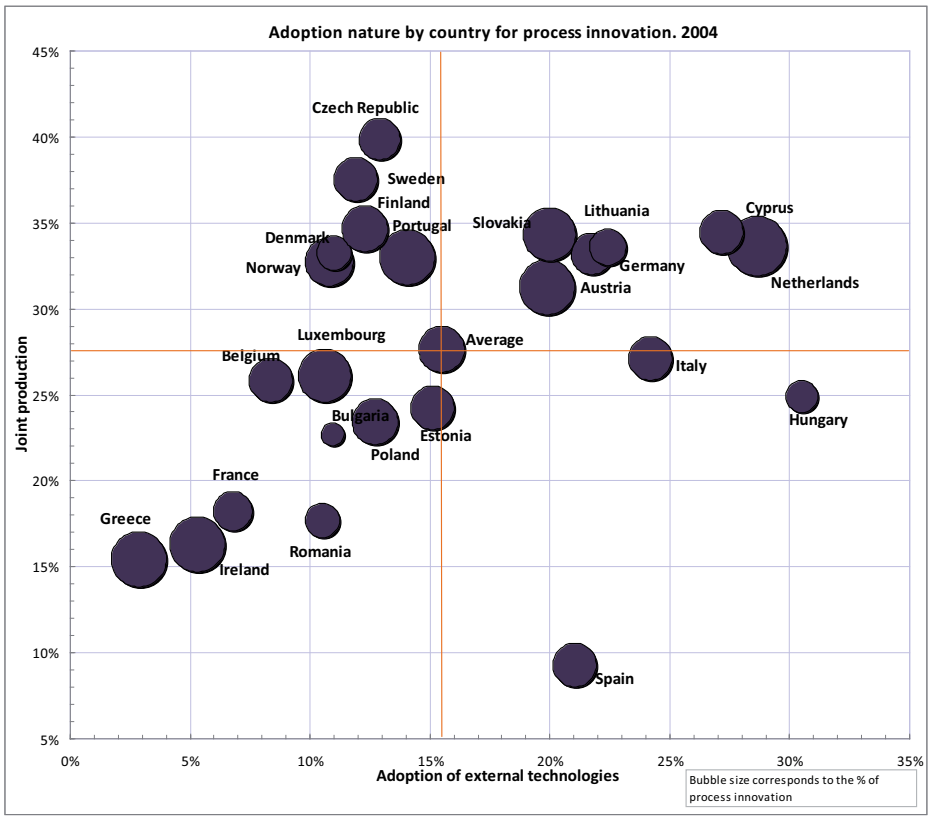



Figure 10. Product innovation and product adoption by countries. 2008

Figure 11. Adoption nature by country for process innovation. 2004



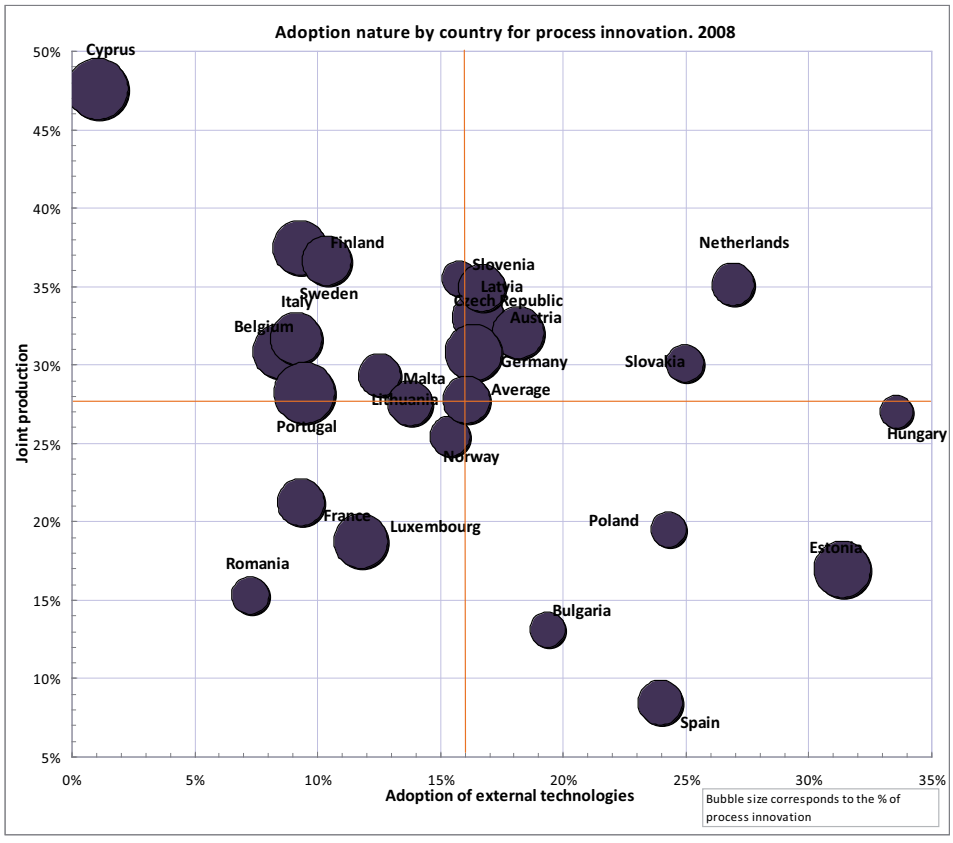
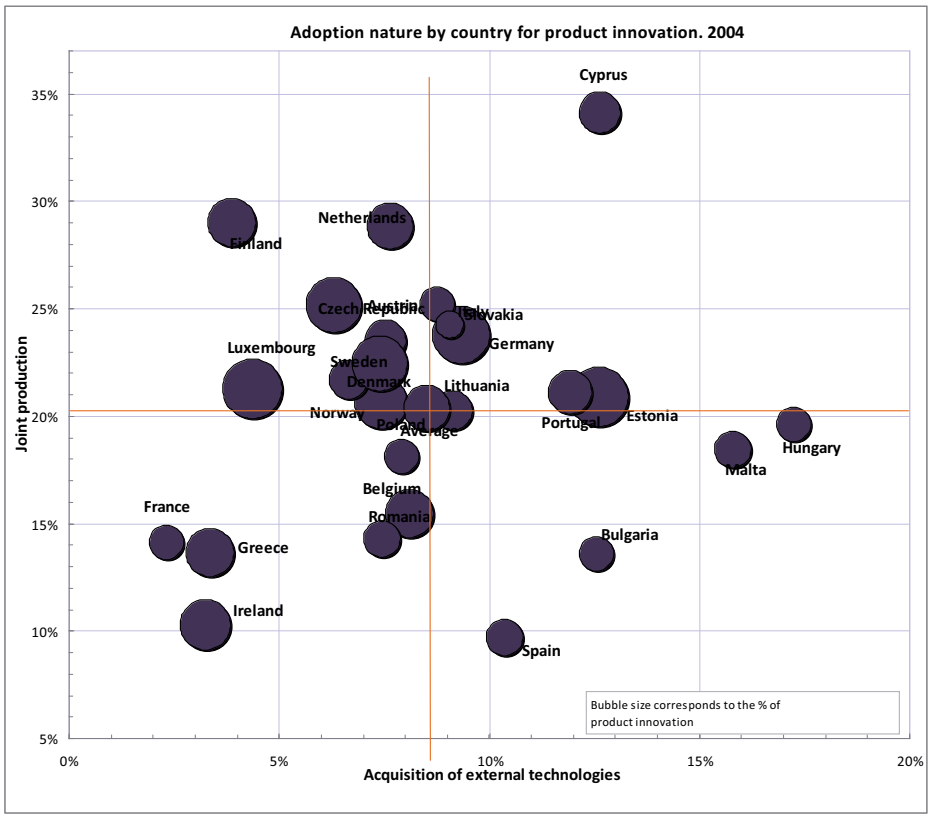




Figure 12. Adoption nature by country for process innovation. 2008

Figure 13. Adoption nature by country for product innovation. 2004



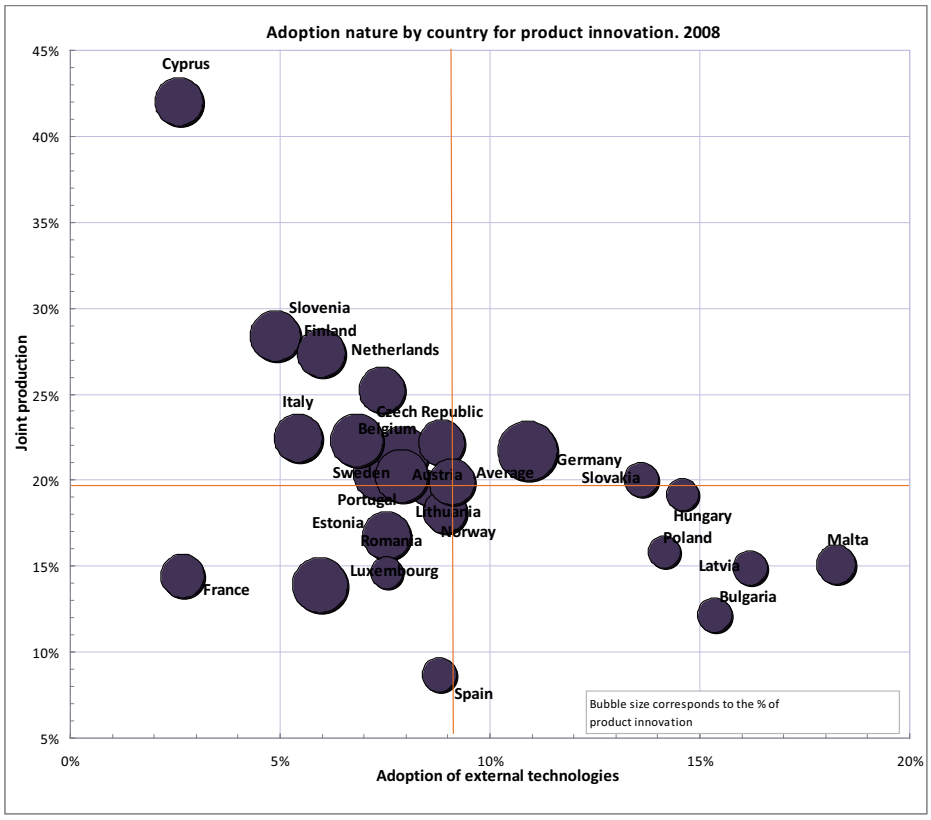




Figure 14. Adoption nature by country for product innovation. 2008

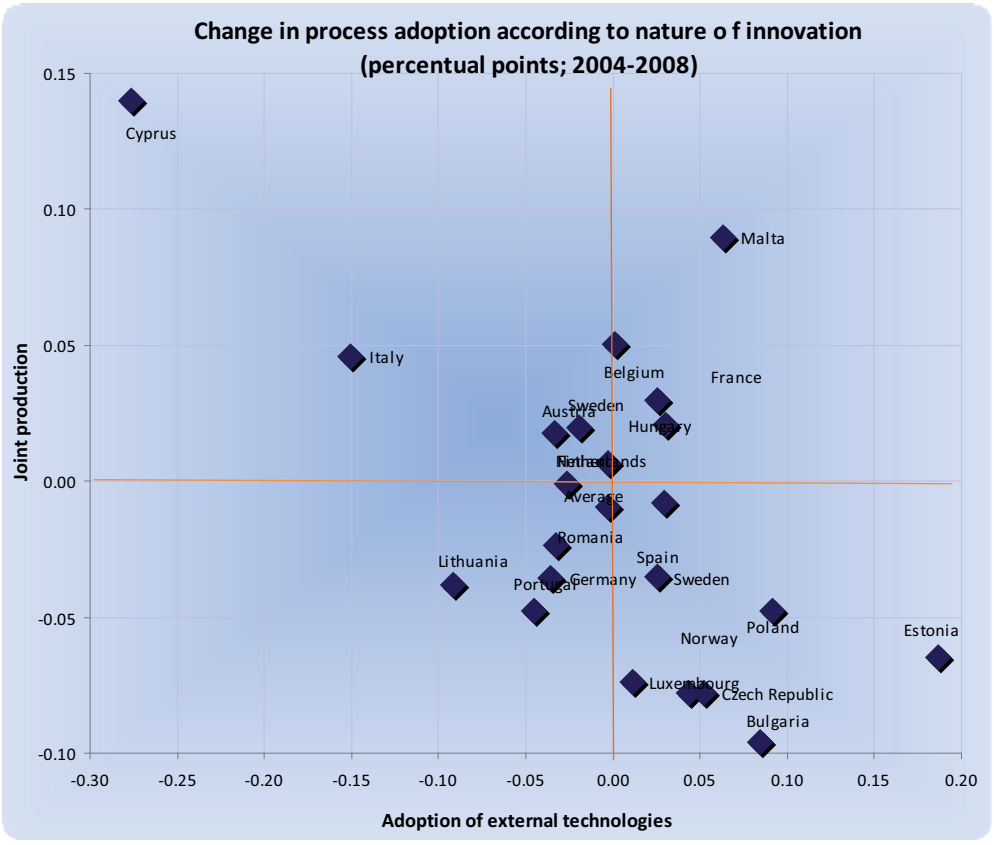



Figure 15. Change in process adoption according to nature of innovation

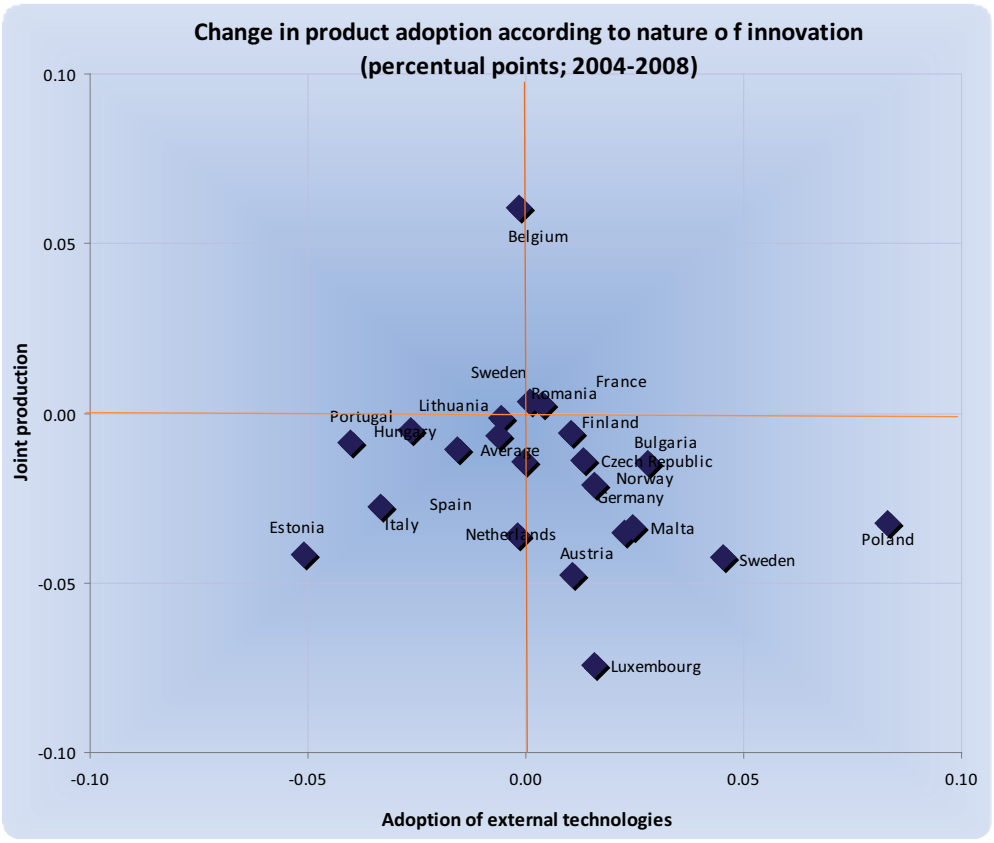



Figure 16. Change in product adoption according to nature of innovation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