Research at the Bank of Spain: An Evaluation

Ricardo Caballero (Massachusetts Institute of Technology)
Jordi Galí (CREI, Universitat Pompeu Fabra and Barcelona GSE)
Lucrezia Reichlin (London Business School)
Luis Servén (World Bank)

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Introduction

This report evaluates the research activities carried out at the Banco de España (henceforth, BdE). The focus of the report is not only on the production of academic-type research but also on how the organization exploits its research capacity for the policy process and for its communication strategy. We also discuss organizational issues, including recruiting and career development.

The main thrust of this report is that research in a central bank must be evaluated not only on the basis of the usual academic standards but also by its ability to contribute to the mandate of the institution. The research function at central banks has been historically created to support the development of policy strategies, the process of decision-making, and the communication of both to the public at large, including the academic community. Moreover, the recruitment of researchers enhances the human capital of the institution, beyond the pure research task. The preparation of policy and the production of research, however, have different organizational requirements. Research needs time to develop and therefore cannot work under the pressure of the policy cycle. The production of policy briefings, on the other hand, needs to be timely. Researchers cannot work exclusively on projects that are determined at the management level since part of the research production involves the identification of interesting topics beyond the immediate needs of the organization. Management, however, is often in a position to identify key policy problems that need supporting research projects and must be able to inspire and motivate these projects.

A successful model for the production and use of research in a central bank must find a way to ensure that the quality and relevance of research are treated as complements rather than substitutes. To this end, it is important to guarantee a two-way communication process between researchers and policymakers, and the involvement of researchers in the discussion and preparation of policy. The report makes a number of suggestions to help achieve this objective.

The report is organized in two parts, which are largely autonomous. In part one, we describe the research function at the BdE, reviewing the organizational models in the different directorates and assessing their relative success. While our focus is on the production of research aimed at publication in academic journals, we seek to take a broader view and discuss also the use of that research—and of researchers' human capital-- by the institution. Our evaluation is based on our meetings with managers and staff at the BdE and on the quantitative analysis reported in Part two (to which we refer). In part one we also outline what, in our view, are the most important challenges facing the research function at the BdE, and conclude with some recommendations. Part two, which can be read as a separate document, evaluates only research production and its academic impact using standard metrics in research evaluation based on the number of publications and their citations. We report statistics for the institution as a whole as well as for the units directly involved in the production of research.

It is important to stress at the outset that the measures of research output considered in our analysis do not include contributions to in-house publications (e.g. the Monthly Bulletin or the Annual Report). The focus of those publications, which are a key element in BdE public communication, is largely one of analysis of current economic developments, even though they occasionally draw on the academic research of BdE economists. We also exclude from our analysis the production of data, which is another important function of the BdE.

The Bank of Spain supplied background information on research outputs and research staff for this evaluation, and arranged interviews with researchers across the institution, as well as meetings with senior managers of research and policy units. We are especially grateful to Juan F. Jimeno, head of the Research Division in DG Economics, for his generous help at various stages of this report. We are, of course, solely responsible for all the views and recommendations expressed in it.

PART ONE. Research at the Banco de España: Overview, Challenges and Recommendations

1. Overview

Research at the Banco de España (BdE) is mainly conducted within the Directorate General of Economics, Statistics and Research (henceforth, DG-Economics). Within this directorate, the Research Division, which belongs to the Department of Monetary and Financial Studies, has the production of research as its main responsibility.

However, at the BdE, research is by no means only present in the Research Division and/or in DG-Economics. Within the latter, research is also conducted in the other divisions of the Department of Monetary and Financial Studies (including the financial studies and monetary policy divisions) as well as in the Department of Economic Analysis and Forecasting. Moreover, research is also conducted in the Associate General Directorate of International Affairs (ADG-International) and in the General Directorate of Banking Regulation (DG-Regulation), in particular in the Financial Stability Department.[1]

Accordingly, we see that the organizational model of the BdE is a hybrid one: even though there is a dedicated research division in a particular Directorate, research is spread over many other parts of the organization. Several aspects of this model have evolved over time. Thus, since 2005 some of the recruitment of researchers has been conducted through the international PhD market rather than through the traditional "public examination" channel, in order to target people capable of conducting and following academic-style research. Interestingly, this welcome change in the recruitment process has not been restricted to the Research Division, which indicates that research is in demand more generally throughout the Bank. This development implies that the Research Division does not have the monopoly of research any longer and substantial, sometimes uncoordinated, research is produced outside its boundaries. This is highlighted in Part Two of our report, which makes clear that the publication of research output is now spread throughout the organization, even though the Research Division keeps playing a prominent role, as reflected in the quantity and impact of its publications.

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[1] Whether a given BdE staff member is to be considered a researcher or not for the purposes of this report—and, in particular, the quantitative analysis of Part 2—can be controversial. We chose to work with the list that was provided to us by the BdE, and which corresponded to that found in the Research Portal of BdE's website. As will be clear later it includes many economists who have not been doing active research in recent years (although they may have in the past).

1.1 Organizational model

The organization of research, the interaction between research and policy work, as well as the allocation of research time, differ across directorates and departments. We have identified the following typologies in the three relevant directorates.

- *DG -Economics*

A substantial amount of research produced in this Directorate originates in the Research Division. Within the latter, all researchers have a PhD from Spanish or international universities, and most of them have a strong profile in terms of academic style type of research. The Research Division, when in full capacity, has eleven people, just below half of the number of economists in the Department of Monetary and Financial Studies (to which it belongs). This includes the head of division, five macroeconomists, and five microeconomists. Currently three people are on leave and the macro group is well below capacity. The micro group is responsible for the maintenance of the Survey on Household Finance and Consumption. The head of the Research Division reports to the head of the Department of Monetary and Financial Studies.

With the exception of those in charge of the household survey, who have a heavy workload related to the maintenance of the dataset, staff in the Research Division allocate about 80% of their time on average to research. The rest of the time is dedicated to administrative tasks or, occasionally, policy-related work. The work program is established in a bottom-up fashion and priorities do not seem to be discussed with senior management. Researchers, including the head of division, do not participate in policy meetings and they are not debriefed by the Department managers who do.

The Research Division organizes two high-level seminar series that are attended by the Governor. In the first series, one or more staff members present their recent research. The other seminar series is more policy oriented and consists in inviting a speaker external to the Bank and having a staff member discuss his or her talk. This is a recent initiative and constitutes one of the few occasions of contact between researchers and policy makers, in particular the Governor.

Although the research group is quite successful on pure research criteria (see Part Two of the present Report), the division seems detached from the rest of the institution, including its own Department and DG. Research is produced, but rarely used by the institution. The blame lies on both sides. Research is not inspired by the policy agenda of the Bank, possibly due to the lack of communication between policy areas and Research. As a consequence, it is seldom used in the formulation of policy. The situation is different in the micro group whose tasks related to the survey are well defined and fully supported by DG-Economics.

Possibly as a consequence of this gap, research is conducted also in the other two divisions of the Department of Monetary and Financial Studies, where many economists produce working papers on a regular basis. There the fraction of time devoted to research lies in the 30-70 percent range and there is limited expectation to push the papers beyond the stage of working papers. These researchers spend a considerable amount of time working on some of the reports published by the BdE, including the Monthly Bulletin and the Annual Report.

In the Department of Economic Analysis and Forecasting, within the same Directorate, four people have been recently hired through the Ph.D. job market (two in the Economic Policy Analysis division and two in the Forecasting and Economic Analysis division) and, in principle, they are expected to devote an important part of their time to research. Other economists in the Department also produce working papers and publications in journals regularly.

- *ADG-International*

The model here is quite different. The research function has been built up recently with the hiring of five PhDs from the international market. In principle they were expected to devote 70 percent of their time to research, but this allocation doesn't seem to be always respected.

Researchers find it difficult to bundle their time in order to put enough effort into a single project and finalize it for publication. Topics are often allocated in a top-down fashion and tend to shift frequently driven by the needs of the policy process. Although management recognizes the importance of research, it has not designed an organizational model whereby staff can contribute to the needs of the policy process and at the same time carve quality time for more ambitious long term research projects.

- *DG-Regulation*

Here research is conducted mostly in the Financial Stability Department. Research is becoming increasingly successful by purely academic standards (see Part Two) while focusing on topics of high relevance to the Bank (and very topical at the present time). Researchers have a clear sense of ``belonging'' to the institution and identify themselves with its mission. Academic-style research is used to support the preparation of the Financial Stability Report. Some projects are conducted in collaboration with the Directorate of Financial Supervision. The time allocated to research is not rigid and varies across individuals, but on average is about 70 percent. The Financial Stability Department, like other units in the BdE, has a history of successful collaboration with academics in joint projects, although collaboration with researchers in other DGs is limited. The possibility and the success of such collaborations can partly be explained by the richness of the data sets available to the BdE in this particular area.

- *DG-Supervision*

  This Directorate General has a very limited role in the production of research, and that's why we leave it out of the subsequent analysis. Most of the analytical work here is directed towards solving specific problems staff may encounter in their policy tasks, especially in relation to their risk management models. This requires finding tools and practical solutions, from the literature or, quite often, from their interaction with banks and other supervisors. Some of their limited research needs are supplied by other units, especially the Financial Stability Department in DG-Regulation, with which there is good cooperation.

We summarize the main problems identified in each DG as follows:

- Limited integration of the Research Division in DG-Economics, leading to a perception of relative isolation of researchers there with respect to the policy process.
- Need for a change in the organizational model in ADG-International, where research is squeezed by policy work, and largely ignored if not directly related to the most pressing issues of the day.
- Good model of integration between research and policy in DG-Regulation. Here a potential problem is the lack of collaboration with other DGs, in particular in the area of monetary policy and financial stability.

Besides the specific problems in the different DGs, it is our impression that throughout the Bank there is no uniform definition of research, or a consensus on its purpose in the institution, or on how it should be organized to preserve its quality and usefulness to the Bank.

This has implications for the integration of researchers in the institution, for the use of research and for the career development of researchers in the Bank and, as a consequence, for the design of an appropriate incentive structure.

Another important weakness is the lack of collaboration between different areas in the bank, which makes it difficult to design projects across directorates or departments. This is regrettable for two reasons. First, in areas where there is no research capability there are often relevant problems that need to be studied with analytical tools and new data. Second, many important research topics of relevance to the bank go across different jurisdictions (i.e. operations and monetary policy, modelling in general, financial stability and monetary policy and so on).

We expand on these points and make some suggestions in section 3.

1.2 Research output

A detailed analysis of research production and its academic impact is provided in Part 2 of this report. Here we highlight the main findings.

The BdE employs several outstanding researchers, both in the Research Division of DG-Economics and elsewhere at the bank. This is reflected in some of the scientific publication statistics discussed below, and in particular, in the rather favourable comparisons of BdE with other central banks in

terms of research performance. Moreover, the research output of the BdE is not limited to publications in international refereed journals. It has several in-house publications and, in addition, is producing a very comprehensive household survey which provides valuable information for research and policy. In this survey work the BdE has set standards in the international community of central banks and provides expertise in the Eurosystem

However, the analysis reveals some weaknesses.

First, if one considers as researchers those defined as such on the BdE research portal, average research productivity is quite low. Typically, a researcher publishes a working paper every two years, and an article in a refereed journal every four years. If we focus on quality-adjusted articles using a uniform standard (that of the *Journal of Monetary Economics*), the finding is that it takes an average of eight researcher-years to publish a high-quality journal article.

Second, the quantity and quality of output are distributed unevenly across researchers. A number of them show very low output over the period under consideration – indeed, some have no publications at all, not even working papers. Over one-third of all journal articles are never cited, and a similarly high proportion is published in marginal journals, which greatly weakens their impact on the profession. At the other end, just eight researchers account for nearly two-thirds of all citations received by BdE articles.

Third, while all three DGs considered in the analysis contribute significantly to the BdE's overall research output, they show marked differences in terms of research productivity. The Research Division in DG-Economics clearly outperforms the other units in this regard, especially in terms of quality-adjusted research output per unit of resources (i.e., researcher-years) employed. The other units exhibit roughly similar performance among them, although their relative ranking varies across different measures. However, there are strong indications of a marked improvement in the research performance of DG-Regulation. This improvement likely reflects the increased topicality of its research themes following the global crisis and an organizational model which motivates policy relevant research.

The finding of low overall productivity suggests that the number of *official* researchers overstates the *actual* number of researchers that can devote at least 50% of their time to research and who are capable of academic style type of work. Since research needs focus and continuous investment in human capital, it is difficult to be productive if research time is not bundled and if there is not at least 50% time dedicated to it. Low productivity, in our view, reflects the lack of clarity on what is defined as research and what is the organizational model to support it (see also our comment in the previous sub-section). In the next section we provide some comments and suggestions on this issue.

The fact that research is unevenly distributed across individuals, our second finding, is not surprising in a policy institution, although it raises the issue of defining the number of highly productive researchers the institution wants to target. This is part of a broader need to define a career path for researchers at the BDE. It is interesting to note that not all the most cited research is produced in the Research Division, which suggests that a better connection between research and policy favours relevance and therefore research impact.

Finally, our third finding, that research is more productive in the Research Division, is not surprising either since its staff members dedicate almost all their time to it. However, we also find that research output across the other DGs is similar. The latter could be interpreted as evidence that the concentration of research is not costly in terms of research output, however we warn that segregation of research may matter for the policy relevance of research output. Integration, which is the model of DG-Regulation has given good results in terms of production of research without jeopardizing the connection between research and policy relevance. Other options for combining research production, relevance and use by the institution are discussed in Section 3.

Challenges

A discussion on the challenges faced by the BDE to develop its research function should start from a clear motivation of why the Bank needs research and from a definition of the desired profile for a BdE researcher.

We start from a traditional motivation of why research is needed in a central bank:

1. To inform and support the policy process with state-of-the-art analytical skills

2. To help develop strategies to deal with policy challenges, in line with stated policy objectives

3. To enhance human capital

4. To help communicate the policies and the views of the Bank to markets, other central banks, the academic community and the public at large.

5. To provide insights for policy formulation in occasional brain storming on key policy issues

Under this perspective, a "researcher" at a central bank is an individual whose central task is that of producing original, publishable research in areas of interest to the bank, and who contributes with his/her specialized knowledge to the improvement of the policy process.

For junior staff the definition that the BdE seems to have adopted appears to be that of a staff member hired in the academic job market. This is appropriate but insufficient. It is also necessary to think of a model of organization of research, in terms of: (i) time allocated to research; (ii) definition of priorities regarding topics (need to balance bottom-up versus top-down); (iii) integration of research in the policy process; and (iv) incentives and career development.

This discussion should start from an identification of the key challenges:

Challenge 1: Integration of research into the life of the institution without jeopardizing research standards

 The spread of research activities across the organization needs to be coordinated to avoid duplication and to foster multidisciplinary cooperation. This goal can be achieved only if research acquires internal visibility (within the institution) and is recognized as a useful input into the process of policy preparation. By this we don't necessarily suggest a regular involvement of research into the

briefing process, but rather an involvement of the researchers in the discussion related to the policy and forecast preparation. This involvement will also ensure that the researchers are not cut off from the information flow within the institution.

Internal visibility implies recognition and therefore serves as a powerful incentive for researchers to work on topics that are related to the Bank's agenda. This is also important in order to ensure that researchers perceive themselves as an integral and central part of the institution. To achieve this general objective, events that help develop mutual awareness of opportunities (policy that informs research and research that informs policy) must be created. It is important to recognize that, to achieve this objective, both the policy and the research side must become aware of the opportunities that this exchange creates for both. This is a two-way process. How can research capitalize from policy and policy capitalize from research?

In DG-Economics it is important to promote a better culture of integration of research with the policy areas. Researchers are not systematically involved in the policy meetings and are not regularly debriefed. Moreover, researchers are rarely in contact with the policymakers and there are few institutional opportunities for this contact to take place. Although research is involved in the organization of two seminar series, there are no regular meetings for brain-storming or briefing on research based policy analysis. Redressing this situation should be a particular concern for the senior management of the DG, who is ultimately responsible for the current lack of communication between both areas. This may require a fresh approach.

Although Research gives some input for model development (DSGE, short term forecasting), it is not involved in the use of the models for policy. The lack of connection between model development and model use is negative for both the researchers (unawareness of the challenges) and the forecasters (lack of expertise). As the need arises to develop models in different directions (e.g. financial markets) this problem will become more acute.

More involvement of research oriented modellers in areas such as forecasting but also operations or payments, as well as some connection between researchers in monetary policy and financial stability, would be desirable. Again, we want to stress that the role of research cannot be seen as that of pure consultation. Researchers must be aware of the policy process to adapt their technical expertise to the demands originating in that process. Importantly, this awareness can also be very productive from a research perspective.

Research, however, is not only about technical expertise. Good researchers are also able to think analytically on a number of questions that may come up unexpectedly and can therefore be used for brain-storming both by senior managers and executive board members. Facilitating this type of communication would be useful for the researchers (inspiring them and making them feel part of the institution) and for the policy makers (using fully the human capital available at the institution).

In order to achieve the goal of integration, an 80-20 split between research and policy on average is not appropriate and more time for policy should be freed up. However, we also think that it might be desirable to have different targets for different people. Research time should be protected for the first two or three years after the Ph.D. For more senior people, targets might be individualized depending on comparative advantages.

We also want to stress that research and policy are not entirely separate functions, so that, with some exposure to policy, research is bound to become better and more topical and the analysis supporting policy is likely to improve. Clearly, it is not optimal to overburden researchers either. This will potentially lead to a rapid deterioration in their human capital and, thus, in the quality of the analytical input into the policy-making process. We think this is the case in the ADG-International where some discontent was expressed in the interviews with researchers. On the other hand, discontent was also expressed by economists in the Research Division who feel isolated and ignored, and who wish to take a more active part in the policy process.

With the right system of incentives and an appropriate management of resources, both the research and the policy sides are likely to benefit.

In our view, an example of a successful model of integration is that of the DG-Regulation so perhaps some lessons can be learned from it. The key principles are: (i) Awareness by senior management of the importance of quality research for the policy process, which ensures communication between researchers and policy makers; (ii) Clear understanding of the policy agenda by the researchers, partly as a consequence of (i) and partly as a result of the involvement in the preparation of the Financial Stability Report; (iii) Role of managers in ensuring points of contact between different divisions and sharing of the data; (iv) Appropriate allocation of time for research to make it possible to have ambitious targets in term of publications; (v) Management of the input of external academics for brainstorming, training, co-authorship and general support of the research function; (vi) Good balance between top-down and bottom-up projects.

Challenge 2: Overcoming "chinese walls" between DGs and between departments and divisions within DGs

At the BdE there is a vertical hierarchical structure within each DG and this makes it difficult to develop a horizontal exchange of ideas on research priorities as well as projects across business areas. The different DGs act as nearly autonomous institutions ("banks within the bank"). On the other hand, many policy questions demand horizontal collaboration and this is especially true for research. Opportunities and incentives for horizontal exchange should be created beyond what is now provided by the academic style seminars.

From the viewpoint of research, we have identified the following difficulties:
- It is hard to carry out projects involving researchers from different DGs, as there is the concern that initiatives may be blocked or looked down upon by supervisors.
- It is hard to collaborate across departments or divisions even within the same DG.
- Researchers' status (at least their self-perception) differs considerably across DGs, due to seemingly different treatment/consideration of research. As pointed out earlier, there is a need to develop a common understanding of the research function and associated organizational needs.

Challenge 3: Career development

There is a need for a well defined "career development" path for economists who enter the bank as researchers. Research time at the junior level should be protected as much as possible, but management should gradually allow more exposure of researchers to the policy process in order to help develop a broader professional profile. This can take different forms which we discuss in Section 5. Most importantly, the institution should decide whether to envisage a career in research, e.g. by creating senior research posts, or whether it wants to consider research an entry point and then manage a gradual switch from research to other areas. Both models are in use in other central banks. Incentives and monitoring should be designed depending on the chosen option.

3. Recommendations

a. Organization of research: principles

In the previous Section we gave a definition of the profile of a researcher and a motivation of the research function. Here we make some recommendations on the organization of research.

We think that the main organizational principles for a successful research function are:

- A critical mass of researchers
- Research focusing on topics of high policy relevance to the Bank (e.g., in the case of the Financial Stability Department, the research on provisioning rules, relation between interest rate levels and banks attitudes toward risk , etc.)
- Original, high quality research should be encouraged, with the aim of publishing in *top* journals (general interest or field). This imposes a discipline that guarantees the quality of the research output. Producing a working paper only should not be deemed sufficient.
- Balanced allocation of time to research vs. other bank work 50/50 or 60/40 seems perfectly reasonable as a flexible benchmark. In practice the distinction is fuzzy, since in a successful model much of the bank work is *connected* with undergoing research (e.g. in-house research is frequently used to back the Financial Stability Report).
- More generally, being on top of academic developments in the field should be viewed as useful for non-research tasks (e.g. institutional reports, international policy meetings, etc.). The best (if not the only) way to guarantee being "on top" is to do active research.
- Promotions, raises, etc. of researchers should be based on a comprehensive assessment of individual output, including (but not exclusively) publications, working papers, seminars, conferences, other professional service.

To achieve these objectives several options can be considered, as we discuss below.

b. Integration of research in the institution

We recommend the following key principles to facilitate the integration of research in the life of the institution:

- Managers should regularly debrief the staff (including researchers) about policy meetings. The form of these debriefings should be designed depending on the organizational option which is adopted (see subsection 3.c).

- All researchers should spend time doing policy work. This should be done in ways so as to prevent fragmentation of research time, and to guarantee that researchers are able to work on ambitious projects without being interrupted for poorly planned policy work. There are several ways to structure researchers' contribution to policy work. One option is a formal requirement that staff in research units regularly devote a minimum portion of their time (say 40 percent) to support policy units – e.g., contributing technical advice, giving input in brainstorming sessions, writing policy notes and papers upon request, etc. This policy work would be evaluated as part of each researcher's regular performance assessment. Another option is to require all researchers to spend periods of time (say 6 or 12 months) in policy units. The choice among these types of arrangements should be guided by the organizational model in use. They can be highly effective at both making researchers aware of pressing policy issues, and raising the overall quality of the institution's policy work.

- To ensure that research pays due attention to key policy concerns of the Bank, managers of research units and senior researchers should engage periodically (say once or twice a year) in research consultations with senior managers of policy units. This would provide a venue for managers of policy units to identify topics in need of research, and for managers of research units to alert their counterparts to relevant ongoing research of which they may not be aware.

- In addition, researchers should take part in occasional brainstorming meetings with senior managers and the Governor. This will encourage them to think "outside-the-box" on issues that are relevant for the Bank and which they may be unaware of. This could take the form of occasional question-based meetings or internal symposia around a specific theme of interest. We expect these meetings to serve both as an incentive for researchers to think about policy relevant questions and compete on the insights they can provide as well as providing a facility to the Governor in preparations of policy decisions or key policy meetings.

- To enhance visibility of research within the Bank and outside we recommend the publication of an annual newsletter listing the publications and other research activities of the bank during the year, with highlights of a few papers, and which can be distributed widely among economists working in related fields worldwide. This would replace the current "research memorandum," whose format is not too attractive for an outside reader, and which does not highlight any particular papers or lines of work. Here are two examples which we like:

the newsletter format of the NY Fed or the ECB.[2] This helps give inside and outside visibility to the research produced in the Bank, and also implies some recognition of those researchers who are more active.

- Constitute ad-hoc task forces on specific projects which are considered key for the institution. When key projects are identified, it is desirable to create a task force including both researchers and policy staff to work on the design and completion of the project. For example, at the ECB forecasters and researchers worked together in a task force to develop new models for short-term forecasting and the analysis of the real time data flow. In that experience, both econometric expertise and data knowledge (as well as briefing expertise) turned out to be key for the success of the project. In general, we think it is not a good idea to separate model developers from model users.

c. Organizational options

There are two polar models of organization of central bank research. At one extreme, the researchers are concentrated in a separate research unit. At the other extreme, they are integrated in the institution's various business areas. A separate research unit is more likely to develop a research culture that stimulates fresh thinking. But it can also lose touch with the policy issues, and thus become irrelevant for policy formulation. In turn, integrated units bring researchers close to the policy issues, but require managers that value research – so that it is not crowded-out by urgent business – as well as strong horizontal coordination across units, both to prevent them from becoming isolated and ineffective owing to lack of critical mass in their units, and to ensure that research themes that cut across policy areas do not fall between the cracks or lead to wasteful duplication of research effort.   Moreover, coordination is necessary also to ensure that career opportunities and performance rewards are deployed in fair and equitable manner for all researchers, regardless of the unit they happen to belong to.

As noted, the current organization of research at BdE represents an intermediate option between these two extremes. In our view, the following alternatives could be considered:

Option 1

- Create the "status" of researcher for a number of economists in Financial Stability department (within DG-Regulation), ADG International, and DG-Economics.
- Create a new transversal position (Head of Research) that would coordinate activities of researchers in all DGs, responsible for WP series, seminars, conferences, annual research report, regular internal seminars, etc. The Head of Research would report directly to the Governor, should be fully aware of the research capabilities of the institution, and participate in policy meetings "as if" s/he was a DG. He or she should be an excellent researcher with a good track record and the "visible face" of research at the Bank.

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[2] See http://www.newyorkfed.org/research/research_update/ru09_10.pdf) and http://www.ecb.int/pub/pdf/other/researchbulletin11en.pdf , respectively.

This organizational model could be consistent with the preservation of the current Research Division within DG-Economics. Alternatively, and more radically, that division could be dismantled, with its current members being given the category of researchers embedded in suitable Depts. within the DG (most naturally Economic Analysis Dept. and Monetary and Financial Studies Dept.)

Option 2

- Same as Option 1 but without creating a new transversal position. Researchers report to their line managers, they participate in the life of their divisions/departments but dedicate at least 50 percent of their time to research (following guidelines defined above).
- The bank creates a research coordination committee attended by DG heads and a senior researcher by DG. This committee evaluates research in the institution and defines some priority projects possibly horizontal. The committee, however, should stay away from micro-management of bottom-up type of research which should be preserved to a certain extent. The committee prepares an annual document which is presented to the Governor.

Option 3

- Do not change the present organizational structure but follow guidelines in this report to foster better integration and better use of research or, where relevant, more protection of research time.

The organizational arrangement currently in place at BdE (Option 3) would benefit from better coordination across research units, as already noted. In turn, Options 1 and 2 represent more decentralized organizations of research, and would pose additional coordination requirements. The Head of Research (under option 1 above), or the research coordination committee (under option 2), would seek to address them. However, in the BdE's vertical hierarchical structure this might not be an easy task. The chances of success would depend greatly on the value attached to research – more precisely, to policy formulation grounded on solid research -- by the senior managers of the various units staffed with researchers. The recent experience at BdE suggests that this could vary considerably across units (and, with any changes in senior managers, over time as well). A Head of Research with a DG-level position, as envisaged under Option 1, and joint reporting by researchers (i.e., both to their line manager and the Head of Research) should help mitigate these risks.

d. Career development

The career path for researchers should be designed with the view that many of them should eventually find a job elsewhere in the institution. This also helps open positions for recruitment of new researchers, which is essential to ensure that BdE research stays abreast of new tools and methods in the profession. However, a special career path should allow first-rate researchers access to senior research positions that would enable them to achieve pay and rank commensurate with management. We think that these positions should be relatively few in number, and should be given to staff that achieve and maintain very high standards of academic-quality research.

In the first few years, researchers must be given the conditions to carry out research work with the aim of producing high quality publications. This implies granting them an appropriate allocation (and bundling) of time for research. Gradually, however, researchers should be exposed to the policy process to achieve, after three years, a 50-50 (or 60/40) time allocation. Research output should be monitored and rewarded every year but, after the first three years, evaluation criteria should not only be based on academic standards but also on the use of research for policy and communication. Although it is more difficult to evaluate policy work than to evaluate research on a quantitative basis, many things can be done in this direction. For example, one can keep track of contributions to policy reviews, development of tools or other inputs to the policy process. In general, the criteria for evaluation must be determined and publicly communicated to researchers, and performance must be appropriately rewarded.

After a sufficiently long tenure (say six years), the research status should be up for renewal (or not) with the understanding that many researchers will move on to other functions in the bank. To find such jobs within the institution, they should be granted an adequate search period (say two years). During this initial period of tenure, every researcher should be encouraged to get direct exposure to a policy area by spending a period of secondment in that area. Secondments, as well as staff departures from research positions, should be primarily voluntary rather than mandatory, and encouraged with incentives that reward mobility in the annual appraisal exercise and/or in promotion decisions across the institution.

PART TWO. Research at the Banco de España: A Quantitative Evaluation

In Part Two of our Report we supply and analyze several statistics pertaining to the quantity and quality of the research produced at the BdE. While our focus is on publications, it is important to stress that the Bde supports a broad range of research-related activities beyond the production of original scientific research. They include a regular seminar series, several research conferences every year, and a visiting scholars program. The level and quality of those complementary activities seem satisfactory, and not in need of any significant change.

Publications: Quantity

Table 1 reports the number of articles and working papers published by BdE researchers over the period 2005-2009. The total number of articles published in refereed journals over this five year period was 135, which corresponds to an average of 27 articles per year. Under the heading "other publications" we report the number of articles in non-refereed journals or chapters in books, which amount to 183 over the five year period, thus implying an average of 37 per year. Finally, the third column shows the number of papers published in the working papers and occasional papers series of the bank: a total 231 papers, or 46 per year. It should be noted that a large fraction of the publications accounted for in the first and second columns were initially published in the BdE working paper series (possibly in an earlier year), thus implying some double counting.

Table 1
Publications by Bank of Spain researchers

Year	Articles in refereed journals	Other publications	Working papers
2005	22	48	49
2006	27	40	47
2007	26	35	47
2008	34	27	48
2009	26	33	40
Total 2005-2009	135	183	231

Source: Bank of Spain Research Memorandum, various issues.

A look at Table 1 suggests a few observations. Firstly, while the number of "other publications" over the entire period considered period is much larger than that of publications in refereed journals, the ratio seems to have become more balanced over time, largely due to an apparent downward trend in the number of non-refereed publications. Secondly, a comparison of the flows of working papers versus publications suggests that roughly one-quarter of the latter are never published in the bank's working paper series, which may limit their visibility both within and outside the BdE. Though we do not pursue this here, it may be worth identifying those papers and trying to understand the reason for the lack of submission to the WP series.

Table 2 contains information that can be used to identify the relative contribution of researchers from different DGs and that of outsiders to the research output summarized in Table 1. In order to do so, and for each publication, we assign weights to the different DGs and the external category in proportion to the number of co-authors from each. For the purposes of this exercise we consider BdE authors only those included in the research staff list found on the BdE Research Portal website at the time of writing this report.[3]

Table 2
Publications by Department (2005-2009)

	Refereed journals	Other publications	Working papers
DG Economics	41.93 (31.1%)	67.68 (36.9%)	89.85 (38.8%)
Research Division	18.50 (13.7%)	17.46 (9.5%)	38.89 (16.8%)
Other	23.43 (17.4%)	50.22 (27.4%)	50.96 (22%)
DG Banking Regulation	15.50 (11.5%)	23.33 (12.7%)	19.58 (8.4%)
ADG International Affairs	16.83 (12.5%)	32.76 (17.9%)	34.15 (14.7%)
External	60.73 (47.2%)	59.23 (32.3%)	87.42 (37.8%)
Total	135 (100%)	183 (100%)	231 (100%)

Source: Authors' calculations based on information in the BDE Research Memoranda and the research staff list in Appendix A.

Table 2 reveals that external co-authors play an important role in BdE publications, especially in those in refereed journals. This observation makes clear that BdE researchers are not isolated and collaborate regularly with co-authors from other institutions.

Leaving aside external contributions, we note that the biggest input into BdE publications comes from DGEconomics and, within it, from researchers outside the Research Division proper. DG-Regulation and ADG-International contribute to BdE publications in roughly similar proportions, with their joint contribution falling well short of that from DG-E in the three publication categories.

However, it is important to keep in mind that the size (in terms of number of staff) of the different units considered in Table 2 varies considerably. To take this fact into account, Table 3 recalculates the contribution of each unit in terms of publications per researcher-year. This is constructed counting the number of years each researcher listed in the BdE Research Portal was present in the unit in question over 2005-2009 , and then summing over researchers in each unit.

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[3] Note that under our approach a former BdE researcher who does not appear on that list will be assigned to the "external" category.

Table 3
Publications per researcher-year

	Number of researchers	Researcher-years (RY) over 2005-2009	Refereed journal articles / RY	Other publications / RY	Working papers / RY
DG Economics	40	176	0.24	0.38	0.51
Research Division	12	53	0.35	0.33	0.73
Other	28	123	0.19	0.41	0.41
DG Banking Regulation	12	57	0.27	0.41	0.34
ADG International Affairs	16	58	0.29	0.56	0.59
BdE Total	68	291	0.26	0.43	0.49

Source: Authors' calculations based on Bank of Spain data.

Note: researchers joining BdE in 2010 or later are not included in the count.

In the case of refereed publications, we see that the output per researcher-year is roughly similar across the three DGs. Within DG-Economics, however, the productivity of researchers in the Research division is almost twice as high as in the rest of the DG. A similar pattern obtains for working papers, even though in this case the productivity of ADG-International is slightly above that of DG-Economics (though not that of the Research Division). In the case of "other publications", however, ADG-International takes the lead, with productivity above the other two DGs, as well as that of the Research Division, which ranks the lowest. That pattern probably reflects the relative importance given to different types of publications by the different units.

The evidence above also points to what appears to be a relatively low overall productivity: on average, a (solo) article in a refereed journal requires four researcher-years; a working paper requires two. However, such low numbers hide a huge heterogeneity across researchers and, to some extent, reflect an overstatement of the "true" researcher base. In fact, among the 68 economists included in this analysis, 6 have not produced a single publication (not even a working paper) over the 5 years considered.

Publications: Quality

An assessment of an institution's research output cannot focus exclusively on the quantity of publications, since their quality and impact can vary considerably. This is so even if we restrict ourselves to articles in refereed journals, for the latter category is too large and heterogeneous.[4] We provide a rough quantitative assessment of the quality of BdE publications in refereed journals based on two indicators: their number of citations, and the impact factors of the journals in which

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[4] Publications listed in the refereed journal category include those in some Spanish journals with limited international visibility, as well as some relatively obscure international journals.

they were published – itself reflective of the frequency of citation of all articles appearing in the journal in question.

For citations we rely on two sources: ISI Web of Science and Google Scholar. ISI only captures citations in journals included in the Journal Citation Reports (JCR), of articles published in the same set of journals. These are widely perceived as the higher-quality journals in most disciplines. Over the period 2005-2009, BdE researchers published 93 articles in JCR journals, which represent 70 percent of the total of 135 articles in refereed journals shown in Table 1.

Google Scholar has a much wider coverage: it includes a broader set of journals, and captures citations made in journal articles, working papers and other publications. Moreover, it lumps citations of published journal articles together with those of their working paper versions. For these reasons, the total number of citations of journal articles published by Bank of Spain researchers is over six times larger in Google Scholar than in ISI.

Table 4
Citation histograms of BdE journal articles published over 2005-2009

	Number of papers	
Number of citations	ISI Web of Science[*]	Google Scholar
0	29	49
1 to 5	39	18
6 to 10	10	12
11 to 20	10	18
21 to 50	4	20
51 to 100	1	10
100 to 200	--	5
200+	--	3
Total	93	135
Total number of citations	499	3222
Average per publication	5.31	23.87
Median	2	6
% articles not cited	31.2	36.3

* JCR journal articles only.
Source: authors' calculations using data from ISI Web of Science and Google Scholar

Citation histograms from both sources are shown in Table 4. A large proportion of all the JCR journal articles published by BdE researchers – 31 percent of the total -- do not get any citations in other JCR journals. Further, the proportion of non-cited articles is not very different (36 percent) if the more encompassing Google Scholar citation counts are considered instead. On the other hand, citations are highly skewed: a relatively small number of articles attract a disproportionate share of all the citations – a fact that is by no means unusual. As a result, in both sources of citations the mean number of citations per journal article is much higher than the median.

Likewise, Tables A1 and A2 in the Appendix show that the distribution of citations across authors is very uneven. In fact, of all the 68 researchers considered in this analysis, 39 get no citations at all in ISI. When using Google Scholar as the source of citation counts, the number of non-cited researchers falls to 33. At the other end, just eight authors account for over 60 percent of all citations in either source.

One way to assess the quality of the output of the different units of the Bank of Spain engaged in research is by looking at the citation counts of their respective publications in refereed journals (Table 5). These can be allocated across DGs and external co-authors on the basis of authorship share, as done in Table 2 above.

Table 5
Journal article citations, by department generating the research

	Total citations from ISI	Total citations from Google Scholar	Refereed journal publications	Average citations per publication (ISI)	Average citations per publication (Google Scholar)
DG Economics	135	889	41.9	3.2	21.2
Research Division	86	530	18.5	4.6	28.6
Other	49	359	23.4	2.1	15.3
DG Banking Regulation	23	291	15.5	1.5	18.7
ADG International Affairs	31	102	16.8	1.8	6.1
External	311	1940	60.7	5.1	32.0
Total	499	3222	135	3.7	23.9

Source: authors' calculations using data from the Bank of Spain, ISI Web of Science and Google Scholar

Table 5 points to large differences in the number of citations per publication allocated to the different units. Independently of whether one uses ISI or Google Scholar, publications allocated to DG-Economics get more citations than those allocated to the other DGs. Within DG-Economics, publications generated in the Research Division rank consistently above the rest in terms of average number of citations.

Interestingly, the average number of citations for DG-Regulation and ADG-International is similar when ISI counts are used, but it is three times larger for the former than for the latter when based on Google Scholar counts. A possible reason for the difference lies in the fact that some of the research of DG-BR has become particularly relevant as a consequence of the financial crisis of 2007-2009, and is being cited in ongoing research that is not yet published in refereed journals. Related to this, we should note that our analysis excludes, by design, journal publications issued in 2010 or still

forthcoming. Three such publications in journals that usually attract a high number of citations were authored by researchers from DG-BR.[5]

A final observation pertains to external co-authors: the average number of citations for their assigned publications is higher than for any other unit, pointing to the above-average impact of the research conducted with external co-authors, and hence underscoring the importance of those collaborations in BdE research.

Another way to get a comparative perspective on the performance of the different units is by looking at citations per researcher-year. These can be computed dividing the number of citations of each unit's research shown in columns 2 and 3 of Table 5 by the unit's total researcher-years shown in Table 3 above. The results are shown in Table 6.

Table 6
Citations per researcher-year, by department

	Average citations per researcher-year (ISI)	Average citations per researcher-year (Google Scholar)
DG Economics	0.77	5.05
Research Division	1.62	10.00
Other	0.40	2.92
DG Banking Regulation	0.40	5.10
ADG International Affairs	0.53	1.76
BdE total	0.65	4.40

Source: authors' calculations using data from the Bank of Spain, ISI Web of Science and Google Scholar

The picture that emerges regarding the impact of the research output of the different units is very similar to that obtained in Table 5 above. In particular, research resources employed in the Research Division of DG-Economics have a much higher impact than those employed elsewhere in the institution.

A second way to assess the quality of BdE publications in refereed journals is to use as a metric the impact factors of the journals publishing the articles. Impact factors reflect the overall citation frequency of articles published in each journal, and offer the advantage of not discriminating in favour of older publications that have had more time than recent publications to accumulate citations.

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[5] Moreover, in 2011 an article by authors from DG-BR was accepted by a journal in the top-five category, in which no BdE author had published over the period of analysis.

We take the 2005-2009 average journal ratings (SJR) from SCOPUS. They are widely used in evaluating research, and comprise as many as **572** journals in Economics and Finance. We use these impact factors to assign a value to each journal publication, and allocate the resulting values across different units as done before with journal articles and citations.[6] Since impact factors have no obvious interpretation, we rescale them in terms of "Journal of Monetary Economics (JME) equivalents", dividing each journal's SJR by that of the aforementioned journal. Hence, a value of one can be viewed as representing one article published in the Journal of Monetary Economics.

Table 7 reports the results of this approach. The first column offers a quality-adjusted measure of journal publications in terms of JME equivalents, for each unit under consideration. Each entry in the column can be understood as the total number of JME-quality journal articles published by the researchers in the respective unit over the period of analysis. Thus, during 2005-2009 Bank of Spain researchers generated a total of 34-35 articles of JME quality. Close to two-thirds of this total came from DG-E, with roughly similar contributions from the Research Division and the rest of the DG.

Table 7
Impact of Bank of Spain journal publications, by department generating the research

	Total impact of all articles	Average impact per article	Average impact per researcher-year
DG Economics	21.05	0.50	0.12
Research Division	10.60	0.57	0.20
Other	10.44	0.45	0.08
DG Banking Regulation	7.73	0.50	0.14
ADG International Affairs	5.65	0.34	0.10
BdE total	34.43	0.46	0.12

Source: authors' calculations using data from the Bank of Spain and SCOPUS.

The second column of Table 7 reports the average quality – in terms of JME-equivalents -- of journal articles published by BdE researchers. Overall, the average quality is just under 0.50, but it varies across originating units – from a high of 0.57 in the Research Division, to a low of 0.34 in DG-International.

Lastly, column 3 illustrates the productivity of BdE researchers in terms of the number of JME-quality journal articles published per researcher-year. The Bank-wide value is 0.12, meaning that on average

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[6] In spite of the large number of journals tracked by the SCOPUS database, it excludes some less-known journals that account for a relatively large portion of the journal articles published by BdE researchers. Specifically, 40 articles were published in such journals. These articles are considered to have zero impact in this analysis.

it takes about eight years of researcher time to publish a JME-quality article. Again there is considerable variation across originating units – from a low of five years in the Research Division to a high of ten years in the rest of DG-E and ADG-IA.

We may use similar methods to assess the program of international job-market recruitment of junior researchers adopted by the Bank of Spain a few years ago. The list of BdE research staff covered by this analysis includes 14 researchers hired from that source, who accounted for a total of 54 researcher-years over the period of analysis. Tables A3-A5 in the Appendix summarize their performance relative to that of other BdE researchers. It is important to keep in mind that researchers recruited from the job market are at the early stage of their careers, and often have not built up yet a significant research pipeline or a publication record. Possibly for these reasons, incoming researchers from the job market exhibit much lower citation counts than the rest, both per published article and per year of work. However, the average impact of their journal publications is higher than that of other researchers, while their average impact per researcher-year is no different from the overall BdE average.

Comparative performance of Bank of Spain research

So far we have focused on the Bank of Spain and its various units doing research. But to get a better idea of the research performance of the Bank of Spain, it may be useful to put it in a comparative context, against the benchmark of similar institutions. Unfortunately, information on other central banks' pool of researchers, and their publications, is not readily available at the level of detail employed in the preceding analysis. However, the data gathered by the IDEAS project in the RePEc publication database offers some scope for a comparative analysis.

Publications catalogued in RePEc include journal articles as well as working papers and some book chapters. Their institutional attribution merits comment. All of an author's publications catalogued in RePEc are allocated to her current institution irrespective of where she was when the piece was written and publication occurred. This means, for example, that the Bank of Spain "captures" all the publications of its current staff members, including any from the years before they joined the Bank. It also means that when someone leaves the BdE, all her publications are shifted to her new institution. Hence comparisons based on this approach give a bibliometric view of the lifetime achievement of authors *currently* employed at the Bank of Spain, compared to the lifetime achievements of individuals employed elsewhere. Such comparisons highlight the performance of Bank of Spain authors, rather than Bank of Spain publications. In addition, it is important to keep in mind that RePEc data do not necessarily capture *all* the researchers affiliated with an institution, but only those who choose to join the service – typically a smaller number. For all these reasons the comparisons of research performance across institutions shown below have to be taken as tentative rather than conclusive.

Table 8: Top non-U.S. Central Banks

(using the 31 RePEc criteria based on research output and citations)

Institution	Overall ranking	Number of affiliated researchers in RePEc
European Central Bank	1	121
Sveriges Riksbank	2	29
Banca d'Italia	3	97
Bank of Canada	4	58
Banco de España	5	37
Bank of England	6	49
Banque de France	7	67
de Nederlandsche Bank	8	36

Source: RePEc website, November 2010.

With these qualifications, Table 8 reports the ranking of RePEc's top non-U.S. Central Banks.[7] The ranks are computed according to RePEc's summary indicator of research output performance, which combines a total of 31 indicators of the quantity, quality and impact of publications.[8] The Bank of Spain places fifth according to the summary indicator. The table also shows that only about half of the total number of researchers considered in the preceding analysis are also listed in RePEc as BdE researchers. A closer analysis shows that they also account for roughly half of the total number of publications in refereed journals by BdE authors over the period analyzed in the previous section.

In turn, Table 9 shows the rankings according to some of the individual components of RePEc's summary index. Overall, the Bank of Spain places below its overall ranking (fifth) in terms of the volume of output, as measured by the total number of works and journal pages, but places above it in terms of the impact of the ouput, as measured by total citations and the institution-wide h-index.[9]

However, neither these individual indicators nor the summary index in Table 8 are adjusted for the size of the institution and, as the second column of Table 8 shows, the number of researchers affiliated with each of these central banks in RePEc varies greatly. In the case of the Bank of Spain, it is among the lowest in the table – sixth out of the eight shown.

The information publicly available from RePEc does not permit proper adjustment of all these performance indicators for the size of the respective institution.[10] However, for two individual indicators – total citations and total downloads – we can recalculate the rankings in per-researcher

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[7] Information is available only for the top 20 Central banks according to the summary indicator. U.S.-based institutions occupy 12 of the 20 spots, including 8 of the top 10 places.

[8] The individual indicators are described in RePEc's website.

[9] The *h*-index is widely used to measure the impact of individual researchers' published work. For the case of institutions, an *h*-index of 20, say, means that 20 researchers affiliated with the institution possess an individual *h*-index of 20 or higher.

[10] While the number of affiliated researchers is publicly available, the absolute value of each performance indicator is published only for those entities ranked in the top 5% of all institutions according to that particular indicator.

terms, to get a rough idea of the productivity of the researchers affiliated with each institution. The results are shown in Table 10. Scaling institutions' citations by the size of their respective pools of researchers does not alter the ranking of the Bank of Spain, which remains in third place according to such measure. However, it rises from sixth to fourth place when the same adjustment is made to the total number of downloads.[11]

Table 9: Top non-U.S. Central Banks

Ranking according to alternative criteria

	Number of journal pages	Number of journal pages adjusted for impact	Number of distinct works	Number of distinct works adjusted for impact	Total citations	h-index	Downloads
European Central Bank	1	1	1	1	1	1	1
Sveriges Riksbank	5	3	8	2	2	6	5
Banca d'Italia	2	4	2	3	4	5	2
Bank of Canada	6	5	4	6	6	2	3
Banco de España	7	6	7	5	3	3	6
Bank of England	4	2	5	4	5	4	7
Banque de France	3	7	3	7	7	7	8
de Nederlandsche Bank	8	8	6	8	8	8	4

Source: RePEc website, November 2010.

Overall, therefore, the RePEc data suggests that BdE research performs quite well relative to that of comparable institutions in other countries. However, this might partly capture the state of economic research in Spain relative to that of those countries, and hence a final dimension of interest concerns the comparative performance of BdE research relative to that of academic institutions in Spain. Using RePEc's summary index, Table 11 shows that the Bank of Spain ranks seventh overall when compared with other Spanish economic research institutions. As before, the size of the pool of researchers varies considerably across the institutions listed, with the Bank of Spain's being fourth largest among those shown, although the table suggests no obvious correlation between size and relative ranking.

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[11] The highest number of average citations per central bank researcher in the RePEc database corresponds to the Central Bank of Cyprus, which shows over 400 citations per head. This reflects the disproportionate influence of one highly-cited single researcher, Athanasios Orphanides, in a pool consisting of just 4 affiliated researchers.

Table 10: Top non-U.S. Central Banks

Ranking according to total citations and downloads per affiliated researcher

	Total citations	Downloads
European Central Bank	2	3
Sveriges Riksbank	1	1
Banca d'Italia	7	7
Bank of Canada	5	5
Banco de España	3	4
Bank of England	4	6
Banque de France	6	8
de Nederlandsche Bank	8	2

Source: RePEc website, November 2010.

Table 11: Top economic research institutions in Spain

(using the 31 RePEc criteria based on research output and citations)

Rank	Institution	Number of affiliated researchers in RePEc
1	Centre de Recerca en Economia Internacional (CREI), Barcelona	14
2	Departamento de Economía, Universidad Carlos III de Madrid, Madrid	68
3	Centro de Estudios Monetarios y Financieros (CEMFI), Madrid	20
4	Departament d'Economia i Empresa, Universitat Pompeu Fabra, Barcelona	58
5	IESE Business School, Universidad de Navarra, Pamplona	19
6	Institut d'Anàlisi Econòmica (IAE), CSIC, Barcelona	27
7	Banco de España, Madrid	37
8	Departament d'Economia i Història Econòmica, Universitat Autònoma de Barcelona	32
9	Barcelona Graduate School of Economics, Barcelona	22
10	Facultad de Ciencias Económicas y Empresariales, Universidad del País Vasco, Bilbao	67

Source: RePEc website, November 2010.

APPENDIX: ADDITIONAL TABLES

Table A1

Citation histogram of BdE authors
(SSCI)

Author percentiles	No. of Authors	Number of citations	% of citations	Cumulative % of citations
10	7	0	0.0	0.0
20	7	0	0.0	0.0
30	7	0	0.0	0.0
40	7	0	0.0	0.0
50	7	0	0.0	0.0
60	7	2	1.0	1.0
70	7	12	6.2	7.2
80	7	23	12.0	19.2
90	7	35	18.7	37.9
95	4	40	21.4	59.3
100	4	76.7	40.7	100.0

Source: Authors' calculations using data from ISI Web of Science

Table A2

Citation histogram of BdE authors
(Google Scholar)

Author percentiles	No. of Authors	Number of citations	% of citations	Cumulative % of citations
10	7	0	0.0	0.0
20	7	0	0.0	0.0
30	7	0	0.0	0.0
40	7	0	0.0	0.0
50	7	3	0.2	0.2
60	7	52	4.0	4.3
70	7	81	6.3	10.6
80	7	132	10.3	20.9
90	7	244	19.0	39.9
95	4	229	17.9	57.8
100	4	540.7	42.2	100.0

Source: Authors' calculations using data from ISI Web of Science

Table A3

Journal article citations, by recruitment source

	Total citations (ISI)	Average citations per article (ISI)	Total citations (GS)	Average citations per article (GS)
Non-job market researchers	169	2.70	1177	18.80
Job market researchers	20	1.67	105	8.97
BdE total	188	2.54	1282	17.26

Table A4

Citations per researcher-year, by recruitment source

	Average citations per researcher-year (ISI)	Average citations per researcher-year (Google Scholar)
Non-job market researchers	0.71	4.97
Job market researchers	0.36	1.94
BdE total	0.65	4.40

Source: authors' calculations using data from the Bank of Spain, ISI Web of Science and Google Scholar.

Table A5

Impact of Bank of Spain journal publications, by recruitment source

	Total impact of all articles	Average impact per article	Average impact per researcher-year
Non-job market researchers	28.25	0.45	0.12
Job market researchers	6.18	0.53	0.11
BdE total	34.43	0.46	0.12

Source: authors' calculations using data from the Bank of Spain and SCOPUS.