

## **Product Differentiation or Spatial Monopoly? The Market Areas of Austrian Universities in Business Education**

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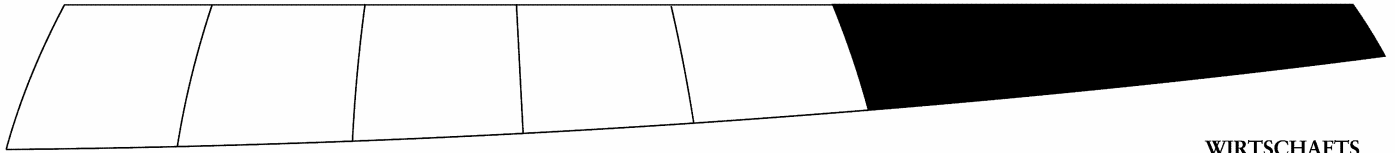
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**The Market Areas of Austrian Universities in**  
**Business Education**

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# **Product Differentiation or Spatial Monopoly?**

## **The Market Areas of Austrian Universities in Business Education**

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### **1. Introduction**

The European Higher Education system is currently in a fundamental transition. In the Bologna declaration from 1999, twenty-nine European countries agreed to reform their respective higher education systems to allow for better comparability of programmes and degrees, higher levels of mobility, and European standards. In the follow-up meetings in Berlin and Bergen this declaration has been substantiated by defining the process toward this goal and by setting a deadline. An important element of the process is the introduction of an undergraduate-graduate-structure. By 2010, the European signatory countries intend to have established the “European Space for Higher Education”.

These activities are closely related to the creation of the “European Research Area” (ERA) and to the Lisbon objectives, which state that the EU should become “the most competitive and dynamic knowledge-based economy in the world” (EU, 2000). The university system is arguably the most important element in this strategy playing a crucial role in both the area of education and the area of research. The strategies implemented in this context clearly aim to make university output more comparable and to increase competition between the institutions.

The relationship between the European actions and the reform measures in the individual countries is not a simple one. For most countries, the European actions are both the result of and the framework for major restructuring efforts within their national higher education system. The Austrian university system, for example, is experiencing a period of constant reform since at least the early 1990s. 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.

Since beginning of 2004 Austrian universities are independent legal entities, new faculty members are employees like in private companies, and teaching is largely decided within the universities, constrained only by a few general regulations. The relationship between government and universities changed from command and control through line item budgeting to partners negotiating a contract that will form<sup>1</sup> the basis of a guaranteed lump sum budget in exchange for a set of services.

All these measures are expected – and intended – to set off a process that American higher education underwent in the last half century. Hoxby (1997) describes it as follows: “Since 1940, American higher education has experienced a very significant change in market structure. Essentially, higher education has been transformed from a series of local autarkies to a nationally and regionally integrated market in which colleges face many potential competitors for inputs and consumers.” (p.1). This is basically a spatial market argument, which she states in terms of trade between formerly isolated spatial units: “If we open trade between many autarkies, each of which has colleges offering education of varying quality (producing vertically differentiated products), then theory predicts several reactions. Colleges’ loss of market power over their local consumers causes a decrease in their rent and a corresponding increase in the average value (quality for cost) they offer students. Colleges’ loss of local monopsony power generates an increase in the wages of college inputs. Since these inputs include students (students are simultaneously consumers of and inputs into education), high ability students are predicted to receive increased subsidies after geographic market integration. Moreover, average college quality should rise in the more integrated market. This is because any given investment in quality has higher returns in the market with open trade. Higher average quality is accompanied by a rise in tuition (though no decrease in value).” (Hoxby, 1997, p.1-2).

The US-discussion is largely concerned with this rise in tuition (e.g., McMillen et al., 2005) and whether it is offset by an equivalent increase in the value of education (Brewer et al., 1999, Leslie and Brinkman, 1988, McPherson and Shapiro, 1998). In Europe, the issue is

rather whether the European university system has entered this process and, if so, how far it has progressed on this course. This is the question we will deal with in this paper. We will frame the issue in terms of spatial competition between institutions and their corresponding market areas. As we will argue in section 2, the transition Hoxby describes for the US-system is a transition from a spatial monopoly structure to a structure of product differentiation. By investigating basic characteristics of the spatial market of Austrian universities in business education, we can derive an answer to this question. Since we only look at the teaching function – more specifically the teaching of business education – of universities, which is just one of the functions of universities (Goldstein et al, 1995), our results apply directly only to this component of the university system. However, teaching is arguably the most important function of universities and business education is, as we will show in section 4, the largest part of Austrian university teaching.

In section 2 of the paper we will briefly sketch the relevant theory and apply it to the issue of a student's choice of university. Section 3 discusses the relevant institutional issues concerning the Austrian university system. Section 4, then, presents the empirical analysis. The paper ends with a summary and conclusions (section 5).

## **2. Spatial competition among universities**

From the students' point of view, participation in higher education can be considered an investment in their own human capital. The money, time, and effort spent on higher education is expected to be repaid in a later career in the form of higher income and more attractive working conditions. So, the decisions made by students about whether or not to go to university, what subject to study and where, can be looked at in terms of a cost-benefit-comparison.

While the costs are probably reasonably clear, the benefits are uncertain for a number of reasons:

- They depend upon the market conditions at the time when the student enters the labour market, which are unforeseeable at the time the decisions have to be made;
- They are not gained at once, but over the whole period the student will be active in the labour market. So, major parts of the expected benefits are not only years but decades in the future and therefore quite uncertain;

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<sup>1</sup> This step is not fully implemented yet.

- The human capital the student expects to accumulate during his or her education may not be the type of knowledge needed in the labour market of the future. Whether this is the case or not, will only become apparent when the student has entered the labour market;
- The student may not receive the type of education, training, and human capital he or she expects to get in the educational programme. These factors are difficult to observe and measure and in most cases only become apparent through consumption.

These factors make higher education choices particularly difficult and risky. For that reason, reputation of universities plays a major role. It can serve as a proxy measure at various levels. On the one hand, students may decide between programmes based on reputation to overcome the problem of partly unobservable characteristics of the programmes. On the other hand, in their hiring decisions future employers may partly decide based on reputation to overcome the problem that the applicant's specific human capital, skills, and knowledge can only partially be observed.

In this investment decision, a high school graduate has to make at least three interdependent choices. He/she has to decide

1. Whether to go to university or not;
2. Which field of study to pursue, and
3. At which university to enrol.

Since we will only deal only with the third decision in the empirical analysis, the following discussion will also concentrate on this aspect.

All three decisions involve a spatial dimension. As far as the decision between universities is concerned, a larger distance between the student's home location and the location of the university will imply higher costs<sup>2</sup>. There may also be regional differences in the reputation of various universities, based, for example, on regional habits. We will come back to this point later.

So, given that the high school graduate has decided to go to university and to study business/economics, he or she has to decide between the various universities that offer this field of study. From a choice theoretic point of view, the prospective student implicitly estimates the benefits and costs of the various alternatives and evaluates them based on

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<sup>2</sup> Also the benefits may differ by the student's home location. If they intend to return to their home location after graduation, the different economic structures of regions will influence the estimated benefits. In Austria, for example, we find that students from rural regions are more likely to study agriculture, forestry, or veterinary medicine than students from urban areas. Since we only deal with the third decision this effect is not relevant in our case.

his/her utility function, compares these utility levels and selects the university that gives the highest utility. Because of this comparison, only the relative levels of reputation and costs play a role in the decision making at this level.

Since the alternatives for the student's decision are distributed in space, the theory of spatial competition may be relevant in this context. This theory looks at the competition between suppliers of a homogeneous good and takes into account the costs to transport the product from the supplier's to the customer's location. Of course, we are well aware that university education is not a homogeneous good. Nevertheless, we will first base our discussion on this assumption and later analyse the consequences of relaxing this assumption.

When a suppliers of the homogeneous good charges a price of  $P$ , the effective price ( $P'$ ) for a customer located a distance  $d$  away from the supplier is

$$P'(d) = P + t*d$$

Where  $t$  is the transport costs per unit of distance (transport rate). Note that the effective price increases with distance. Consequently, with elastic demand the demand of the customer will decline with increasing distance from the supplier.

When there is more than one supplier, since the product is assumed to be homogeneous, the customer will always buy at that supplier that leads to the lowest effective price at his or her home location. This gives a well defined boundary between the market areas of suppliers. For two suppliers being a distance of  $D$  apart and charging prices of  $P_1$  and  $P_2$ , respectively, the market boundary will be at distance  $d'$  given by

$$d' = [tD + (P_2 - P_1)] / 2t$$

When the two prices are equal, the market boundary is right in the middle between the two suppliers (see figure 1).



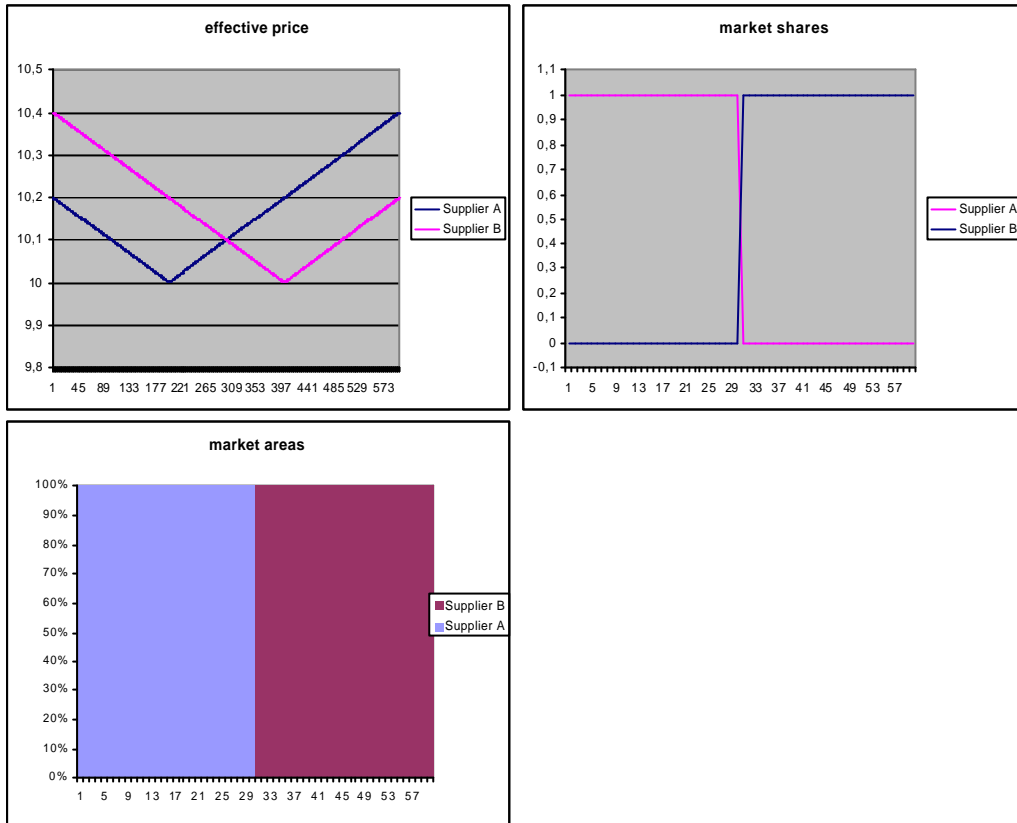


Figure 1: effective prices, market shares and market areas for homogenous goods

The theory of spatial competition has derived a number of interesting results, not all of which are relevant in our context (see Greenhut and Ohta, 1975, Beckmann and Thisse, 1986, Greenhut et al., 1987, Beath and Katsoulacos, 1991). One relevant consequence is that in such a situation the market areas are perfectly delimited. Up to the market boundary, all customers buy from the respective supplier, beyond the boundary none. Another relevant consequence is that competition in such a spatial market is limited to the area of the market boundary. When a supplier lowers the price, the market boundary will shift out and a few customers will switch over to him from his competitor. The size of this effect depends upon the transport rate.

In the immediate vicinity, a supplier enjoys a captive market. Customers enjoy a low effective price because of the short distance to the supplier, but can switch to another supplier only at much higher costs. So, for the vicinity of his or her location the supplier enjoys a so called spatial monopoly. In such a situation the supplier can set the price strategically like a monopolist, despite the fact that there is a homogeneous good and a number of competitors.

Since the product has been assumed to be homogeneous, the (effective) price is the only factor by which the supply of two suppliers may differ. Because of their identical characteristics, customers will always be indifferent between the products from one or the other supplier irrespective of their utility function. Consequently, effective price is the only

differentiating factor. When the products are similar but heterogeneous, as is the case with higher education, customers may value them differently. When customers' preferences are heterogeneous as well, the market boundaries of the theory of spatial competition will get blurred. Some customers will prefer the characteristics of a distant supplier's product so much that they will buy it despite the higher effective price. Therefore, in the case of heterogeneous products, the market areas will not be perfectly delimited. We will expect the market share of a supplier to decline with distance from his or her location, but not to drop off sharply as in the homogeneous case.

Conceptually, we can characterise this situation by adding a random component ( $R$ ) to the effective price equation:

$$P'(d) = P + t*d + R$$

$R$  is a random variable which takes on a different value at every location and for every supplier. So, when the customer compares the effective prices of two suppliers (located a distance of  $D$  apart), the result will depend upon the specific values of the random variables:

$$P_1'(d) - P_2'(D-d) = P_1 + t*D + R_1 - P_2 - t(D-d) - R_2 = P_1 - P_2 + t(2d-D) + R_1 - R_2$$

Figure 2 shows on the left hand side the situation where the heterogeneity (random component) is relatively small as compared to the transport rate, on the right hand side the situation where it is relatively large. As we can see, when heterogeneity is high, the suppliers do not serve well defined market areas, but attract customers at different distances from their locations.

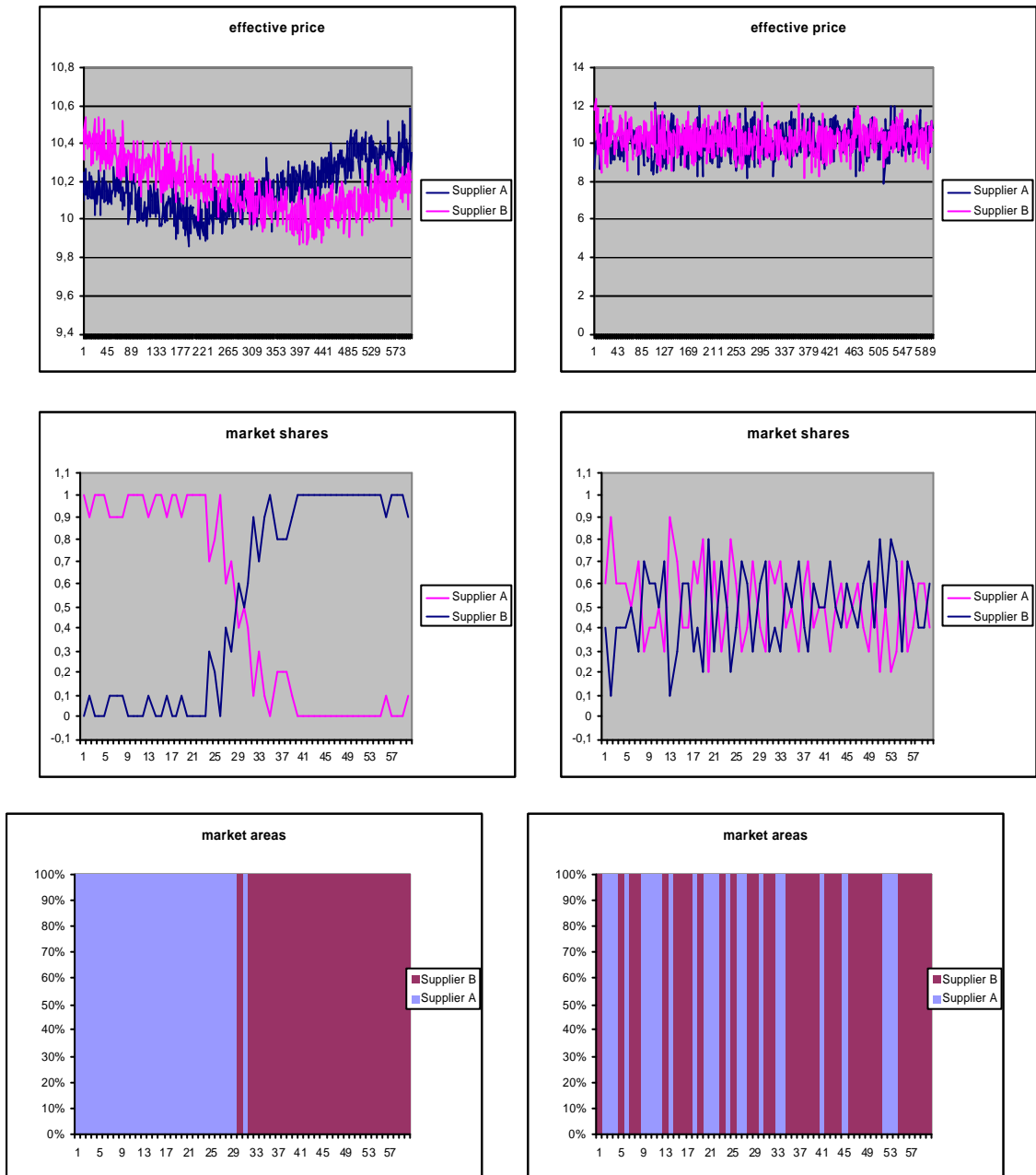


Figure 2: effective prices, market shares and market areas for goods with low (left) and high (right) level of heterogeneity

In reality the heterogeneity of products is not random, but typically targeted toward certain groups of potential customers. Suppliers differentiate their products strategically to attract customers with specific preferences. In the extreme, a number of suppliers may serve the same spatial market, but divide it up horizontally through product differentiation rather than vertically through spatial monopolies. In the empirical analysis of the paper we will try to find out which situation better characterises the higher education market for business education in Austria.

### **3. The Austrian university system**

Before we can turn to the empirical analysis, we need to take a quick look at the Austrian university system (for details see Beerkens, 2003; Wadsack, Kasparovsky, 2004). In the introduction we have already sketched the transition of Austrian universities from public administration units under the direct command of the ministry to autonomous legal entities. This major step in the transformation of the Austrian higher education system, however, became effective 2004, past the end of our observation period (1990 – 2002). The most fundamental changes in the Austrian universities happened after this regulation became effective. Therefore we do not expect any major direct implications for our analysis. What we do expect, however, are indirect effects due to anticipation of this transition.

Until July 2005, the Austrian universities were characterised by free access. Any Austrian student who passed the final high school exams (Matura) could sign up at any Austrian university and had to be accepted. Exceptions existed only for arts schools and some areas had special requirements. For business/economics no such requirements existed. This is an important feature for our analysis. Because of free access the data about university choice of first year students really show the preferences and cost benefit calculations of the students and are not distorted by the acceptance policy of universities or some administrative unit.

Until fall 2001 studying at an Austrian university was also free of charge. In the study year 2001/02 a moderate tuition fee was introduced which led to a temporal decline in student numbers. Since this tuition fee was introduced at all universities at the same time, it affected all of them simultaneously and therefore will not impact the students' comparison between universities.

An important factor of increased competition in Austrian higher education was the introduction of the so called "Fachhochschule" system in 1993 with the first institutions going into operation in 1994. These institutions are subject to special regulations which some universities argue lead to unfair competition. Most importantly, "Fachhochschulen" are not subject to the free access that universities have to provide. They screen applicants and in average accept less than half of them. On the other hand, they have less research function than the universities and are not allowed to award doctoral or PhD degrees.

#### 4. Empirical analysis

In this section we will apply the conceptual arguments of section 2 to a segment of the Austrian university system. As mentioned in the introduction, we will concentrate on business education.

The two market structures, spatial monopoly and product differentiation, are characterised by distinctly different features. In the case of spatial monopoly, we expect to find spatially clearly delineated market areas with little differentiation between the various institutions. In the case of product differentiation, market areas would overlap strongly and institutions would be clearly differentiated, where in our context differentiation can be measured by differences in reputation. Based on observation and earlier investigation (Maier, 2003), we expect the Austrian university system to be closer to a spatial monopoly structure. Because of the series of reforms and the external pressures, however, we expect to see the system move away from the hypothesised spatial monopoly structure toward product differentiation.

The information we have available is about students of Austrian nationality beginning their first degree program at an Austrian university for the period between fall 1990 and summer 2003. This does not involve students from “Fachhochschulen” (see section 3). Although we have information per semester, we aggregate them to study years. So, year 1990 consists of fall semester 1990 and spring semester 1991; year 2002 consists of fall semester 2002 and spring semester 2003.

Table 1: First year students by study area (1990-2002)

<b>Area</b>	<b>No.of stud.</b>	<b>Percent</b>
Bus	68227	22,74%
Med	43454	14,48%
Tech	42835	14,28%
Law	34853	11,62%
Phil	28206	9,40%
Lang	24364	8,12%
Comp	15187	5,06%
Land	7544	2,51%
Rel	2478	0,83%
Other	32852	10,95%

When we aggregate the programmes offered at Austrian universities to broad categories, it turns out that over a fifth of the 300,000 beginning students of our observation period decided for business, economics or a similar subject (see table 1). We refer to this

category as “business education”. At the programme level business is highly differentiated. The names of the programmes differ from one university to the other and some universities offer a set of business education programmes. This is quite different from areas like medicine or law, which are highly standardized and named identically at all Austrian universities offering such a programme. So, as far as naming the programmes is concerned, we see product differentiation between Austrian business education programmes.

Seven universities in Austria offered a business education programme during the whole time period of our analysis. Three of them are located in Vienna (University of Vienna, TU Vienna, WU Vienna), the remaining four can be found in Innsbruck, Klagenfurt, Linz and Graz (University). TU Graz began offering a business education programme in 2002 and had only 0.22% of all the students beginning business education. Since this option became available only in the last year of our study period, we exclude TU Graz from the further analysis.

As can be seen from table 2, WU Vienna (The Vienna University of Economics and Business Administration) is by far the largest business education institution in Austria. Aggregated over the 13 years of our observation period, it attracted over 40% of all beginning business education students. Next in importance are the universities in Linz (16.7%) and Graz (12.5%).

Table 2: First year business students by university (1990-2002)

<b>University</b>	<b>No.of stud.</b>	<b>Percent</b>
Uni.Vienna	8168	11,97%
Uni. Graz	8550	12,53%
Innsbruck	7895	11,57%
TU Vienna	1799	2,64%
TU Graz	153	0,22%
WU Vienna	27570	40,41%
Linz	11362	16,65%
Klagenfurt	2730	4,00%

Since we know the home location of all the first year students – and all business education students among them – in our observation period, we can calculate the share of business students entering each of the seven universities for every home location. Home location is reported by “district”<sup>3</sup>.

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<sup>3</sup> There are 100 districts in Austria, the smallest one being “Rust“ with 1714, the largest one being “Vienna” with 1,550,123 inhabitants in 2001.

As it turns out, for most districts there is one university that captures the absolute majority (over 50%) of students. These universities clearly dominate the market for business education in these districts. The districts belong to the “area of market domination” of these universities. When the dominating university captures over 50% of the students, we talk about “strong market domination”, when its share is below 50%, we call that “weak market domination”. Two (University of Vienna and TU Vienna) of the seven universities in our set cannot dominate any one of the districts. They do not have an area of market domination.

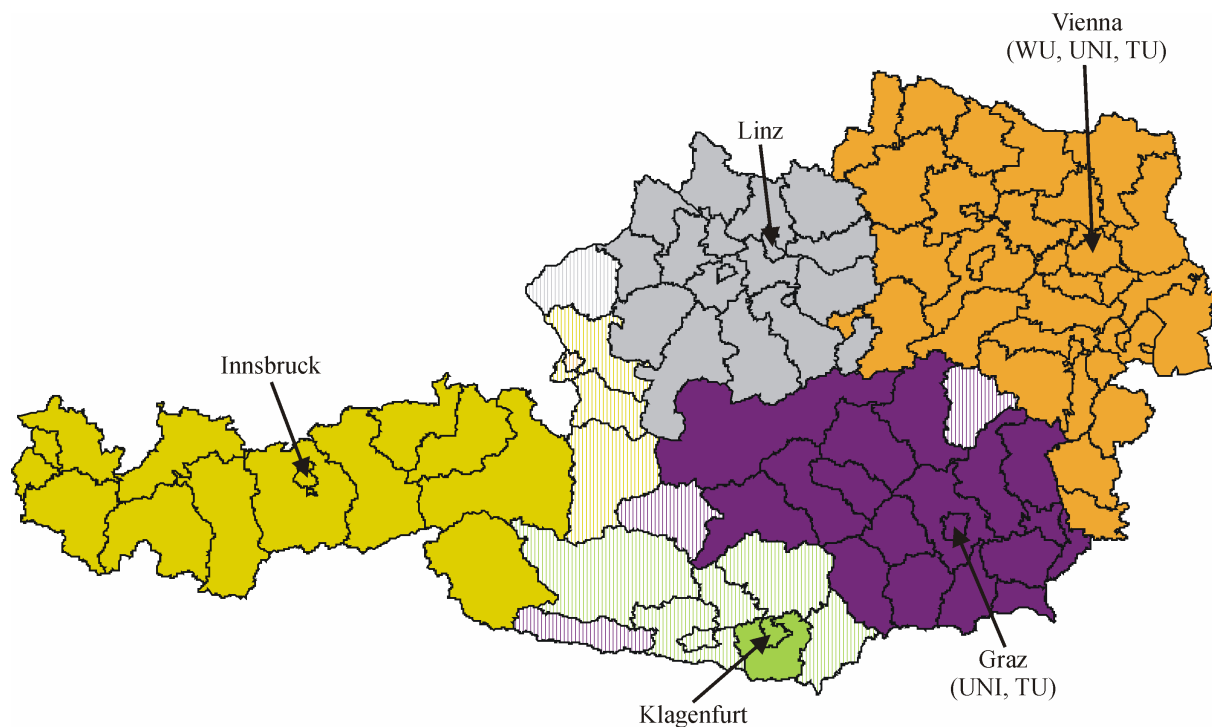
When we map the areas of market domination calculated for the whole period of time, we get a striking picture (see figure 3). The locations of the universities are marked by arrows. Districts where a university captures over 50% of first year business education students are in solid colours. When a university attracts most, but less than 50% of the students from a district, its area is shaded in the same colour.

Each one of the remaining five universities has its own area of strong market domination. It forms a contiguous region around the location of the respective university. For most of them, this area of strong market domination is also the most important source of students. As we can see from table 3, four of the five universities recruit much more than three quarters of their Austrian first year students from this area surrounding their location. Only Klagenfurt has a much lower rate which results from the fact that this university has a small area of strong, but a large area of weak market domination.

Table 3: Percent of first year business students coming from the respective area of strong market domination by university (1990-2002)

<b>University</b>	<b>Percent</b>
Uni. Graz	79.7%
Innsbruck	78.8%
WU Vienna	81.1%
Linz	90.1%
Klagenfurt	41.6%

For three of the universities (Linz, Klagenfurt, Innsbruck) also the area of weak market domination is contiguous around the location of the respective university. Only two districts, “Salzburg Stadt” and “Hermagor” are not contiguous to the area of market domination to which they belong. From “Salzburg Stadt” 34.1% of business education students begin their studies at WU in Vienna, as compared to 26,2% in Innsbruck and 22.4% in Linz. The business education students from “Hermagor” are almost evenly split between Graz (28.9%), WU (27.2%) and Klagenfurt (24.4%).



The weak area of market domination is of overwhelming importance for all universities that can develop such an area. As shown in table 4, the shares of first year students coming from these areas exceeds 80% for all universities. The highest percentage values, i.e. the most localised demand, exist for Linz and Klagenfurt.

Table 4: Percent of first year business students coming from the respective area of weak market domination by university (1990-2002)

<b>University</b>	<b>Percent</b>
Uni. Graz	82.4%
Innsbruck	84.4%
WU Vienna	82.2%
Linz	91.8%
Klagenfurt	87.8%

From the analysis thus far we see clearly separated market areas around the locations of the universities and a significant share of students coming from these areas. This supports the hypothesis that the Austrian university system in business education is characterised by spatial monopolies. However, the analysis of the area of market domination concentrates only on the highest shares of students and ignores the lower shares. This discards part of the information that is available. In the following analysis we will take into account the full set of information.



From the analysis so far we know that for each university the highest shares of students are clustered around the location of the university. At a more general level, the hypothesis of spatial monopolies implies that districts with high student shares will be near other districts with high shares, and those with low student shares will be near ones with low shares. This relationship can be measured by Moran's I (see Anselin, 1988). So, if the hypothesis of spatial monopolies holds, we will see significantly positive values for Moran's I for all universities. In addition, the hypothesis implies that the districts with high shares will be clustered around the location of the respective university.

Table 5 shows the Moran's I statistics for all universities as well as the simulated means and standard deviations based on a random permutation approach (see Anselin 2005). Clearly, all the statistics are positive and highly significant. This again supports the hypothesis at least insofar as spatial clustering is concerned.

Table 5: Moran's I statistics for rates of first year business students by universities (1990-2002)

<b>UNI</b>	<b>Moran's I</b>	<b>Mean</b>	<b>Stddev</b>
Uni Vie	0.77	0,080	0,047
Uni Graz	0.86	0,022	0,080
Innsbruck	0.93	0,004	0,083
TU Vie	0.63	0,013	0,065
WU	0.87	0,024	0,061
Linz	0.89	-0,008	0,058
Klagenfurt	0.86	-0,006	0,068

To verify that the markets are centred at the location of the respective university location, we compute local Moran statistics and map the significant values (see figure 4).

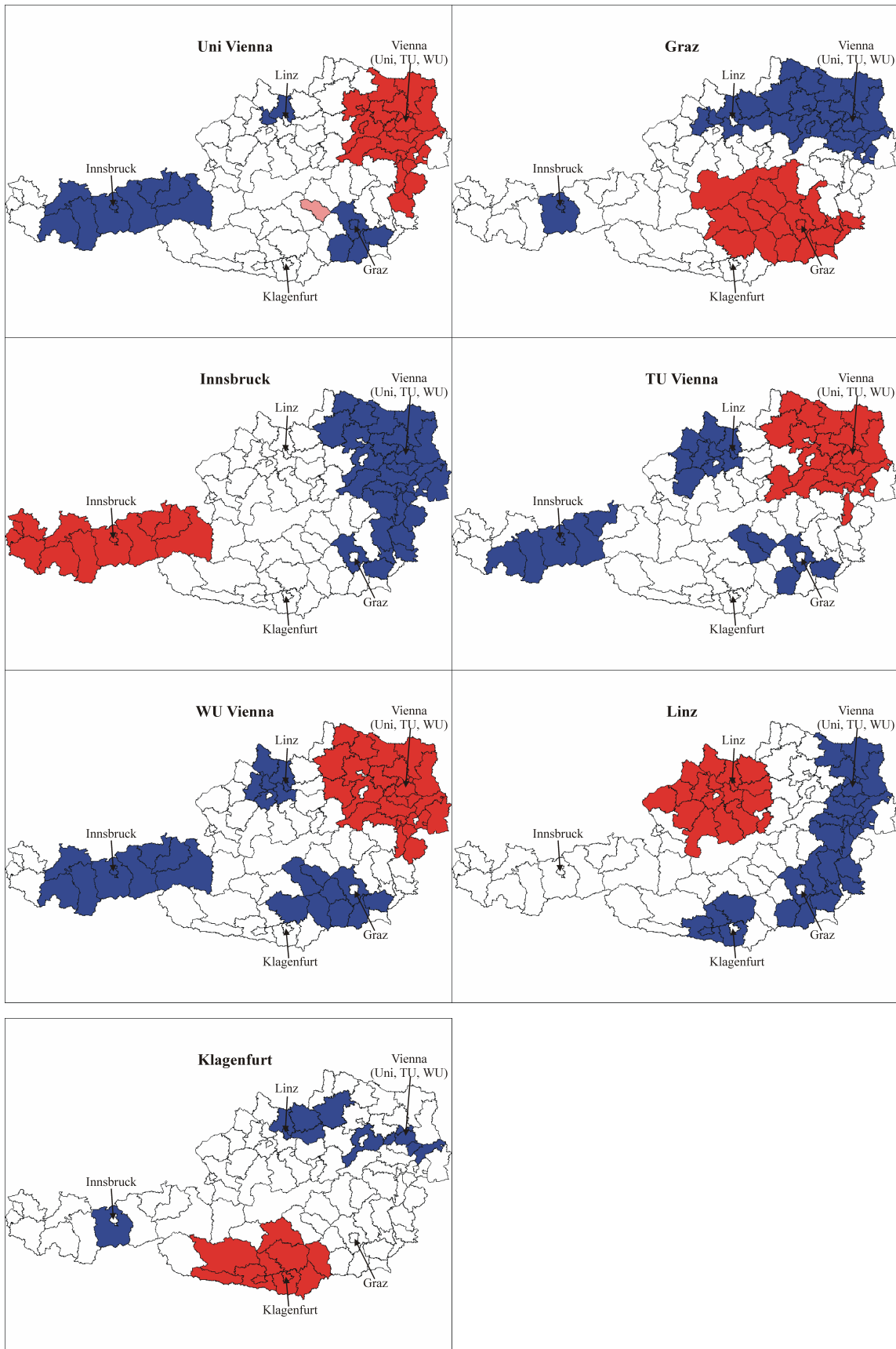


Figure 4: Clusters of significantly high (red) and low (blue) local Moran statistics

As we can see from these maps, for all universities the clusters of high local Moran statistics (meaning high shares of students in the district and in the neighbouring districts) are indeed centred at the location of the respective university. Moreover, the clusters of low values (meaning low shares in the district and in the neighbouring districts) are typically centred at the locations of the competing universities. Only Klagenfurt is somewhat an exception as on the one hand it does not develop a cluster of low values in most cases, and on the other generates rather small clusters of low levels at its competitors' locations (and none at all in and around Graz). Klagenfurt, it seems, is a relatively weak competitor for business education students in Austria.

The analysis of the full range of student shares supports the results of the previous analysis of areas of market domination: in business education we see highly concentrated spatial markets for those Austrian universities that offer such programmes.

In the introduction we have mentioned the fundamental transitions in the European higher education system in general and the Austrian one in particular. This raises the question, whether due to these changes or their anticipation, the competitive position of Austrian universities has changed over the observation period. To check for this, we could repeat the analysis for each year of observation and check whether there are any significant changes over time. However, it is difficult to find significant changes in maps and Moran statistics. Therefore, we focus directly on the students' decision making for this step of the analysis.

The arguments put forward in section 2 above, provide the basis for this step of the analysis. There, we have argued that students decide between universities based on expected costs and benefits, where the latter are closely related to the reputation of the respective university. In the available dataset, we can identify the students' home location, their chosen university and field of study. Since we only look at business education, the latter category is irrelevant for the decision between the universities.

We model the decision of students between universities as a logit model with students as decision makers, universities as alternatives, and the following explanatory variables:

- $D_u$  ... a vector of alternative (i.e., university) specific dummy variables with WU as the baseline alternative;
- $Dist_{ru}$  and  $Dist2_{ru}$  ... distance and distance squared between the student's home and university location;
- $Dom_{ru}$  ... a dummy variable which is 1 when the student's home location is in the area of strong market domination of the respective university (except WU).

The alternative specific dummy variables capture all university-location specific aspects of the decision. These are factors like the general reputation of the university, but also price level and quality of life of the respective city. The parameter values need to be interpreted relative to WU, our baseline alternative. With the distance variable we capture travel costs between home and university, but also factors like the need for accommodation at the university location and the associated costs that increase with distance, and a possible systematic decline of reputation of more distant universities. Because of this multitude of factors, we do not assume a linear relationship, but allow for a quadratic one by use of *Dist2*. The variable *Dom* is intended to capture any effect of the area of market domination in addition to the influence of distance. Since almost all districts belong to the area of strong market domination of one of the universities, we had to exclude one of the universities in order to guarantee convergence of the estimation procedure. If the hypothesis of a spatial monopoly structure holds, this variable will have to show a significantly positive parameter.

The alternative specific dummy variables also serve another purpose. From table 2 we know that the largest share of business education students chose WU. This can be the result of a high reputation of this university as compared to others (reputation effect), but could also result from the fact that WU is located in the population centre of Austria so that many students choose this university because it is nearby (location effect). The dummy variables in the logit model only measure the reputation effect, and thus allow us to separate it from the location effect.

The results of the estimation for all thirteen years are shown in table 6. All parameters are highly significant for all years. From the corrected rho-square value, which is calculated relative to the model with all parameter values equal to zero, we see that the model explains the decision of the students quite well.

Table 6: Estimation results of logit-model

	1990	1991	1992	1993	1994	1995	1996
D(Uni- Vienna)	-2,07	-1,39	-1,46	-1,02	-0,98	-0,99	-0,76
D(Klagenfurt)	-4,06	-3,37	-4,27	-4,03	-4,14	-4,17	-3,82
D(TU- Vienna)	-2,71	-2,76	-2,84	-2,88	-2,82	-3,07	-2,84
D(Graz)	-2,17	-1,77	-2,08	-1,85	-2,01	-2,08	-1,95
D(Innsbruck)	-1,77	-1,23	-1,41	-1,17	-1,24	-1,42	-1,54
D(Linz)	-2,51	-2,29	-2,37	-2,04	-2,40	-2,53	-2,24
DIST(*100)	-3,03	-2,72	-3,25	-3,32	-3,28	-3,26	-3,22
DIST2(*100000)	4,22	3,80	4,60	4,75	4,73	4,54	4,24
REG	1,07	1,28	1,12	0,77	0,99	0,98	0,89
Corr. rho-square	0,61	0,57	0,6	0,57	0,56	0,56	0,56

	1997	1998	1999	2000	2001	2002
D(Uni- Vienna)	-0,95	-1,16	-1,18	-1,01	-1,11	-2,17
D(Klagenfurt)	-4,06	-3,77	-3,97	-3,95	-4,22	-3,91
D(TU-Vienna)	-2,84	-2,79	-2,44	-2,16	-2,54	-3,37
D(Graz)	-2,06	-2,23	-2,15	-2,01	-2,27	-2,33
D(Innsbruck)	-1,44	-1,41	-1,62	-1,59	-1,81	-1,90
D(Linz)	-2,39	-2,75	-2,75	-2,64	-2,98	-2,96
DIST(*100)	-3,19	-3,20	-3,37	-3,15	-3,30	-2,96
DIST2(*100000)	4,34	4,52	4,70	4,33	4,34	3,98
REG	1,02	1,08	1,01	0,90	0,68	0,83
Corr. rho-square	0,56	0,56	0,57	0,52	0,52	0,61

Since we ran separate estimations for each year, the parameter estimates cannot be compared directly from one year to the other (Ben-Akiva, Lerman, 1985, Maier, Weiss, 1990). Moreover, the parameters of the alternative specific constants can only be compared relative to the baseline.

Nevertheless, our estimations give a number of interesting results:

- Since all the parameters are highly significant, we can statistically confirm all three effects: a reputation effect, a distance effect, and a market domination effect. Likelihood ratio tests with constrained versions of the model show that the market domination effect contributes least to the full model. Distance effect and reputation effect are both extremely important for explaining the process. When we compare the two, it turns out that constraining the reputation effect reduces the explanatory power of the model more than constraining the distance effect.
- Since all alternative specific constants are significantly negative for all years, we can confirm a reputation effect as compared to the location affect, and conclude that the reputation of WU, our baseline alternative, exceeds that of all its competitors over the whole observation period. Figure 5 shows the estimated reputation of the universities relative to that of WU. Although some universities (Uni-Vienna and Innsbruck; TU-Vienna and Linz) trade places for some years, the ranking is quite stable and identical in the first and in the last year of the observation period. While WU clearly has the highest level of reputation in all years, Klagenfurt clearly has the lowest.
- Since none of the signs changes from one year to the other and none of the parameters becomes insignificant, we can conclude that qualitatively the results do not change over the observation period.
- As far as the distance effect is concerned, we find a negative coefficient for *Dist* and a positive one for *Dist2* for all years. This implies a strong distance decay close to the

university location that levels off at larger distances (see figure 6). The minimum of this quadratic function is between 347 and 380 kilometres. The maximum distance possible between a district and a university location is 523.5 kilometres.

- As far as the market domination effect is concerned, it applies only to the universities outside Vienna (Uni-Vienna and TU-Vienna do not have an area of market domination, WU-Vienna is excluded from this dummy variable). For them, the market domination effect compensates the reputation effect as compared to WU within their area of market domination. This compensation, however, is only partially. For none of the universities the parameter value of the market domination effect exceeds the absolute value of the respective negative reputation effect at any year. So, even within their areas of market domination these universities do not reach WU's level of reputation.

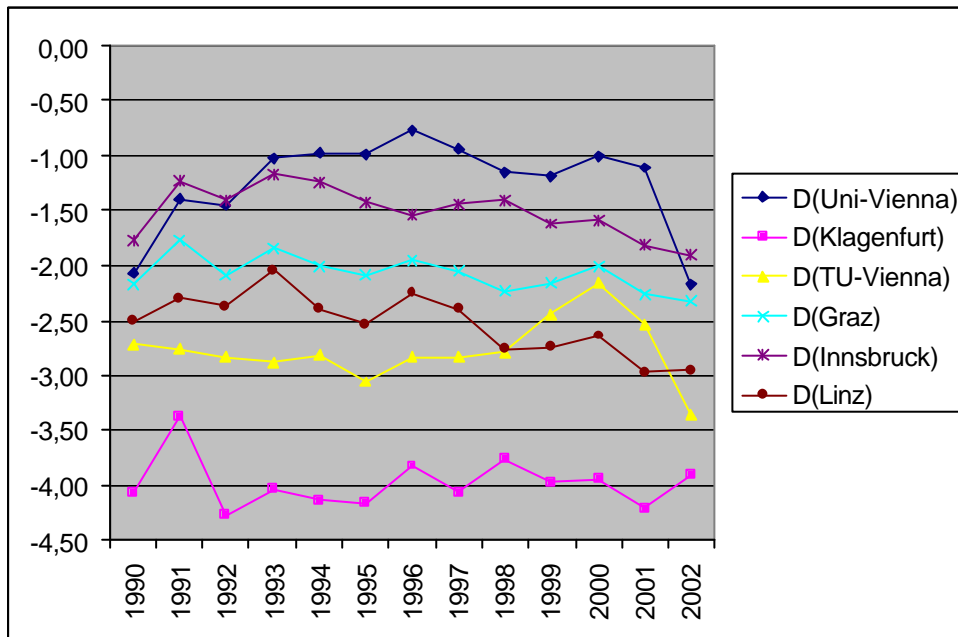


Figure 5: Estimated reputation of universities

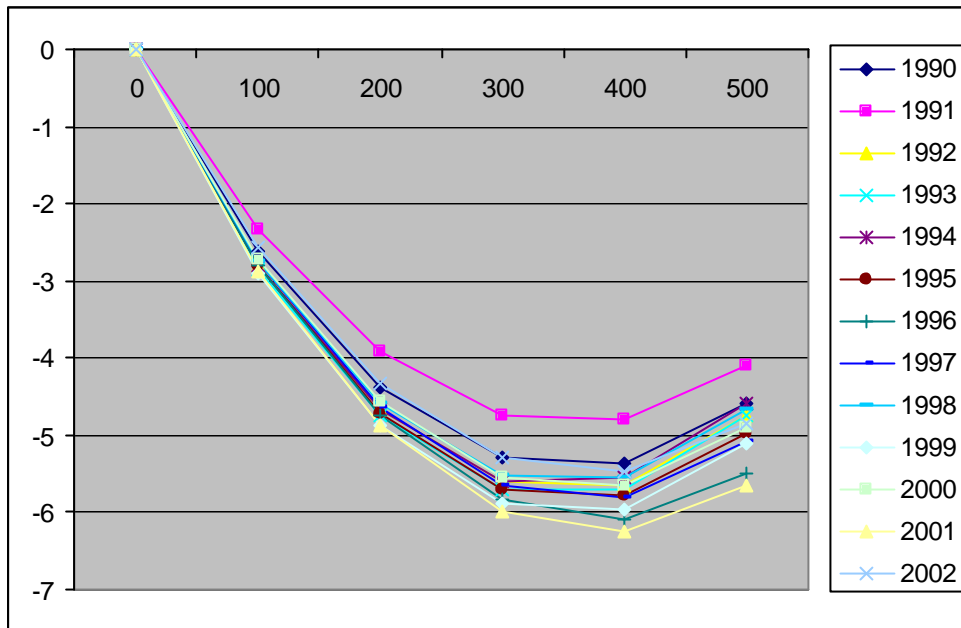


Figure 6: Estimated distance decay of university choice

As far as the basic research question is concerned, the logit model yields support for both, spatial monopoly structure and market differentiation. The significant market domination effect and the distance effect support the hypothesis of a strong spatial component and of a captive student market around the university location. This result confirms the results of the earlier analyses. The significant and fairly important reputation effect, however, shows that there is also substantial differentiation between the universities competing for business students.

The analysis does not show any pronounced changes over time. From the analysis we do not see any indications for a transition from spatial monopoly to product differentiation or vice versa. The structure remains fairly stable over time and particularly when we compare the first and the last year of our observation period, we can see no significant differences. This is a little surprising in so far as some fundamental changes have occurred in the Austrian university system during this period or at least it became apparent that they will occur in the immediate future. Our results show that the market structure has not reacted to these changes or anticipated them.

## 5. Summary and conclusions

In this paper we have analysed the question, whether universities in Austria act like spatial monopolists or like product differentiating suppliers in their competition for students. We analysed this question for the area of business education, because on the one hand it is the

most important one in Austria and on the other is not structured by external regulations and therefore provides opportunities for product differentiation.

The analysis starts from the hypothesis that for historical institutional reasons competition between Austrian universities is limited, which lets us expect spatial monopolies, but that because of the substantial pressures resulting from changes in Austria and in the European Union, there should be a transition toward more direct competition and toward product differentiation, as it has occurred in the USA over the last half century.

The empirical results provide evidence for spatial monopolies. Most universities offering business education have developed a sizeable area around their location, which they dominate. For these areas, the respective university is the most important provider of business education. At the same time, these areas are most important source of students for most of the universities. This perception is also supported by an analysis of spatial clustering using spatial statistics methods.

While the results at the aggregate level only support the hypothesis of spatial monopolies, an analysis based on students' decisions gives more diverse results. On the one hand it does not contradict the hypothesis of spatial monopolies, but on the other hand provides strong evidence for substantial differences in reputation between the universities, indicating that they offer differentiated products. So, based on these results, we may say that while the Austrian university system is dominated by spatial monopolies, there is also substantial direct competition through product differentiation.

The one thing, for which we could not find empirical evidence, is the expected change over time. Over the thirteen year period of our analysis, the structure remained fairly stable. In particular, there is no indication of any trend in one direction or the other. This could result from the fact that the most fundamental changes have occurred after the end of our observation period (although they could have been anticipated). Therefore, it will be interesting to repeat this analysis in a few years to see whether the expected changes have occurred once the structural changes were implemented.

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