Should the distribution of research funds in Europe be centralized?•

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Abstract

The distribution of research funds in the European Union is currently mainly a responsibility of its member states. In this paper we ask the question whether there is a case for centralizing the distribution of research funds. In our model a social planner decides on what proportion of total research funds is distributed on the European and what proportion on a national level. On either level contests are employed to distribute the money. The researchers have two instruments in the contest: they can invest in productive effort or in persuasion. The social planner wants the researchers to spend much productive effort but little persuasion. We find that depending on the distribution of abilities, the relative effectiveness of the two instruments as well as on the marginal cost of spending productive effort, there are cases in which a centralization of the distribution of research funds is socially beneficial.

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1. Introduction

According to the Lisbon strategy promoting research is one of the major objectives of the European Union (EU). In the EU, the competence for research policy lies mainly by the member states. The member states decide on the priorities, the institutional framework and on the budget for research. However the EU set the target of increasing the investment in research and development towards three percent of the GDP by 2010. At the moment it seems quite unlikely, that this objective will be reached since the research budgets of the member states are still quite low as compared to other countries like the USA or Japan and they are raised only slowly.

The main aim of the European research policy is to integrate and coordinate the research in Europe. The European research policy is institutionalized in the so called framework program (FP).[1] The current sixth FP devotes some funds to research with a focus on seven key priority areas which are perceived to be of exceptional interest for the EU.[2] Thus for researchers in these fields, the FP is a source of funding alongside national programs. The Commission proposed to raise the funds for the 7th FP. However, as the money comes from the member states, the extent of such a rise is still debated and it remains to be seen if a rise in European research funds is accompanied by a cut in national research budgets.

All in all it seems to be the case that the total budgets for research are raised only slowly. So if the total amount of money stays roughly the same, is there a case for distributing some of these funds on a central (European) level like it is done in the priority areas in the FP? Centralization could be a way to spend existing resources more efficiently. However centralization might enlarge inequalities in the research capacity of different countries by distributing funds away from countries with less able researchers. Since the intention of the EU is to integrate the research in Europe, becoming a leading research area might not only include the aim of spending the money efficiently but also to achieve some convergence between the member states.

In this paper we ask whether research funds should be distributed on a centralized or on a decentralized level when the distributing institutions do not have perfect information and are influenced by rent seeking activities. We assume that there are two countries which differ with respect to the distribution of abilities of their researchers. The countries have exogenously given research budgets. A social planner decides upon how the total research funds are distributed. He can induce the member states to give some or all of their research budget to the EU. The remaining national research budget is then distributed among the national researchers by a national funding agency while the European research budget is distributed among all researchers of all member countries by a European funding agency.

The main objective of the funding agencies is to give the funds to the most able researchers. If the distribution of abilities in the countries differ, the European funding agency might also care about giving some funds to researchers of a country with less able researchers in order to achieve some convergence (or at least to prevent

[1] Banchoff (2002) argues that the FP is one reason for the failure of the integration of research because it established institutions that resist a change, i.e. a shift of the focus from distribution towards coordination.

[2] These areas are: life-sciences, genomics and biotechnology for health; information society technology; nanotechnologies and nano-sciences, knowledge based functional materials, new production processes and devices; aeronautics and space; food quality and safety; sustainable development, global change and ecosystems; citizen and governance in a knowledge based society.

further divergence) in the research capacity of the different countries. The problem is that the ability of the researchers is not observable to the agencies. In order to get information they set up contests among the researchers.

The researchers have two means to influence their position in the contest. They can invest productive effort i.e. develop a good idea for their proposal. The proposal can be submitted to the national and the European funding agency. We assume however that the contest designer cannot perfectly observe the quality of the proposal. Thus the researchers can influence the perception of their proposal by undertaking rent seeking activities.

Some issues related to research policy are discussed in Lazear (1997). Our question of whether to centralize or decentralize the distribution of research funds is of course related to the literature on fiscal federalism which is reviewed in Oates (1999). However (up till now) we abstract from differences in the information of the different layers of government and attempt to investigate the question in the framework of a rent seeking contest (for a survey on how to model such contests see Nitzan (1994)). Epstein and Gang (2002) compare a centralized and a decentralized allocation process in a hierarchical rent seeking model. In contrast to their model we assume that the money stems from the lower layer of government and allow for the possibility of having two sources of funding, a national and a European, alongside each other. Here, the proportion of total funds which is distributed on the national level is determined by a social planner that is not influenced by rent seeking activities of the countries. Moreover in our model, the researchers have two instruments to influence the outcome of the contest. A lobbying contest with two instruments has been investigated by Epstein and Hefeker (2002).

Our paper is structured as follows. In the next section we describe a benchmark model where the ability of the researchers is perfectly observable and compare the centralized and the decentralized outcome. In section 3 we develop our model. Section 4 concludes.

2. Benchmark

We assume that there are two countries in the EU. Both countries have research funds of size F which we normalize to 1 to be distributed among the researchers. A number of n researchers work in each country. The researchers differ with respect to their ability a. For simplicity we assume that there are four different ability levels: high ability a_h, low ability a_l and middle ability a_m^1, a_m^2 with $a_h > a_m^1, a_m^2 > a_l$. The distribution of abilities is not the same in both countries. Specifically we assume that in country 1 a proportion of κ_h^1 researchers has high ability and a proportion of $\kappa_m^1 = 1 - \kappa_h^1$ has the ability a_m^1 while in country 2 a proportion of κ_l^2 has low ability and a proportion of $\kappa_m^2 = 1 - \kappa_l^2$ has the ability a_m^2. We assume that the average ability in country 1 is larger than the one in country 2:

$$\kappa_h^1 a_h + (1 - \kappa_h^1) a_m^1 > \kappa_l^2 a_l + (1 - \kappa_l^2) a_m^2 \qquad \text{(A 1)}$$

2.1 Centralization

In the case of centralization, the social planner distributes the total research funds of size 2 among all researchers of the two countries. For the moment let us assume, that the social planner can perfectly observe the ability of the researchers. If there are constant returns from using the research funds, the most efficient allocation would be to give all the funds to the most able researchers.

However we assume here that another sharing rule is employed. Since in our model which is developed in section 3 every researcher that invests in the contest gets some funds, we also want to assume here a sharing rule where this is the case. The contest designer distributes the funds according to ability, such that higher ability types get a higher proportion of the funds.

We normalize the highest ability level $a_h = \bar{a}$ and assume that the highest ability types get a share of $s_h = s$ of the funds. All lower ability types get a share which is proportional to the relative ability as compared to the types with the highest ability. Types of the middle ability levels with $a_m^c = \tau_m^c \bar{a}$ (where c indicates the country, c=1,2) get a share of $s_m^c = \tau_m^c s$ and types of the low ability level with $a_l = \tau_l \bar{a}$, where $\tau_l < \tau_m^c < 1$, get a share of $s_l = \tau_l s$. Since total funds of 2 can be distributed, the following restriction holds:

$$\kappa_h^1 ns + \kappa_l^2 n\tau_l s + (1-\kappa_h^1) n\tau_m^1 s + (1-\kappa_l^2) n\tau_m^2 s = 2$$

According to the above described sharing rule, the shares that the researchers get are:

$$s_h = \frac{2}{n\kappa_h^1 + n\tau_l\kappa_l^2 + n\tau_m^1(1-\kappa_h^1) + n\tau_m^2(1-\kappa_l^2)}$$

$$s_m^c = \frac{2\tau_m^c}{n\kappa_h^1 + n\tau_l\kappa_l^2 + n\tau_m^1(1-\kappa_h^1) + n\tau_m^2(1-\kappa_l^2)}$$

$$s_l = \frac{2\tau_l}{n\kappa_h^1 + n\tau_l\kappa_l^2 + n\tau_m^1(1-\kappa_h^1) + n\tau_m^2(1-\kappa_l^2)}.$$

2.2 Decentralization

When the distribution is decentralized, every country distributes its research funds of size 1 each among its own researchers. Again the above described sharing rule is employed. For country 1 the restriction here is, that:

$$\kappa_h^1 ns + (1-\kappa_h^1) n\tau_m^1 s = 1.$$

Thus, the shares of the researchers are:

$$s_h^1 = \frac{1}{n\kappa_h^1 + n\tau_m^1(1-\kappa_h^1)}$$

$$s_m^1 = \frac{\tau_m^1}{n\kappa_h^1 + n\tau_m^1(1-\kappa_h^1)}.$$

For country 2 let us define that the types with low ability $a_l^2 := \tilde{a}$ get a share of $\tilde{s}$ and the types with higher ability $a_m^2 = \tilde{\tau}_m^2 \tilde{a}$ get a share of $\tilde{s}_m^2 = \tilde{\tau}_m^2 \tilde{s}$ where $\tilde{\tau}_m^2 > 1$. Then the restriction is, that: $\kappa_l^2 n\tilde{s} + (1-\kappa_l^2) n\tilde{\tau}_m^2 \tilde{s} = 1$. The shares are:

$$\tilde{s}_l^2 = \frac{1}{n\kappa_l^2 + n\tilde{\tau}_m^2(1-\kappa_l^2)}$$

$$\tilde{s}_m^2 = \frac{\tilde{\tau}_m^2}{n\kappa_l^2 + n\tilde{\tau}_m^2(1-\kappa_l^2)}$$

2.3 Comparison of the centralized and the decentralized outcomes

The researchers with the highest ability get a larger share in the centralized regime if:

$$\frac{2}{n\kappa_h^1 + n\tau_l\kappa_l^2 + n\tau_m^1(1-\kappa_h^1) + n\tau_m^2(1-\kappa_l^2)} > \frac{1}{n\kappa_h^1 + n\tau_m^1(1-\kappa_h^1)}$$

This expression can be rearranged to yield:

$$\frac{\kappa_l^2\tau_l + (1-\kappa_l^2)\tau_m^2}{\kappa_h^1 + (1-\kappa_h^1)\tau_m^1} < 1.$$

According to assumption A 1, the weighted average of the abilities of researchers in country 1 is larger than the one in country 2. Thus, the above equation is always fulfilled. The researchers with the highest ability gain from a centralization of the distribution of research funds because they get more money under a centralized regime.

Since the lower ability people in country 1 get a proportion τ_m^1 of the share of the high ability researchers of country 1 in both regimes, also the lower ability people in country 1 get a larger share in the centralized situation as compared to the decentralized one. The researchers of the other country will get less under the centralized regime.

Thus the highest ability people get a higher share and the lowest ability researchers a lower share in the centralized outcome. This corresponds with the objective to give money to the most able. However in the case that the higher ability researchers in country 2 have a higher ability than the lower ability researcher in country 1, the researchers with the second highest ability level get less in the centralized regime and the researchers with the second lowest ability more.

3. Contest with two instruments

Let us now assume that the ability of the researchers is not observable. One means for the social planner to elicit information about the researchers' abilities is to set up a contest. For such a contest, researchers submit a proposal. The quality of the proposal depends on productive effort which is correlated with the ability. We assume that also the quality of the proposal is not perfectly observable. That opens the researchers the possibility to improve the perception of the quality of their proposal by persuasive activities.

We set up a two stage game. In the first stage, a social planner decides what proportion of the total research funds is distributed on the national and which on the European level. In the second stage the research funds are distributed. In the next subsection we describe the model before we solve it using backwards induction in subsections 3.2 and 3.3.

3.1 Model

A social planner can induce the countries to give a part of δ of their research funds to the EU. The countries distribute their remaining research funds of the size of $(1-\delta)$ among their national researchers while the EU distributes funds of 2δ among researchers of both countries. On both, the EU and the national level, the research funds are distributed in a contest between the researchers which have different abilities as described in the previous section. We assume that the abilities of the researchers are close enough to each other so that all researchers participate in (at least one of) the contests.

A researcher i can invest two kinds of effort in these contests: productive effort e_{gi} and persuasion e_{bi}. We assume that the investment in productive effort is the same in both contests. The investment in persuasion however only influences the researcher's position in one contest. Thus, the total investment in persuasion is the sum of the investments in the two contest: $e_{bi} = e_{bi}^N + e_{bi}^{EU}$ where e_{bi}^N denotes the persuasion invested in the national contest and e_{bi}^{EU} denotes the persuasion invested in the European contest. The amount of total effort a researcher can spend in the contest might be constrained e.g. by time.

We assume that the funds are distributed according to a Tullock contest success function of the form:

$$p_i^L = \frac{h_i^L}{\sum_j h_j^L}.$$

Here p_i^L is interpreted as the share of the funds that researcher i gets from the total budget of level L = N, EU of the contest, with N denoting the national level and EU the European one. Thus, every researcher that invests a positive amount of h_i^L gets some funds.[3]

We assume that the inputs in the contest h_i take a Cobb Douglas (CD) function. This CD function depends on the persuasion e_{bi} and on the quality of the proposal Q_i which depends on the productive effort e_{gi} that researcher i invests as well as on his ability a_i:

$$h_i^L = AQ_i e_{bi}^{L\gamma} = A e_{gi}^{\alpha} a_i^{\beta} e_{bi}^{L\gamma},$$

Given this specification, a researcher gets only funds if he invests in both, productive effort and persuasion. We assume that the CD function is twice continuously differentiable and concave in all three parameters, i.e. $\alpha, \beta, \gamma \in (0,1)$ (all the exponents are positive, but less than 1).

[3] This interpretation can be justified by the observation that in research contests typically more than one researcher gets funds. However it would be more accurate to model a contest with several prizes (see e.g. Clark and Riis (1998), Moldovanu and Sela (2001) or Szymanski and Valletti (2005)).

Researchers not only derive utility from the research funds, but they have some direct utility from spending productive effort which will be denoted by $\tilde{u}e_{gi}$ where $\tilde{u} > 0$. The costs of participating in the contest are assumed to be:

$$C_i = \frac{e_{gi}}{a_i} + e_{bi}, \text{ where } e_{bi} = e_{bi}^N + e_{bi}^{EU}.$$

Thus, researchers with higher ability have lower marginal cost of productive effort which gives them a comparative advantage in the investment in productive effort as compared to lower ability types.

We define the objective function of researcher i as:

$$U_i = (1-\delta)p_i^N + 2\delta p_i^{EU} + \tilde{u}e_{gi} - \frac{e_{gi}}{a_i} - e_{bi}.$$

3.2.1 Second Stage: Utility maximization

In the second stage, every researcher takes the decision of the social planner about the proportion of the funds distributed on the different levels as given and maximizes his objective function:

$$\max U_i = (1-\delta)p_i^N + 2\delta p_i^{EU} + \tilde{u}e_{gi} - \frac{e_{gi}}{a_i} - e_{bi}$$

with respect to e_{gi}, e_{bi}^N and e_{bi}^{EU} which cannot take negative values.[4] Utility maximization yields the 1st order necessary conditions:

$$\frac{\partial U_i}{\partial e_{gi}} = (1-\delta)\frac{\alpha}{e_{gi}}p_i^N(1-p_i^N) + 2\delta\frac{\alpha}{e_{gi}}p_i^{EU}(1-p_i^{EU}) + \tilde{u} - \frac{1}{a_i} \le 0$$

$$\frac{\partial U_i}{\partial e_{bi}^N} = (1-\delta)\frac{\gamma}{e_{bi}^N}p_i^N(1-p_i^N) - 1 \le 0$$

$$\frac{\partial U_i}{\partial e_{bi}^{EU}} = 2\delta\frac{\gamma}{e_{bi}^{EU}}p_i^{EU}(1-p_i^{EU}) - 1 \le 0$$

$$e_{gi} \ge 0,\ e_{bi}^N \ge 0,\ e_{bi}^{EU} \ge 0$$

$$\frac{\partial U_i}{\partial e_{gi}}e_{gi} = 0,\ \frac{\partial U_i}{\partial e_{bi}^N}e_{bi}^N = 0,\ \frac{\partial U_i}{\partial e_{bi}^{EU}}e_{bi}^{EU} = 0$$

As already stated above, we assume that the ability levels are close enough to each other such that every researcher participates in at least one contest. This being the case, the first condition and at least one of the second and the third are fulfilled with equality and we get from these 1st order conditions the equation:

$$e_{gi} = \frac{\alpha}{\gamma}\frac{a_i}{1-\tilde{u}a_i}e_{bi} \qquad (1)$$

Thus, there is a positive relationship between the productive effort and the persuasion. Researchers investing higher productive effort also use a higher amount of persuasion than researchers using a lower amount of productive effort.

[4] We solve this problem for the case that a constraint on total effort is not binding but we plan to include a constraint in future work.

In the following exposition we concentrate on the interior solution i.e. on the case that all three first order conditions are binding, i.e. that every researcher spends a positive amount of productive effort and persuasion in both contests as long as $\delta \neq 0$ and $\delta \neq 1$.

3.2.2 Second Stage: Comparative Statics

How does e_{gi} change with δ? By developing the Hessian and using Cramer's rule we get the following expression which determines the sign of $\frac{de_{gi}}{d\delta}$:

$$-p_i^N(1-p_i^N)((1-2p_i^{EU})\gamma-1)+2p_i^{EU}(1-p_i^{EU})((1-2p_i^N)\gamma-1). \quad (2)$$

This expression has to be divided by the determinant of the Hessian which we assume to be negative because the 2nd order condition for maximization is fulfilled if the Hessian is negatively definit. Thus e_{gi} will rise in δ if expression (2) is negative.

To see when this is the case let us define $p_i^{EU} = kp_i^N$. We assume that $k<1$ because more researchers participate in the European contest. Then expression (2) can be reformulated and the following condition must hold in order to have $\frac{de_{gi}}{d\delta} > 0$:

$$\gamma(p_i^{N^2}(4k^2-2k)-p_i^N(2k^2+2k-1)+2k-1) < 2k-1-p_i^N(2k^2-1) \quad (3)$$

We have to distinguish three cases according to the sign of the right hand side (RHS) expression of (3). The RHS is equal to zero for:

$$k_1 = \frac{1}{2p_i^N}(1-\sqrt{1-2p_i^N(1-p_i^N)}) \quad \text{and} \quad k_2 = \frac{1}{2p_i^N}(1+\sqrt{1-2p_i^N(1-p_i^N)})$$

For $p_i^N \in \left[0, \frac{1}{2}\right]$ k_1 is decreasing in p_i^N: it takes the values $k_1 \approx 0.2929$ for $p_i^N = \frac{1}{2}$ and ½ for $p_i^N \to 0$.

The following three cases can occur:

- The RHS of (3) is positive. This is the case for $k \geq \frac{1}{2}$ but also for smaller k for which $k > k_1$. If this is the case we can again rearrange equation (3) to get:

$$\frac{2kp_i^N(p_i^N(2k-1)-1)}{(2k-1)-p_i^N(2k^2-1)} + \frac{\gamma-1}{\gamma} < 0$$

  which is always negative if $\gamma < 1$ since both terms on the left hand side (LHS) are negative. Thus, e_{gi} rises with δ.
- The RHS is equal to zero. Also in this case e_{gi} rises with δ since

$$p_i^{N^2}(4k^2-2k)-p_i^N(2k^2+2k-1)+2k-1 \leq 0$$

with the equality sign only holding for the case that p=0 and k=1/2.

- The RHS is negative. In this case, e_{gi} rises with δ only if:

$$\frac{2kp_i^N(p_i^N(2k-1)-1)}{(2k-1)-p_i^N(2k^2-1)}+\frac{\gamma-1}{\gamma}>0$$

This condition is only fulfilled for some special values of γ, p_i^N and k. In most cases the opposite will hold i.e. e_{gi} falls with δ.

Thus, if the share of funds that researcher i gets in the European contest (p_i^{EU}) is relatively large (small) as compared to the one he gets in the national contest (p_i^N) i.e. larger or equal to (smaller than) k_1, the researchers will spend the more (the less) productive effort, the higher is the proportion of funds distributed on the European level.

To see how a change in δ affects e_{bi} let us restate equation 1:

$$e_{gi}=\frac{\alpha}{\gamma}\frac{a_i}{1-\tilde{u}a_i}e_{bi}$$

The term $\frac{\alpha}{\gamma}\frac{a_i}{1-\tilde{u}a_i}$ is positive and does not depend on δ. Hence, the change in e_{bi} broad about by a change in δ goes in the same direction as the change in e_{gi} i.e. in the first two cases e_{bi} rises with δ while in the third case it falls with δ.

3.3 First Stage

In the first stage, the social planner decides on the proportion of funds distributed on the European and the national level. What is the optimal δ the social planner should choose? We assume that the social planner wants the researchers to spend much productive effort but little persuasion. Thus his objective is to maximize the difference between the productive effort and the persuasion:

$$\sum_A\left(e_{gi}-e_{bi}\right)+\sum_B\left(e_{gi}-e_{bi}\right).$$

Because e_{gi} and e_{bi} are either both rising or both falling in δ, the optimal δ will depend on whether the change in e_{gi} or the one in e_{bi} is larger. If e_{gi} rises (falls) by more, δ should be set to 1 (to 0), if e_{bi} rises (falls) by more, it should be set to 0 (to 1). From equation (1) we can see that the expression $\frac{\alpha}{\gamma}\frac{a_i}{1-\tilde{u}a_i}$ determines which change is larger. If this expression is larger than 1, e_{gi} rises (falls) by more than e_{bi}. The expression

$$\frac{\alpha}{\gamma}\frac{a_i}{1-\tilde{u}a_i}>1$$

can be rearranged to yield:

$$\frac{\alpha}{\gamma}>\frac{1}{a_i}-\tilde{u} \qquad (4).$$

The LHS of (4) is a measure of the relative effectiveness of productive effort as compared to persuasion while the LHS denotes the marginal cost of the productive effort (net of the marginal direct utility $\tilde{u}$). Since α and γ are the same for all researchers, equation (4) is more likely to be fulfilled for high ability types.

For e_{gi} to be positive, it must hold that: $\frac{a_i}{1-\tilde{u}a_i} > 0$ and thus that $\tilde{u} < \frac{1}{a_i}$. Thus, the RHS of (4) is always positive and the increase (decrease) in e_{gi} is larger than the one in e_{bi} if α is sufficiently larger than γ i.e. if there is placed a sufficiently higher weight on productive effort than on persuasion in the CD function h_i. This being the case for all researchers, the social planner wants to distribute all funds on the European (national) level: $\delta = 1$ ($\delta = 0$).

It has to be taken into account however, that the researchers have different abilities. So there might be some researchers for which $\frac{de_{gi}}{d\delta}$ is positive and some for which it is negative. Moreover it might be the case that $\frac{\alpha}{\gamma}\frac{a_i}{1-\tilde{u}a_i}$ is larger than 1 for some ability levels (the high ability types) and smaller than 1 for others. How should the social planner set δ in these cases?

The social planner knows the ability distribution and can compute $\frac{\alpha}{\gamma}\frac{a_i}{1-\tilde{u}a_i} - 1$ for all ability types. As explained above, these terms indicate whether a change in δ has a larger impact on productive effort or on persuasion. In order to decide on the optimal δ the social planner has to calculate the weighted average of these terms. Also in these cases it is not optimal to have both contests alongside each other i.e. δ is either 0 or 1. As for each researcher the difference between the productive effort and the persuasion is either always rising or always falling in δ, the same holds for the average difference. Thus the (average) difference is maximized at the boundaries i.e. at $\delta = 1$ or $\delta = 0$.

For the case that the sign of $\frac{de_{gi}}{d\delta}$ is the same for all researchers, but the sign of $\frac{\alpha}{\gamma}\frac{a_i}{1-\tilde{u}a_i} - 1$ differs, the weighted average:

$$\kappa_h^1 n\left(\frac{\alpha}{\gamma}\frac{a_h}{1-\tilde{u}a_h} - 1\right) + \kappa_m^1 n\left(\frac{\alpha}{\gamma}\frac{a_m^1}{1-\tilde{u}a_m^1} - 1\right) + \kappa_m^2 n\left(\frac{\alpha}{\gamma}\frac{a_m^2}{1-\tilde{u}a_m^2} - 1\right) + \kappa_l n\left(\frac{\alpha}{\gamma}\frac{a_l}{1-\tilde{u}a_l} - 1\right) \quad (5)$$

has to be compared to zero. If (5) is larger than zero and $\frac{de_{gi}}{d\delta} > 0$ ($\frac{de_{gi}}{d\delta} < 0$), the contest designer should set $\delta = 1$ ($\delta = 0$) because the expected change in e_{gi} is larger than the one in e_{bi}.

For the case that the sign of $\frac{de_{gi}}{d\delta}$ differs, the social planner compares the absolute value of the weighted average of the types for which $\frac{de_{gi}}{d\delta} > 0$ holds to

absolute value of the weighted average of the types for which $\frac{de_{gi}}{d\delta} < 0$. The optimal δ is set according to which of these absolute values is higher. If the absolute value of the weighted average of the types for which $\frac{de_{gi}}{d\delta} > 0$ holds is higher, δ should be set to 1 (0) when the weighted average of these types is larger (smaller) than 0.

Proposition:
It is socially optimal to centralize the distribution of research funds, if

(i) $$\left|\sum_i \left(\frac{\alpha}{\gamma}\frac{a_i}{1-\tilde{u}a_i}-1\right)\right|_{\frac{de_{gi}}{d\delta}>0} > \left|\sum_i \left(\frac{\alpha}{\gamma}\frac{a_i}{1-\tilde{u}a_i}-1\right)\right|_{\frac{de_{gi}}{d\delta}<0} \quad \text{and}$$

$$\sum_i \left(\frac{\alpha}{\gamma}\frac{a_i}{1-\tilde{u}a_i}-1\right)\Bigg|_{\frac{de_{gi}}{d\delta}>0} > 0$$

(ii) $$\left|\sum_i \left(\frac{\alpha}{\gamma}\frac{a_i}{1-\tilde{u}a_i}-1\right)\right|_{\frac{de_{gi}}{d\delta}>0} < \left|\sum_i \left(\frac{\alpha}{\gamma}\frac{a_i}{1-\tilde{u}a_i}-1\right)\right|_{\frac{de_{gi}}{d\delta}<0} \quad \text{and}$$

$$\sum_i \left(\frac{\alpha}{\gamma}\frac{a_i}{1-\tilde{u}a_i}-1\right)\Bigg|_{\frac{de_{gi}}{d\delta}<0} < 0$$

4. Conclusion

In the EU the distribution of research funds is currently decentralized. In our benchmark model we saw that a centralization of the distribution of research funds is beneficial because the most able researchers get more research funds under a centralized regime than under a decentralized one. Also if the research funding agencies cannot observe the abilities of researchers and if they are influenced by rent seeking activities, a centralization of the distribution of research funds can be socially beneficial. Whether this is the case depends on the relative share that the researcher can win in the European contest as compared to the national one, on the relative effectiveness of productive and rent-seeking activities in the contests and on the marginal costs of investing productive effort.

Since the effect of a change in the proportion of the funds that is distributed on the European level on the productive effort goes in the same direction as the effect on persuasion, rising productive effort comes at the cost of raising the amount of rent-seeking activity. In this model we assumed that the objective of the social planner is to maximize the difference between productive effort and persuasion. Up till now we did not account for other objectives like the one of achieving convergence in the research ability of the member states. To achieve such convergence, the social planner might have to sacrifice some amount of productive effort and accept a larger amount of rent seeking activity. Especially for low ability types it is likely that the effect of a change in the proportion of funds distributed on the European level on persuasion is

larger than on productive effort because their marginal costs of productive effort are relatively high.

This model is only in his first steps. Future work will be needed to enrich the model. Up till now we assumed that there is no binding constraint of the total effort. The next step is to include such a constraint. As mentioned in the last paragraph, we attempt to include considerations for convergence in the objective function of the social planner. It might be optimal to demand different proportions of funds (δ) from the different countries. Another important aspect might be to introduce asymmetries between the different levels. For instance it might be harder for researchers to persuade the European actors than the national ones. However the national funding agencies might possess more information about the national researchers than the European one has. Moreover the influence of the persuasion on the shares is assumed to be exogenously given in our model. As this parameter might be thought of the openness to corruption, it might be worthwhile to endogenize it. Finally it might be worthwhile to change the distribution of the abilities in and between the countries.

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