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### *Universities in external knowledge networks: Particular roles for particular universities?*

**Abstract:** Research questions

The paper addresses the key issue within the special track “One size does not fit all”: are there distinct ways that different kinds of universities interact with their environments at local, regional and national levels? In this paper, we begin from the critique in the call for papers to this track of what is termed a simplistic model of the universities’ regional enhancement role. The session seeks to explore how universities (or different tertiary level/higher education institutions) relate with other organizations in their environment in particular ways, depending on the characteristics of both the regions and the universities. In this paper, we seek to contribute to these debates by addressing the research question of whether there are distinct profiles of different kinds of higher education institutions that can be observed in terms of how academic employees in universities interact with external organizations in their environments and who they interact with.

In general, organizational factors – or characteristics of higher education institutions – have been less explored when it comes to interaction between universities and external organizations (Perkmann et al. 2013), partly because individual level and scientific field level variables account for a substantial element of variance in external engagement. Several empirical studies have found that academics in different fields of science differ with respect to the level of external engagement and the kinds of external engagements academics participate in (Schartinger et al 2002; Perkmann et al 2013, Ramos-Vielba & Fernandez-Esquinas 2012, Abreu & Grinevich 2013; Olmos Penuela et al., 2013a; b). Hughes & Kitson (2013) find however that the level of interaction (measured on the proportion of staff within each scientific field that was involved in external engagement activities was relatively equal, what differed was how the activities were carried out and who academics’ collaborate with.

However, organizational level factors, such as the profile of the higher education institution (applied/professionally oriented institution vs general academic institution, research university versus polytechnic/regional college), location, scientific quality of universities, and institutional commercialization policy and strategies have also been found to influence academics’ external engagement activities in some studies (Audretsch & Lehmann 2005, Perkmann et al. 2013, Bishop et al. 2011, Wright et al. 2008, Abreu & Grinevich 2013) in addition to scientific fields. Some recent studies indicate that the effect of organizational level characteristics (such as the scientific quality of the institution) on academics external engagements differ systematically by fields of science (Perkmann et al. 2011, Bishop et al. 2011). As a consequence, it is critical to also account for the relative importance of

organizational variables (size, location, kind of institutions, quality of institution, leadership, IPR policy, etc.) when controlling for differences between scientific fields and profile of academic staff. A methodological problem is, however, that samples of higher education institutions in many countries are small and that one would need a range of variables to distinguish institutions at academic field and institutional level characteristics in the same analysis.

### Methods and data

To address the question of whether there are distinct institutional profiles, we look at whether institutional characteristics (institutional type and location) matter for academics' external engagement activities in the complete higher education system of Norway, when we also control for a range of scientific field and individual level variables.

We address this question by utilising data from a survey administered to 8500 tenured/permanently employed academic employees in all public higher education institutions in Norway (the survey received 4440 useable responses, giving a response rate of 52,5 percent). The respondent analysis showed no significant differences between the sample and the whole population of academic staff in Norway, entailing that the data is in general representative for the whole population of academic employees in Norwegian higher education institutions. The survey included a range of questions about external engagement (frequency, kinds of external contacts/modes of interaction, kinds of external organizations that academics mainly interacted with, academics' motivation for external engagement, drivers for external engagement and level of external funding of research activities among academic staff). The survey also includes data on academics' teaching and research activities. Data on the institutional and disciplinary affiliation, as well as a range of individual level characteristics, was collected through the Norwegian database on academic personnel (Forsker-personaldatabasen).

To investigate patterns of external engagement activities, respondents were asked to indicate what kinds of external engagement activities they had been involved in over the last three years. 22 different activities could be selected, and 93 percent of the sample indicated that they had been involved in at least one external engagement activity. The survey also asked whether the respondents had collaborated with external partners the last three years, where respondents could select ten different partners (public, private and third sector at local, national and international level). In both questions multiple responses were possible. We use factor analysis to discern between main clusters of external engagement activities, and use these clusters as dependent variables in the regression analyses to explore the characteristics that influence how interaction is carried out and who the partners are.

Scientific fields are measured by standard Norwegian classification of scientific fields employed for statistical purposes (six categories: humanities, social sciences, technical sciences, mathematics/natural sciences, medical/health sciences and agriculture/veterinary sciences). We discerned higher education institutions by legal status, age and location (five categories: pre 2005-universities, post-2005 universities, scientific colleges, urban state college and regional state college)

## Results

The factor analysis of interaction modes identified five main patterns in how academics interact with external organizations: dissemination/communication, education/competence oriented, research collaboration, mobility/consultancy and research commercialization.

There are not large differences between institutional types with respect to participation in different kinds of external engagement activities, other than in the area of commercialization of research. However, the state colleges as a group participate to a lesser extent than employees in all other institutions also within collaborative research and consultancy forms of interaction, but above average in competence/education related activities with external users.

In the regression analysis we did however discerned between urban and regional state colleges as well, and tested whether the observed differences are significant, when also controlling for other factors. The analysis indicates that the observed differences between institutions with respect to commercialization are not statistically significant, entailing that the pre-2005 universities are not significantly more active than other institutions. We do however find significant differences between institutions with respect to research collaboration, where the post-2005 universities and the regional state colleges are significantly more active than other institutions. We therefore see that the regional institutions are more prone to active engagement in the form of research collaboration, than other institutions. State colleges both in the urban centers and in the regions are significantly more active than other institutions in dissemination activities, and urban state colleges are also more active than other institutions in competence enhancement activities. Regional state colleges are also more active in consultancy activities.

There are also interesting differences between institutions the main collaborating partners (public sector, industry or third sector). A factor analysis indicates three clusters of partners that academics' collaborate with: Private industry, regional, public/community organisations and national and international public organisations. The regression analysis indicates that post-2005 universities and specialized university-institutions collaborate significantly more with private industry than all other institutions. The old universities and state colleges (both regional and urban) collaborate significantly less, and there are no significant differences between these institutions. There are less differences between institutions in collaborating with public national institutions, and the post 2005 universities and state colleges collaborate significantly more than all other institutions with regional public institutions.

## Conclusions

The paper has addressed whether we can observe distinct ways that different kinds of universities interact with their environments at local, regional and national levels? To do this, we have looked at the behavior of academic employees in terms of how they are participate in external engagement activities of diverse forms and who they collaborate mainly, looking at a large dataset from the Norwegian higher education system. The dataset contains many different variables at institutions, scientific field and individual level, but in

this paper differences between institutions of different legal status (and thereby profile) and location matter for how academics interact with their environment.

There are of course observable disciplinary differences that match the patterns found in previous studies, but we are looking at institutional differences when also controlling for other variables. The descriptive results indicated relatively small differences between institutions of different type, but large differences between fields of science. The regression analysis did however find that there are significant differences between institutions in all main modes of external knowledge engagement, and where the regional state colleges and post-2005 universities (also regional) have a significantly higher level of engagement in most forms of interaction compared to the pre-2005 universities. In fact, the older and larger pre-2005 universities do not have any higher propensity to engage in any form of external knowledge engagement activity compared to other Norwegian higher education institutions, which is perhaps surprising. The main conclusion to the research question on whether there are particular roles for particular universities in this case is not straightforward. In general, we see that certain institutions are active in all modes of interaction and collaborates with both public and private organisations. In this context, the regional institutions at both university and college level are more active participants than other institutions. Compared to the older established universities, it is more the case of regional institutions taking an active role; while the universities do not appear to take any particular role.

The results contribute to the ongoing discussion about the nature of university profiles for societal engagement – particularly at the regional scale – as well as contributing to a more nuanced understanding of the sources of heterogeneity in the role of higher education institutions in regional development.

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