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Design and construction of a set of indicators for innovation production and adoption in EU countries

Rosina Moreno*, Corinne Autant-Bernard^, Sylvie Chalaye^, Fabio Manca*, Jordi Suriñach*
*UB-AQR, ^UJM-GATE

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OBJECTIVE

Indicators of the production of innovation are available at the EU level, whereas those of adoption and diffusion are not straightforward available. Since it is important for policy makers to hold precise information about the adoption of innovation, in this paper we discuss and produce a suitable indicator apt at measuring these technological processes, especially when we acknowledge (as it is done in the literature) that innovation and technology are the engine of economic growth and social prosperity.

MAIN RESULTS

At the EU level, the innovation adoption rate is quite high (39%). This is especially true for process innovations. Most adopters rely on cooperation, stressing the important role played by interaction between users and suppliers in the adoption process.

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. This runs counter to the hypothesis of a specialization of the EU countries on different phases of the innovation process, according to which core countries would specialized themselves on the invention of new product and processes, while peripheral countries would be specialized on adoption-based innovation. On the contrary, the results support the idea of a complementary dynamics linking innovation and adoption in most of the European countries.

Looking at sectoral heterogeneity we show that some industries are essentially relying on adoption (Whole sale trade, Transport and communication, Electricity, gas and water supply) while others are recording at the same time very high innovation rate and very low adoption rate (Manufacturing and Computer and other business services). Due to the low number of sectors for which we have been able to have homogeneous information, it is however difficult to enter into more detail for sector

analysis. The absence of correlation between adoption and innovation at the sector level has been observed. This may highlight the occurrence of inter-sector technological flows.

POLICY IMPLICATIONS

As a result of the experience working with the CIS dataset in order to study the innovation diffusion process in the EU countries, we can offer some suggestions for future implementation of CIS data and questionnaires:

- With the available information in CIS, **it is nowadays impossible to compute any indicator on innovation diffusion for the ENCs**. **None of them are present in the CIS.** Therefore, it would be desirable to increase the number of countries available.

- Some improvements in the CIS survey may allow coping with the main limitations highlighted in this study. In particular, **collecting more quantitative information** about the way innovation is produced would be of great help in econometric and economic analysis. For instance, the shares (or the intensity) of innovation made within the firm, in cooperation or developed by others should be registered directly for each case. Moreover, the usefulness of the CIS data comes from the possible crossing of several items. Most of these crossing cannot be implemented using aggregated data available on Eurostat website while micro data are needed. **Increasing the availability of data at the micro level** (which for now is restricted to only few EU member states) would thus provide more tractable information and richer analysis of the adoption process and its determinants.

- A second suggestion would be that of **trying to eliminate the subjectivity in some of the questions of the CIS** questionnaire in order to be able to better define categories and quantify the answers. Some of the present questions, for instance, ask to define whether an innovation has been developed "mainly" by other firms or in collaboration. This subjectivity impedes to measure or consistently define the same processes across countries due to the possible biases related to the subjectivity of the answer. As suggested above, this subjectivity may be partly solved by asking the share of innovation that relies on each type of innovation and not as a result of the interpretation of the word "mainly".

- **In the present CIS3 and CIS4 questionnaires, the items allowing to deal with the innovation adoption issue, do not provide separated information about diffusion occurring within the country and across countries.** A revision of this question may solve directly this problem.

- **EUROSTAT should provide a technical annex on how the macro data** provided in their web-site **have been treated starting from the micro data**. Aggregation issues and different methodologies may be in fact a problem for researchers which have to know, first, how the statistical office treated micro data in order to obtain macro ones.

- So far in CIS we know if a firm has made innovation or adoption but not **the intensity of such processes**. Therefore, a firm making some innovation but at a very small scale and a big firm making a lot of innovation are, at the moment, considered equally. **A question (even qualitative) about the importance of innovation in the firm activity could be added**. This question should be

asked for each type of innovation (innovation made within the firm/ innovation made in collaboration / innovation made by others).

- Another drawback of the CIS is that it does not allow us to assess the intensity of technological flows between EU countries. The CIS does not provide us with information on the geographical origin of the technologies adopted by the firms. This kind of information is crucial to determine whether innovation diffusion arises mainly within countries, or if significant technological flows occur also between countries. Identifying the countries that mostly benefit from these international flows would also be of interest. According to our results, the hypothesis of a diffusion arising mainly between Core countries appears as the most plausible one. The highest levels of adoption are recorded for Core countries. But obviously this requires additional investigations.