

**TITLE:** Case Study on the End of the “Professor’s Privilege” in Norway: Relationship Between National Policies and University-based Innovation

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## INTRODUCTION

This report studies a natural experiment which is the end of the "Professor's Privilege" in Norway to test the impact of the national policy on university-based innovation. The Professor's Privilege was abolished in June 2002 by unanimous Parliament and the new law officially implemented for all public higher education starting from 2003. Before the new policy, university researchers own full rights for their properties; however, according to the new policy, they need to transfer two-third of university's researchers' rights for new business ventures and intellectual property they created to the university. There is around a 33 percentage point increase in the effective tax rate for founding a new startup or applying for a new patent for university researchers (Hvide & Jones, 2018. p. 1864). The reform used the US system as a reference because it increased the innovation in the US higher education system. However, is it work in Norway? We hypothesise that the end of the "Professor's Privilege" may decrease the innovation in founding new startups and creating new patents by university researchers. The question is essential in the sense that by examining the impact of the change in policies may help us to understand the relationship between the allocation of rights and innovation among high-skilled workers.

The data we use is the collection by Hans K. Hvide and Benjamin F. Jones. Under Norwegian register databases, they could link individuals with workplace ID, education level, companies and patents information so we could test our hypothesis. In this report, the university-employed with PhDs are the treated group which is around 20% of the total population while people who not worked at a university are the control group. We compare the change of start-ups' foundations and patents applications before and after 2003 for two groups. In Total, there were 129 start-ups held by individuals with PhD employed in universities among 49119 start-ups, and there were 251 patents applied from university professors while 3486 patents are applied from the control group. Our analysis starts from 2000 to 2007 to avoid the recession in 2008. By

applying the difference-in-differences regression, we test whether the end of "Professor's Privilege" policy decreases the innovation rate for start-ups and patents between two groups.

## EMPIRICAL EVIDENCE AND DISCUSSION

For the empirical analysis, we need to examine our hypothesis with a control group which is the new start-ups and patents found by people outside the university. That is because we could not know whether the outcome change for the treated group is caused by the reform or other factors without the control group. For instance, there may be other reforms happened in 2003 in Norway may influence the university researchers' innovation and by just merely comparing itself change, we could not know by how much the reform of the end of "Professors' Privilege" took effect. To involve the control group, which was not influenced by the reform of the end of "Professors' privilege" but influenced by other same factors as our treated group received, we could use the difference-in-differences regression to figure out the impact of the end of "Professors' Privilege" separately.

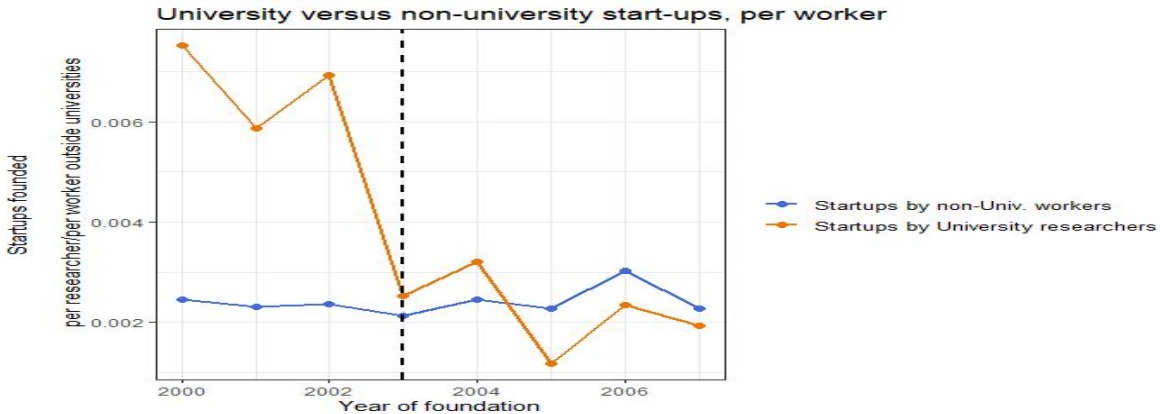
TABLE 1. THE MEAN OF BOTH PATENTS AND START-UPS IN 2002 AND 2003

foundation year	start-ups per capita for outside Univ. workers	start-ups per capita for Univ.professors	application year	patents per capita for outside Univ. workers	patents per capita for Univ.professors
2002	0.00236872	0.006938885	2002	0.00017697	0.013077129
2003	0.002127227	0.002526993	2003	0.000172347	0.007351252

Notes: Data collected by Hans K. Hvide and Benjamin F. Jones. The start-up data, collected from the government registry *Brønnøysundregisteret*. The patent data, collected from Norwegian Patent Office and Nordic Institute for Studies in Innovation, Research and Education (NIFU)

From Table 1, we could see the mean of the start-ups per capita for both groups decreased from 2002 to 2003. However, the start-ups per capita for university professors decreased 18 times larger than the control group. As for the patents per capita, the control group had slightly decreased; however, for the university researchers, the decrease for the patents per capita decreased 40 % more. The results show that reform decreases the innovation rate of start-ups and patents by university researchers.

FIGURE 1. UNIVERSITY VERSUS NON-UNIVERSITY START-UPS, PER WORKER



Notes: Data on rose registrations per year from the records of the *American Rose Society*. Patent data combine all rose PP (plant) patents (USPTO). Fi

Figure 1 shows the trends for both university professors and the control group's number of new start-ups per capita varies by the year. We could see that there is a huge decrease starting from 2002 and continuing to 2003 and after 2003, there is a slight increase compared with the control group. As for the Professor's privilege, it was abolished in June 2002, so we may think that act also influenced the behavior of professors to respond to the start-ups and patents are starting from the middle of 2002. The slight increase from 2003 to 2004 is not caused by the decrease in the number for university professors but caused by the increase in patents, and it is normal to have variations.

FIGURE 2. UNIVERSITY PATENTS VERSUS NON-UNIVERSITY PATENTS, PER WORKER

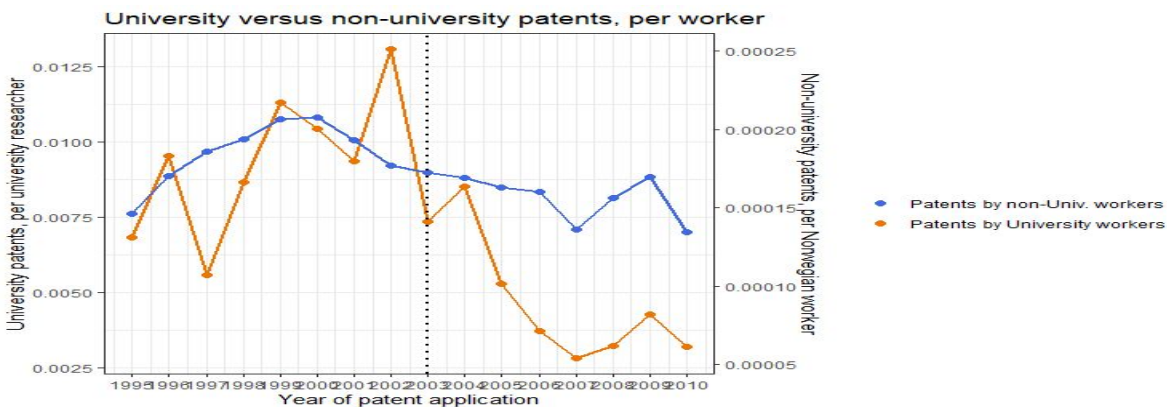


Figure 2 shows the trend for the patents per capita for university researchers as well as the control group. From the graph, we could find that around 0.94 per cent of university professors granted the patents before 2003; however, a 49% drop in per capita after the reform took effect. As for the control group, the average for patents per capita is 0.019% before the reform.

However, after 2003, it became 0.016% with a 15% drop which is much lower than the university researchers.

By applying a simple t-test, the mean of the per cent change in start-ups per 100000 workers for the university professors and outside university full-time employed are significant differences with a p-value with 0.0086. However, when we apply the t-test to the group of people with PhD and not employed by the university, the p-value is 0.8302 which is too large, so we cannot reject the null hypothesis which there is no significant difference between the per cent change in start-ups per 100000 workers in university professors and people with PhDs but not worked in universities. For the t-test with the patent, the p-value is 0.8103 so that we could not reject the null hypothesis. That means the difference between the per cent change in patent per capita is not significant.

The econometric approach we use is difference-in-differences regressions, using the end of “Professor’s Privilege” reform to separate the time to pre-2003 and post-2003. We use the panel model in (1) to compare the coefficient of start-ups and patents rate for the group of university professors and people outside the university sectors. In the equation, beta0 tests for the coefficient of year effect and beta1 testes for the coefficient of treated effect.

$$y_{it} = \beta_0 Post_t + \beta_1 Treat_i + \beta_2 Treat_i \times Post_t + \varepsilon_{it} \quad (1)$$

TABLE 2. SUMMARY STATISTICS FOR START-UPS AND PATENTS IN NORWAY, 2000---2007

	(1)	(2)	(3)	(4)	(5)
Treated X post-2003	-44.256 *	-44.256 **	-44.256 **	-15.419	
	(24.227)	(17.538)	(17.538)	(16.014)	
Post-2003	0.568	0.568		-28.269 **	
	(17.131)	(12.401)		(11.324)	
Treated	53.865 ***	53.865 ***	53.865 ***	-7.858	134.438 ***
	(19.153)	(13.865)	(13.865)	(12.661)	(13.798)
Patent_post_2003					-0.407
					(12.341)
Patent_treat X post					-67.312 ***

Year FE	no	no	yes	no	no
Field FE	no	yes	yes	yes	yes
Control group	All workers	All workers	All workers	With PhD	All workers
N	160	160	160	160	128
R <sup>2</sup>	0.069	0.540	0.540	0.804	0.613

\*\*\* p < 0.01; \*\* p < 0.05; \* p < 0.1

According to Table 2, in the first three columns, they test the difference-in-differences for start-ups per 100,000 researchers for university professors and other full-time workers outside the university. Through the result, we could find that there is no difference for whether it involves the year fixed effect and the fixed field effect in this case. From the result, we could tell that for the estimated treatment effect, per 100.000 university professors have 44.256 fewer start-ups found after the reform took effect. For the column three, we compare the university professors with not university-based employees with PhDs and the result turned out to be of no significance which may be caused by the limited sample size as for there are only 160 observations. For the fifth column, we could tell that for the estimated treatment, per 100.000 university professors have 67.312 fewer patents applied after 2003 and that it is significant with p-value < 0.01.

## CONCLUSION

This report uses the end of “Professor’s Privilege” as a natural experiment to test the impact of national policies on university-based innovation. By using the difference-in-differences empirical analysis, we could find that the reform decreases the innovation in founding new startups and creating new patents by university researchers. The original intention of abolishing the “Professor’s Privilege” system and introducing the new model by referring to the United States is to increase innovation and give universities more autonomy to involve the commercialization policies; however, the empirical evidence has yielded the opposite result which the reform was reducing the innovation of founding startups and applying for the patents. It is important to study the impact of the policy reform on the formal experiments which will be helpful to future policymaking.

## Work Cited

Hans K. Hvide and Benjamin F. Jones. (2018). University Innovation and the Professor's Privilege. *American Economic Review* 2018, 108(7): 1860–1898

