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CEMI report

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The CEMI Survey of University Technology Transfer Offices in Europe

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Acknowledgements

We owe special thanks to the 211 respondents who found time in their very busy schedule to answer our survey. Obviously, nothing would have been possible without them.

The preparation of this survey greatly benefited from the advice of Georgia Tech professor Jerry Thursby and from interaction with participants to the Geneva workshop 'Dialogs on Knowledge and Technology Transfer: Economists meet TT Officers' on April 3-4, 2008. The survey was substantially improved in its testing phase thanks to the comments and suggestions of technology transfer professionals from the Universities of Aalborg, Copenhagen, Galway, Geneva, Ghent, Leuven and Trento as well as the CERN, the EPFL, Imperial College, the INSERM and the Karolinska Institute.

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Executive summary

The present survey was addressed to the Technology Transfer Offices (TTOs) of all universities located in Western European countries whose researchers published more than 200 scientific articles in the period 2004-2006. Out of the target population of 355 universities, we obtained 211 responses, i.e. a response rate of 59.4%. The sample is broadly representative of the target population in terms of size and geography.

The main findings are as follows:

- Economic development and in particular local development is more important than revenue generation for the majority of respondents.
- Industry sponsored research contracts are equally important or more important than licenses for the majority of respondents. 105 respondents indicated that they spend more time negotiating and managing research contracts than licenses, 42 spend about the same time and 65 spend more time on licenses.
- Industry sponsored research contracts are often poorly recorded. 34% of the respondents said that university researchers do not have to inform the TTO of their industry sponsored contracts and an additional 31% said that informing the TTO is compulsory only for certain categories of contracts. Despite the difficulties encountered by TTOs, a better recording of industry sponsored research contracts is advisable.
- The average TTO in the sample had 2.9 employees with a PhD degree in Science and Engineering, 2.5 employees with five years of experience or more in industry and a total of 10.8 employees.
- There are large differences in staffing levels across European countries. For instance, the average Austrian TTO has eight times as many employees as the average Swiss TTO per 1’000 scientific publications.
- European TTOs are young: 60% of TTOs in our sample were created in the last ten years.
- 29% of TTOs in our sample receive a share of licensing income or industry sponsored research contracts.
- TTOs from Ireland, the UK, Belgium, Switzerland and Denmark make more licenses than the European average.
- TTOs from Sweden, the Netherlands, Finland, Switzerland and Germany make more start-ups than the European average.
- TTOs from Denmark, Spain, Switzerland and France make more industry sponsored research contracts than the European average.

A more detailed analysis of the survey results is underway.

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1. Target population and sample representativity

1.1 Target population

This survey was designed with a carefully defined target population. Specifically, we wanted to target TTOs from universities located in Western European countries: Germany, the United Kingdom, France, Spain, Italy, the Netherlands, Belgium, Ireland, Portugal, Denmark, Sweden, Finland, Austria, Switzerland, Norway and Iceland. Countries from Eastern Europe were not included.

We constructed a list of universities from these countries using the ISI Web of Science, a database that keeps track of scientific publications in more than 7000 scientific journals. We excluded from the target population universities that published less than 200 scientific articles in 2004-2006. Although there are a number of universities below that threshold, we expected that their technology transfer output would be rather limited and that many of them may not have a technology transfer office in the first place.

Research institutions such as the CNRS in France, the Max Planck Society and the Frauenhofer Institutes in Germany, the UK Medical Research Council, the European Organization for Nuclear Research (CERN) and the European Molecular Biology Laboratory (EMBL) were not in the target population. There are substantial differences in terms of the organization of technology transfer both between research institutions and universities and within research institutions. We thus felt that including research institutions would expand the scope of the survey too far.

355 universities in Europe met our eligibility criteria. In a small number of cases the TTO from these universities could not be identified. This probably means either that the university does not provide technology transfer services to faculty or that technology transfer support is embryonic.

There is no one-one relationship between universities and TTOs as some universities have merged their Technology Transfer Offices. Examples include the universities of Zurich and Bern, the universities of Berlin and the universities of the Greater Lyon Area.

1.2 Sample and sample representativity

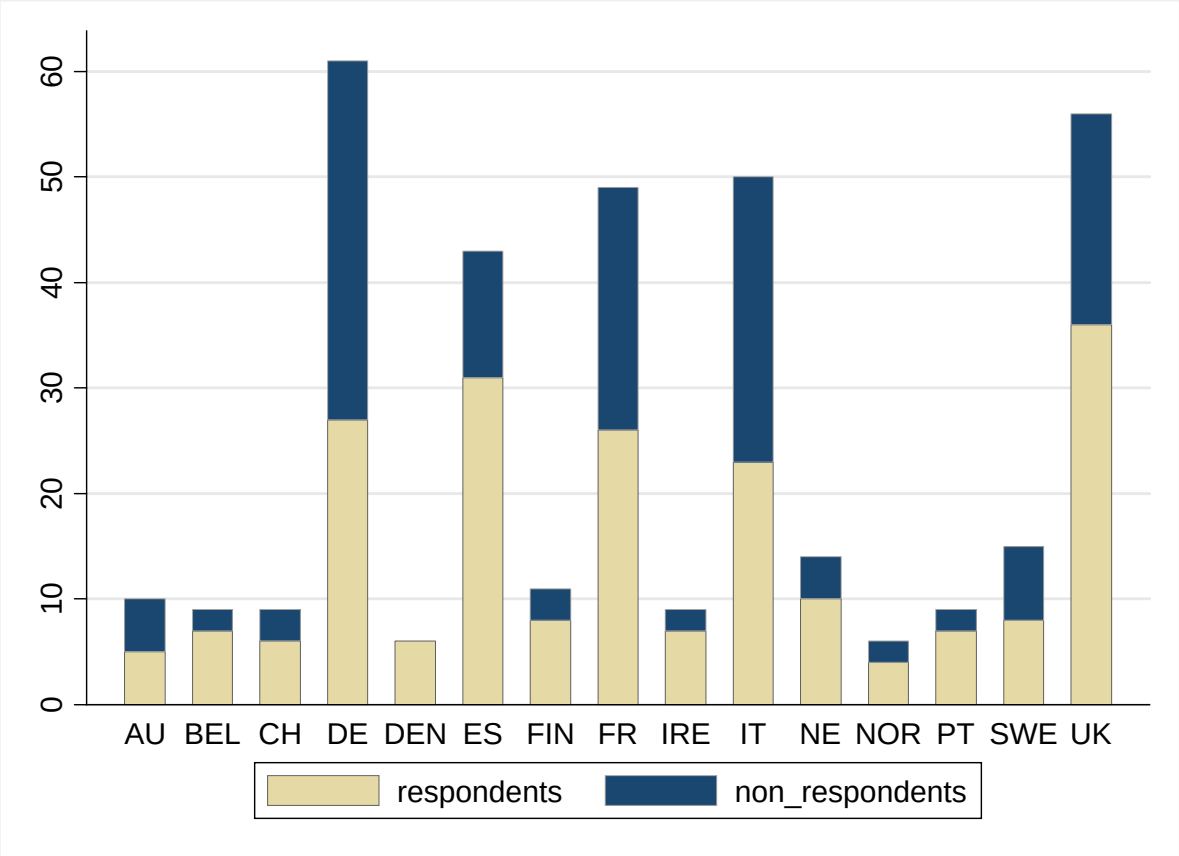
We received 211 answers, which corresponds to a response rate of 59.4%. 173 of these answers were complete. The others had one or more incomplete questions but had the majority of questions answered.

Our definition of the target population enables us to assess the representativity of our sample using observable characteristics of the target population. The average university in our sample produced 2295 scientific publications in the period 2004-2006, which is slightly higher than the average university in the population (2182 publications). This can be linked with the fact that some of the smaller universities in the target population do not have TTOs and thus did not answer the survey. At the other end of the spectrum, the two European universities with the largest number of publications did not answer the survey.

In terms of geographic coverage, we have answers coming from 15 countries with four or more answers for each country. We have response rates higher than average for small countries such as Switzerland, Denmark, Belgium, Norway, Finland, Portugal and Ireland. The lowest response rates

are for Germany with 27 answers out of 61 universities in the target population (44.2%) and Italy with 23 out of 51 (46%).

Figure 1: Sample representativity



The size and representativity of our sample compares favourably with other surveys conducted in Europe by professional associations.

The ASTP 2007 survey[1] is directed at ASTP members and includes 100 valid answers, 76 of which are from universities and 24 from research institutions. France, Italy, Spain and Sweden are underrepresented in the ASTP survey with three answers or less.

The Proton 2006 survey includes 325 answers. Half of responses come from the UK alone. On the other hand, the report includes only 3 responses from Germany, one from the Netherlands and none from France, Sweden and Switzerland. Leaving aside issues of geographical coverage, it is a mystery how the target population has been defined in the Proton survey[2].

[1] Available at www.astp.net/Survey/Summary_2007_ASTP_report.pdf.
[2] The Proton 2006 survey includes 162 answers from the UK and reports a response rate of 49.8%. However the Higher Education Funding Council for England (HEFCE) lists only 130 higher education institutions in the UK.

2. Objectives and metrics

We were interested to know which objectives TTOs are pursuing and how they measure their success. We first asked the respondents about the importance they attached to diffusion of scientific knowledge, revenue generation, national development, local development and faculty service.

Table 1: Objectives

	Extremely important	Very important	Important	Somewhat important	Not important
"Promote diffusion of scientific knowledge and technology"	**99**	60	30	4	18
"Generate revenues"	33	37	**83**	31	26
"Promote local economic development"	52	**61**	58	18	21
"Promote national economic development"	28	56	**82**	22	19
"Attract and retain faculty through quality of technology transfer services"	50	50	**57**	18	27

Respondents were asked to rank the importance of each objective. Number of respondents who assigned a given importance to the respective objective. Most frequent answer for each objective is in bold; n=211.

The majority of respondents gave a high importance to diffusion of scientific knowledge as an objective. The next most important objectives were faculty service, local development, national development and generating revenues.

The data also allows comparisons of the relative importance of different objectives for each TTO. For instance, 94 respondents gave a higher importance to local development than to revenue generation, 73 ranked them as equally important and 45 gave a higher importance to revenue generation.

Respondents were also invited to specify other objectives that they were pursuing. Four respondents mentioned increasing the reputation of the university. Three others sought to promote entrepreneurship among students and/or faculty.

We next asked which metrics of success respondents were using. The figures should be interpreted with caution because not all respondents are dealing with the same range of technology transfer activities. For instance, there are cases where start-ups are under the responsibility of another office.

Table 2: Metrics

	Extremely important	Very important	Important	Somewhat important	Not important
License income	36	41	**68**	29	31
Number of licenses/options executed	31	22	56	**63**	35
Industry sponsored research contract income	58	**58**	47	14	27
Number of industry sponsored research contracts	38	**61**	57	16	33
Number of patents awarded	30	47	**73**	29	29
Number of start-ups established	46	**66**	56	21	16

Respondents were asked to rank the importance of each metric. Number of respondents who assigned a given importance to the respective metric. Most frequent answer for each metric is in bold; n=205.

Metrics related with industry sponsored research contracts and the number of startups were more often said to be very important or extremely important than patents, licenses or license income.

Table 3: Relative importance of metrics

# of industry sponsored research contract income is more important than license income	41.3%
# of industry sponsored research contract income is equally important as license income	40.7%
# of industry sponsored research contract income is less important than license income	18%
# of industry sponsored research contracts is more important than # of licenses	32.1%
# of industry sponsored research contracts is equally important as # of licenses	43.1%
# of industry sponsored research contracts is less important than # of licenses	24.8%
# of licenses is more important than license income	29.7%
# of licenses is as important as license income	49.9%
# of licenses is less important than license income	20.4%

Percentage of respondents saying that metric A is more important, equally important or less important than metric B. n=205.

We also report in Table 3 the relative importance given to selected different pairs of metrics.

Again, respondents were invited to specify other metrics that they were using. Several respondents mentioned income generated from shareholding in start-ups as well as other start-up related measures: number of employees, turnover, equity value, time to exit. Other metrics mentioned include the number of invention disclosures, measures of faculty satisfaction, media attention, placement of graduate students in industrial jobs and income from EU-projects.

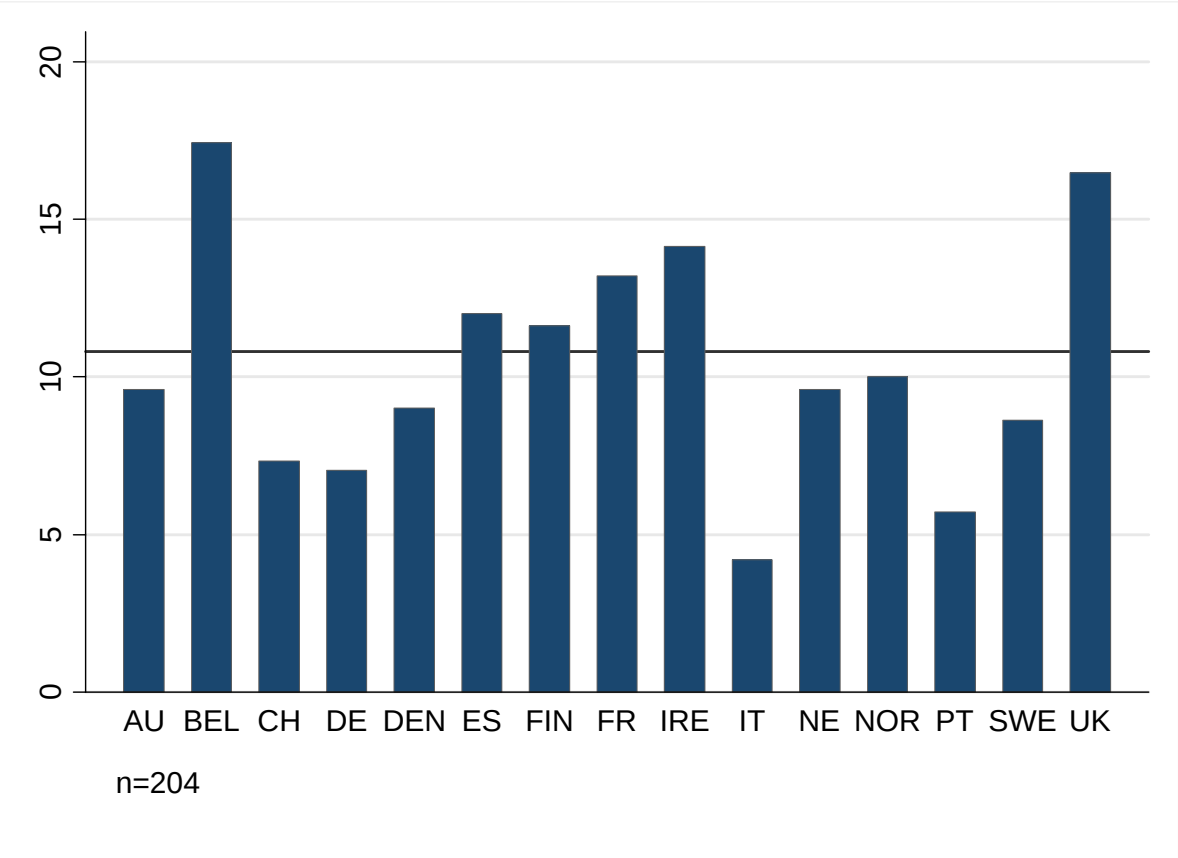
3. Staff

Our survey included a number of questions on TTO staffing in terms of both the number of employees and their qualifications. Specifically, we asked questions on: 1) the number of full time equivalent (FTEs) working in the TTO; 2) the number of FTEs with a PhD in science and engineering; 3) the number of FTEs with 5 years of experience in industry or more; 4) whether the Head of Office had at least 5 years of experience in industry; 5) the number of FTEs with a degree in law.

3.1 Total staff

In 2007 the average TTO had 10.8 FTEs, with a minimum of 0.3 FTEs and a maximum of 65. On average, Belgian TTOs have the greatest number of personnel, while Italian TTOs have the lowest.

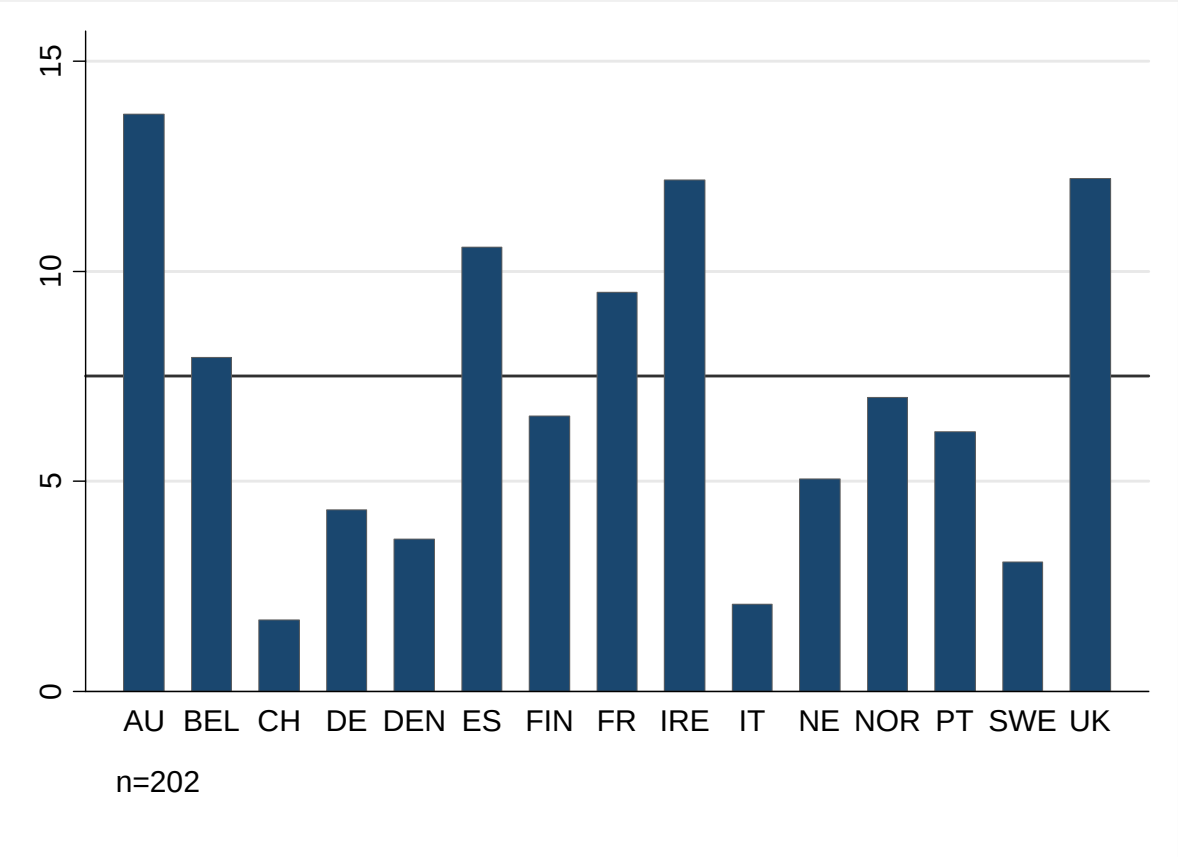
Figure 2: Average of staffing levels by country



It is more informative, however, to look at the size of TTOs not in absolute terms but relative to the size of the university it is attached to. Because information on university funding and employees of the university is not available for all countries in our sample, we used the number of publications in science and engineering as a rough measure of the size of the university. Figure 3 shows the average number of staff per 1’000 academic publications in science and engineering.

Austrian TTOs have the highest share of staff per scientific publications, followed by the UK and Ireland. At the other end of the scale Switzerland has the lowest share, followed closely by Italy. The differences across European countries are quantitatively important. For instance, the average Austrian TTO has eight times as many employees as the average Swiss TTO per 1’000 scientific publications.

Figure 3: Staff per 1’000 scientific publications by country

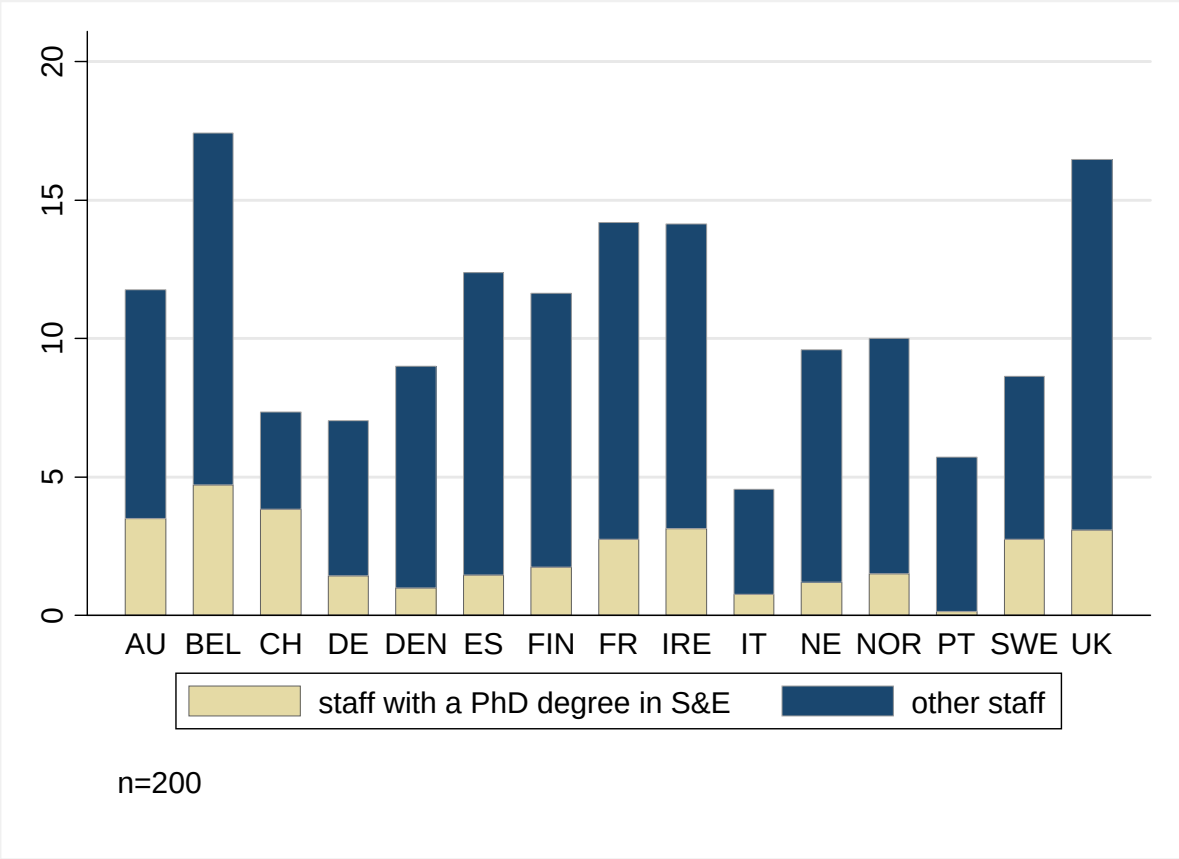


3.2 Staff with a PhD Degree in science and engineering

We asked a question on the number of TTO employees with a PhD degree in science and engineering. In previous research we found that this is correlated with the number of licenses executed by a TTO[3]. Our story was that employees with a PhD degree shared common backgrounds and values with academic inventors and that this facilitated interaction between the TTO and the academic inventors. An alternative explanation is that licensing may be a more skill-intensive activity than other activities in technology transfer. Thus, TTOs with a larger share of employees with a PhD may be more oriented towards licensing.

The average TTO in our sample employs 2.9 staff with a PhD degree in science and engineering, with a minimum of 0 PhDs and a maximum of 14. Belgian TTOs employ the greatest number of PhDs and Portuguese TTOs the lowest. If we consider the number of employees holding a PhD relative to the total number of employees, Switzerland has the highest share and Portugal the lowest.

Figure 4: Staff with PhD in S&E



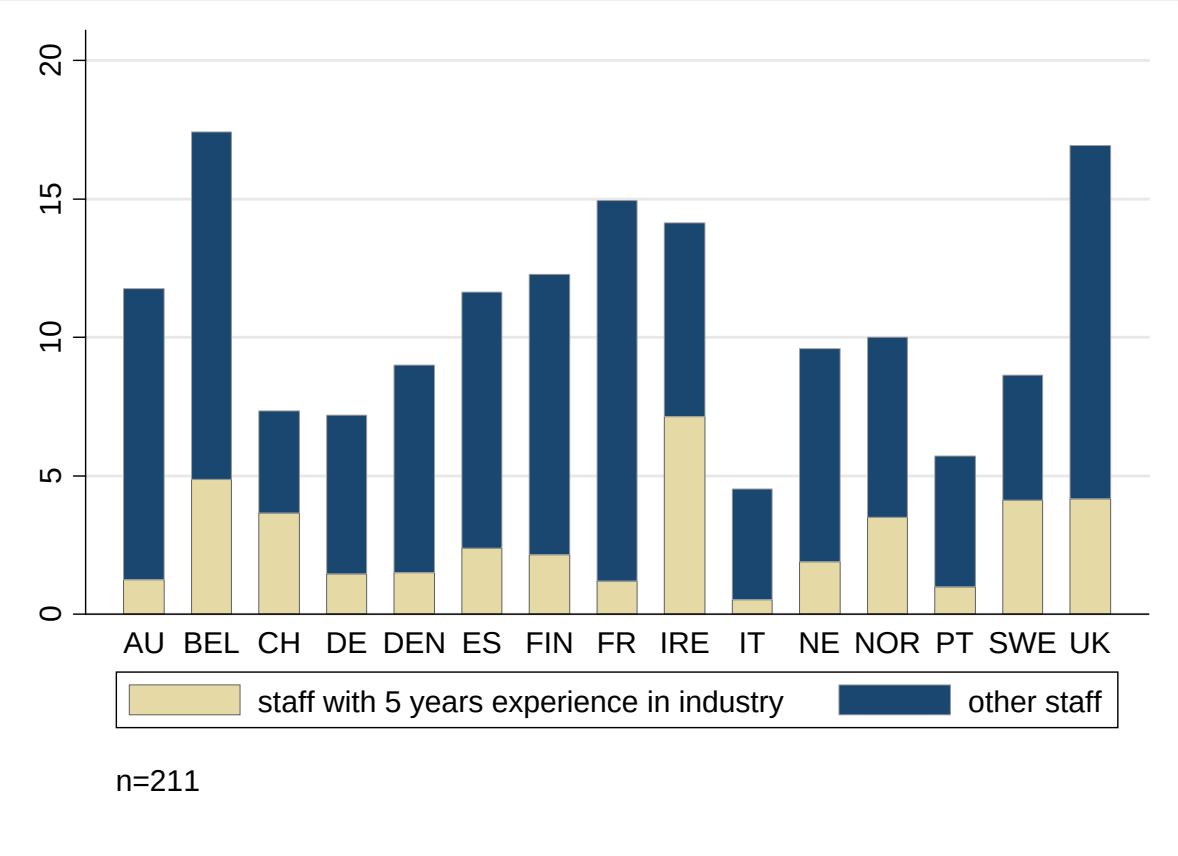
[3] Cf Conti, Gaulé & Foray (2007) "Academic licensing: a European study". CDM working paper. Available at http://ideas.repec.org/p/cmi/wpaper/cemi-workingpaper-2007-001.html

3.3 Staff with experience in the industry sector

Following the suggestions of a number of technology transfer professionals, we asked how many TTO employees had five years of experience or more in industry. A number of professionals interviewed in the design phase of the survey had suggested that employees with experience in industry found it easier to negotiate with companies, either because they understand their needs and values better or because their experience gives them more credibility.

The average number of FTEs with an experience of 5 years or more in the industry sector is 2.5, with a minimum of 0 and a maximum of 30. Irish TTOs employ the greatest number of FTEs with experience in industry and Italian TTOs the lowest. 43% of the respondents reported that their Head of Office had at least five years of experience in industry.

Figure 5: Staff with experience in industry



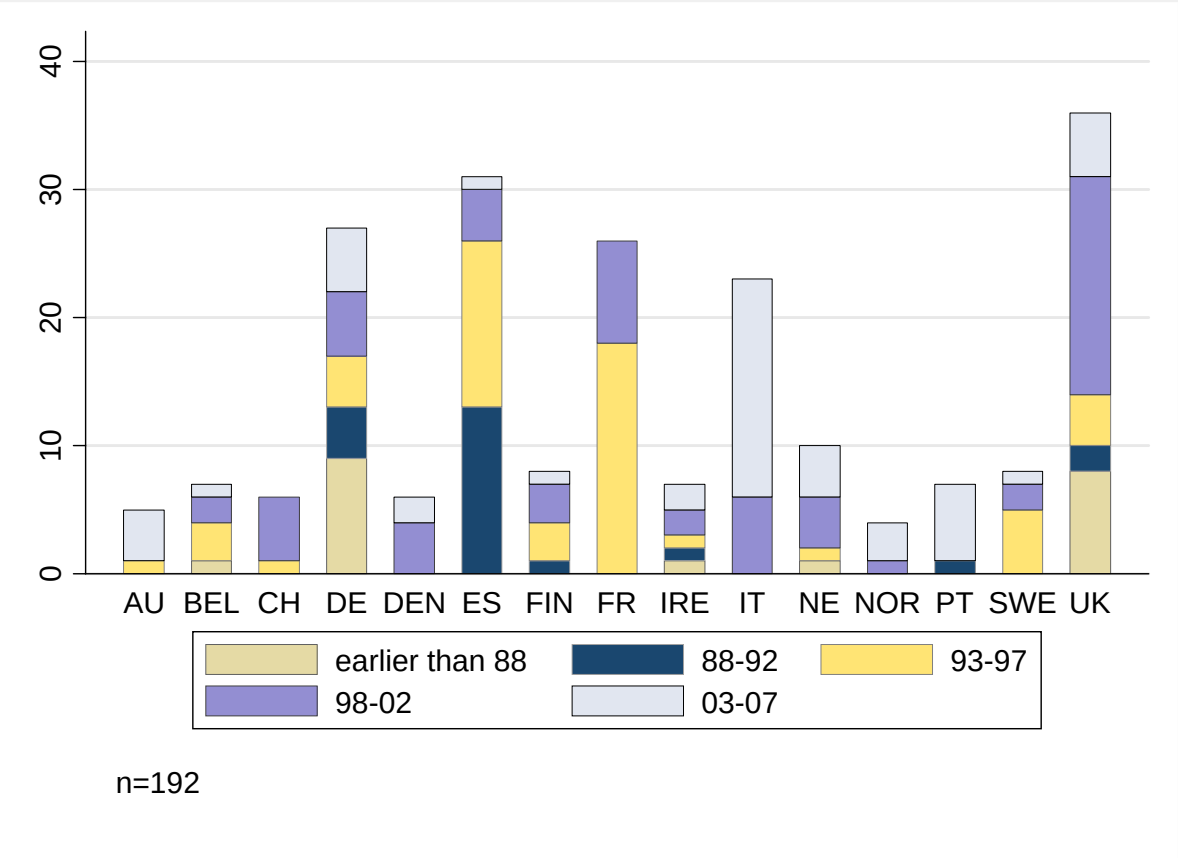
4. Organization

We were interested in gathering information on the organization of European TTOs. For this purpose we asked questions on: 1) the age of the TTO; 2) whether the TTO has experienced any restructuring since its inception; 3) whether there has been an embryonic structure helping university researchers with technology transfer issues before the creation of the TTO; 4) how the TTO allocates its time among different activities; 5) whether the TTO outsources in part or in whole technology transfer activities; 6) whether the TTO derives a direct share of licensing and industry sponsored research contract income.

4.1 Age

TTOs in Europe were established relatively recently. In fact, 60% of our respondents were founded in the last ten years, while 23% were founded between 1988 and 1997, and the remaining 17% before 1988. The differences across countries are important. Italian, Austrian and Portuguese TTOs are the most recent, being established mainly after 2002. The majority of the UK and Swiss TTOs were founded between 1998 and 2002. In France 73% of the respondents were established between 1993 and 1997. In Spain, almost half of the TTOs were founded between 1988 and 1992. Germany and the UK host a significant minority of TTOs established before 1998 (35% and 22% respectively).

Figure 6: Year of establishment by country



46% of the respondents said that their TTO had experienced a restructuring since its inception. The most recurrent types of restructuring were mergers of existing units performing some technology transfer activities and decentralization of tasks. Several respondents also mentioned change in the private/public nature of a TTO and increase in funding available for technology transfer. Some of them cited a shift towards support for university startups.

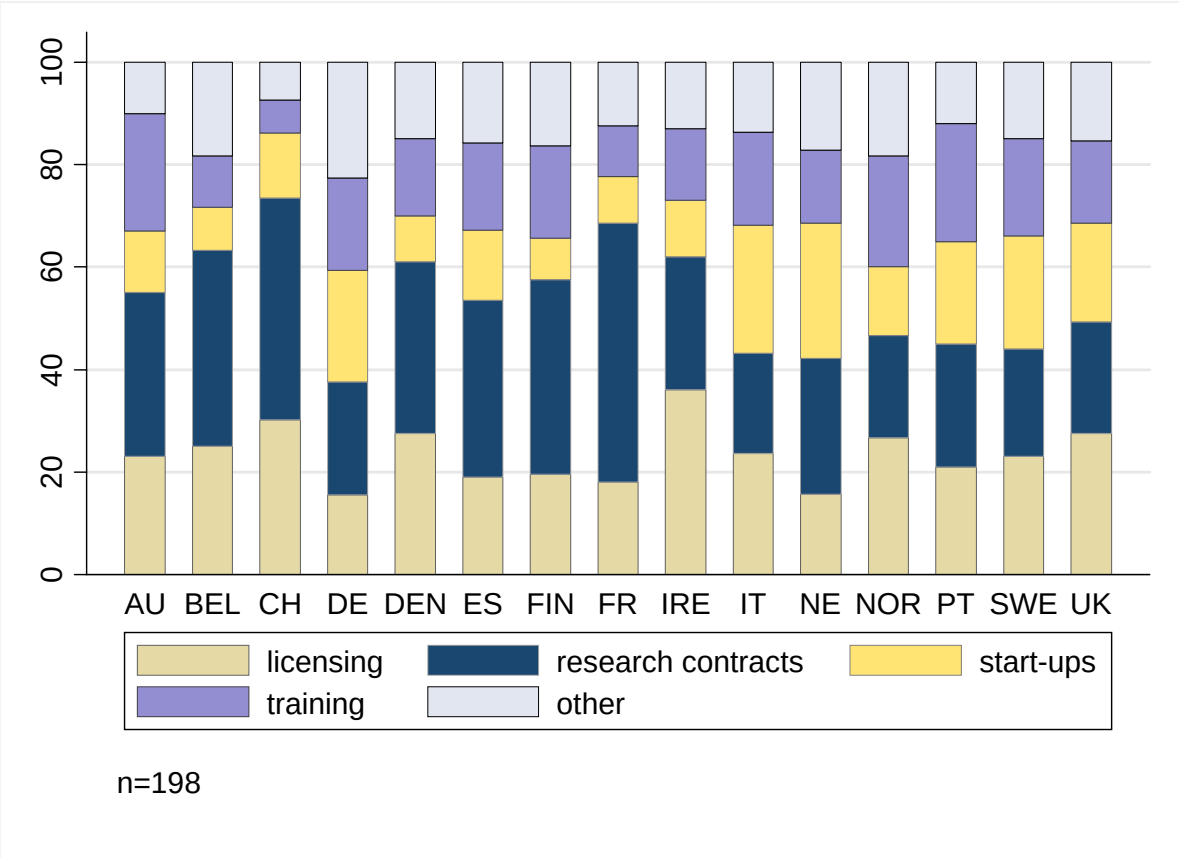
39% of the respondents indicated that before the inception of their TTO there was an existing "embryonic" structure offering some assistance to academic researchers, mainly in terms of advice on legal issues.

4.2 Time allocation

On average, European TTOs spend more time negotiating industry sponsored research contracts (30%) than licenses (22%); and more time negotiating licenses than supporting startups (17%). Finally, 16% of their time is dedicated to create awareness of technology transfer opportunities among industry and academic researchers.

At the country level some interesting patterns can be highlighted. French TTOs spend more than half of their time negotiating industry sponsored research contracts, followed by Swiss, Danish and Spanish TTOs. In Sweden, TTOs allocate more time to support university startups; while in Austria and in Belgium TTOs dedicate more time to negotiate licenses.

Figure 7: Time allocation by country



4.3 Outsourcing of activities

We were interested in knowing whether TTOs outsource in part or in whole some of their technology transfer activities.

Discussions with technology transfer professionals revealed that activities such as assessing the patentability of inventions, negotiating industry sponsored research contracts and supporting university startups are sometimes outsourced or performed in collaboration with other offices. These offices are either within the university or external. For instance, university TTOs in France tend to collaborate with TTOs of other research institutions when assessing the patentability of inventions and negotiating licenses. In Germany it is often the case that university TTOs either outsource to or work in collaboration with Regional Agencies.

Following these discussions, we asked questions on whether technology transfer activities were performed by a TTO, another office in the same university, the TTO of another research institution, a National Agency, a Regional Agency or others.

83% of the respondents assess patentability of inventions and negotiate licenses in-house. 18% either collaborate with or outsource to another office in the same university. 7% do the same with a TTO of another research institution and 10% with a Regional Agency. Not surprisingly, 86% of the respondents who chose the option "TTO of another research institution" were French, while 75% of the respondents who chose "Regional Agency" were German.

Table 4: Outsourcing of activities

	Your office	Another office in your institution	TTO of another research institution	National Agency	Regional Agency	Others
"Assessing the patentability of inventions, drafting, filing and managing patent applications. Negotiating and managing licenses"	83%	18%	7%	2%	10%	6%
"Negotiating and managing industry sponsored research contracts and/or grants (regional, national, EU)"	84%	35%	5%	0%	2%	6%
"Supporting start-up companies"	83%	15%	2%	4%	7%	14%

Respondents were asked whether technology transfer activities were performed by their office; another office of their institution, the TTO of another research institution; a National Agency; a Regional Agency; Others. The numbers do not add up to 100% because categories are not mutually exclusive. n=206.

84% of the respondents negotiate industry sponsored research contracts in-house. 19% either outsource this activity to another office in the same university or collaborate with it. This result is consistent with discussions we had with technology transfer practitioners who pointed that some TTOs either do not deal with industry sponsored research contracts at all or deal only with specific

types of contracts. In a number of cases, for instance, EU contracts are treated by other offices within the same university.

83% of TTOs provide support to startups in-house. As expected, they also tend to collaborate with other facilities, mainly incubators located inside or outside the university.

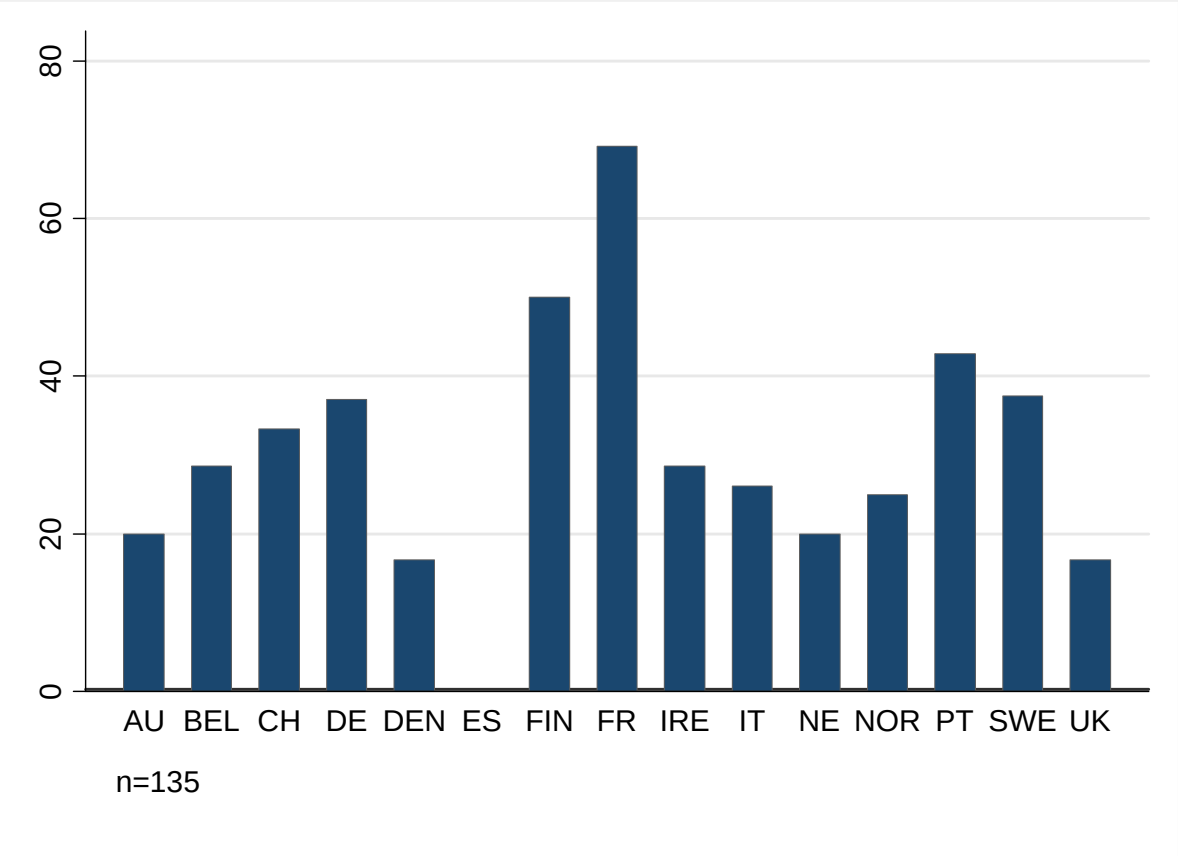
4.4 Financing

We wanted to know whether TTOs receive a direct share of income from licenses and industry sponsored research contracts.

29% of the respondents said that they earn a direct share of income derived from licenses and industry sponsored research contracts they negotiate. On average they receive 20% of the total income. However, this figure has to be interpreted with caution. Discussions with technology transfer professionals revealed that the share they earn is often non-linear in the income generated from licenses and industry sponsored research contracts.

The differences across countries are important. In France 69% of the respondents receive a direct share of income from licenses and industry sponsored research contract; in Finland 50% and in Portugal 43%. At the other end of the scale, none of the Spanish respondents receive a direct share of income from licenses and industry sponsored research contracts.

Figure 8: Percentage of TTOs receiving a direct share of income, by country



5. Quantitative outcomes

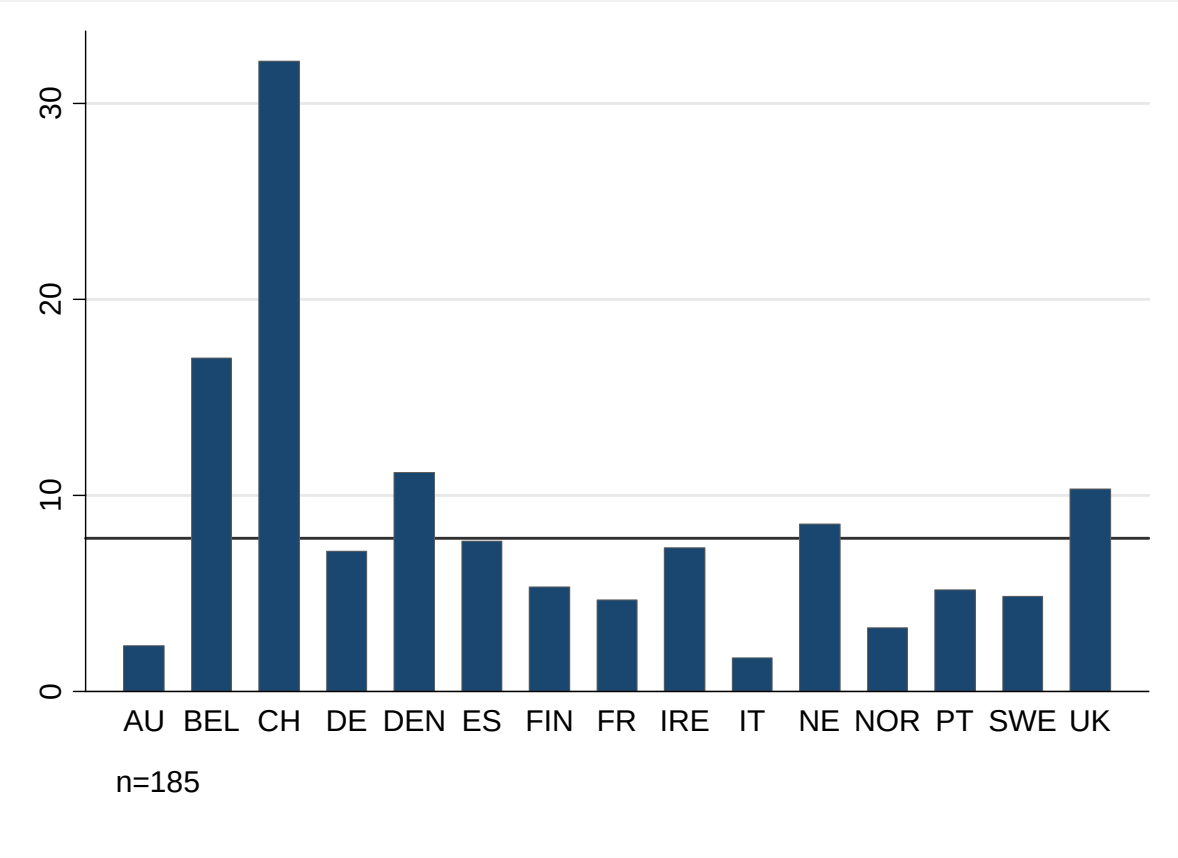
This section asked information about a) the number of licenses and options executed; b) the licensing income earned; c) the number of startups established; and d) the number of industry sponsored research contracts executed. All information asked refers to the year 2007. Data on licenses also include assignments of inventions.

In the remaining section we show some interesting statistics on quantitative outcomes. Some caution is required in interpreting the data. For instance, Italy and Sweden have in place the so-called "professor's privilege" which allows academic professors/researchers to own the results from publicly-funded R&D. This implies that university personnel can transfer technologies without involving the university and/or the TTO. Moreover, some activities are performed by a TTO in collaboration with other offices inside or outside the university. Finally, some respondents might not be in charge of some of the activities encompassed in the survey (eg. research contracts and startups).

5.1 Number of licenses/options executed

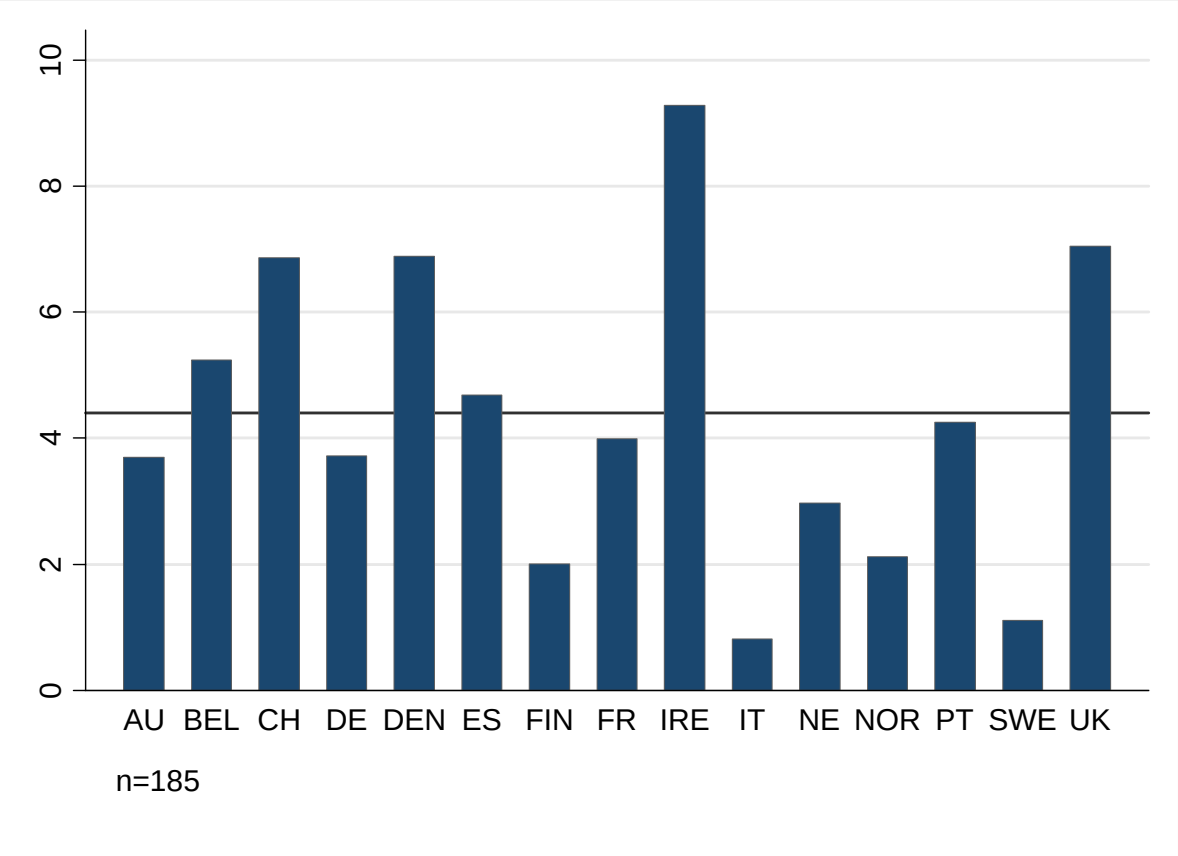
On average TTOs executed 7.8 licenses/options in 2007 with a minimum of 0 and a maximum of 64. 74% of the respondents made less than 10 licenses/options and 16% made 0. Swiss TTOs executed the greatest number of licenses (average = 32.2), while Italian ones made the least (average = 1.7).

Figure 9: Average number of licenses by country



In Figure 10 we show the ratio of licenses/options per 1’000 scientific publications. Again, scientific publications are a rough measure of the size of the university. The mean value of the ratio is 4.4. Irish TTOs show the highest share of licenses per publications followed by the UK, Denmark and Switzerland. At the other end of the scale, we have Italy and Sweden with the lowest shares. This last result is most likely related to the “professor’s privilege” policy in place in these countries.

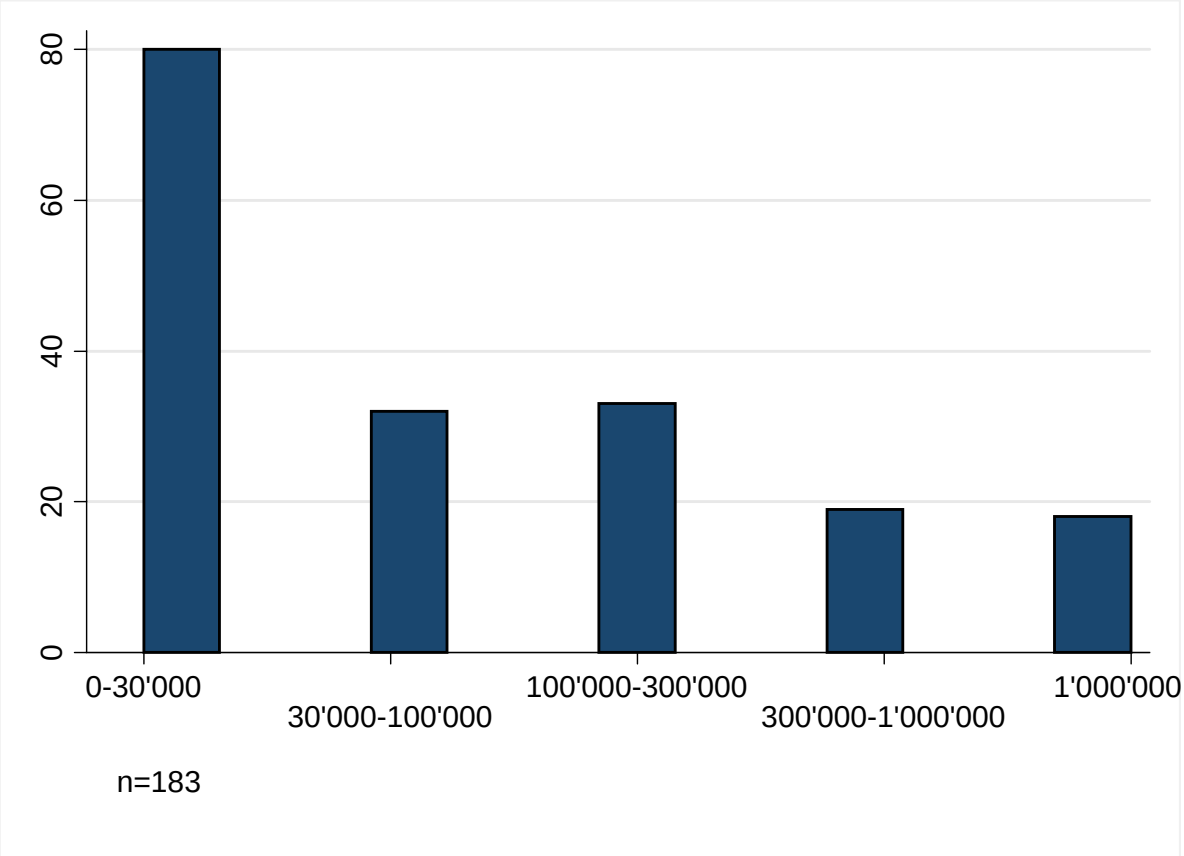
Figure 10: Number of licenses per 1’000 scientific publications by country



5.2 Revenue from licenses

Given that information on revenue from license is sensitive and cumbersome to pin down precisely, we only asked respondents to choose one of five intervals: less than 30’000 euro, between 30’000 and 100’000, between 100’000 and 300’000, between 300’000 and 1 million and more than 1 million euro. Figure 11 gives the distribution of licensing income. The distribution is skewed to the left with 44% of the respondents reporting less than 30’000 euro in licensing income and only 10% reporting more than 1’000’000 euro.

Figure 11: Revenue from licenses



Switzerland is the country that earns the most from licenses. This result is very interesting if we consider that Swiss TTOs have the lowest share of staff per scientific publications and in general their staff size is below the European average. Denmark, Belgium, the UK and the Netherlands were also above the average in terms of licensing income earned; Ireland, Germany and France were around the average and the other countries were below.

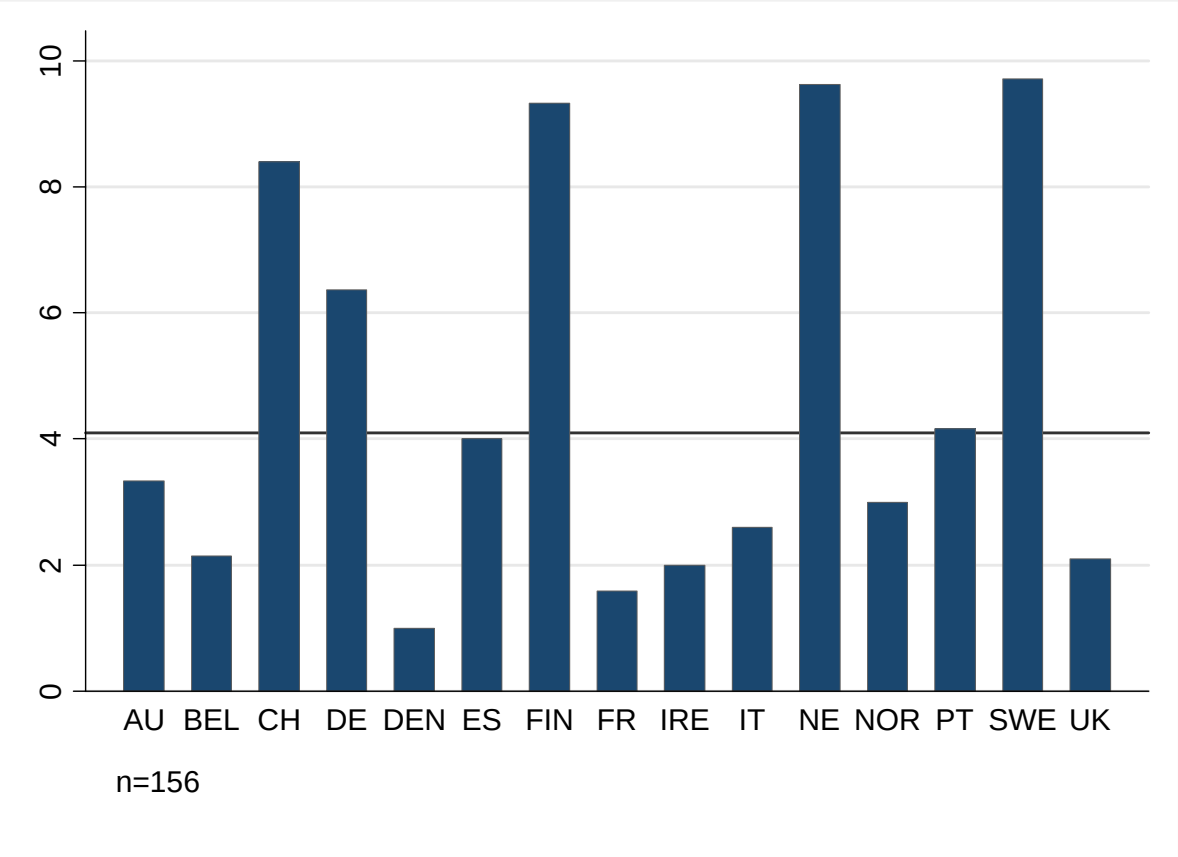
5.3 Number of startups

On average, TTOs founded 4.1 startups in 2007, with a minimum of 0 and a maximum of 35. 18% of the respondents did not establish any startup. Swedish and Dutch TTOs founded the greatest number of startups, while Danish and French TTOs the least. The result for Sweden can be linked to the great amount of time Swedish TTOs spend in supporting university startups. Discussions with Swedish TTOs revealed that support to startups is an important activity, especially in the light of the “professor’s privilege” which restricts the range of tasks they can execute.

As stressed by several respondents, the data on the number of startups is only partially informative. Indeed, additional information on turnover, employment and venture capital financing would give a more exhaustive picture of the phenomenon of university startups in Europe.

When constructing Figure 12, we excluded 32 answers from those respondents who said that their office is not involved in supporting university startups.

Figure 22: Average number of startups by country



5.4 Number of industry sponsored research contracts

On average, TTOs concluded 99 industry sponsored research contracts with a minimum of 0 and a maximum of 497. Danish TTOs made the greatest number of industry sponsored research contracts in 2007, followed by Spanish and Swiss TTOs. Italian and Portuguese TTOs stand at the other end of the scale with the lowest number of industry sponsored research contracts concluded.

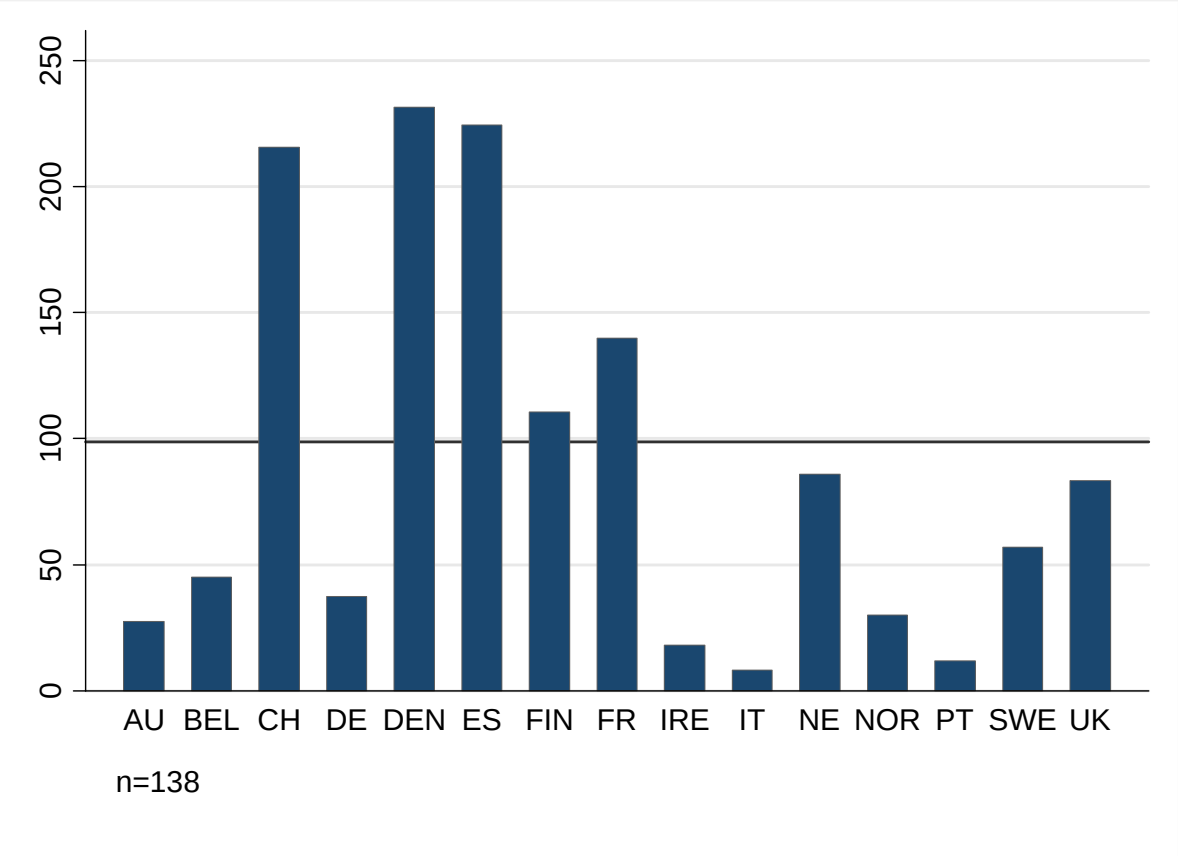
The results on the number of contracts should be interpreted with caution. As already mentioned, the "professor's privilege" adopted in Italy and in Sweden allows academic researchers to conclude contracts with industry without having to involve their university TTO. Moreover, the figures we provide are only partially informative of the total number of industry sponsored contracts made by an academic institution. In fact, 34% of the respondents declared that university researchers do not have to inform the TTO of their industry sponsored contracts and an additional 31% declared that

informing the TTO is compulsory only for certain categories of contracts. Finally, discussions with technology transfer professionals revealed that the category of industry sponsored research contracts includes a great variety of contract typologies and we cannot be sure that all respondents used the same deifinition of industry sponsored research contracts.

When constructing Figure 13, we excluded 26 answers from those respondents who declared that their office is not involved in negotiating industry sponsored research contracts.

Incomplete reporting of industry sponsored research contracts contrasts with the importance given to them. As we have seen, European TTOs spend on average more time negotiating industry sponsored research contracts than licenses. Despite the difficulties encountered by TTOs, a better recording of industry sponsored research contracts is advisable.

Figure 13: Average number of industry sponsored research contracts by country



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