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The Market Areas of Austrian Universities

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### The Market Areas of Austrian Universities

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### Abstract

This paper uses a dataset of first-time students in Austria, which shows among other information the home location and the university location of those students. Since Austria has a free access university system, where universities have to accept high school graduates, these data reflect the preferences of these students. From a university's point of view, the data reflect the area from where they can attract students, i.e. the market areas of the universities. Currently, the market areas of Austrian universities are largely unknown. It is also unknown whether the universities serve spatial markets like a spatial monopolist or compete on a national scale. This information, however, is of crucial importance for the future strategies of the Austrian universities who are in a process of restructuring from a bureaucratically governed system to one of independence and autonomy. For universities who have to develop their own strategies information about their market is essential.

### 1. Introduction

Since the early 1990s the university system in Austria is experiencing a period of constant reform. The laws regulating organizational structure, the employment status of faculty, the structure and contents of teaching all changed more than once in a period of just over ten years, most of the time exposing the sector to inconsistent regulations. In the early 1990s universities in Austria were part of public administration governed – at least formally - by the Ministry of Higher Education. Faculty members were civil servants appointed by that ministry. The basic structure of the teaching was defined by law. Beginning 2004 Austrian universities will be independent legal entities, new faculty members will be employees like in private companies, and teaching will largely be decided within the universities, constrained only by a few general regulations. The relationship between government and universities will change from command and control through line item budgeting to partners negotiating a contract that will form the basis of a guaranteed lump sum budget in exchange for a set of services.

This change in the Austrian university system is, of course, part of a larger trend that can be observed in most European countries. Within the European Union this process is often paraphrased as Bologna process, because of the aim of an integrated system of higher education that European leaders have formulated at the EU-summit in Bologna 199?.

It would be naive to expect such a transition to be smooth and without frictions. All partners in this process have to undergo major changes. The Ministry of Higher Education has to give up direct control over the university sector. The universities have to develop management competencies. The rectors turn from "primus inter pares" of an academic faculty to managers of fair size companies. Faculty will have to get used to documenting its activities and being evaluated in different ways. But not only individual departments and faculty members become more concerned about inputs and outputs, also university administrations feel the need to know better their environment, the subtleties of the production process of their organization, and the behavior of their customers. Therefore, this change in the regulatory environment which is part of the process of European integration is accompanied by a growing demand for research on different aspects of higher education: its management, quality control, the measurement of its output in teaching, research, and public services, its effects on cities and regions, its contribution to economic growth, etc.

### 2. Market area of universities

A major factor influencing the future of universities will be the behavior of its students, for example, their choice of a place to study. Currently, we have little knowledge about the "market areas" of universities in Austria. The spatial area where their students come from or the area the universities serve is little known. Does each university have a well defined catchment area like a spatial monopolist limiting competition to the market boundaries or do they all serve the country as a whole and compete through the quality (or perception of it) and portfolio of programs they offer? The difference may be crucial for a system moving from a regulated to a competitive structure, because of its implication on the volatility of demand. In a structure of spatial monopolists universities can take more risks in redesigning programs, for example, because of their captive clientel and limited competition. In a spatially competitive structure, on the other hand, it would be sensible for the universities to try to differentiate their products from those of the others and to target specific segments of young people.

In the following section we will present a first answer to the question of the market areas of Austrian universities. It is a first descriptive analysis of a dataset that allows more detailed and more sophisticated analyses. These, however, will have to be done later.

### 3. Empirical Analysis

Our dataset gives the numbers of students beginning to study for the fall semesters of three years over a ten year period: 1990, 1995, and 2000. This period covers some of the major structural changes in the Austrian university system that we have discussed above. It also covers a period, when international student mobility became a major factor in Austrian universities. Within Europe this was supported by the mobility programs of the European Union.

The universities in our dataset are quite different<sup>1</sup>. There are comprehensive universities and specialized universities. Comprehensive universities<sup>2</sup> beyond doubt are

- The University of Vienna,
- The University of Graz, and
- The University of Innsbruck.

Comprehensive universities lacking some major faculties (most notably medicine) are

- The University of Salzburg, and
- The University of Linz.

The specialized universities fall into different categories. There are two technical universities in Vienna and Graz with a well developed set of faculties and programs. In Vienna we can find

- The Vienna University of Economics and Business Administration (WU),
- The Agricultural University (BOKU), and
- The University for Veterinary Medicine (VetMed).

The University for Metallurgy (Montanuniversität) is the smallest university in Austria and located in Leoben, a small city in upper Styria. The University of Klagenfurt is the youngest Austrian university and has originally been founded as a university for educational sciences.

<sup>&</sup>lt;sup>1</sup> The art universities are not in the dataset. Also, polytechnics (Fachhochschulen) are excluded.

<sup>&</sup>lt;sup>2</sup> All three of them will have to spin off their medical faculty into an independent university by the end of 2003.

Later, the school has broadened its scope of faculties, but has not reached the diversity of a comprehensive university.

The dataset contains information about a total number of 111,166 students. Over the three observation points the numbers are

| Year | Number |
|------|--------|
| 1990 | 35,582 |
| 1995 | 37,040 |
| 2000 | 38,544 |

The dataset contains students who begin to study at one of the twelve Austrian universities. This may be students who enter a university for the first time as well as those who transfer to this school from another university in the country. In our empirical analysis we concentrate on the first-time students, i.e. those students who begin to study at an Austrian university for the first time. Thus, we exclude students who transfer from one university to another in the country.

This reduces the total number of students in our analysis to 66,775 (60% of the total). The breakdown by year is

| Year | Number |
|------|--------|
| 1990 | 21,771 |
| 1995 | 21,780 |
| 2000 | 23,224 |

While the number of new students has grown only by 0.04% between 1990 and 1995, in the period 1995 - 2000 the number has grown by 6.63%, corresponding to a 1.3% annual increase.

### Where do the students come from?

These students come from all parts of Austria and from foreign countries. For 7 of the 66,775 students the origin is unclear. Just 297 students come from foreign countries<sup>3</sup>. This leaves us with 66,471 Austrian first year students with the following breakdown by year

| Year | Number |
|------|--------|
| 1990 | 21,628 |
| 1995 | 21,686 |
| 2000 | 23,157 |

Our dataset contains information about the home location of students. This information is available by Austrian political districts. There are 99 political districs in Austria, the smallest, Rust, with 1,696 inhabitants in 1991, the largest, Vienna, with 1,539,848. Excluding Vienna, the average size of a political district in Austria is 64,858 inhabitants.

Therefore, it is not surprising that by far the largest share of students (22.4%) come from Vienna, not just the most populous city, but with five universities also the largest concentration of institutions of higher education in the country. Other important sources of students (districts contributing over 2%) are

| Graz           | 5.43% |
|----------------|-------|
| Linz           | 2.98% |
| Salzburg       | 2.31% |
| Innsbruck-Land | 2,26% |
| Mödling        | 2.14% |

Because of the unequal distribution of population as well as of institution of higher education, students from different districts in average cover quite different distances when getting to their university. Students resident in Vienna travel in average just 1.4 kilometers<sup>4</sup>. Students from the far western district of Bregenz in average need to cover 303.9 kilometers to go to university. The following figure shows the respective average distances for all districts. The

<sup>&</sup>lt;sup>3</sup> This number is surprisingly low, even when taking into account that the data do not include exchange students from foreign countries. However, since we want to concentrate on the relationships within Austria, this does not raise major concern.

<sup>&</sup>lt;sup>4</sup> This number underestimates the true distance because we do not have information about the home location of students in Vienna. Therefore, we had to set the distance for students living and studying in Vienna to zero. The same holds true for other students who study at their home location.

results in this map also reflect the specialization of the different universities and their local focus. We will come back to this in later analyses.



### Figure 1

To get a more appropriate picture, however, we should correct for the different sizes of the districts. The most appropriate number available is the population below 20 years of age in the year 1991. Figure 2 shows the sum of new students in the three observation years coming from the Austrian districts relative to the young population (0-19 years of age) of the respective district (student ratio). There are a few important things to note

- The student ratio is among the highest in the districts with a university (marked by the little flags). The largest student ratios are to be found in Graz and Klagenfurt.
- The student ratio also tends to be high even in those urban districts that don't have a university (e.g., Eisenstadt (rank 4), Villach (rank 8), Wels (rank 11), Krems (rank 12)). This is insofar a little surprising as Polytechnics have been founded in many of these districts in the 1990.
- Some of the suburban districts around cities also show high ratios. One of the highest is in Mödling (south of Vienna, rank 3), other examples are Wien-Umgebung (rank 10) and Klagenfurt-Land (rank 13) and Linz-Land (rank 14). Vienna reaches only the ninth rank.

This is probably the result of the population structure of the city (over-proportional share of immigrants among the young population).

- The lowest student ratios are found in the rural districts in the east (Zwettl, Scheibbs, Hartberg, Feldbach, Gmünd, Rohrbach, Horn, Radkersburg). The student ratio in Zwettl is less than one fourth of that in Graz. Interestingly, none of the districts with the lowest student ratios belongs to Burgenland, the least developed region in Austria.
- It is also interesting to see that the classical old industrial areas in upper Styria form a belt of districts with fairly high student ratios. A similar statement can be made for some parts in Carinthia.

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### Figure 2:

There seem to be a number of factors that lead to the observable pattern of participation in higher education. Only one of them is spatial proximity to a university. Other important factors seem to be level of urbanization and sectoral structure of the economy. In some further analyses one could try to estimate the relative contribution of these factors.

#### Where do students go?

As has been mentioned above, the Austrian universities are quite different and offer the prospective student different sets of programs. For example, a student planning to study medicine can choose between the Universities in Vienna, Graz, and Innsbruck. If the students wants to become a mathematics teacher, he/she can chose among seven universities, if he/she wants to study the Finnish language, the University of Vienna is the only choice. Viewed from the other side, the University of Vienna offers 82 areas of study ("Studienrichtungen"), the University of Veterinary Medicine only two. The specialized universities typically offer only a few areas; ten to twenty at the technical universities and at the university in Leoben, less than ten at the others. All the comprehensive universities offer twenty or more areas of study.

These differences, of course, have an impact upon the choice of the students'. For universities that offer a portfolio of areas that is similar to that of other universities we would expect a fairly localized market. Particularly for the smaller schools. For specialized universities with a unique portfolio of areas we can expect a more national market.

The following maps show the numbers of students that each university can attract from the districts relative to that district's population age 0-19. The location of the university under consideration is marked by a black flag, the locations of the other universities are marked by gray flags. The first three maps show the results for the comprehensive universities in Vienna, Graz and Innsbruck. The next three maps give the results for the smaller universities in Salzburg, Linz, and Klagenfurt.

In all six cases we see a localized market and a clear gradient around the location of the university. This pattern is very pronounced in all cases. The university of Innsbruck, for example, clearly serves the western part of the country, the university of Graz the state of Styria, the university of Linz the state of Upper Austria. The university of Vienna attracts students from a larger area and also some from areas outside its core market area, notably from Carinthia in the south and from Vorarlberg in the far west of the country.

The relationship between the universities in Innsbruck, Salzburg and Linz is interesting. The university of Innsbruck also serves a considerable part of the state of Salzburg, the home territory of the university of Salzburg. The university of Salzburg, in turn, serves parts of the territory of the university of Linz.













For the specialized universities we see a more differentiated picture. We expect them to serve a more specialized demand than the general universities and therefore cover a larger market area. This expectation is clearly confirmed for the most specialized universities, the agricultural university (BOKU) and the university for veterinary medicine (VETMED). Although they too show a remarkable spatial gradient around their location (they are both located in Vienna), these schools can attract noticeable proportions of young people also from districts further away, most noticeable some rural districts. The smallest university in Austria, the university of Metallurgy (Mont.Univ.) in Leoben again has a fairly localized market despite its high level of specialization. The curricula offered by this university are probably not considered an option by young people far beyond the location of this school.

While most of the programs offered by BOKU, VETMED and Leoben are unique in Austria, the technical universities and the University of Economics and Business Administration (WU) face competition within the country. When we compare the maps for the two technical universities in Vienna and Graz, we see that they both have a fairly localized market area. The technical university in Vienna reaches out further than its competitor in Graz. TU-Graz serves mainly the state of Styria and to a lesser extent Carinthia.

Despite of being a specialized university, WU competes with a number of other Austrian universities for students interested in Business and Economics. In addition to WU, such programs are also offered in Graz, Innsbruck, Linz, Klagenfurt and at the University of Vienna. Therefore, the market area of WU is similarly localized as that of a general university. However, we will discuss the distribution of students in Business and Economics in more detail below.

The following table shows the average distances between the home and the university location of students of the various universities. The overall average distance is 67.6 kilometers. These distances can also be interpreted as an indicator of the market areas of these universities.

| University            | av.distance |
|-----------------------|-------------|
| Univ. Vienna          | 75.7        |
| Univ. Graz            | 52.2        |
| Univ. Innsbruck       | 74.4        |
| Univ. Linz            | 36.1        |
| Univ. Salzburg        | 49.7        |
| Univ. Klagenfurt      | 25.4        |
| TU Vienna             | 78.7        |
| TU Graz               | 84.1        |
| BOKU Vienna           | 111.5       |
| Vet.med. Univ. Vienna | 110.9       |
| WU Vienna             | 65.0        |
| Mont. Univ. Leoben    | 87.8        |

The numbers in the table correspond with our previous results. The market areas of the specialized universities are in general larger than those of the general universities. The only exception is WU, probably for the reasons that we have mentioned above. The larger comprehensive universities (Vienna, Graz, Innsbruck) clearly have larger market areas than the smaller universities in Linz, Salzburg and Klagenfurt. We observe the smallest average distance for students beginning their studies in Klagenfurt.









### Students Vet.Med. Vienna per capita of pop. age 0-19





All the maps show fairly clear distance gradients. This raises the question, whether Austrian universities can dominate the "student market" around their location and thus are in a position similar to a spatial monopolist. Therefore, we identify for each of the Austrian districts the university that receives the largest share of its student pool. The results of this exercise are shown in the following map.

The results are quite striking. First of all, we see that only the general universities can develop an area of market domination, but not the specialized universities. None of those can capture the largest student share in any one of the districts. Second, the areas of market domination of the universities are contiguous in almost all cases. The only two exceptions are the university of Graz, that dominates just one district (Hermagor in western Carinthia) outside its vicinity, and the university of Vienna, that captures three such districts, namely Gmunden and Ried in Upper Austria and Spittal in Carinthia. Given the size of the university of Vienna this is not surprising. We would have expected to see the university of Vienna dominating even more districts. Note that all four of these districts are at the edge of the market areas of universities with particularly small average distances.



### Figure 15

### What do students study?

As we have already mentioned above, the universities offer quite different portfolios of programs. Our dataset distinguishes 129 different programs. The structure of these programs reflects the development of the Austrian university system, strategies of different schools, and cultural differences between different groups. So, for example, there is only one program named medicine and one named law – both offered at a number of universities – reflecting also the high level of organization in the respective professions. In business on the other hand we find very similar programs being offered under different names at different universities. Because of this, and because of the number of programs, we cannot analyze the raw data but need to aggregate them.

To gain a better understanding of what these students study, we form the following 10 categories:

- Religious studies [rel]
- Technical studies (incl. Architecture and the Sciences) [tech]
- Land studies (agriculture, forestry, etc.) [land]
- Languages [lang]
- Business (incl. Economics, international Business, etc.) [bus]
- Computing (incl. informatics, mathematics, statistics, etc.) [comp]
- Law [law]
- Philosophy [phil]
- Medical studies (incl. dentistry, Pharmaceutics, micro biology, vet. Medicine, etc.) [med]
- Others [other]

When we group the students according to these categories, we see that with over 14,500 new students business is the largest area. With over 10,000 new students the technical studies are on second place. Medical studies and law only follow on places three and four. This despite the fact that in the raw data law is clearly area with the most students.

| area  | n.of students |
|-------|---------------|
| rel   | 558           |
| tech  | 10,199        |
| land  | 1,721         |
| lang  | 5,393         |
| bus   | 14,740        |
| comp  | 3,569         |
| law   | 8,003         |
| phil  | 5,859         |
| med   | 9,348         |
| other | 7,081         |

When we break this analysis down to the districts and identify the dominating area for each district, we see that business dominates a large part of Austria. Quite interesting is the island of districts dominated by technical studies around the (technical) universities in Graz and Leoben. The availability of the TU Graz and the university of metallurgy in Leoben obviously have a strong effect of the study choice of students. However, all the other districts that are dominated by technical studies are far from any school offering such programs. This is particularly the case for the three districts in the west of Tirol.

Despite of their individual importance, law and medicine can dominate only very few districts. Among them, only Salzburg, which is dominated by law, is the location of a university (offering law).



### Figure 16

### Market areas for Business students

The previous analysis has shown, that business is a fairly dominant area at Austrian universities. Therefore, and because my university is specialized in business, we will now take a closer look at the market areas for students in business. As mentioned above, our category "business" consists of a number of areas of study like business administration, economics, international business, commerce, etc. Programs that we categorize as business are offered at the following universities

- University of Vienna,
- WU-Vienna,
- University of Linz,
- University of Graz,
- University of Innsbruck,

• University of Klagenfurt.

The numbers of students beginning business at these universities in our three years of observation are:

| University       | No.of bus.<br>Students |
|------------------|------------------------|
| Univ. Vienna     | 1,181                  |
| Univ. Graz       | 1,874                  |
| Univ. Innsbruck  | 1,721                  |
| Univ. Linz       | 1,942                  |
| Univ. Klagenfurt | 507                    |
| WU Vienna        | 5,988                  |

Also, when we look at business only, the market areas of the respective universities are fairly localized. For all business students the average distance between their home location and their university location is 58.6 km. This indicator differs again quite markedly between the schools:

| University       | av.distance |
|------------------|-------------|
| Univ. Vienna     | 80.2        |
| Univ. Graz       | 51.7        |
| Univ. Innsbruck  | 81.6        |
| Univ. Linz       | 32.0        |
| Univ. Klagenfurt | 25.1        |
| WU Vienna        | 65.0        |

Again, as is the case for all their studies, the universities of Linz and Klagenfurt serve a very local market. In both cases the average distance for business is even smaller than for all their students. The University of Graz and WU fall into the middle, whereas the business programs at the universities of Vienna and Innsbruck attract students from in average over 80 kilometers away. For the university of Innsbruck this is in part explained by the distant location of Innsbruck as compared to that of the other business programs. The university of Vienna, however, is located in the same city as WU-Vienna, which covers a 15 km smaller average distance. This difference cannot be explained by location, but must be the result of the programs offered. In fact, business and economics at the university of Vienna has concentrated on the quantitative and mathematical aspects of the disciplines, thus occupying a

market niche that obviously limits competition with other business programs and attracts students – in smaller numbers – from a larger spatial area.

When we calculate the number of business students of each university by home district relative to the young population of that district, the resulting maps are very similar to those of the universities as a whole. Therefore, we do not reproduce these maps here. However, we will again generate the areas of market domination for the universities offering business. The result is displayed in the following map:

# Areas of Market Domination in Business



### Figure 17

We see that with the exception of the university of Vienna, every university offering business studies has its well defined area of market domination. Only two districts are outside a contiguous area: Salzburg and Hermagor in Carinthia. Surprisingly, the areas of market domination are almost identical to the Austrian states. The universities of Innsbruck, Linz, and Graz cover the districts of their respective states (Tirol, Upper Austria and Styria, respectively) plus some of neighboring Länder. Only the area of market domination of the university of Klagenfurt does not cover all of Carinthia. In addition to Tirol the university of

Innsbruck captures also Vorarlberg and most of the state of Salzburg. It seems that in addition to proximity also state affiliation plays a role in determining the areas of market domination.

This raises the question, how different the shares are between the districts inside and outside the area of market domination. Is there a gradual transition from one area to the other or is there a steep drop in the percentage of business students that a university can attract at the edge of its market. We answer this question by plotting the share of a university in a district (vertical axis) against the district's distance from the university location (horizontal axes). In addition, we mark the districts in the university's area of market domination.



### Figure 18

The plot for WU shows that there is a strong difference between the districts inside and outside the area of market domination. Only Salzburg and Hermagor show up as outliers. The other districts in the area of market domination form a clear cluster with high shares and low distances, which is distinctively different from the others.











Univ. Linz







For the other universities offering business studies, the picture is even clearer. This is particularly the case for the universities of Graz and Linz. For Klagenfurt and Innsbruck we also see a clear separation, but a smaller gap between the two groups. For Innsbruck this is probably the result of its extreme location with respect to the other schools offering business.

### 4. Conclusions

In this paper we have raised the question of the market areas of universities in Austria. In a process of transition from a bureaucratically regulated system of universities to one of autonomous organizations this is an important but new question. The difference between a spatially captive student body or a quality oriented spatially mobile student body may imply very different strategies of the newly autonomous institutions.

The answer of our descriptive empirical analysis is surprisingly clear. All steps in our analysis indicated that Austrian universities serve a fairly local market with limited mobility and limited competition. We could identify clear areas of market domination with sharp edges. Although we did not analyze this directly, it can be conjectured that major changes in student numbers will result from demographic factors and changes in the attractiveness of certain area of study rather than changes in the reputation of a school due to quality changes in its programs or successful marketing.



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