

Connectivity enabled by ESRC funding

More than one organisation can be associated in some way with a grant, and so when we award a grant we create opportunities for collaboration.

Based on data recording instances of individuals in Research Organisations (ROs) acting as PI, Co-I or Project Partner on the 1818 ESRC research, training and Fellowship grants authorised since 1 January 2013, this analysis sets out some of the patterns in these collaborations. It does not include collaborations with organisations other than ROs, for example businesses.

Not all collaborations associated with a grant will be recorded on the relevant grant record, and not all collaborations recorded may be significant. New collaborations may arise during the life of a grant and old ones may end. Projects may be collaborative by virtue of the fact that they are issued through the same call – they may even have coordination resources associated with them – and yet this may not show in the figures. People who are meant to work together may fall out and not speak, or forget to speak. So in the end this view provides only an impression of what might be happening as a result of our funding, not a quantified summary of all collaborations.

One key omission is that while grants for doctoral training of all kinds tend to be collaborative across multiple institutions, these collaborations are not recorded in the three grant headings used to derive the data and so are not represented here. As a result the net extent of inter-institutional collaboration on grants enabled by ESRC funding may well be slightly greater than that shown, although given the possibility of some recorded collaborations not actually working out we cannot be sure.

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The basics

Figure 1 shows the breakdown of all research, training and Fellowship grants awarded since January 2013 according to their collaboration type.

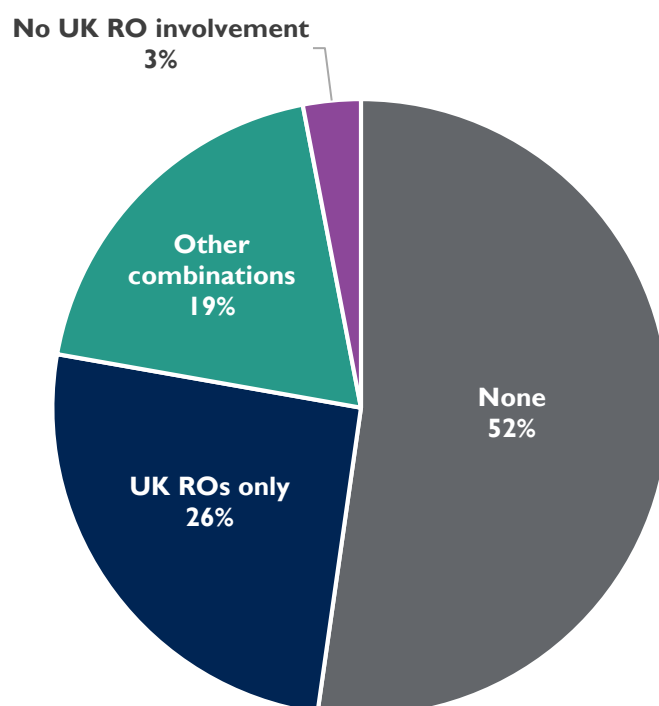


Figure 1: collaboration type for ESRC research, training and Fellowship grants awarded since January 2013

Of the 1818 grants authorised in the period, 950 had just one associated organisation and so in the terms of this analysis did not feature collaboration. It follows that just under half of ESRC grants directly enable inter-organisational collaboration by bringing together more than one RO. This might be between UK ROs only (26%), more complicated combinations of UK ROs and other organisations (19%) or between organisations that are not UK ROs (3%).

The distribution of the number of partners on grants across the whole data set is shown in Figure 2:

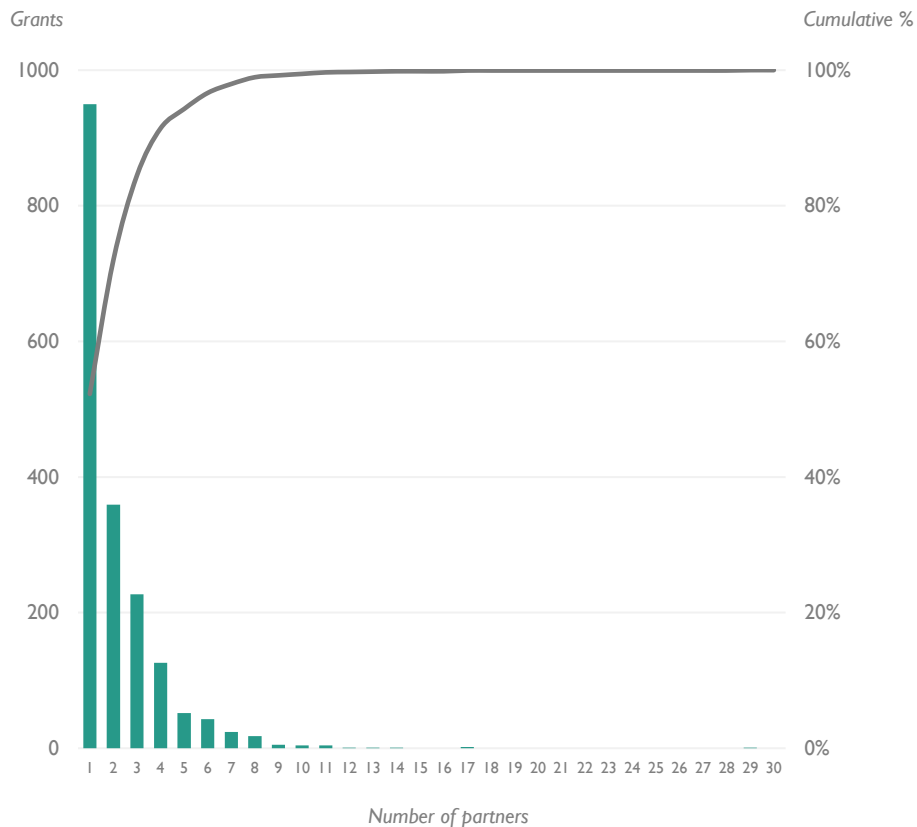


Figure 2: counts of grants associated with 0...30 partners between any ROs for ESRC research, training and Fellowship grants awarded since January 2013 (left axis) and cumulative % of total grants by number of partners (right axis)

The degree of collaboration tails off rapidly, with more than 90% of grants having four collaborators or fewer.

UK collaboration

681 grants, slightly less than a third of the total, have more than one UK RO involved and so feature some degree of research collaboration within the UK. 119 unique UK ROs have at least one linkage to another UK RO enabled by an ESRC grant. All except five of these ROs are HEIs. There are 1483 unique linkages between these ROs, and 2795 individual linkages in total.

The mean number of linkages per grant is 4.1 but, as the number of links per grant climbs steeply as the number of ROs on a grant increases, the median number of links per grant is just 1. Figure 3 shows the count of grants having each of the possible number¹ of UK RO to UK RO links in the data:

¹ The possible numbers are limited to $(n^2-n)/2$, where n is the number of ROs associated through a grant. The x axis of Figure 3 could equivalently be labelled with the number of collaborating organisations on a grant (1, 2, 3...)

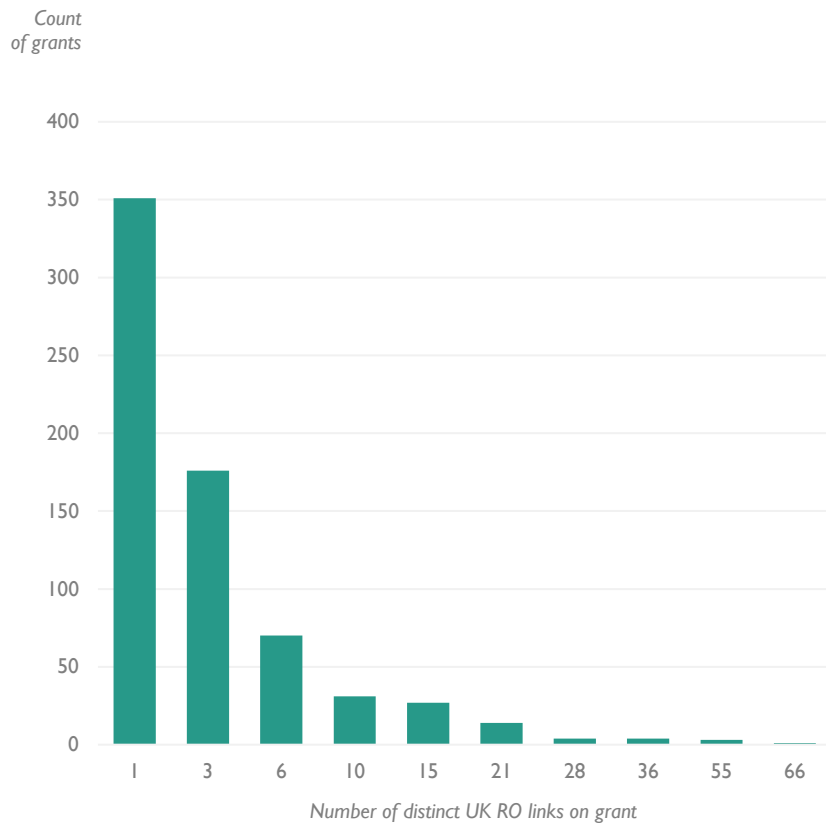


Figure 3: counts of grants generating 0...66 linkages between UK ROs for ESRC research, training and Fellowship grants awarded since January 2013 which feature UK RO collaboration.

Roughly 50% of the grants awarded, 351 in total, are collaborations between just two partner ROs, featuring just one link. The remainder, 330 in total, bring together more than two UK ROs. The maximum number of partners (PIs, Co-Is and Project Partners) found on a UK-only grant is 12, giving 66 combinations and linkages created by that grant. This degree of connectivity is rare though, with just one grant creating this density of linkages.

Maps of UK collaborations

Figure 4 overlays the 2795 individual linkages between ROs on a map of the UK to show who is or was (nominally) collaborating with who:

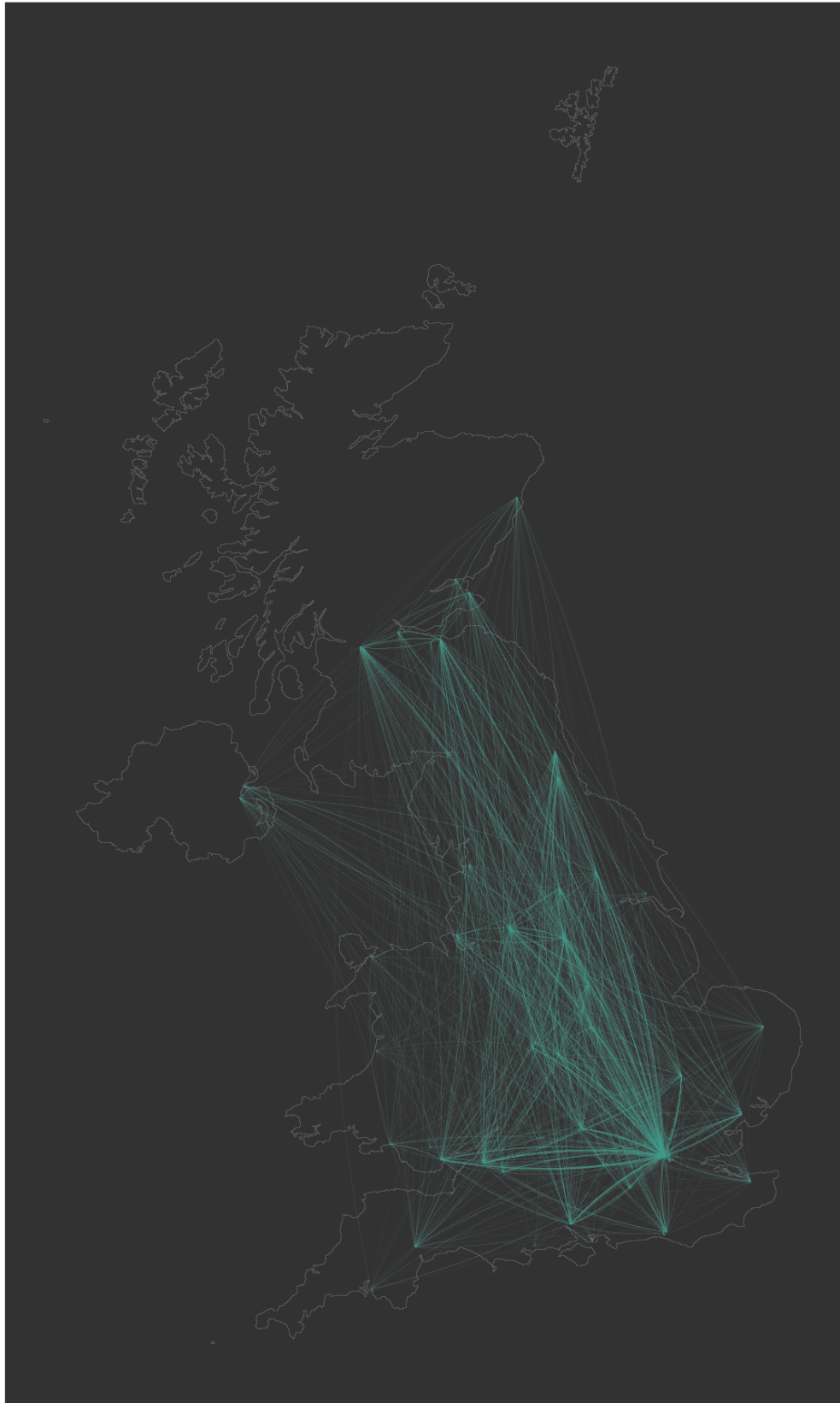


Figure 4: linkages between UK ROs for ESRC research, training and Fellowship grants awarded since January 2013 which feature UK collaboration. Each line is a single instance of a linkage between two ROs.

As well as the physical map of connectivity in Figure 4, there is also a mathematical map of connectivity: the graph or network of linkages (links or edges) between ROs (vertices or nodes) implied by the data and shown in Figure 5:

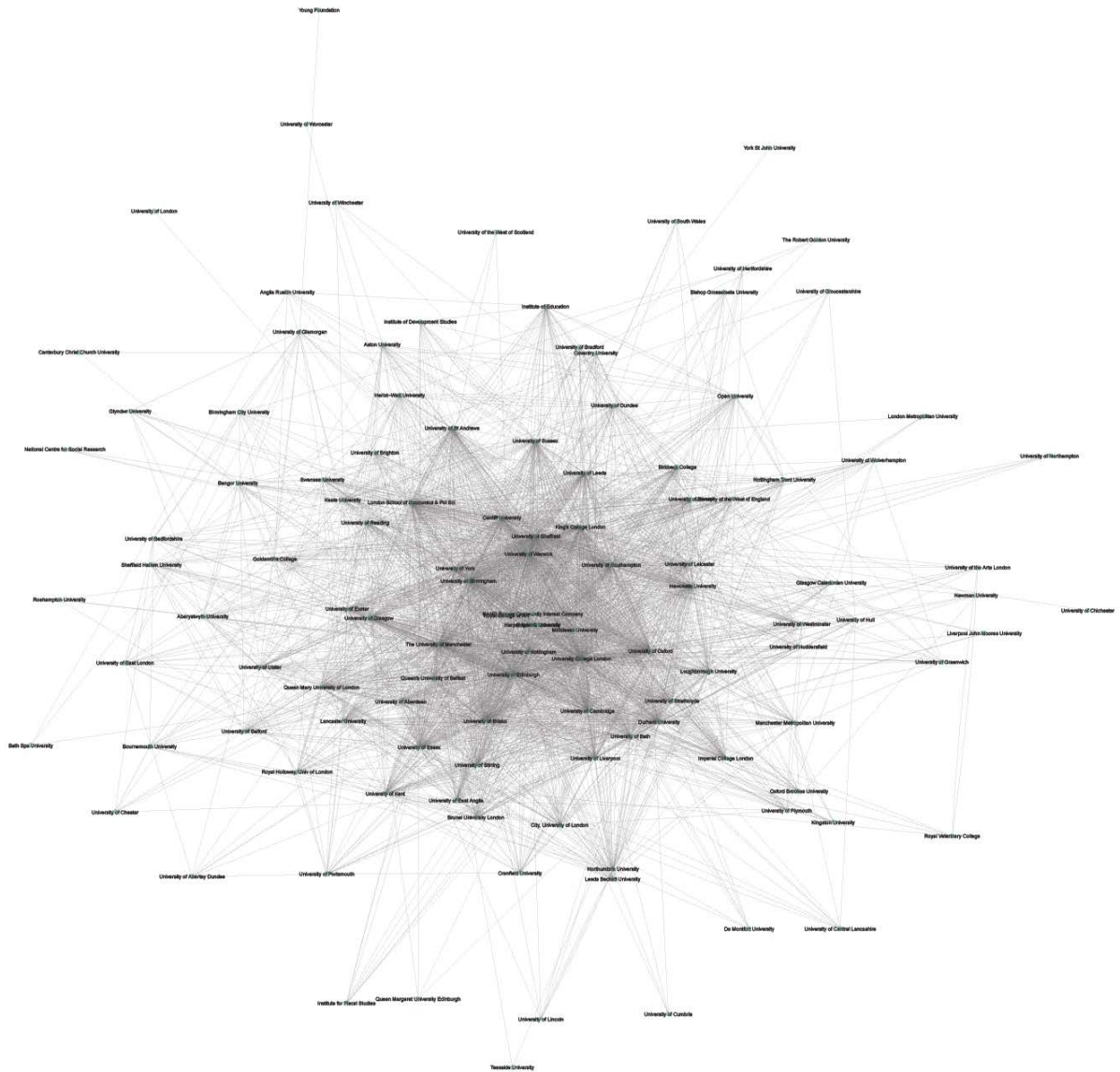


Figure 5: the graph of RO connectivity implied by Figure 4

Purely by inspection, and as might well be expected, the larger organisations are more central in the graph and tend to have a greater density of connections. But it can be hard to interpret these objects visually. A more mathematical understanding of their structure is likely to be more revealing and useful.

Measuring collaboration

A graph's density is the fraction of all possible edges in the graph that is actually found. For these data it is 0.21, indicating that about a fifth of possible connections are actually present. Clearly all potential partnerships are not equally attractive or feasible.

The number of other ROs that an RO is connected to – that RO's 'degree' – reflects both the number of grants awarded to that RO and also the number of connections on those grants. It cannot be taken as a simple indicator of behaviour. But there is a positive association between the total number of instances of collaboration enabled by co-occurrence of ROs on ESRC grants and the degree of each RO (Figure 6) although the relationship is not linear.

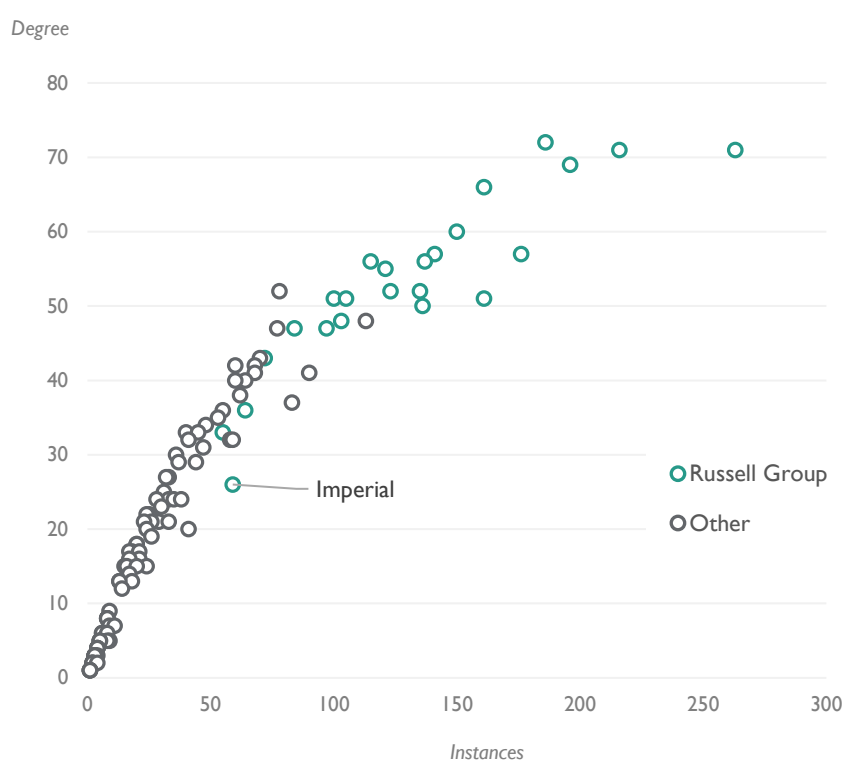


Figure 6: RO degree vs instances of occurrence as PI, Co-I or Project Partner on an ESRC research, training or Fellowship grant issued since 1 January 2013.

As ROs appear more frequently on grants, the rate of increase in the number of links they make with other ROs decreases. This suggests that more active (in the sense of the number of ESRC grants they hold) ROs are more likely to work with only a few collaborators, while less active ROs might more commonly receive ESRC funding mainly as part of a larger collaboration.

As the trend is related to scale, it is no surprise to find that Russell Group organisations are quite distinct from other ROs, though the clarity of separation is itself perhaps quite surprising. The main exception is Imperial College, which has a small ESRC footprint for obvious reasons.

The organisations with the 10 highest degrees, and their total numbers of instances of collaboration, are in the table below. All 10 are members of the Russell Group.

RO	Degree	Instances
The University of Manchester	72	186
University College London	71	263
University of Sheffield	71	216
University of Edinburgh	69	196
University of Warwick	66	161
Cardiff University	60	150
University of Bristol	57	176
University of Southampton	57	141
King's College London	56	137
University of Nottingham	56	115

54% of all UK collaborations are between members of the same group (where all non-Russell Group organisations are categorised as 'other'.) Across all ROs, whether members of the Russell Group or not, there is a degree of homophily (the tendency to associate with those with similar characteristics.) But members of the Russell Group are 1.7 times more likely to collaborate with members of their own group than are ROs who are not members of the Russell Group.

However, this preference for the Russell group is particularly strong for ROs who are not members of it: they are five times more likely to collaborate with members of the Russell Group than with other organisations. Clearly there are forces at work in the system which push ROs towards collaboration with larger organisations, but these are balanced with a tendency for larger organisations to want to go it alone.

Summary

ESRC spends around 15% of the total public funding for social science in the UK. As a result the network of connectivity enabled by ESRC funding is likely to be sparse and will not represent all, or even most, collaborative activity in social science. Even so, we can say that collaboration between UK ROs on ESRC grants is not uncommon, although it may not be the most favoured model.

As with the resources themselves, connectivity is not evenly distributed across recipients of ESRC funding. Even collaboration is concentrated, and it is concentrated in the Russell Group. The Russell Group consists of organisations that are the sort of organisations that are members of the Russell Group. The preference we see in the data and maps may be for that sort of organisation rather than for members of the group per se. Everyone prefers collaborating with the Russell Group, but perhaps not (primarily) because they are members of it.

Organisations that less commonly receive ESRC funding tend to be more collaborative than the more consistent recipients. It is easy to see why this might happen and to rationalise it. Whether this is the way it happens to be, the way it must be, the way we want it to be or the way we make it happen is not clear. Research Councils have always produced strong messages about the benefits of collaboration. The effects of those messages are not yet understood.