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Student mobility – Recruitment to studies and supply of post-graduates in a geographical perspective

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Abstract: An important incentive for a regional, decentralised university- and college structure is that higher education institutions should supply the local labour markets with sufficient high-educated labour. Local and regional recruitment to studies is expected to increase the probability that post-graduates will stay in the regions after studies. The main aim of the paper is to investigate the function of the higher education institution due to the local, regional and national *recruitment* to high education and the local, regional and national distribution of the *supply* of post-graduates.

The investigation is based on the geographical *recruitment* to university and college graduation in the year of 2002 by the regional residential background of students defined by categories of regions by distance from the region of study. Second, the regional distribution of the *supply* of post-graduates is based on all students in the year of 2004 that were not in higher education in the year of 2005 and their regional settlement in the years of 2007 and 2010 measured relatively to their region of study.

National average indicates a higher local supply of post-graduates compared with the local recruitment. Small deviation in the geographical distribution of post-graduates between the years of 2007 and 2010 indicates that regional adjustments among graduates mostly take place during their studies or just after their graduation. It is detected small gender deviation between the share of recruitment and supply of post-graduates within the regions of study, while the female percentage increases when extending the local area to cover the remaining local county of study. Furthermore, it is observed higher local recruitment to studies and higher local supply of post-graduates among older than younger students. The local supply of post-graduates is higher among students finishing a short higher graduation compared with those obtaining a master or a doctoral degree.

Business and administration, humanities and arts, education and health and welfare are the fields of education that show the highest local recruitment, while the highest local supply of post-graduates is found in the fields of education of social science and low and humanities and arts, while health and welfare and education increase their local importance when including the remaining local county of study as part of the local area.

There are observed strong variations in local recruitment and local supply of post-graduates between the regional levels of centrality and between single regions within equal centralities indicating a heterogeneous local structure of recruitment to studies and supply of post-graduates across regions even when controlling for the field of education structure. The most central regions show, however, higher local supply of post-graduates than the local recruitment to studies suggest.

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1. Background and challenges

A public commission appointed by the Norwegian government to promote cross-country growth in skill-intensive jobs (NOU 2011:3) put forward several requests and hypotheses considering the development of regional labour markets especially concerning high-educated labour. They did, however, not stress much the factual part of university and colleges in the regional labour markets. It is often argued that an important incentive for a regional, decentralised university- and college structure is that higher education institutions should supply the local labour markets with sufficient high-educated labour, and that local recruitment to studies is expected to increase the probability that post-graduates will stay in the regions after studies. The Norwegian Ministry of Local Government and Regional Development inquired an investigation that should "map" the geographical settlement of students before and after graduation.

There were, however, small systematic information of where the students at different higher educational institutions and fields of education come from, and where they go after getting through their education. One report at Nordregio in Stockholm were at the initiation of our project in progress, and is recently published in Lindqvist, Olsen and Baltzopoulos (2012), featuring e.g. a Swedish pilot study that illuminates the student and post-graduates mobility in Sweden.

Nordic Institute for studies in innovation, research and education makes every second year a sample candidate investigation, and their most recent results are published in Wiers-Jensen (2012). These investigations register the students' destination at the admission to study and place of work five months after graduation. On the other hand the Norwegian Social Science Data Services has detailed information of new students' place of adolescence, but do not follow the post-graduates into the labour market. The Norwegian Ministry of Local Government and Regional Development preferred a settlement "mapping" of graduates approximately 3-5 years after graduation, when the settlement is assumed to be more established.

A recent project at the College of Oslo and Akershus compares, however, the recruitment to studies and supply of post-graduates in Western Norway and the capital area of Oslo (see Gythfeldt and Heggen, 2012). The focus is at welfare studies, like e.g. teachers, nurses and social workers. The conclusion is that Western Norway has a typical local and regional structure of recruitment to studies, while the capital area attracts students from all over the country. Furthermore, a considerable share of the students graduated outside their home area stayed in their region of study two and five years after their graduation. However, it seems "easier" to bring back graduates to central regions than to smaller regions. The main conclusion was, however, that place of studies is important for the future settlement of high-educated labour and it is reasonable to put forward the question what would happen without a decentralised college system?

Previous analyses in Stambøl (2011) suggest that regions that contain both university and colleges have strong ability to increase the number of higher educated labour and re-allocate jobs within firms from low to high-educated jobs, high population growth, higher than average net in-migration of population due to relatively low out-migration and strong import of knowledge through in-migration than export of knowledge through out-migration, thus

experiencing a strong regional “brain-gain”. Furthermore, the regions where the higher education institution itself represents a minor part of the local high-educated labour perform mostly better than those regions where the higher education institution itself represents a medium or large part of the local high-educated labour. Finally, the regions without higher education institutions mostly “perform” worse than average on most indicators, except the ability to create new jobs in new established firms. However, these regions also show higher than average closures of firms generally.

In the present paper the ”geography” of graduates seek documentation of the local and regional role of the higher education institutions in the entire nation, and how the role vary by field of education and size and centrality of the regional labour markets. The role is primarily defined as (1) the degree of recruitment to studies from the local, regional and national area, and (2) the supply of post-graduates locally, regionally and nationally measured some years after the graduation.

In section two we make a short presentation of the approaches, including descriptions of data, definitions and regional classifications. The results of the analyses are presented at two different geographical levels. First, we make in section three a general presentation showing all results as weighted averages across all university and college regions in the entire nation. Then we present in section four some results by five typologies of regions by centrality, and a combination of regional centrality and each single higher education institution region. In section five we have made some estimations of the effect of local recruitment to studies on the regional distribution of supply of post-graduates. Finally, in section six we conclude.

2. Approaches

An important incentive for a regional, decentralised university- and college structure is that higher education institutions should supply the local labour markets with sufficient high-educated labour. Local and regional recruitment to studies is expected to increase the probability that post-graduates will stay in the regions after studies.

The main aim of this paper is to investigate the function of the higher education institution due to:

a. The local/regional/national *recruitment* to high education.
b. The local/regional/national distribution of the *supply* of post-graduates.

A) *The regional recruiment* to studies takes first into consideration all students in the age of 18-25 years at all higher education institutions in Norway in 2002, including only those students in 2002 that were not in higher education in 2001.

These students are further distributed by:
- The localisation of their place of study by regions and centrality.
- The field of education of all new students this year.
- The place of recruitment (the regional background), defined by the new students’ place of residence in their age of 17.

However, 3 per cent of all new students in 2002 in the age of 18-25 years do not have information of their place of living in their age of 17. As we could expect, the majority of this group (90 per cent) were born abroad. For to decide the place of recruitment for this group,

we searched information of their place of living in their age of 18 years , then 19 years and further until their age of 24. The residual group of students that had no information of place of residence in Norway neither in their age of 17, nor in their ages 18-24 years during the period 1994-2001, represent the students in 2002 that immigrated directly to studies in 2002. This group of students represents recruitment from abroad.

This defines the regional recruitment for all new students in 2002 in the age-group 18-25 years. These students are further classified in categories of regions by distance from the localisation of their place of study as follows:

1) The same local region as their region of study
2) Other local regions in the same county
3) Other regions in the same part of the country
4) Other regions in Norway
5) Other countries

Place of recruitment for persons older than 25 years are defined as those regions where these "new" students were living the previous year before they started a study in 2002 (which means place of living in 2001). Another criterion is that they were not registered in any higher education in the years of 2000 and 2001. The definition of local/non-local recruitment is defined in the same way as for new students in the age-group 18-25 years.

Thus the geographical recruitment structure is decided by the difference between the localisation of registered place of living previous to a university and college graduation and the localisation of each student's region of study in 2002.

B) ***The regional supply*** of new post-graduates is based on all students in the year of 2004 that were not in higher education in the year of 2005. These post-graduates are expected to offer their supply of labour based on their highest level of education and field of education at the end of 2004. The regional distribution of the supply of post-graduates is measured relatively between the region of study in 2004 and the destination region of post-graduates in the years of 2007 and 2010 respectively.

Initially, we had at least three choices how to measure the supply of post-graduates by education level and field of education: 1) Take into consideration all students in higher education in 2004 that did not study in 2005, and their current educational level and field of education. 2) Take into consideration their registered highest level of education at October 2004, or 3) Take into consideration their registered highest level of education at October 2005. We detected that a high percentage of these students did not attain any valid higher education level neither at October 2004 nor at October 2005, and were still registered with a low education level as their highest level of education. When these students were not in high education in 2005, their highest level of registered education at October 2005 also reflects their highest level of education at the end of 2004. We decided to use alternative 3) for measuring the highest level of education including their highest level of field of education. When we take into consideration only those students that had registered a higher level of education by October 2005 we exclude all students in 2004 that did not attain any higher education within the end of this period.

All new graduates by their regions of study in 2004 are further distributed at their regions of destination in 2007 and 2010, or approximately three and six years after they completed their higher education in 2004.

Place of living for new post-graduates are mainly defined and aggregated relatively to their regions of study in the same manner as recruitment regions relatively to the regions of study. One difference is that we have excluded post-graduates that died before the years of 2007 and 2010. Fortunately, this group is not large, but it makes it possible to define the group of post-graduates that chose to emigrate to other labour markets outside Norway rather than to choose one of the domestic labour markets. Totally, all new post-graduates in 2004 are thus distributed at their regions of destination in 2007 and 2010 relatively to their region of study in 2004 as follows:

1) The same local region as their region of study
2) Other local regions in the same county
3) Other regions in the same part of the country
4) Other regions in Norway
5) Other countries
6) Death

The geographical distribution are further broken down by two main categories of post-graduates defined as 1) Post-graduates that by the end of 2004 had finished a short high education with an obligatory duration of one to maximum four years of study, and 2) Post-graduates that by the end of 2004 had finished a high level of high education with an obligatory duration of five years or more.

All new post-graduates are distributed by their field of education. In the statistics of education this is defined as the field of education in which students has completed their highest level of education. Logically, this field of education should be their main supply to the labour market. However, this definition may rise supplies from fields of education in regions were we do not observe recruitment to the same fields of education. This might be due to few students in the field of education, were the university or college do not recruit students to this study in the year we are analysing, but also due to previous higher ranked examines made at other university or colleges than the field of education they have completed in the year of 2004.

Finally, we have broken down the analyses to clarify gender differences in the local recruitment to study and local supply of post graduates. We have also divided the analyses by looking at the younger part of new post-graduates in the age of 18-34 and the post-graduates in the age of 35-74 years. For to detect any differences between natives and immigrants, we have made separate analyses of students and new post-graduates without immigrant background, immigrants and students born in Norway by immigrant parents.

3. Student mobility in a national-regional perspective

This section introduces some results illuminating the total geographical recruitment to studies by the students' regional background compared to the geographical distribution of new post-graduates measured as a weighted average for all regions that includes higher education institutions. Among totally 89 economic regions in Norway, there were in 2004 located

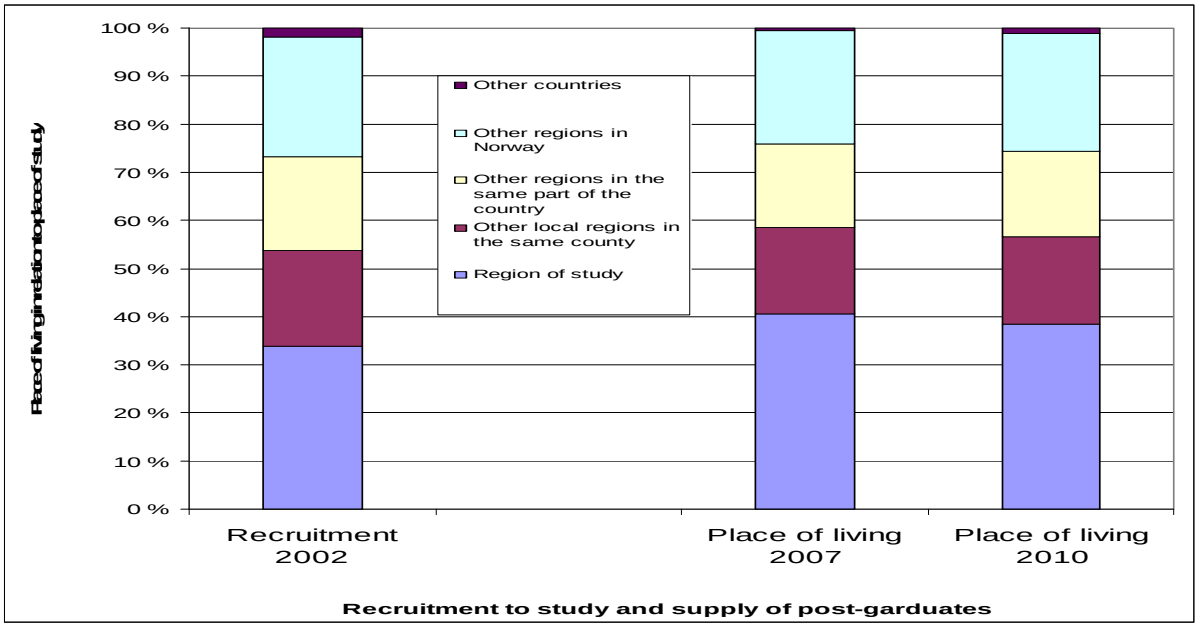
universities and/or colleges in 43 of these regions, or in approximately half of all economic regions.

It was in average a somewhat higher percentage of local supply of post-graduates compared to the local share of recruitment to studies, due to the fact that the local recruitment from the region and county of study represents a lower share of the total recruitment compared to the local supply of post-graduates correspondingly (see figure 3.1). While the average share of local recruitment represents just above 50 per cent of the total recruitment, the local supply of post-graduates covers just below 60 per cent of the total supply of new post-graduates.

The geographical differences between the recruitment to studies and distribution of post-graduates are in some way as expected, although less than expected, since a high share of the recruitment to studies also originate from regions without higher education institutions. On the other hand a certain share new post-graduates will also settle in regions without any university or colleges.

Furthermore, small deviation in the geographical distribution of post-graduates between the years of 2007 and 2010 indicates that regional adjustments among post-graduates mostly take place during their studies or just after their graduation.

Figure 3.1 Recruitment to studies in 2002 by regional background and supply of new post-graduates in 2004 distributed by their place of living in 2007 and 2010. Weighted average of all regions with higher education institutions in Norway. Per cent



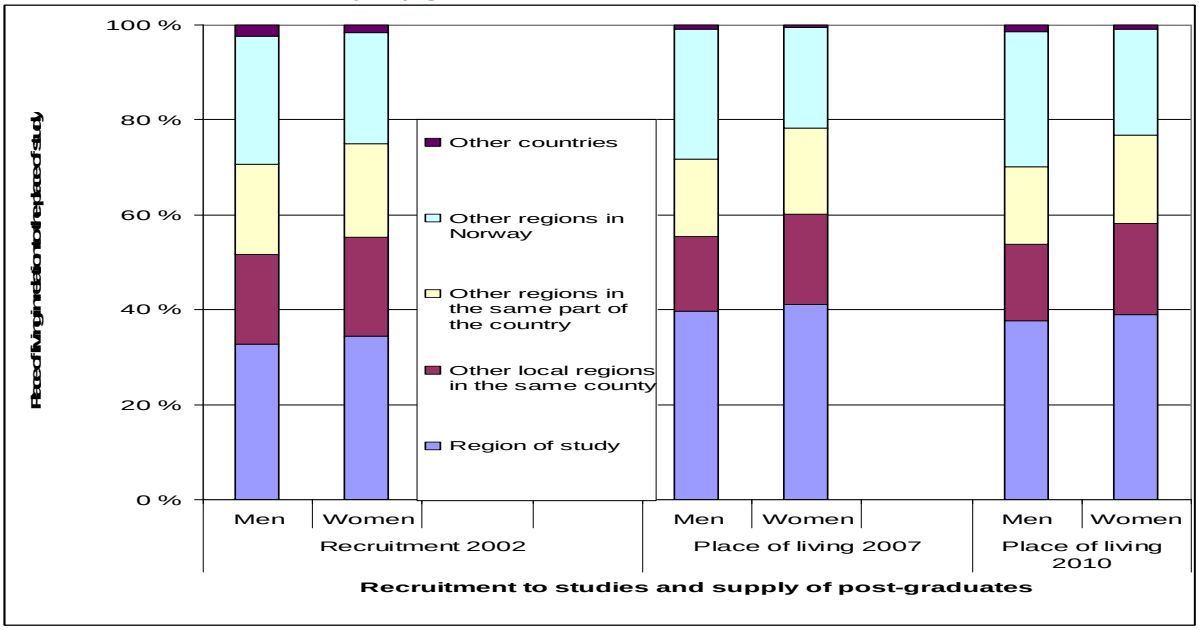
Distribution of new students and supply of new post-graduates by gender:

The female participation in higher education has strongly increased during the recent decades, and the female share of students has grown steadily, and even into a majority at universities during the last years. This gender change of studies has also contributed to a stronger local dimension in both recruitment to studies but especially considering the local supply of post graduates (see figure 3.2). There are, however, small deviations between the male and female recruitment to studies and supply of post-graduates within regions of study. The local share of

women does, however, increases when extending the local area to cover the remaining part of the county of study, and especially considering the local supply of post-graduates.

The strongest gender deviation is, however, found in regions located far away from the higher education institutions, where men show higher shares both considering the remote recruitment to studies but especially considering the remote supply of post-graduates.

Figure 3.2 Recruitment to studies in 2002 by regional background and supply of new post-graduates in 2004 distributed by their place of living in 2007 and 2010. Weighted average of all regions with higher education institution in Norway. By gender. Per cent



Distribution of new students and supply of new post-graduates by age:

When the geographical distribution of recruitment to studies and supply of post graduates is made by age groups, the local percentage is somewhat higher in the older age group of 35-74 years compared to the younger age group of 18-34 years (figure 3.3). This is also in accordance with the expectation, when young students, in addition to be in an age of high mobility, also move from regions where we do not find any higher education institutions, thus showing a higher recruitment from more remote regions outside the region and county of study compared to the older age group. We may expect that the recruitment to study among the older age group also is connected to an established settlement and labour market participation, where studies might be part of a process of life long learning or simply an additional pleasure besides job and family-life. It is, however, important to note a higher local supply of young post-graduates than their recruitment to studies suggests, which indicates a stronger contribution to local supply among younger than older persons relatively to the local share of recruitment.

Distribution of new students and supply of new post-graduates by nationality:

In this section we distribute the geographical structure of recruitment to studies and supply of post-graduates by persons without immigrant background, immigrants and persons born in Norway by immigrant parents. The results indicate a strong local recruitment to studies and local supply of post graduates among persons born in Norway by immigrant parents (figure 3.4). They do, however, show a slightly lower local supply of post-graduates than their local

recruitment to studies suggest, but still their local supply of post-graduates are higher than in any other groups in this study. Local recruitment among immigrants is more similar to that of natives, although somewhat stronger from the local regions of study and weaker from the counties of study. On the other hand immigrants have higher local supply of post-graduates compared to natives, and clearly higher local supply of post-graduates than their local recruitment to studies suggests. It is, however, important to mention that immigrant students and especially students born in Norway by immigrant parents are mostly to be found in central regions.

Figure 3.3 Recruitment to studies in 2002 by regional background and supply of new post-graduates in 2004 distributed by their place of living in 2007 and 2010. Weighted average of all regions with higher education institution in Norway. By age. Per cent

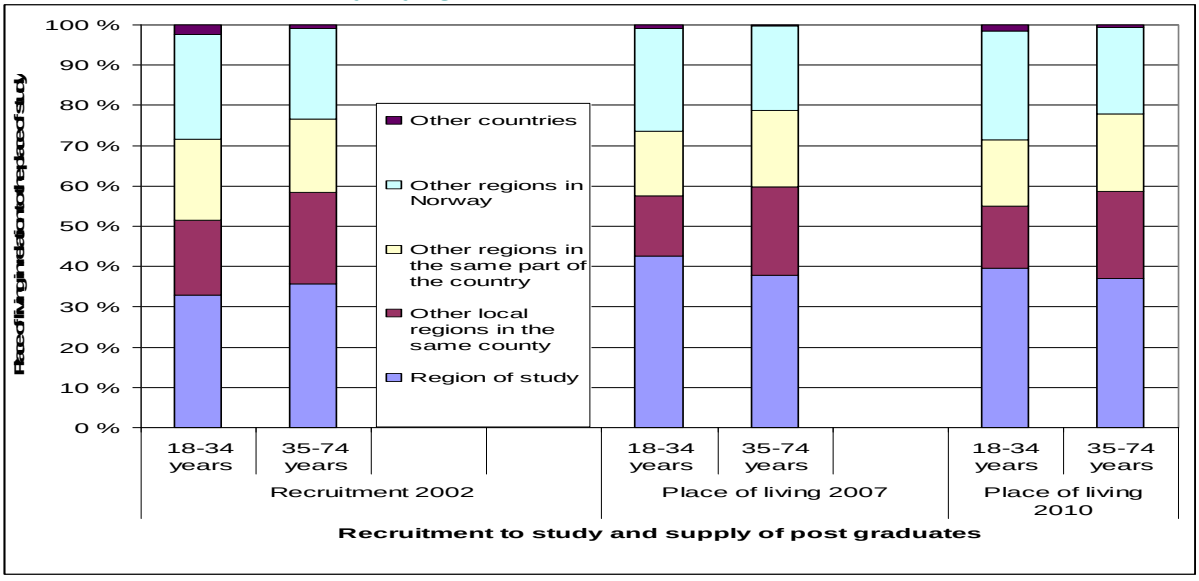
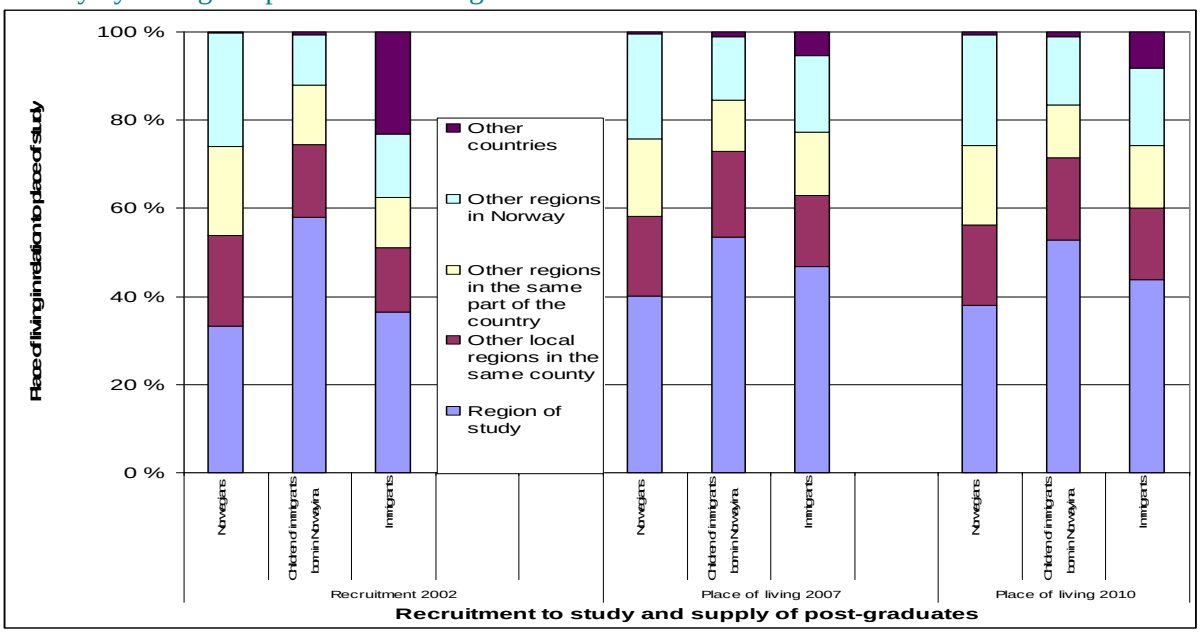


Figure 3.4 Recruitment to studies in 2002 by regional background and supply of new post-graduates in 2004 distributed by their place of living in 2007 and 2010. Weighted average of all regions with higher education institutions in Norway. Persons without immigrant background (natives), persons born in Norway by immigrant parents and immigrants. Per cent

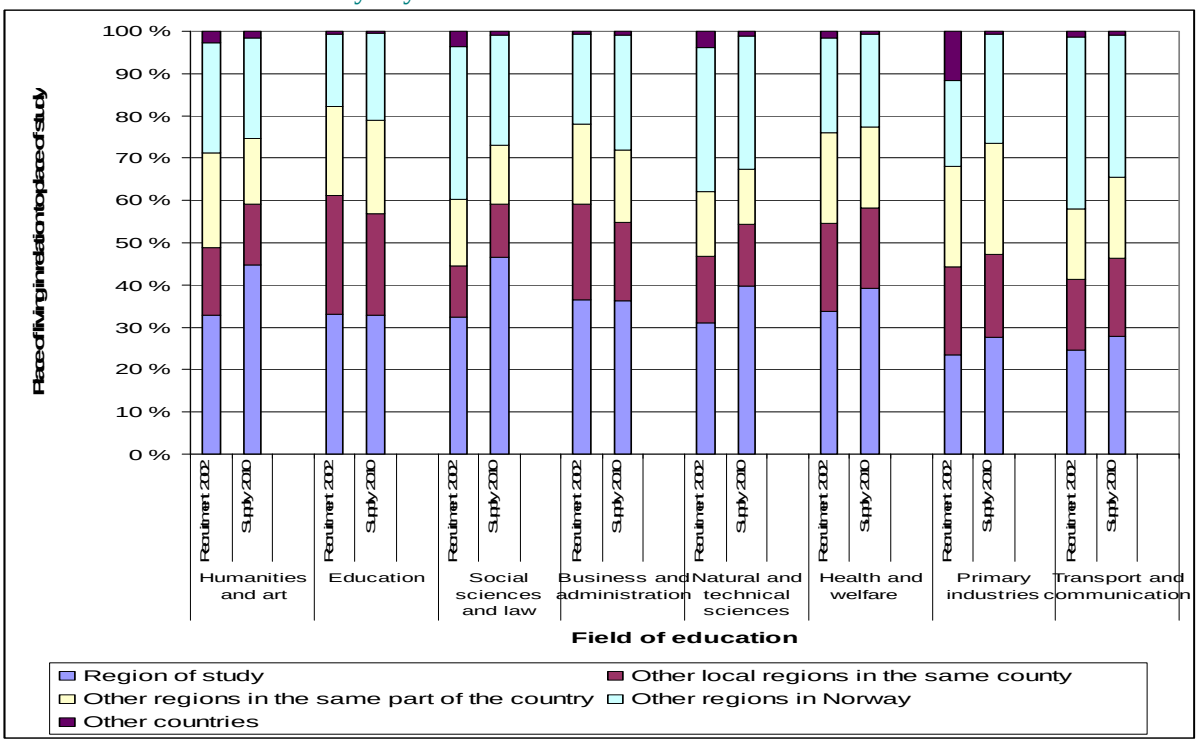


Distribution of new students and supply of new post-graduates by field of education:
Furthermore, we have combined the geographical structure of recruitment to studies in 2002 and the geographical supply of post-graduates in 2010 by their field of education (see figure 3.5). The regional differences in the supply of post-graduates between 2007 and 2010 are rather small, so we just concentrate the results to the post-graduates regions of living in 2010.

A majority of the fields of education indicate a stronger local supply of post-graduates than the local recruitment to these fields of studies suggests. This is especially the situation in social science and law and humanities and art. In the opposite direction we find large fields of education like education and business and administration, that show weaker local supply of post-graduates than the local recruitment suggests, and especially when including both the region of study and the county of study as part of the local area.

The fields of education that show the highest percentage of distant recruitment, which here means recruitment from regions in other parts of the country, do also show the highest remote supply of post-graduates. This mostly concerns transport and communication, social sciences and law and natural and technical sciences. These fields of education show, however, a stronger distant recruitment to studies than distant supply of post-graduates, which means that a higher share of the post-graduates settle closer to the regions of study than the recruitment to studies suggests.

Figure 3.5 Recruitment to studies in 2002 by regional background and supply of new post-graduates in 2004 distributed by their place of living in 2010. Weighted average of all regions with higher education institution in Norway. By fields of education. Per cent

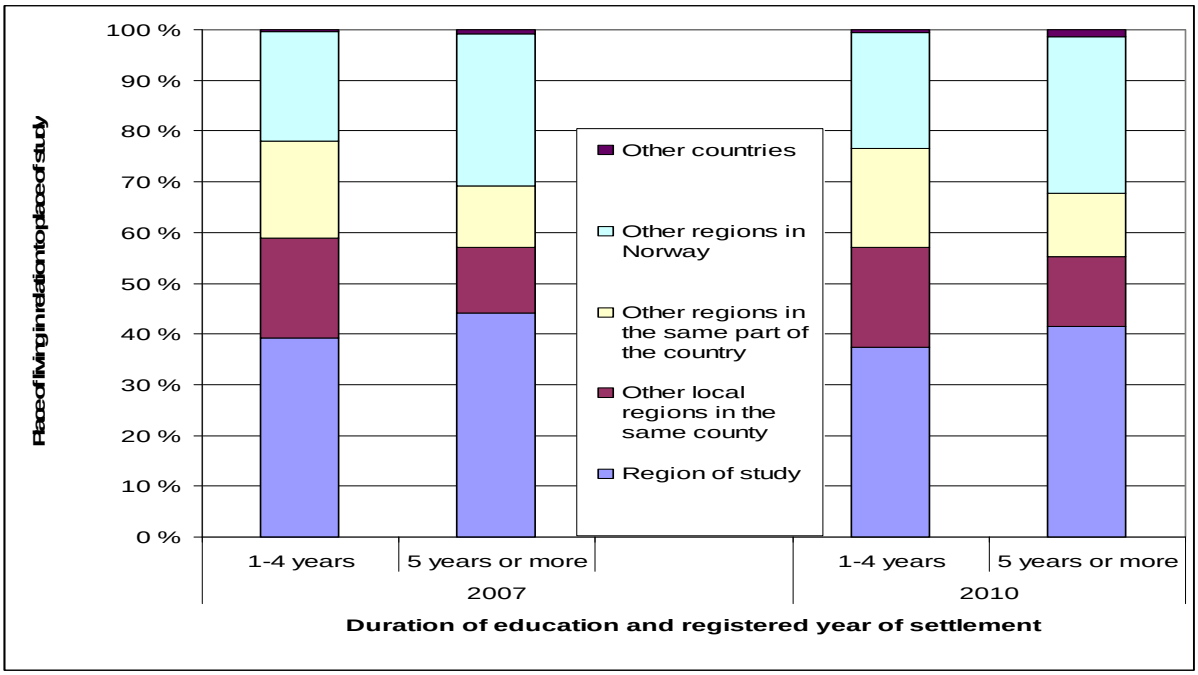


Supply of new post-graduates by duration of graduation:
Finally, we examine if the regional distribution of post-graduates is dependent on a short or long higher education, which means a formal education up to four years (short) or a high education with five years or more of obligatory studies (long). Typically, studies representing

a short high education are to be found in colleges educating teachers and nurses but also university and college studies leading to a bachelor degree, while studies leading to a master degree and especially doctoral degree are definitely to be classified as long high education.

The results suggest that post-graduates that have completed a long higher education have a predominance to settle in the local region of study and in regions located outside the part of the country where their university or college is located (see figure 3.6). On the other hand post-graduates that have completed a short higher education have predominance to direct their supply towards other parts of the county of study and to other regions in the same part of the country. In average we thus face a two folded tendency where post-graduates with a long higher education offer their knowledge to the nearest and most remote labour markets relatively to their place of study, while post-graduates with a short higher education in average serves the regional labour markets in between.

Figure 3.6 Supply of new post-graduates in 2004 distributed by their place of living in 2007 and 2010. Weighted average of all regions with higher education institutions in Norway. By duration of study. Per cent



4. Student mobility in a geographical perspective.

One main aim of this investigation is to detect the local dimension of the recruitment to studies and how large share of the post-graduates that chose to stay within the area of study after finishing their studies. Here we present a more geographical detailed distribution of local recruitment to studies and local supply of post-graduates. In figure 4.1 we have collected the local recruitment and supply of post-graduates for each region of study recognised by their regional typology of centrality.

The local recruitment to studies is shown along the x-axis as total share of recruitment that descends from each county of study. In the same manner we also define the local supply of post-graduates by measuring the share of all post-graduates in 2004 that live in their county of study in the year of 2010. These shares are measured along the y-axis.

The diagonal indicates if the local recruitment is larger or smaller than the corresponding local supply. Regions placed above the diagonal indicate a larger local supply of new post-graduates than the local recruitment to studies suggest, while regions placed below the diagonal indicate that the local recruitment to studies is not so strong reflected in the local supply of post-graduates. Regions placed along the diagonal have a reasonable balance between the local recruitment and local supply. Each region is, however, not recognized by any names in the figure, but only by the five regional typologies of centrality they belong to.

The results suggest a rather large dispersal both across regional typologies as well as between single regions, indicating a heterogeneous structure of local recruitment and supply. These results become even more complex when regions of study with equal centrality show strong variation in local "performance", both considering the balance between local recruitment to studies and local supply of post-graduates recognized by their position above or below the diagonal, as well as how much the local dimension of recruitment and supply constitutes of the entire recruitment and supply given by the distance from origo.

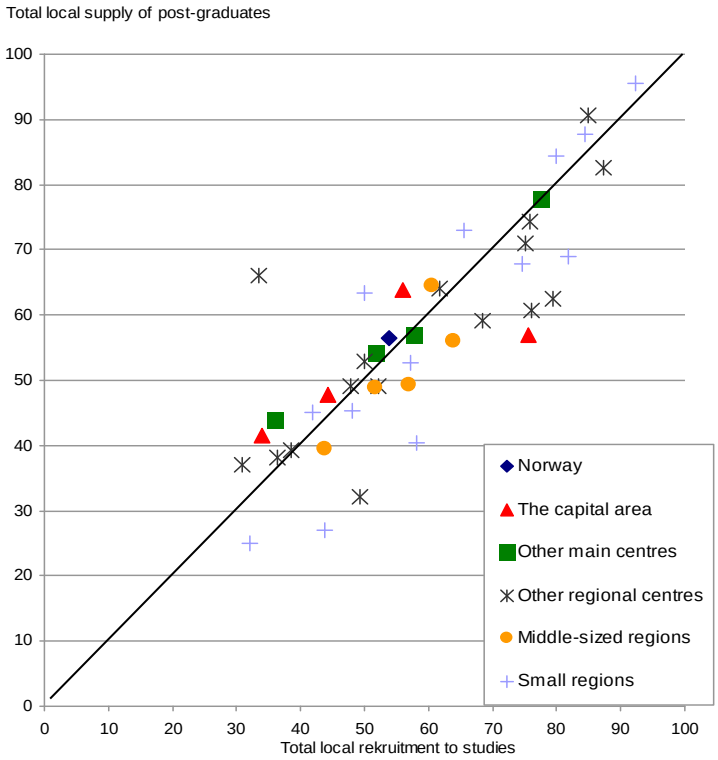
In the figure we have also included the placement of the national average, as earlier detected indicates a stronger local supply of new post-graduates than the local recruitment to studies suggests. Three out of four regions located in the capital area are mainly placed above the diagonal from a rather low up to just above average intensity in the percentage of local recruitment to studies, and partly higher and partly below the average level of local supply of post-graduates.

Regions in 'other main centres' show mostly a balance between local recruitment to studies and local supply of post-graduates. An exception is to be found in the city region of Trondheim, showing a stronger local supply of post-graduates than the local recruitment to studies suggests. It is, however, strong variation in the local dimension across the regions in this regional typology, from 40 percent of total recruitment and total supply in the city regions of Trondheim, and up to approximately 80 percent of the total recruitment and supply in the petrol region of Stavanger.

The regions representing 'other regional centres' show a rather heterogeneous local performance and especially how much the local dimension in recruitment and supply means for each region. The main tendency is, however, a stronger local recruitment to studies than local supply of post-graduates, although some regions within this category are strongly performing in opposite direction, and especially one of the regions, Alta, which is located in the northernmost county of Finnmark. The main reason for a much stronger local supply of post-graduates than the local recruitment suggests is to be found in the special economic support given by the Government to this region to secure a stable population pattern.

The 'middle-sized regions' are somewhat more homogeneous according to the local dimension, although the local recruitment to studies seems to be stronger than the local supply of post-graduates. The smallest college regions show, however, a heterogeneous local "performance", with variations of the local dimension from around 25-30 percent and up to 90 percent of the total recruitment and supply. However, the main tendency is a lower local supply of post-graduates than the local recruitment to studies suggests, but also here we find several examples in opposite direction.

Figure 4.1 Total local recruitment to studies in 2002 and total local supply of post-graduates in 2004 by their regions of living in 2010. University and college regions by typology of regions by centrality.



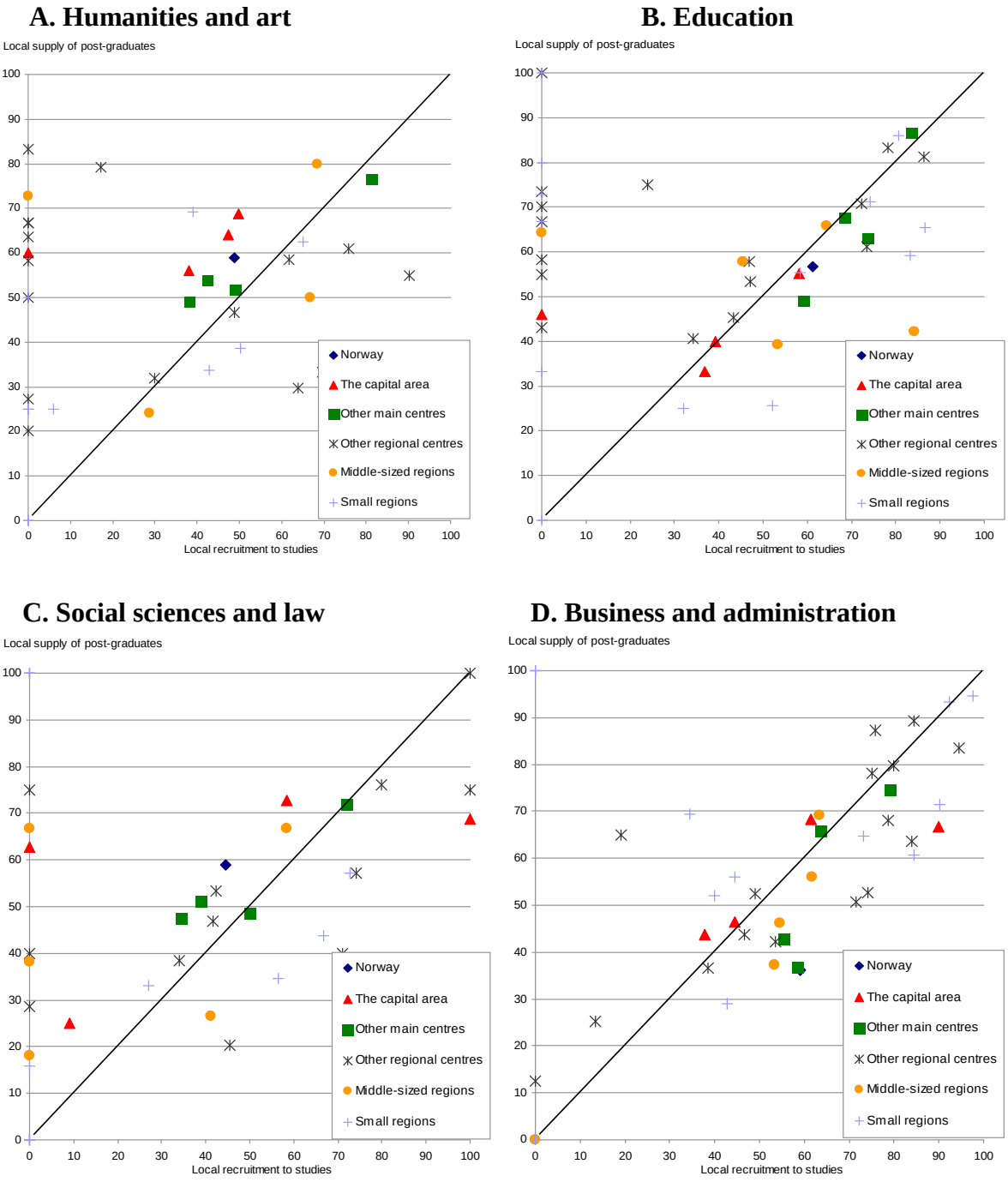
Furthermore, we have broken down the results by fields of education (figure 4.2). As already observed the local supply of post-graduates from humanities and art are stronger than the local recruitment suggests. This is, however, most pronounced in the central regions of the capital area and other main centres. In education the situation is opposite, with somewhat lower local supply than the local recruitment suggests. It is the central regions and the smallest regions that experience lower local supply than expected, while other regional centres have a stronger local supply than recruitment.

In the field of education of social science and law it is like in humanities and art the most central regions that gain most from stronger local supply of post-graduates than the local recruitment suggests. Like in education the field of education of business and administration shows lower local supply of post-graduates than the local recruitment suggests. Like in other fields of education there are strong regional variations both considering the level of local dimension and the balance between local recruitment to studies and local supply of post-graduates. Natural sciences and technology shows somewhat stronger local supply than local recruitment, but there are remarkable variations across regions within the same typology of centrality. Health and welfare shows also an excess of local supply than local recruitment. In spite of strong variation in the local dimension of both local recruitment and local supply, a majority of the smaller regions show higher local supply of post-graduates than the local recruitment suggests.

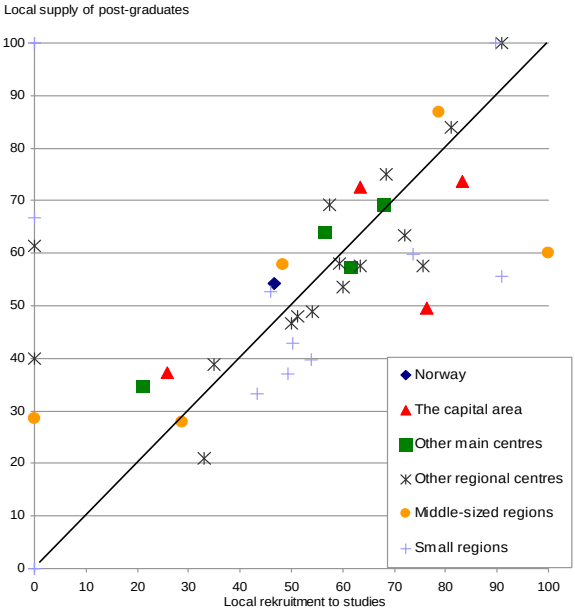
Finally, the fields of education of primary industries and transport and communication are less represented in the regions of study. In spite of that it is strong dispersal across regions and partly also between regions within the same typology of centrality. This is in fact the main tendency for all fields of education, showing a strong dispersal across regions both

considering the local dimension as well as considering the balances between local recruitment to studies and local supply of post-graduates.

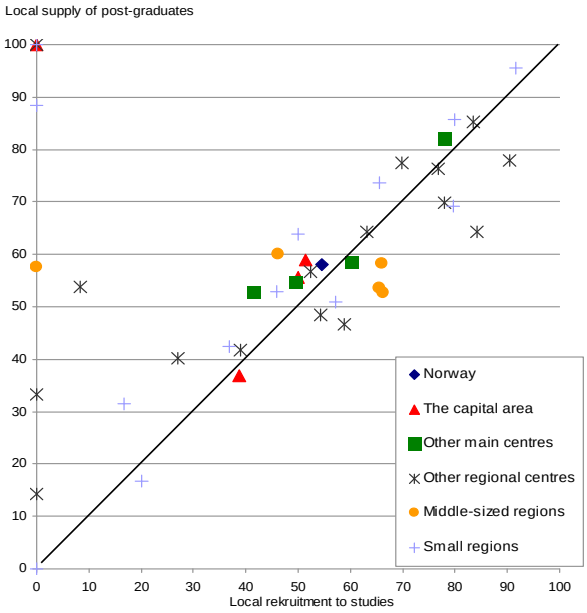
Figure 4.2 Local recruitment to studies in 2002 and local supply of post-graduates in 2004 by their regions of living in 2010. University and college regions by typology of regions by centrality. By fields of education.



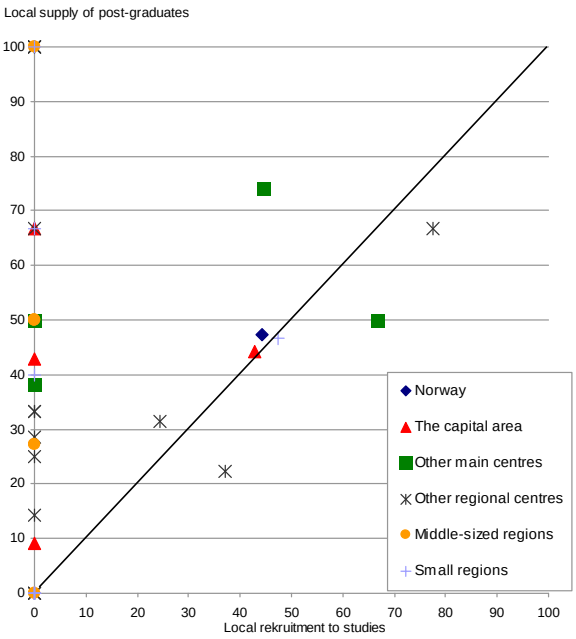
E. Natural and technical sciences



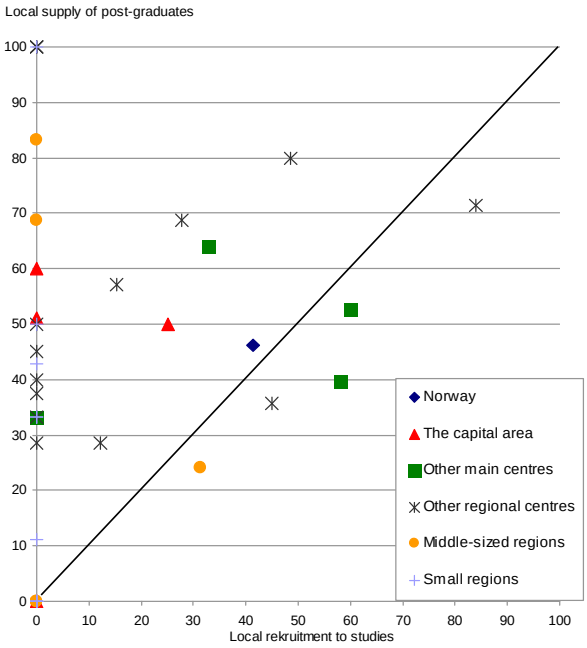
F. Health and welfare



G. Primary industries



H. Transport and communication



5. The relationship between local recruitment to studies and local supply of post-graduates

As detected above there are partly strong differences in local recruitment to studies and local supply of post-graduates both considering different groups of students as well as between different fields of education, duration of graduation and centrality of the place of graduation. One main question put forward in the introduction is how much the local recruitment to studies means for the local supply of new post-graduates?

We made some simple estimations where we measure the relationship between the regional dimension of the supply of post-graduates and the level of local recruitment to studies, or in other words how is the effect of local recruitment on the regional distribution of supply of post-graduates. One important aspect of local recruitment to studies is that this shall increase the probability that post-graduates will stay in the region after studies. As already observed several regions experience a stronger supply of new graduates than the local recruitment suggests. This should reflect a benefit for these regions due to the fact that local "output" is stronger than local "input", thus representing a "brain-gain" during the process of graduation and post-graduation. On the other hand this means that some regions will also experience the opposite, by a weaker local supply of post-graduates than the local recruitment to studies suggests. It is, however, not necessary an imbalance in this distribution across regions because much of the recruitment and supply also include all regions without higher education institutions. Such imbalances will, however, become more "visible" when extending the local area to include also the entire county of study.

Table 5.1 The relationship between local recruitment to studies in 2002 and supply of new post-graduates in 2004 by place of living in 2010. Different groups of students.

Supply: Local recruitment from the local region plus the local county:	To the local region and local county	To other regions in the same part of the country	To other regions in Norway	To other countries
All students:	0,823*** (9,87)	-0,437*** (-4,07)	-0,353*** (-4,06)	-0,013 (-1,17)
Men:	0,704*** (7,71)	-0,300** (-2,71)	-0,295*** (-2,83)	-0,020 (-1,46)
Women:	0,862*** (10,99)	-0,464*** (-4,62)	-0,362*** (-4,35)	-0,004 (-0,39)
Age 18-34 years:	0,811*** (9,48)	-0,389*** (-3,55)	-0,375*** (-3,83)	-0,016 (-0,74)
Age 35-74 years:	0,765*** (8,05)	-0,454*** (-4,61)	-0,232** (-2,46)	0,009 (1,65)
Short high education 1-4 years (based on total local recruitment):	0,807*** (9,76)	-0,446*** (-4,27)	-0,3387*** (-4,07)	0,002 (0,36)
Long high education 5 years or more (based on total local recruitment):	0,454** (2,35)	-0,422* (-1,75)	0,131 (0,69)	-0,11 (-0,52)
Norwegians:	0,817*** (9,76)	-0,443*** (-4,31)	-0,352** (-4,01)	0,001 (0,12)
Students born in Norway by immigrant parents:	0,331 (1,06)	-1,128** (-2,73)	-0,622 (-0,75)	------
Immigrants:	0,620*** (6,35)	0,039 (0,14)	-0,135 (-0,96)	-0,131 (-1,28)

Level of significance: 99% ***, 95% **, 90% *. T-values in brackets

First, we have estimated the relationship between the level of local and regional supply of post-graduates and the corresponding level of local recruitment to studies (see table 5.1). The local dimension is defined as the recruitment to studies and supply of post-graduates in each county of study. The results suggest a clear positive relationship between the level of local recruitment to studies in 2002 and local supply of post-graduates in 2010, while there are mostly negative relationships considering more remote regions relatively to the county of study. This is as expected when operating with a relatively larger than restricted local definition. However, there should be of interest to examine the differences between groups of students and fields of education.

The results indicate a stronger positive relationship between local recruitment to studies and local supply of post-graduates among women than men. It is, however, small deviations between the younger and older students in this respects, but a much stronger accordance between local recruitment and local supply among post-graduates with a short higher education than among graduates with a long higher education, which in turn show positive estimates between local recruitment and exports of new graduates to more remote regions in other parts of the country. Furthermore, it is observed strong and positive relationship between local recruitment to studies and local supply of post-graduates among persons without immigrant background. This relationship is clearly positive also among immigrants, while graduates born in Norway by immigrant parents show none significant local relationship, though with a positive tendency.

We have estimated the corresponding relationship when the students and post-graduates are distributed by fields of education (see table 5.2). When the local area is still defined as the county of study we find the strongest relationship between local recruitment to studies and local supply of post-graduates in the fields of education of health and welfare, natural and technical sciences and business and administration. Health and welfare is a field of study that establishes the foundation for local employment in health services, where much of these functions are managed by the local municipalities. A strong local relationship between recruitment to and supply from this field of education is considered to be of immense importance for the districts. Education shows a more intermediate relationship between local recruitment to studies and local supply of post-graduates. One reason is establishment of special colleges for teachers that is expected to serve more than their local area. A somewhat weaker relationship between local recruitment to studies and local supply of post-graduates in humanities and art and social sciences and law is connected to a stronger local supply of post-graduates in central regions than the local recruitment to studies suggests. Weakest relationship is to be found in transport and communication. This is due to a weak regional covering reflecting a low percentage of higher education institutions that offer studies in this fields of education, and thus serving regions outside the local areas. However, none of eight fields of education show negative relationship between local recruitment to studies and local supply of post-graduates, although the results for three of them were not significant positive.

Table 5.2 The relationship between local recruitment to studies in 2002 and supply of new post-graduates in 2004 by places of living in 2010. Graduates by fields of education.

Supply: Local recruitment from The local region plus the local county:	To the local region and local county	To other regions in the same part of the country	To other regions in Norway	To other countries
Humanities and art:	0,183 (1,11)	-0,158 (-0,78)	-0,152 (-0,96)	-0,004 (-0,24)
Education:	0,552*** (3,81)	-0,410*** (-2,87)	-0,265 ** (-2,07)	-0,007 (-1,17)
Social sciences and law:	0,191 (1,17)	0,259 (1,57)	-0,256** (-2,65)	-0,289* (-2,14)
Business and administration:	0,606*** (6,06)	-0,219* (-1,99)	-0,288*** (-3,24)	0,010 (1,33)
Natural and technical sciences:	0,730*** (6,90)	-0,247* (-1,79)	-0,312** (-2,56)	0,02 (0,11)
Health and welfare:	0,659*** (8,47)	-0,343*** (-4,19)	-0,295*** (-3,58)	-0,026** (-2,95)
Primary industries:	0,614* (1,87)	-0,315 (0,64)	-0,293 (-0,76)	------
Transport and communication:	0,124 (0,50)	-0,111 (-0,60)	0,043 (0,20)	-0,60 (-0,95)

Level of significance: 99% ***, 95% **, 90% *. T-values in brackets

Finally, we divide the local recruitment to studies in 2002 and local supply of post-graduates at 1) the region of study and 2) the remaining county of study. The results indicate a clear local division for all groups involved (see figure 5.3). It is positive and significant relationship between local recruitment to studies and local supply of post-graduates within the region of study and within the remaining county of study respectively, while the relationship across these local levels are negative and mostly significant. This indicates that local recruitment to studies from the remaining county of study has a tendency to return to the same local areas after graduation. In the same manner the local recruitment from the region of study has higher probability to supply the local region of study more than the remaining county of study after graduation.

There are also now observed stronger relationship between local recruitment and local supply among female than male graduates and clearly stronger relationship among persons with a short higher education than a long higher education. There is, however, small deviation between graduates by age-groups in 2010, but the local relationship is somewhat stronger for the older age group when measuring the supply in the year of 2007. Graduates without immigrant background also show stronger relationship between separated local recruitment and supply of graduates than high-educated immigrants and those born in Norway by immigrant parents.

Table 5.3 The relationship between local recruitment to studies from the region of study and the remaining county of study in 2002 and supply of new post-graduates in 2004 by places of living in 2010. Different groups of students.

Supply to: Recruitment from:	To the region of study	To the remaining county of study	To other regions in the same part of the country	To other regions in Norway	To other countries
All students:					
1. From the region of study	0,854*** (9,48)	-0,368*** (-3,08)	-0,305** (-2,37)	-0,143 (-1,35)	-0,004 (-0,36)
2. From the remaining county of study	-0,307* (-1,74)	0,839*** (12,04)	-0,218 (-1,56)	-0,310*** (-2,78)	-0,011 (-0,90)
Men:					
1. From the region of study	0,794*** (7,86)	-0,274** (-2,39)	-0,277** (-2,20)	-0,176 (-1,47)	-0,013 (-0,91)
2. From the remaining county of study	-0,250 (-1,34)	0,627*** (7,24)	-0,088 (-0,57)	-0,197 (-1,54)	-0,014 (-0,71)
Women:					
1. From the region of study	0,881*** (10,24)	-0,384*** (-3,14)	-0,295** (-2,31)	-0,140 (-1,39)	-0,004 (-0,47)
2. From the remaining county of study	-0,370** (-2,17)	0,860*** (13,28)	-0,262** (-1,98)	-0,288*** (-2,77)	-0,009 (-0,96)
Age 18-34 years:					
1. From the region of study	0,878*** (9,19)	-0,387*** (-2,91)	-0,269* (-1,89)	-0,132 (-1,08)	-0,002 (-0,11)
2. From the remaining county of study	-0,332* (-1,82)	0,798*** (9,99)	-0,234 (-1,59	-0,322** (-2,57)	-0,019 (-0,75)
Age 35-74 years:					
1. From the region of study	0,766*** (9,11)	-0,336*** (-2,89)	-0,348*** (-3,16)	-0,054 (-0,55)	0,011** (2,38)
2. From the remaining county of study	-0,297* (-1,83)	0,753*** (9,24)	-0,152 (-1,06)	-0,196* (-1,90)	-0,004 (-0,71)
Short higher education (1-4 years):					
1. From the region of study	0,862*** (9,78)	-0,365*** (-3,06)	-0,298** (-2,33)	-0,163 (-1,63)	0,001 (0,27)
2. From the remaining county of study	-0,343* (-1,96)	0,838*** (12,21)	-0,238* (-1,74)	-0,264** (-2,42)	0,000 (0,08)
Long higher education (=> 5 years):					
1. From the region of study	0,581*** (2,83)	-0,241 (-1,38)	-0,427* (-1,82)	0,028 (1,15)	0,008 (0,25)
2. From the remaining county of study	-0,188 (-0,72)	0,645*** (3,97)	0,042 (0,13)	0,125 (0,60)	-0,016 (-0,31)
Norwegians:					
1. From the region of study	0,849*** (9,49)	-0,360*** (-3,06)	-0,306** (-2,49)	-0,145 (-1,37)	0,002 (0,57)
2. From the remaining county of study	-0,316* (-1,79)	0,841*** (12,14)	-0,221 (-1,61)	-0,309*** (-2,71)	-0,002 (-0,53)
Students born in Norway by immigrant parents:					
1. From the region of study	0,699** (2,34)	-0,095 (-0,16)	-0,203 (-0,32)	-0,870 (-1,45)	-------
2. From the remaining county of study	-0,112 (-0,31)	1,014** (2,79)	0,379 (0,42)	0,833 (1,03)	-------
Immigrants:					
1. From the region of study	0,676*** (5,83)	-0,351* (-1,87)	0,047 (0,17)	-0,008 (-0,05)	-0,002 (-0,22)
2. From the remaining county of study	-0,050 (-0,31)	0,744*** (6,42)	0,441 (1,65)	-0,194 (-1,07)	-0,138 (-1,18)

Level of significance: 99% ***, 95% **, 90% *. T-values in brackets

6. Main findings

An important incentive for a regional, decentralised university- and college structure is that higher education institutions should supply the local labour markets with sufficient high-educated labour. Local and regional recruitment to studies is expected to increase the probability that post-graduates will stay in the regions after studies.

The investigation is based on the recruitment to university and college graduation in the year of 2002 by the regional residential background of students defined by categories of regions by distance from the region of study. The regional distribution of the supply of post-graduates is based on all students in the year of 2004 that were not in higher education in the year of 2005. The regional distribution of the supply of post-graduates is measured relatively between the region of study in 2004 and the regional destination of post-graduates in the years of 2007 and 2010. In 2004 there were universities and/or university colleges in approximately half of the 89 economic regions of Norway.

National average indicates a higher local supply of post-graduates compared with the local recruitment. Small deviation in the geographical distribution of post-graduates between the years of 2007 and 2010 indicates that regional adjustments among graduates mostly take place during the studies or just after the graduation.

It is small gender deviations between the share of recruitment and supply of post-graduates within the regions of study, while the female percentage increases when extending the local area to cover the remaining local county. Furthermore, it is observed higher local recruitment to studies and higher local supply of post-graduates among older than younger students. The local supply of post-graduates is higher among students finishing a short higher graduation compared with post-graduates that obtain a master or a doctoral degree.

Business and administration, humanities and arts, education and health, welfare and sports are the fields of education that show highest local recruitment, while the highest local supply of post-graduates is found in the fields of education of social science and low and humanities and arts, while health and welfare and education increase their local importance when we add to the region of study the remaining local county as part of the local area.

Furthermore, there are observed strong variations in local recruitment and local supply of post-graduates between the regional levels of centrality and between single regions indicating a heterogeneous local structure of recruitment and supply of post-graduates across regions. Regions with equal centrality also show strong variations in the balance between local recruitment and local supply of post-graduates even when controlling for the fields of education structure.

The most central regions show higher local supply of post-graduates than the local recruitment to studies suggest. However, regions in the northernmost county of Finnmark also show much higher local supply of post-graduates than the local recruitment suggest, which may be explained by a special economic support to that region.

At the local level the relationship between recruitment to studies and supply of post-graduates between the local regions of study and the remaining local counties indicate a tendency among post-graduates to settle in the local area from where they became recruited.

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