

Response to Anonymous Referee

I thank the referee for her helpful and constructive comments. It is good to see a clear confirmation that the analysis in the paper is correct.

The paper contributes to the existing literature in a number of ways that have not been picked up before. In particular: (i) it provides a clear categorization of university types based on the nature of funding, in the most simple setting without introducing extra influences (e.g., competition amongst HE institutions, different type of academics with the concomitant incentive issues, etc.) that would inevitably make the analysis cumbersome and dilute the main message the paper tries to convey; (ii) it places the budget constraint faced by a (representative) university on centre-stage, unlike other contributions in the field.

Addressing your major comments:

1. *Absence of competition amongst universities.* This is a deliberate choice dictated not only by a desire to keep the modelling simple and the analysis tractable but more importantly driven by the understanding that if one can derive a sharp result in the absence of oligopolistic competition (as in the present paper) then these results would carry over in a more complicated model with HE competition, and the phenomena of 'research elite' or 'binary divide' would be accentuated but then we would not be able to point out with clarity to the fundamental determining factors, i.e. the basic financing constraints as captured by the budget constraint. Enriching the analysis in the way you suggest would certainly bring out what you mention regarding the 'research elite' etc. but it would necessitate a completely different model. The various research exercises in the UK (RAE, now called REF) do have a funding component attached to research quality but this is more related to the actual ratings obtained and although these are somehow related to the ability of attracting good researchers, this is not the full story. And, indeed there are some very few teaching positions that are used to alleviate teaching pressures from the 'star' researchers but these are far and few between and generally not allowed in the majority of universities.

2. *Homothetic preferences in the universities objective function:* not as strong an assumption as it seems. To obtain the results you just need well-behaved preferences. *Assumption on decreasing returns to scale in research:* the crucial assumption here is that each academic has one unit of time available to her to utilise between teaching and/or research. It is in this particular sense that decreasing returns to scale relate. I would be cautious of introducing increasing returns to research as, as you correctly anticipate, this would bring in a certain degree of non-convexity and then as we all know well 'anything can happen'. Regarding the cases picked up by set B, on page 11 top paragraph, we explain that this 'arises when the funding for teaching is not sufficient to cover the gap between academic salaries and the required funds for research', a not so common situation.

3. *Empirical evidence:* there should be no problem in providing empirical evidence. A lot of the assumptions are based on the evidence that is clearly available in the UK at least.

4. *Relation between teaching and research quality:* The paper concentrates on the time allocation of research and teaching. Your suggestion to consider an alternative technical relation, other than time allocation, is an interesting one that could be explored in future research. Thanks for raising it.

5. *Universities break-even assumption:* On page 11, there are two cases (i) a university can run a surplus and (ii) a university breaks even. The choice of (ii) is dictated by the observation that universities are operating as not-for-profit organizations, hence a good approximation is to assume that they break-even. It is not clear that having at least one university accumulating surplus would eliminate the 'research elite'. There are also efficiency reasons for why a university would break even.