

A comparative analysis of the publication behaviour of MSCA fellows

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The development of a pool of researchers is one of the four pillars of European research policy (cooperation, ideas, people, capacities)¹. The EU has addressed this task primarily through the European Framework programmes for research and technological development. These programmes are the financial tool for implementing the EU research policy and currently represents around 7% of total public research funding in Europe. While this share seems relatively low, its true potential for influencing the direction of European research becomes clearer when one considers that the share of FP in total EU project funding is considerably higher.

Complementarily, the EU Structural Investment Funds (ESIF) has become increasingly important) for research and innovation, especially in the Central and Eastern European (CEE) and Southern European (SE) Member States. A considerable share of ESIF for regional development can be spent on reinforcing regional research and innovation systems. The conditions for receiving research funding from structural funds are different from the very competitive selection process that characterises different EU Framework Programmes. For example the success rate of the Marie Skłodowska Curie Action (MSCA) programme (FP7 2007-2013) was 22%, for the collaboration project (FP7 2007-2013) it was 20% and for the ERC starting grants (period 2007-2013) 9%. Some analysts and EU policy makers are concerned that without adequate inducement mechanisms, researchers in CEE and SE MS will frequently decide not to apply for the more selective FP funding in light of the more easily accessible structural funds.

In this report we will make a distinction between countries which experience a high ESIF intensity (ESIFIC) and those which experience a high FP funding intensity (FPIC) as follows:

ESIFIC	Estonia, Latvia, Lithuania, Poland, Czech Republic, Slovak Republic, Hungary, Slovenia, Croatia, Romania, Bulgaria, Serbia, Montenegro, Italy, Portugal, Greece, Spain, Cyprus, Malta
FPIC	United Kingdom, Ireland, Belgium, The Netherlands, Luxemburg, Germany, Denmark, Switzerland, Austria, France, Finland, Norway, Sweden, Iceland

Among the stated objectives in Horizon 2020 (the 8th Framework programme) are (i) the improvement of excellence of European science and (ii) the widening of research capabilities. One of the approaches to adhere to both objectives simultaneously would be to strengthen participation of researchers in the ESIFIC regions in the Framework programmes, without reducing selection standards.

As part of its funding programme the European Community supports a number of individual fellowship schemes which are collectively known under the brand name of 'Marie Skłodowska Curie Fellowships'. A distinguishing feature of the Marie S. Curie Scheme is the requirement of international mobility: to meet the eligibility requirements a fellow must be prepared to move to a research institution in another European country. In addition to providing targeted training, promoting international mobility and career development, this programme aims to promote excellent research. Another aim of the MSCA scheme is to foster international research collaboration.

DG Research and Innovation have commissioned a number of evaluations of the MSCA programmes in 2005 and 2010 (Van de Sande et al, 2005; Watson et al, 2010) and an ongoing evaluation in 2017. Although the twofold objectives of EU policy are to develop

¹ https://ec.europa.eu/research/fp7/index_en.cfm?pg=capacities

a single market for research and to boost excellence, the issue of excellence has remained relatively unaddressed in analyses of the impact of FP funding. At national level, a study indicated that FP funded research in climate change research had in Sweden a higher average impact than all other funders (including internationally co-authored papers) and in the Netherlands an about equal impact as internationally co-authored papers, but also higher than other funders (Van den Besselaar & Sandström 2013). In both cases, the EC funded research on average outperformed the research funded by the national councils. A test for some medical fields shows a similar pattern (Sandström, U., Wold, A., Van den Besselaar, P., Forthcoming). A Danish evaluation of the impact of FP funding on scientific output found that international collaboration could explain the differential impact scores for FP6 funded research, but that FP7 funding had a marked additional impact that could not be explained by international co-authoring alone. Secondly, the study highlighted that research funded by the ERC and Marie Curie accounted for most of the effect of FP funding on impact in comparison to national grants (DASTI, 2015).

According to Ackers (2008), the Marie S. Curie Fellowship Scheme explicitly seeks to reconcile the potentially conflicting objectives of promoting excellence and equality of opportunity at an individual level with balanced growth: i.e. the aforementioned twin objectives of promoting excellence and "widening". In this analysis we limit ourselves to different groups of successful MSCA applicants. The aim of the report will be to analyse to which extent successful applicants from the ESIFIC countries, differ from researchers from FPIC countries in terms of:

- The mobility pattern (location and "quality" - in terms of field weighted citation impact - of the home and host institution)
- The change in their publication behaviour over time
- The change in impact of these publications over time

'Over time' refers here to a comparison of publications and impact before they have received the grant and after they have been funded.

The answers to these questions will show whether the combination of widening and excellence leads to:

- Different criteria for receiving the grant between researchers from ESIFIC and FPIC countries.
- A difference in the returns on investment between the groups: does scientific excellence develop differently between the groups

They will also help explore whether the environment (host country and host institution) influences the returns on investment in the two groups.

Most (of the scarce) empirical work argues that there is a clear positive relationship between international mobility, research productivity and publication impact (Jonkers and Cruz Castro, 2013; Defazio et al. 2009). This argument is also made by Edler et al. (2011). Yet other studies found small or even negative short term effects of international mobility on the productivity researchers (Cruz-Castro and Sanz-Menendez, 2010; Fernandez-Zubieta, Geuna, Lawson, 2015). The successful MSCA applicants are not only internationally mobile, they also receive a prestigious research grant which allows them to spend time at a different research organisation selected because of the favourable environment it offers for furthering the applicants research agenda. This, in combination with the increase in seniority of the applicants, suggests it is a reasonable expectation that both the productivity and the average impact of the publications of a successful MSCA applicant will increase in the period after he/she has received funding.

The broad aim of this study is to explore the effect of the MSCA grant on scientific excellence. The following approach was taken: the comparison of two different groups of successful MSCA applicants. The first group originates from the countries most heavily reliant on structural funds (ESIFIC), the other group originating from countries which

especially rely on FP funding (FPIC) and to a lesser extent on Structural Funds for research and innovation.

The first part of this analysis aims to (i) assess whether there are statistically significant differences between the publication profiles of the two groups of researchers. Several interesting issues can be investigated through this method. ii) This is followed by an analysis of the mobility pathways: do grantees from the different parts of the EU make different mobility steps? For example, do they tend to select other host countries and institutions, and do they differently change (improve) the research environment? (iii) Thirdly, to what extent does a significant difference exist between the two groups in terms of their further performance? If an initial gap exists, is this widening or narrowing?

Data and sample

CORDA is the common research data warehouse, central repository of data of present and past Framework Programmes (FP) collected and/or derived during the course of FP implementation. It contains among others data on funded (and non-funded) applicants in the MSCA programme.

For methodological reasons, the effort involved in matching described in the subsequent section and the need for a sufficiently long measurement period after the grant was awarded, the sample was restricted to the years 2007-2008. For similar reasons the sample was limited to researchers in three fields: the Life Sciences (LIF), Environmental Sciences (ENV) and Chemistry (CHE). Following matching and various cleaning steps we retained a final sample of 265 authors that will be used in the subsequent analyses (to be expanded in the final paper) and a corresponding set of 5000 matched articles.

Results

Figure 1 shows a boxplot of the difference between the score of the researcher host institution and the score of his/her home institution.² A Kolmogorov-Smirnov test tends to separate the distribution for researchers from ESIFIC countries from those for researchers from FPIC or RoW countries. Visually, the median of the distribution is noticeably higher for researchers from ESIFIC countries. This is a clear indication of the tendency of ESIFIC grantees to move towards organisations with a stronger quality. This conclusion is strengthened by the Mann-Whitney U statistics which detects no significant shift in the median between the distributions of the RoW and FPIC researchers. On the contrary, the shift between FPIC and ESIF researchers is highly significant (p-value less than 1%) and the one between RoW and ESIF researchers is barely above the 5% threshold (p-value of 7%).

Figure 1 Difference between quality home and host institution

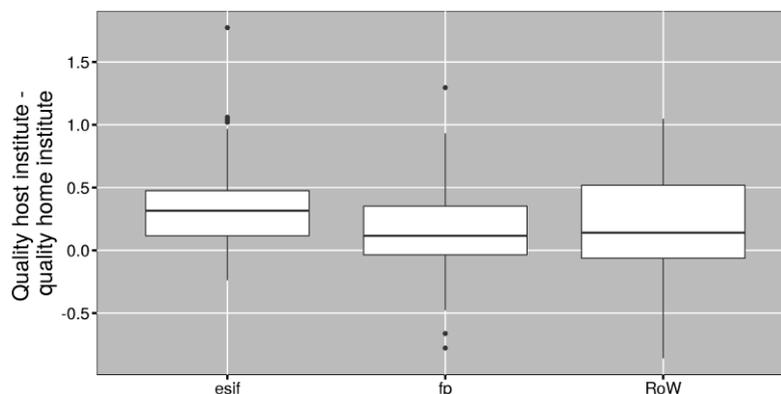
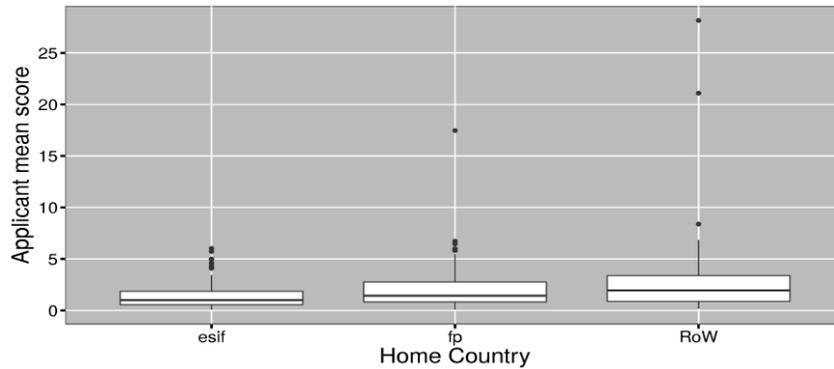


Figure 2, below illustrates the boxplot of the distribution of the mean citation score of each successful applicant broken down by the geographical macro area of origin of the applicant.

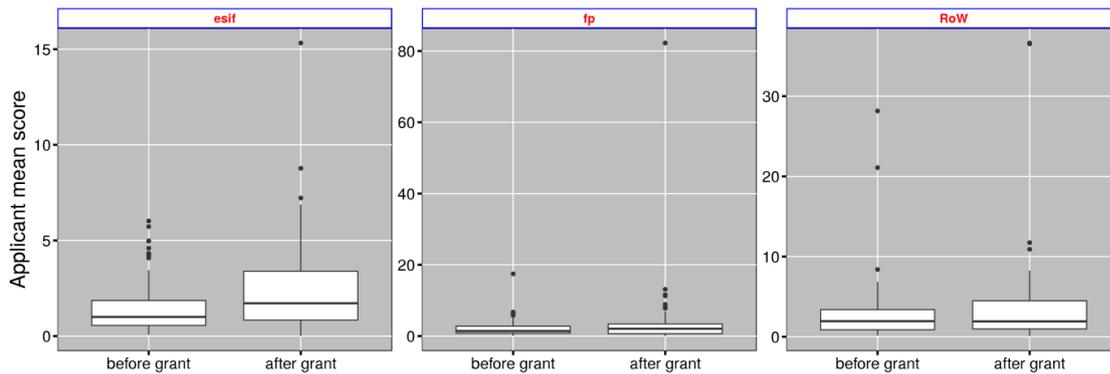
² Both metrics are averaged along the years before the award of the grant.

Figure 2 Boxplot of the applicant mean citation score before receiving the grant



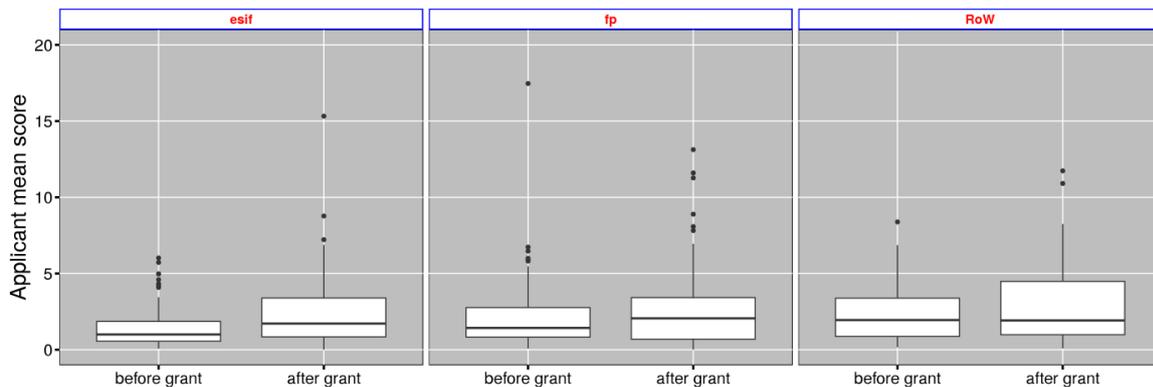
A Kolmogorov-Smirnov test indicates that the differences in the distributions of the mean score for applicants from FP or Rest of the World (RoW) countries are not statistically significant at the 5% p-value level. However, the distribution for applicants from ESIFIC countries appears to be statistically different from the other two. At a descriptive level, it exhibits lower median and lower data dispersion around the median. In other words, there are more high performing researchers (in terms of field weighted citation impact) in our FPIC and RoW sample than in the ESIFIC sample.

Figure3: boxplot of the applicants' mean citation scores before and after the grant



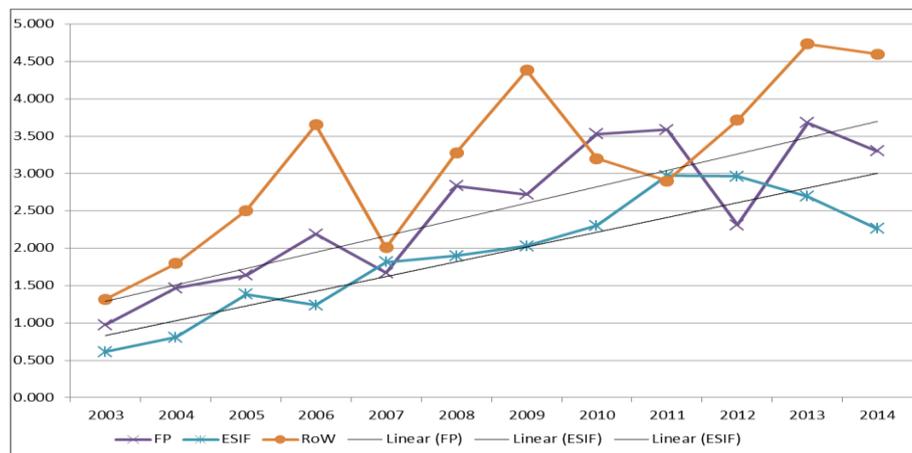
In figure 3 we plot vis-à-vis the boxplot of the applicants' mean score before the grant and after the grant. Mind the different scale in the three figures on the y axis for clarity. The changes in the distributions are evaluated as statistically significant only in the case of applicants from ESIFIC intensive countries (p-value of the Mann-Whitney U statistics below 1%). However, in all the cases we register an increase of the median value of the researcher mean publication score.

Figure 3 boxplot of the applicants' mean citation scores before and after the grant with a common scale on the Y axis



We discussed the hypothesised relatively larger gain for grantees from ESIF, because they often move to better funded research systems and institutions. To assess this we looked at the difference between the three groups in terms of their performance. For this the author level P*NCSf scores were aggregated at the level of the respective regions. Then their averages were computed year by year. Due to missing data we considered only the 2003-2014 period and 127 authors from the FPIC region, 76 from the ESIF and 62 from the RoW regions.

Figure 4 performance gap between ESIFIC and FPIC researchers measured by average NCSf per year



We observe that there is a significant initial gap between the FPIC and ESIFIC authors. Eyeballing the graph nor statistical tests indicate that the difference between the two curves is decreasing. It is therefore not possible to confirm from this part of the analysis our second hypothesis that the gap between ESIFIC and FPIC is narrowing after the grant.³

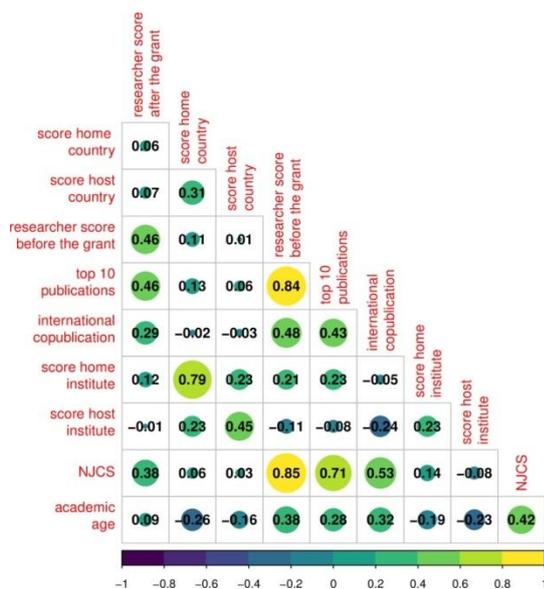


Figure 5 Pairwise Correlation analysis with Post grant citation impact

Figure 5 presents the results of a simple pairwise correlation to assess the correlation of the post grant P*FWCS (researcher score after the grant) with a number of other variables. The analysis indicates that in our sample, it is only the pre-grant P*FWCS (research score before the grant) and the number of top 10% most highly cited publications (another variable indicating high impact and highly correlated with researcher score before the grant) that are significantly positively correlated.

³ This might be due to a small sample size, but neither eyeballing nor tests of statistical significance suggest such a convergence to be occurring.

Discussion and conclusions

We can observe that there is a consistent increase in the impact of articles published by MSCA fellows before and after the grant. This holds for all fields and for researchers from ESIFIC, FPIC and RoW countries. The average impact of the journals in which they publish after the grant is higher than before the grant, which can be associated with part of this increase. Without an adequate control variable it is not possible to conclude whether these improvements are due to the impact of the grant or due to e.g. seniority effects or due to some combination of factors.

We observe a significant difference in the performance of funded researchers from ESIFIC and FPIC countries at the time of the grant: with researchers from FPIC countries exhibiting stronger performance. There can be a good rationale for the potential preferential treatment that may underlie this observation, based on the consideration that the performance of researchers is affected by their environment. Given the different level of development of research systems in ESIFIC and FPIC one may assume that a researcher with a somewhat lower performance from an ESIFIC country to have the same or higher potential as a somewhat better performing researcher from an FPIC country.

Upon receiving the grant, ESIFIC researchers experience a greater increase in the quality of their research environment, proxied by the differential between the impact of the host and home organisation. We would therefore have expected these researchers to experience a stronger increase in their performance. However, our analyses do not show the expected convergence between the performance of funded researchers from ESIFIC and FPIC countries.

Post grant performance and international collaboration intensity (as proxied by international co-publications) appear to be correlated especially to pre-grant performance and international co-publication intensity respectively. If promoting excellence and collaboration are the main aims of the MSCA instrument, pre-grant performance on these indicators appear to offer the best selection criteria. There may of course be other reasons, including capacity building in the context of the Commission's "widening agenda", for giving a mild preferential treatment to researchers from ESIFIC countries in the selection process. However, we also found that the increase of higher impact papers of the ESIFIC researchers is partially due to increased collaborations with researchers from FPIC countries. The finding that post grant performance is solely correlated to pre-grant performance also begs the question whether it is necessary to consider e.g. the quality of the host organisation in selection decisions. Since excluding this criteria might lead to a more equitable spread of MSCA fellows across host countries it is a finding that is worth assessing in greater depth.

Evaluations of the extent to which EC funding programmes (including the MSCA) can attempt to address the following questions: Is the scholarly impact of EC funded research (on average) higher than the impact of research funded by other research funding institutions? And is the selection process robust: are the best researchers selected? This could be done, e.g., by a collaboration of researchers who have done studies on the relevant national and EU funders, in which one may pool the data about these funders.

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