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UNIVERSITIES IN THE REGIONAL ECONOMY. EVIDENCE FROM SWEDISH EMPLOYER-EMPLOYEE LINKED DATA

by

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Universities in the regional economy. Evidence from Swedish employer-employee linked data

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Abstract
This study uses employer-employee linked data on all Swedish firms to analyze the impact of a college on the local economy. It focuses on colleges established in the 1970s and measures the effects 20 years after the establishment. The results show that there are no significant effects on survival rate of establishments, overall employment growth, overall growth of college graduates or employment growth in OECD defined high-tech industries. The results do not support the political motives behind the establishment and they reject the hypothesis of large regional spillovers from a college. But it is also possible that it takes more than 20 years before a university has a significant impact on regional development.

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1. Introduction

Human capital is considered as an important determinant of long-term economic growth.[1] The new growth theory shows that education affects growth through greater innovation and adoption of new technologies.[2] Particularly, firms located close to a university get access to new knowledge and information from education, teachers and researchers, and these spillovers affect firms ability to grow. A region with a university and a high concentration of firms of a certain scale can even generate growth by themselves (Krugman, 1991). University education is also considered a key variable in the Lisbon strategy adopted by EU-countries to make EU the most competitive economy in the world. Obviously, it is important to evaluate the effects of investments in higher education. Sweden ranks among the top-three OECD-countries spending most on higher education.

In this paper we analyze whether there is a relationship between universities and regional economic performances in Sweden. In contrast to previous studies we use administrative employer-employee linked data consisting of all establishments in Sweden, which are followed until 1995. Moreover, we exploit four different outcome measures and compare regions that got a college in the 1970s with regions without colleges. Further, we investigate whether the results are sensitive to choice of comparison group. This strategy allows us to evaluate one important goal of the decentralization strategy of higher education in Sweden, namely that a university should affect regional employment and economic growth. Furthermore, the empirical models include control variables which correlate with the selection of college regions.

Most studies of the regional economic impact of a college use data from the US.[3] These data have either been aggregated along some regional dimension or collected

[1] See e g Aghion and Howitt (1998), Barro and Sala i Martin (1995) and Topel (1999) for discussions of the relationship between education and growth.
[2] See Romer (1986, 1990) for theoretical presentations of the endogenous growth theory.
[3] Examples of studies from other countries are, Florax (1992) who analysis Dutch data and Andersson, Quigley and Wilhelmsson (2004) who analyze Swedish data.

through surveys, sometimes of one particular region.[4] There are results supporting the idea of colleges as regional boosters as well as results showing no significant effects of a college (Anselin et al., 1997). There are various explanations to this pattern, and one is that the analyses have been based on inappropriate data.

The results in this study show that survival rate of new firms, regional employment rate or employment growth among university graduates do not vary significantly between regions with colleges[5] that were established in the 1970s and other regions. The results do not vary much between different college regions and neither are the results sensitive to choice of comparison groups. Our data are collected from administrative records kept by Statistics Sweden and we have detailed information on all establishments in a region. Therefore the results cannot be due to measurement or aggregation errors. The results suggest that the regional economic impact of a college might be minor. Since the last outcome year is 1995, the results also suggest that it takes at least 20 years before a college might have an impact at least on the outcome measures used in this study.

The paper is organized as follows. Section 2 gives a brief institutional background. Section 3 discusses the empirical strategy and some empirical problems. Section 4 presents the data and Section 5 the descriptive statistics. Section 6 presents the empirical results. Section 7 concludes the paper.

2. Institutional background

Before 1965, there were only four universities in Sweden providing higher education within most academic fields.[6] In the 1960s, there was a rapid increase in the number of students at the universities, especially at the Faculty of Arts and Social Sciences. To meet the increased demand for higher education, the government decided, among others, to

[4] See e.g. Varga (1998) and Anselin, Varga and Acs (1997) for overviews of studies.
[5] University and college are used interchangeably throughout this paper. In Sweden, a university provides doctoral education in all academic fields, while colleges do not. There are a few semi-private colleges but they receive grants from the government, and must follow, *e.g.* stipulated rules for admission.
[6] Lund, Göteborg, Stockholm and Uppsala universities. There were also three specialized institutions; Chalmers University of Technology, Royal Institute of Technology and Stockholm School of Economics.

establish new colleges.[7] At the introductory stage, new colleges provided mainly first-year education in some of the subjects at the Faculty of Arts and Social Sciences.[8] The colleges started to provide second- and third-year education at the time they were formally established.

In 1977, 12 new colleges[9] were established and located to parts of the country with limited traditions of higher education. Three new universities were established in the 1980s, and additional three in the 1990s.[10] In 2000 there were 50 institutions for higher education in Sweden located at different parts of the country.[11]

Various factors influenced the decision to establish new colleges.[12] One was that the traditional universities, because of capacity constraints, could not accept more students. Another argument was that the new colleges would attract students with weak parental background. This argument was based on the assumption that distance to college had a negative impact on the probability to enrol in college education especially for students with a weak parental background. Yet another argument was that a college would have a positive impact on regional employment and economic growth. This role of a college has been reinforced during the 1990s, and nowadays universities are seen as "engines of growth" (Ministry of Industry, Ds 2000:7).

The analyses in this paper focus on colleges established in 1977. The Swedish decentralization strategy started with these colleges and the political purposes with them were the same. Although these colleges have their specialities they provide education within the same broad range of fields. During the 1990s some of them became universities, which means that they also provide postgraduate education within many

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[7] Umeå university was established in 1965, Luleå Institute of Technology in 1970 and Linköping University in 1975.

[8] Linköping, Växjö, Örebro and Karlstad Universities began providing education in the 1960s but were formally established in the 1970s. In 1999, Växjö, Örebro and Karlstad became universities.

[9] Borås, Falun/Borlänge, Gävle/Sandviken, Kalmar, Karlstad, Kristianstad, Växjö, Örebro, Östersund Eskilstuna/Västerås, Sundsvall/Härnösand and Jönköping.

[10] Halmstad, Karlskrona/Ronnerby and Skövde in the 1980s, Trollhättan/Uddevalla, Malmö, Södertörn and Gotland in the 1990s. Mitthögskolan, Mälardalen and Dalarna were also established in the 1990s, but they are mainly mergers of universities established in the 1970s and 1990s. In the 1990s, some universities for health sciences have been incorporated into the state-run universities.

[11] This number includes also universities of health sciences, technology, teaching, art and theology.

fields. Further, these colleges have had the time to establish themselves and become an important part of the regional economy.

3. Empirical considerations

3.1 Survival rate

If a firm survives for only a short period of time the firm will probably have a small impact on regional economic development. Therefore, we start by investigating whether there are regional differences in firms survival rate in a medium and long run perspective. Particularly, we estimate the probability of a firm exiting, using a sequential logit model (Maddala, 1983). The model is defined as follows[13]

$$Ln[prob(closed\ year\ 1\text{-}4)/prob(survived\ year\ 4)] = X_j' \beta_1 + \alpha_2 D,$$
$$Ln[prob(closed\ year\ 5\text{-}7)/prob(survived\ year\ 7)] = X_j' \beta_2 + \alpha_2 D. \quad (3)$$

where X_j' is a vector of firm specific characteristics and D are the dummy variables for colleges. The values of the variables denote the values from the time when the establishment enters the market. β_i is a column vector of coefficients and α_2 the impact of a college on the likelihood of establishments to exit the market, which is the parameter of interest. The coefficients β_1 are estimated from the entire sample by dividing the sample into two groups: establishments that exited after 1-4 years and establishments that survived more than 4 years. The coefficients β_2 are estimated from the sub sample of establishments that have survived for at least 5 years by dividing this

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[12] See Wikhall (2001) for an overview of the arguments behind the Swedish decentralization strategy.
[13] The sequential model assumes that the probability of the choice at each stage is independent of the probability of choices at other stages. That is, we assume that entrepreneurs do not have perfect foresight and that the number of years an establishment will survive depends on different factors. If new establishments decide their year of exit when they enter the market, and keep to their plans, the sequential model is not appropriate.

sub sample into two groups: establishments that exited after 5-7 years and establishments that have survived the whole period.

3.2 Employment growth

A firm must both survive and hire people to have an impact on regional employment rates, suggesting that it is important to analyze employment growth as well. In the second analysis of the impact of a college on regional economic performance we use employment growth in existing establishments and in new establishments that have survived for at least 7 years as the outcome measure. The analysis is based on the following OLS-model

$$Y_j = \beta X_j + \alpha_3 D + \varepsilon_j \qquad (4)$$

where Y_j is average employment growth in establishment j defined as

$$Y_j = [ln(size_{t+7}) - ln(size_j)] \; / \; 7$$

t is equal to 1987 for all continuing establishments, and equal to 1987 or 1988 for all new establishments. X_j is a vector of characteristics of establishment j, D is a vector of dummy variables for colleges and ε_j is a random error.

3.3 Knowledge intensive industries

This and the following analyses focus on college "specific" spillovers, which are related to the production of college education. Students who graduate from a college might stay and start to work in local high-tech firms. Firms might also choose to locate part of their research and high-tech production near a college with educations that fit the profiles of the firms. Therefore, it is possible that we see a local employment effects in high-tech

firms. This is also a motive behind the establishment of new colleges. We exploit two outcome measures within in the same empirical framework as in previous section. The first measure of knowledge intensive industries includes industries with the highest shares of university educated employees. The selected industries are; computer consulting and computer service agencies, education, research and development, health services, and childcare. We use this broad measure since it relates to an important political motive behind the new colleges, namely to increase the local supply of college graduates in general.

The second measure includes only industries that are defined as high-tech industries according to the OECD standard. This measure includes electrical machinery and optical goods, computer consulting and computer service agencies, research and development, and education. Since our data are aggregated over some industries we cannot identify all industries defined as high-tech by the OECD. But our measure includes those industries that we can truly identify as high-tech, providing a pure measure of high-tech industries. Our measure does not include the pharmaceutical industry, which in our data is included in the chemical industry. The chemical industry as a whole is not defined as high-tech industry by the OECD.

3.4 A qualified work force – the share of highly educated

A clear and visible mechanism creating spillovers is the hiring of local university graduates whose education is assumed to embody some of the university research. Therefore, our final outcome measure is the growth of college graduates in regional firms over the period 1986-1995. Since the dependent variable contains a lot of zeros – many establishments have no university educated employees the first year, the last year, or both years – we use a more unconventional growth measure. We estimate the employment growth as

$$Y_k = (size_{t+7} - size_t)/[\,(size_{t+7} + size_t)/2]$$

This measure is symmetrical about 0 and restricted to finite values. If an establishment changes from 0 to a positive number of university educated employees, the rate corresponds to +2, and if the establishment changes from a positive number to 0, the corresponding value is -2.[14] Thus, employment growth among college graduates is distributed around three values, -2, 0 and +2, creating a distribution with three peaks. Therefore, we sort the data into three groups and estimate the relationship between the college and regional growth of college graduates, using the ordered probit model (*e.g.* Greene, 2000).

$$Ln\ (y_j)=\alpha_k+X'\beta_1+D\beta_2 \qquad (5)$$

In equation 5 the probability of having low, medium or high employment growth of high-skilled employees in the firm depends on *X*, a vector of characteristics of establishment *j* and *D* which includes the dummy variables for universities. *X* also includes a set of regional controls. There is one intercept, α_k for each outcome *k*. β_2 is the parameter of interest, showing whether the likelihood of high-skilled employment growth varies between universities.

3.5 Selection issues

One general problem with analyses of the impact of a college is that the geographical choice is not random. Instead various factors influence the decision to establish a university in a particular area. These factors might be related to the outcome measures used to capture the impact of a college on regional economic performances. For example, if a new college is located to a region with high potential or actual growth, the observed changes in the local economy might be due to other factors than the college. Previous studies have not addressed this problem.

[14] Davis, Haltiwanger and Shuh (1996).

One way of addressing the problem is to construct comparison groups consisting of regions that do not have a college but are identical to the college regions in the development of the outcome measure prior to the establishment of the colleges. Differences in outcome measures can then be linked to the college. However, even if it is possible to identify regions that are similar with respect to observed factors there might be some observed factors that affect the observed outcomes. Neither has this problem been discussed in previous studies. Generally, it is difficult to address the problem. But if different comparison groups lead to similar conclusions then the selection problem might not be severe. Therefore we use different comparison groups to investigate whether the problem is important.

Another way of addressing the problem is to add to the equations data on factors that may have affected the decision to locate a college to a specific region. We use this approach as well. In Sweden, there were three important political arguments behind the establishment of new universities (e.g. Wikhall, 2001; Kjellström and Regnér, 1999). One argument was that the old universities, because of capacity constraints, could not accept more students. A second argument was that a university located near a city that is within daily travelling distance for many persons could attract new groups of students. In particular, it was argued that the decentralization of university education would affect the enrolment decisions of students with a weak parental educational background. Another argument was that a university could affect regional development.

A problem in constructing indicators of potential selection variables is that not all data in Sweden can be broken down on regions in particular prior to 1980. This concerns for example unemployment and employment where there are accurate regional data from 1985. However, Statistics Sweden has published data on net migration and income tax revenues ever since the 1960s. The variables capture important aspects of the regions and are related to the political arguments behind the establishment of new universities. These variables also capture differences in regional economic performances, which may have affected the political decision to locate a university to a particular

region. For example, by establish a university in a region suffering from migration, people may decide to stay and enrol into high education at the local college.

It is also possible that the political majority in the region affected the decision at the central level about college location. It is probably easier to influence decisions at the central level when the majority at the local level is the same as that at the central level. An indicator of regional political majority is included as a control for selection of college regions.

Appendix presents data on regional net migration as percentage of the population in the region, regional income tax revenues in relation to country averages and political majority. Table A1 shows that there are no clear patterns in tax revenues among the counties where a college was established in 1977. Tax revenues were higher in some new college regions compared to the country average in the period 1968-1972 but lower in others. In the period 1973-1977 only two college regions (Västerås and Karlstad) had revenues above the country average. Neither is there a clear pattern in net migration in the regions that got a college in 1977. The largest changes prior to 1977 occurred in regions without colleges.[15]

Table A2 in appendix shows the local political majority and the majority in the parliament. The bold names are the regions that got a college in 1977. Columns defined as right and left show the percentage votes that the right and left wing parties got in three elections prior to the establishment of colleges and one after the establishment. Left wing parties held the majority in the parliament in 1970 while parties to the right were in majority in 1973 and 1976. The political majority in the region that got a college in 1977 differs in many cases from that at the central level in all years prior to the establishment of the college, i.e. during the period when the decisions were made. Again, there is no clear pattern in the data.

[15] There is a rather high correlation between net migration and income taxes during the period 1968-1970 but not during the period 1971-1982. The correlation coefficient is between 0.70-0.52 in the former period and 0.32-0.03 in the latter period.

4. The data

We use employer—employee linked data to analyze the regional effects of a university. The data contain detailed information on all establishments in a region.[16] Data have been constructed from registers kept by Statistics Sweden and consists of establishments that either existed during the whole period 1985-1995, or were created in 1987 and 1988.[17] We follow all establishments from 1987 or 1988. Those who already existed in 1985 are followed from 1987. Establishments are followed up to 1995.[18]

The identity variable in the data set is the establishment. There is information about number of employees, the region, industry, type of ownership (private or public), and whether or not the establishment is part of a multi-unit firm. The employees at each establishment are divided into four educational groups based on the level of education attained. New establishments are classified according to their status as genuinely new, new as the result of a merger, or new due to dispersal. Information is also provided on the year of exit if this occurs before 1995.

A problem that generally arises when administrative data is used, concerns distinguishing the births and deaths of establishments on the one hand, from changes in the organizational structure, ownership or administrative identifiers on the other. This can yield spuriously large job flows, especially in the form of "false" entries and exits. To create high-quality data for identifying the births and deaths of establishments, a demographic method has been used in compiling the data set.[19]

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[16] The construction industry, which amounts to around 6 per cent of total employment, is excluded. The reason for this is that establishments in the construction industry are mobile and connected to building sites, which makes it difficult to define new or exiting establishments in an accurate or meaningful way.

[17] An establishment is defined as an address (not a household address), a building or group of adjacent buildings where a firm or an authority operates. The activities of a firm or authority are assigned to the location from which the work is administered when it is a question of a mobile activity (for example home-help services), or of a succession of temporary work sites, or of a work spread over a large area, or if the work consists of renting out premises or apartments. If the firm or the authority has one establishment only, that establishment is taken as synonymous with the firm or the authority.

[18] See Persson (1999) for a thorough description of the data.

[19] When creating this new data set, around 13 per cent of the new establishments turned out to be "false", that is they arose from administrative changes and not from the creation or destruction of establishments.

To examine the effect of a university on the local business structure and the level of education we analyze the regions were new universities were established in 1977. For comparison reasons we need to follow changes in other regions as well. We therefore include Lund and Uppsala as representatives of old universities. Nine regions were chosen as comparison regions with no university. Örnsköldsvik, Skellefteå and Piteå are merged into region "north", Norrköping, Lidköping and Södertälje constitute the region in the "middle", and Helsingborg, Hässleholm and Oskarshamn the "south".

5. Descriptive statistics

An underlying assumption in the new growth theory is that fractions of universities contribution to innovation trough spillovers is captured locally as new companies. Figure 5.1 shows the number of new establishments in relation to incumbent establishments across different regions. The highest amounts of new establishments are created in the regions with old universities. Lund has the highest share of new establishments. Out of every hundred existing establishments, there are 36 new establishments created. The new university region Kristianstad has the lowest figure. For every hundred establishments, 16.4 new ones are created, which is less than half the rate of Lund.

A direct expected effect is that a college produces research and labour with specific skills which in turns attracts skill-intensive firms. Therefore, it is interesting to investigate the regional pattern in skill intensive industries. Figure 5.2 presents the share of new establishments in skill intensive industries, using our broader definition of knowledge intensive industries. Again, Lund has the highest share of skill-intensive establishments, where every fifth new establishments is in skill intensive industries The new university region Kristianstad has the lowest share, only 1.6 per cent of the new establishments was created in skill intensive industries.

<FIGURES 5.1 and 5.2 about here>

An establishment's regional effect will also depend on its survival. Table 5.1 shows the number and rates of new establishments that survive and the number and rates of people employed by those establishments during the years subsequent to entry. Between 25 and 40 per cent of those that were new in 1987 still remained in 1995. Although the survivors tend to grow, the decline in employment due to closing establishments is higher than the growth of surviving establishments in the same cohort. As in the case of number of new establishments, Lund has the highest rate of surviving establishments, and the highest rate of employed at those same establishments. After 8 years, four out of ten establishments were still in business. The new university regions Karlstad and Kalmar have the lowest rates.

<TABLE 5.1 about here>

In Table 5.2 we look at the employment growth in incumbent establishments, that existed during the whole period. Between 1987 and 1995 overall employment declined by 12 per cent in existing establishments. The smallest percentage decline occurred in the new university region Örebro, while the largest decline took place in the new university region Eskilstuna/Västerås. Both the decline the old university regions and the non-university regions were in between Örebro and Eskilstuna/Västerås.

<TABLE 5.2 about here>

Table 5.3 shows the employment growth in continuing knowledge intensive establishments, using our broad definition. Contrary to total employment, which has decreased with 12 per cent at continuing establishments, the employment has increased with 7.4 per cent in skill intensive industries. However, in Eskilstuna/Västerås, Uppsala and the north non-university region, it has actually declined. The highest growth occurred in the new university regions Gävle/Sandviken and Östersund, which are both located in the northern part.

<TABLE 5.3 about here>

Another way to look at aspects of production of knowledge is to study employment of people with a university education. Table 5.4 presents the share of the work force with a university education among continuing establishments. For the whole country, the educational level of the work force has increased a lot from 1987 to 1995. The share with university education has increased from 21.0 per cent 1987 to 29.5 per cent 1995. The increase is somewhat larger for those with a shorter university education, than for whose with a university education of at least 3 years.

<TABLE 5.4 about here>

The educational level increased in all regions, except for the southern non-university regions, where the share with a university degree was almost the same 1995 as it was 1987. Both in 1987 and 1995 the non-university regions are in the lower end of the distribution of highly educated shares. The old university regions have the incomparably highest shares of university educated in both years. Around 30 per cent of the workforce had a university education in 1987. In 1995 the share had increased to about 40 per cent.

6. Empirical findings

The results presented in this section have been obtained from models that control for establishment size, establishment size square, a dummy variable which is one if the establishment is part of a multi-unit firm, a dummy variable which is one if the establishment is new due to mergers or dispersals, and 16 industry dummies. The models also include regional income taxes[20] and political majority prior to the establishment of the colleges in 1977. These variables are assumed to capture the selection of college

[20]We also tried to include a control for regional net migration, but the parameter estimates became too extreme.

regions. The tables report results using three different comparison groups (non-college south region, non-college middle region and non-college north region). New college regions refer to regions in which a college was established in the 1970s.

6.1 Survival rate

Table 6.1 presents the estimated probabilities of exiting for new establishments created in 1987 and 1988. Odds ratios above one suggest higher likelihoods to exit (or less likelihood to survive) while odds ratios below one suggest lower likelihoods to exit. For example, the result for the variable completely new shows that new establishments, which are not new due to mergers or dispersals, have a higher likelihood to exit or a significantly lower probability to survive than older establishments. Even when the establishments have been active for seven years or more (long run) the survival rate of new establishments is lower. We can also see that large establishments are more likely to survive (size) than small establishments and that there are significant differences between industries. There are also some differences between the medium (establishments have existed for at least four years) and long run effects. For example, establishments in the hotel and restaurant industry are less likely to survive in the medium run than establishments in manufacturing but there are no significant differences in the long run. Establishments in the service, education and R & D, as well as financing and insurance are more likely to survive in the medium run as well as in the long run perspective than establishments in mining and manufacturing. Obviously, these regional industry dummies capture important differences in business climate among college regions and between college regions and comparison regions.

<TABLE 6.1 about here>

Turning to the odds ratios of the dummies for university regions we see that most of them are not significant at the usual level. In the long run perspective only

establishments in one region that got a college in the 1970s (Sundsvall/Härnösund) and the old regions (Lund and Uppsala) are more likely to survive than establishments in regions in the southern part of the country that do not have a college. But the results are different when we compare with regions in the middle part of the country. Now firms in the new college regions Borås, Jönköping, Kristianstad and Östersund are more likely to survive, and the odds ratio for the old college region Uppsala is no longer significant. All college regions, except Kristianstad, do worse than non-college regions in the northern-part of the country. Obviously, the results are sensitive for choice of comparison group.

In all, the results show that establishments in new college regions as well as in old college regions do not survive to a greater extent than establishments in non-college regions neither in the medium run perspective nor in the long run perspective. Actually, compared with non-college regions from the northern part of the country establishments in college regions are less likely to survive. These results suggest that a college on its own may have only a small impact on regional economic performance.

6.2 Employment growth

Table 6.2 reports coefficients from OLS-regressions of university on establishment level regional employment growth (among both skilled and unskilled labour). The first column reports results which have been obtained using all non-college regions as a comparison group. The other columns reports results from comparisons of university regions with regions without colleges in the south, middle and northern part of the country. The analyses are based on firms that have been active over the whole period 1987-1995.

<TABLE 6.2 about here>

The results in column one shows that employment growth in college regions is not significantly different from that of non-college regions. There are significant differences

between two university regions and non-college regions, but the results suggest that the employment growth is lower in these university regions. The estimates also show that the old university regions do not perform better in terms of employment growth than non-college regions. The results are not sensitive to choice of comparison groups.

The results suggest that overall employment growth has not been better in university regions (in neither new nor old university regions) compared to non-college regions. One interpretation of this result is that a college on average adds little to overall employment growth. Another interpretation is that during the last 20 years there has not been any major spillovers from universities resulting in major changes in regional employment growth in firms located in the university regions.

6.3 Employment growth among college graduates

A university might attract skill-intensive firms, which employ only individuals with college degrees. Consequently, a university might have an impact mainly on employment growth among college graduates, which in turn might explain the insignificant differences between college and non college regions in overall employment growth. Therefore, we narrow down our outcome measure to employment growth among college graduates. Again we focus on firms that have existed since 1987. Since high skilled employment growth is distributed around three values, we use the ordered probit model to analyze the relationship between university and employment growth. We have divided the outcome variable into three categories, one if firms reduces the number of college graduates, two if there are no changes in the number of college graduates and three if firms increase the number of college graduates. Table 6.3 reports the estimated coefficients from the ordered probit models.

<TABLE 6.3 about here>

As in previous sections there are no major differences between college and non-college regions. The few estimates that are significant show that the probability of employment growth among high skilled labour is higher in firms in non college regions than in firms in college regions. The result is the same for firms in new as well as in old university regions. As before, the results are no particularly sensitive to the choice of comparison groups. The results suggest that firms in college regions are not more likely to employ college graduates than firms in non-college regions.

6.4 Knowledge intensive industries

A university produces high skilled labour. Some colleges produce college graduates who have a broad range of general skills while others produce graduates who has specific skills, as for example in engineering, ICT or computer programming. The degree of specialisation might be higher in new colleges. Reason for that is that it might be easier to attract students and create a productive work environment for teachers and researchers. Specialized colleges might have a direct impact mainly on regional employment within their particular fields. One way to capture this potential effect is to analyze employment growth in high-tech industries. In this section we exploit two such outcome measures, one broad measure containing traditional high-tech industries as well as industries in the public sector with a high degree of college graduates (e.g. health care), and one measure including only industries that are defined as high-tech industries by the OECD. Because of the sample restriction the size of the sample is smaller than in previous sections. Therefore we do not report results for different comparison groups.

Table 6.4 report coefficients from OLS regressions of university on regional employment growth in firms in high-tech industries. The results in column 1 show that only two university estimates are significant, a college that was established in the 1970s (Falun/Borlänge) and the second oldest university in the country (Lund). Both estimates are negative, suggesting that the employment growth in firms in high-tech industries in

these regions are significantly smaller than in non-college regions. That is, non-college regions attract high-skilled firms despite the fact that they do not have a university.

<TABLE 6.4 about here>

The results in column 2 do not differ much from those reported in column 1. Only, one estimate is significant and it suggests that employment growth in local high-tech firms is smaller in a college region that got a college in the 1970s (Örebro) compared to non-college regions. But the other estimates are not significant, showing that high-tech employment growth in local establishments is not higher in college regions compared to non-college regions. These results indicate that a university might have small or even no direct effects on employment in high-tech firms located in the college region.

7. Summary and concluding remarks

In this study we have exploited firm-level data over all Swedish establishments and five different regional outcome measures to investigate the impact on the regional economy of colleges that were established in the 1970s. The firms have been followed until 1995, which means that the study has measured the effects almost 20 years after the establishment of the colleges. The results showed no significant differences between the new colleges and regions without colleges in the survival rate of establishments, overall employment growth, overall growth of college graduates and employment growth in knowledge intensive industries. One important political motive behind the establishment of new colleges was that a college will affect regional economic performance. The results in this study do not support this idea. But it is also possible that it takes more than 20 years before a university has a significant impact on the regional economy.

The literature on the impact of colleges is divided between studies that find positive effects of a college and studies that find no effects. One problem with some of

these studies concerns the quality of the data. Another problem is that many studies have analyzed only a few college regions in a country (case studies), which means that it is difficult to generalize the findings. This study has used a large establishment level data set covering all establishments in the economy and detailed information on their location. Further, our analyse also covers a large number of universities. Therefore, one interpretation of the results in this study is that a college provides the basis for economic development but it needs more than a college to change regional economic performances. Moreover, one should be careful in drawing general conclusions from results in studies based on one or only a few colleges.

The effects of a college have been identified by comparing regions that do not have a college. A problem with this type of analysis is that the results depend on factors which are related to the political choice of college region. Previous studies have not recognised this problem. In this study we have adjusted for the problem by including data on factors that may have been important for the decisions.

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FIGURE 5.1 Number of new establishments 1987, per cent

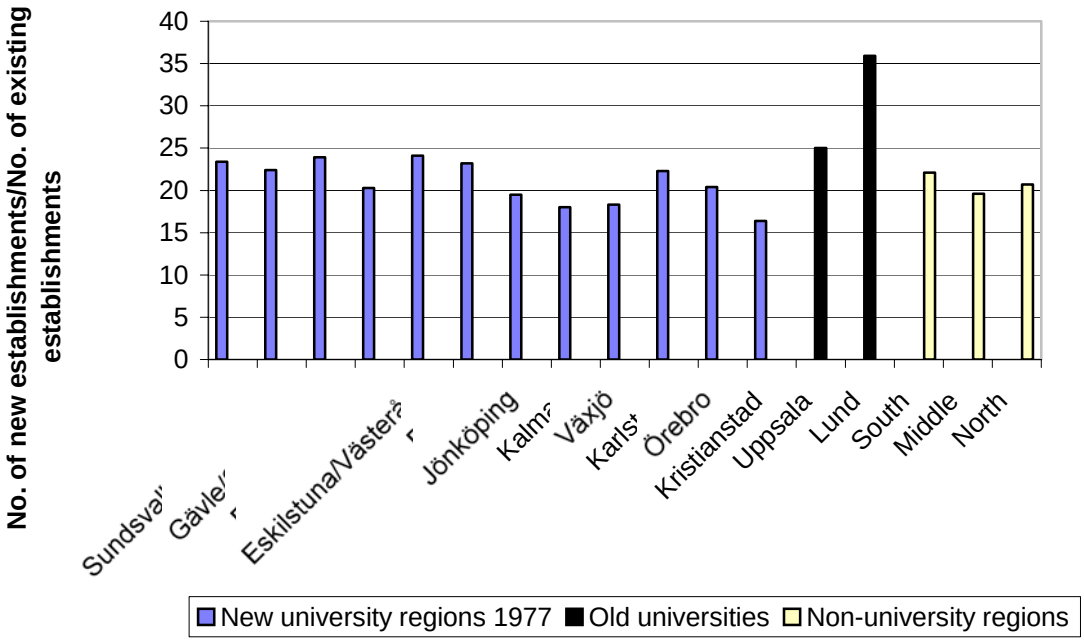

FIGURE 5.2 Share of new establishments 1987 in knowledge intensive industries (computer consulting and computer service agencies, education, research and development, health services, and childcare)

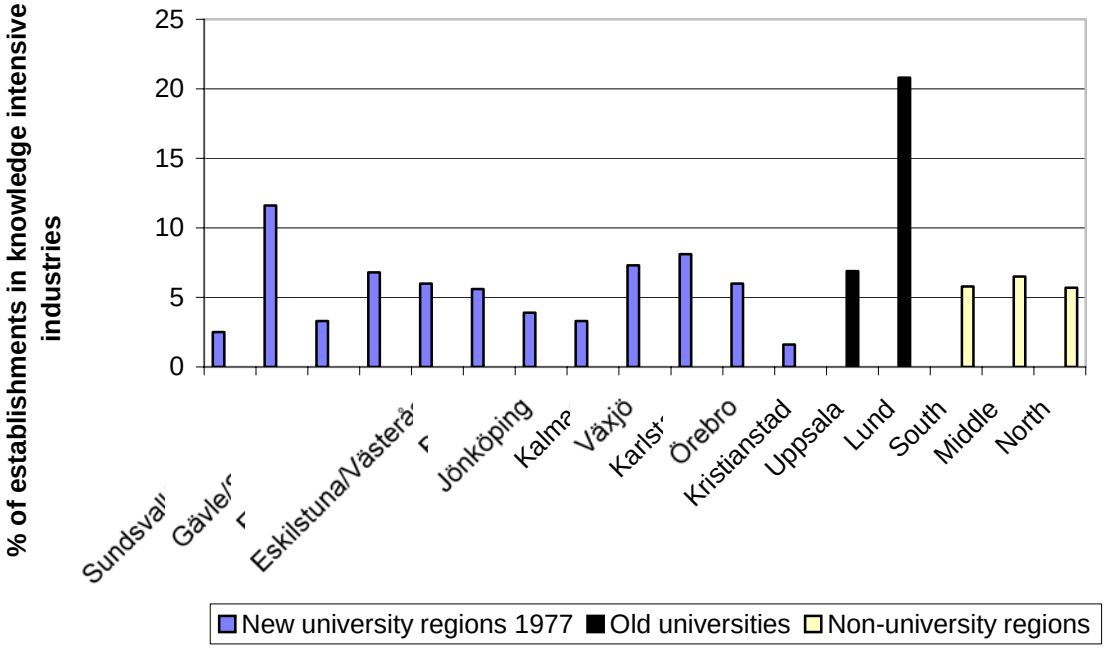

TABLE 5.1 Survival and employment growth of new establishments

New university regions 1977	1987	1988	1989	1990	1991	1992	1993	1994	1995
Borås									
% of survivors	100	74	63	55	48	41	37	35	31
% of employees	100	110	127	116	104	75	66	63	57
Eskilstuna/Västerås									
% of survivors	100	79	66	56	49	44	40	37	35
% of employees	100	108	106	98	95	92	94	90	88
Jönköping									
% of survivors	100	76	65	54	46	42	38	33	31
% of employees	100	94	87	86	81	70	57	55	53
Växjö									
% of survivors	100	76	60	51	44	41	36	32	29
% of employees	100	100	102	109	104	94	82	80	74
Kalmar									
% of survivors	100	74	62	50	45	39	33	29	26
% of employees	100	91	80	77	78	64	56	54	48
Kristianstad									
% of survivors	100	79	67	57	48	43	39	35	31
% of employees	100	96	93	82	72	67	58	60	61
Karlstad									
% of survivors	100	75	63	53	43	37	30	29	25
% of employees	100	97	90	87	72	65	62	65	53
Örebro									
% of survivors	100	75	58	46	40	35	32	29	27
% of employees	100	101	93	87	80	82	80	75	76
Falun/Borlänge									
% of survivors	100	78	68	55	48	41	39	378	32
% of employees	100	104	107	100	96	84	72	73	73
Gävle/Sandviken									
% of survivors	100	75	65	57	50	44	38	32	30
% of employees	100	100	100	99	91	76	68	69	73
Sundsvall/Härnösand									
% of survivors	100	75	66	57	49	44	38	36	32
% of employees	100	102	98	92	86	84	75	75	73
Östersund									
% of survivors	100	73	60	51	42	37	33	29	25
% of employees	100	86	83	84	69	74	64	62	61
Old universities									
Uppsala									
% of survivors	100	72	60	50	42	37	34	31	28
% of employees	100	85	82	74	69	70	62	61	58
Lund									
% of survivors	100	75	65	57	55	52	46	42	40
% of employees	100	95	91	92	94	90	78	79	80

Non-university regions									
South									
% of survivors	100	77	64	54	47	41	35	32	30
% of employees	100	104	110	105	100	94	73	72	68
Middle									
% of survivors	100	74	62	51	44	39	36	34	32
% of employees	100	95	90	87	81	71	64	63	63
North									
% of survivors	100	72	60	52	43	39	35	32	28
% of employees	100	90	88	79	73	67	58	53	57
The country									
% of survivors	100	74	62	52	44	38	34	31	28
% of employees	100	97	93	88	80	72	63	61	58

TABLE 5.2 Change in total employment between 1987 and 1995

ESTABLISHMENTS THAT EXIST THE WHOLE PERIOD, 1987 TO 1995

University established in	No. of employees			% of total employment	
1977	1987	1995	Δ empl. in %	1987	1995
Borås	**34 451**	**29 636**	**-14.0**	**1.3**	**1.3**
Eskilstuna/Västerås	**68 222**	**55 725**	**- 18.3**	**2.6**	**2.4**
Jönköping.	**37 008**	**33 914**	**- 8.4**	**1.4**	**1.4**
Växjö	**25 739**	**21 864**	**- 15.1**	**1.0**	**0.9**
Kalmar	**19 650**	**17 805**	**- 9.4**	**0.7**	**0.8**
Kristianstad	**25 658**	**23 600**	**- 8.0**	**1.0**	**1.0**
Karlstad	**29 265**	**25 612**	**- 12.5**	**1.1**	**1.1**
Örebro	**39 252**	**36 391**	**- 7.3**	**1.5**	**1.6**
Falun/Borlänge	**32 719**	**27 567**	**- 15.7**	**1.2**	**1.2**
Gävle/Sandviken	**42 517**	**39 077**	**- 8.1**	**1.6**	**1.7**
Sundsvall/Härnösand	**40 316**	**35 639**	**- 16.6**	**1.5**	**1.5**
Östersund	**22 330**	**19 169**	**- 14.2**	**0.8**	**0.8**
Old universities					
Uppsala	**50 245**	**42 269**	**- 15.9**	**1.9**	**1.8**
Lund	**35 785**	**31 868**	**- 10.9**	**1.3**	**1.4**
Non-university regions					
South	**59 546**	**53 932**	**-9.4**	**2.2**	**2.3**
Middle	**77 330**	**66 248**	**-14.3**	**2.9**	**2.8**
North	**52 905**	**45 967**	**-13.1**	**2.0**	**2.0**
The country	**2 658 863**	**2 340 263**	**- 12.0**		

TABLE 5.3 Change in employment in knowledge intensive industries[a] between 1987 and 1995

ESTABLISHMENTS THAT EXIST BOTH 1987 AND 1995					
Universities established in	No. of employees			% of total employment	
1977	1987	1995	Δ empl. in %	1987	1995
Borås	**4 028**	**4 343**	**7.8**	**12.8**	**15.9**
Eskilstuna/Västerås	**10 517**	**10 190**	**- 3.1**	**17.7**	**20.2**
Jönköping.	**5 055**	**5 457**	**8.0**	**14.6**	**17.2**
Växjö	**3 885**	**4 179**	**7.6**	**17.0**	**20.9**
Kalmar	**2 712**	**2 716**	**0.1**	**14.5**	**16.1**
Kristianstad	**3 779**	**4 168**	**10.3**	**15.6**	**18.7**
Karlstad	**4 212**	**4 735**	**12.4**	**15.4**	**20.0**
Örebro	**6 426**	**7 277**	**13.2**	**17.7**	**22.5**
Falun/Borlänge	**5 077**	**5 509**	**8.5**	**16.4**	**21.0**
Gävle/Sandviken	**5 302**	**6 655**	**25.5**	**13.4**	**18.0**
Sundsvall/Härnösand	**6 653**	**6 226**	**-6.4**	**17.2**	**18.2**
Östersund	**1 878**	**2 252**	**19.9**	**9.5**	**13.5**
Old universities					
Uppsala	**9 648**	**9 628**	**-0.2**	**20.4**	**24.3**
Lund	**6 653**	**7 270**	**9.3**	**19.6**	**23.9**
Non-university regions					
South	**7 443**	**8 057**	**8.2**	**13.3**	**16.0**
Middle	**9 862**	**10 926**	**10.8**	**13.5**	**17.5**
North	**9 276**	**7 763**	**-16.3**	**17.6**	**18.2**
The country	**397 426**	**426 797**	**7.4**	**16.1**	**19.6**

[a] Knowledge intensive industries are defined as computer consulting and computer service agencies, education, research and development, health services, and childcare.

Table 6.1 Odds of exiting for establishments that existed 1987, and establishments created 1987 and 1988.

	Ref: non-college south regions		**Ref: non-college middle regions**		**Ref: non-college north regions**	
	Medium run	Long run	Medium run	Long run	Medium run	Long run
Establishment size	0.955**	0.984**	0.959**	0.984**	0.958**	0.984**
Establishment size ^{2}/1 000	1.006**	1.002**	1.005**	1.002**	1.006**	1.002**
Multi-unit	0.644**	1.056	0.640**	1.067	0.625**	1.036
Empl. growth since year 1	-	0.046**	-	0.041**	-	0.043**
Existed 1987	1	1	1	1	1	1
Completely new	2.809**	1.792**	2.805**	1.730**	2.850**	1.764**
Mergers	1.099	0.840	1.021	0.752	1.041	0.840
Dispersals	1.029	1.189*	0.985	1.150	1.040	1.208**
Mining, manufacturing	1	1	1	1	1	1
Agriculture	1.088*	1.105	1.085*	1.049	1.159**	1.099
Not defined	1.550**	1.129	1.540**	1.148	1.476**	1.083
Motor vehicle trade	0.880*	0.924	0.877*	0.905	0.843**	0.883
Other corporate services	0.866**	0.874*	0.865**	0.896	0.846**	0.853*
Trade	1.004	0.930	0.990	0.942	0.972	0.884*
Transport and storage	0.957	0.980	0.951	1.000	0.936	0.946
Real estate	1.110	1.116	1.116	1.110	1.038	1.010
Hotel and restaurant	1.504**	1.098	1.490**	1.059	1.432**	1.075
Computer	1.055	1.266	1.059	1.334*	1.110	1.282
Other services	0.560**	0.579**	0.582**	0.586**	0.539**	0.566**
Financing, insurance	0.760**	0.558**	0.794*	0.550**	0.746**	0.506**
Electricity, water, waste disp.	0.681*	0.810	0.662**	0.700*	0.648**	0.647*
Health care	0.584**	0.754**	0.569**	0.785**	0.553**	0.703**
Education and R&D	0.662**	0.478**	0.634**	0.464**	0.600**	0.450**
Communication	0.674**	1.861**	0.672**	1.648**	0.665**	1.695**
University regions						
Borås	0.938	1.027	0.844**	1.159	0.885	1.616**
Eskilstuna/Västerås	1.208**	0.885	1.052	0.928	1.184*	1.323*
Jönköping.	0.933	0.969	0.843**	1.091	0.872	1.498**
Växjö	1.005	1.005	0.883	1.163	0.959	1.699**
Kalmar	0.923	1.079	0.875	1.161	0.820*	1.419**
Kristianstad	0.876*	0.918	0.815**	1.011	0.791*	1.286
Karlstad	1.024	1.046	0.914	1.184	0.969	1.676**
Örebro	1.063	0.988	0.945	1.130	1.009	1.609**
Falun/Borlänge	1.050	0.911	0.951	0.969	0.987	1.301*
Gävle/Sandviken	1.130	1.050	1.012	1.071	1.085	1.445**
Sundsvall/Härnösand	1.152*	0.836*	0.990	0.908	1.145	1.365*
Östersund	0.970	1.014	0.862*	1.157	0.922	1.660**
Old university, Lund	0.982	0.677**	0.742**	0.918	1.090	1.899*
Old university, Uppsala	1.106*	0.829**	0.935	1.001	1.099	1.083*
Selection variables						
Regional taxation	0.990	2.534*	2.238**	1.098	0.468	0.175*
Regional political majority	0.890*	1.060	0.923	1.132	0.850**	1.090
No. of closed establishments	18,167	7,640	18,198	7,632	17,851	7,411
No. of observations	53,760	35,593	53,999	35,801	52,893	35,042
Likelihood ratio	7,849.6	2,041.3	7,697.5	2,064.0	7,847.8	2,066.9

Note: * Significant at 5 % level, ** Significant at 1 % level

Table 6.2 OLS-estimates of the relationship between annual employment growth and university.

	Ref: all non-college regions		**Ref: south non-college region**		**Ref: middle non-college region**		**Ref: north non-college region**	
Constant	-0.0025	(-0.65)	0.0003	(0.04)	0.0061	(1.02)	0.0117	(1.06)
ln(employment)	-0.0032	(-16.14)	-0.0030	(-13.86)	-0.0033	(-14.50)	-0.0031	(-14.23)
Multi-unit	0.0043	(6.72)	0.0039	(5.34)	0.0047	(6.24)	0.0042	(5.66)
Existed 1987	**Reference**							
Completely new	0.0517	(27.62)	0.0493	(23.99)	0.0508	(24.18)	0.0492	(23.61)
Mergers	-0.0047	(-0.50)	-0.0099	(-0.98)	0.0097	(-0.98)	-0.0087	(-0.01)
Dispersals	0.0123	(4.02)	0.0128	(3.71)	0.0114	(0.06)	0.0108	(3.13)
Industry dummies:								
Mining, manufacturing	**Reference**		**Reference**		**Reference**		**Reference**	
Agriculture	-0.0070	(-0.01)	-0.0072	(-8.05)	-0.0068	(-7.32)	-0.0069	(-7.31)
Not defined	0.0018	(0.39)	0.0014	(0.28)	0.0082	(1.51)	0.0034	(0.68)
Motor vehicle trade	-0.0033	(-3.09)	-0.0034	(-2.83)	-0.0025	(-2.03)	-0.0027	(-2.14)
Other corporate services	-0.0056	(-4.42)	-0.0060	(-4.41)	-0.0057	(-4.07)	-0.0054	(-3.85)
Trade	-0.0043	(-5.06)	-0.0044	(-4.71)	-0.0045	(-4.63)	-0.0045	(-4.60)
Transport and storage	-0.0048	(-4.47)	-0.0049	(-4.11)	-0.0046	(-3.77)	-0.0051	(-4.13)
Real estate	-0.0037	(-2.20)	-0.0036	(-1.85)	-0.0037	(-1.88)	-0.0044	(-2.33)
Hotel and restaurant	-0.014	(-5.68)	-0.0142	(-5.50)	-0.0135	(-5.56)	-0.0133	(-17.52)
Computer	0.0089	(1.97)	0.0088	(1.77)	0.0117	(2.37)	0.0100	(1.99)
Other services	-0.0049	(-5.67)	-0.0051	(-5.29)	-0.0046	(-4.74)	-0.0053	(-5.32)
Financing, insurance	-0.0038	(-2.65)	-0.0030	(-1.81)	-0.0031	(-1.84)	-0.0040	(-2.39)
Electricity, water, waste	0.0008	(0.10)	0.0035	(0.81)	0.0022	(0.51)	0.0032	(0.75)
Care	-0.0011	(-1.08)	-0.0029	(-2.57)	-0.0006	(-0.47)	-0.0029	(-2.57)
Education and R&D	0.0002	(0.20)	0.0000	(0.01)	0.0008	(0.59)	0.0002	(0.12)
Communication	-0.0055	(-4.91)	-0.0060	(-4.60)	-0.0055	(-4.19)	-0.0060	(4.63)
University regions								
Borås	0.0013	(1.05)	0.0010	(0.82)	0.0025	(1.58)	0.0040	(1.65)
Eskilstuna/Västerås	-0.0016	(-1.72)	-0.0013	(-0.85)	-0.0024	(-2.17)	0.0012	(0.66)
Jönköping.	-0.0016	(-1.58)	-0.0018	(-1.75)	-0.0005	(-0.36)	0.0010	(0.46)
Växjö	0.0000	(0.03)	-0.0001	(-0.10)	0.0014	(0.88)	0.0032	(1.21)
Kalmar	0.0003	(0.28)	-0.0001	(-0.08)	0.0008	(0.58)	0.0019	(0.98)
Kristianstad	-0.0013	(-1.25)	-0.0017	(-1.48)	-0.0007	(-0.51)	0.0007	(0.33)
Karlstad	-0.0004	(-0.28)	-0.0005	(-0.39)	0.0008	(0.49)	0.0025	(1.00)
Örebro	-0.0014	(-1.29)	-0.0016	(-1.38)	-0.0001	(-0.10)	0.0016	(0.63)
Falun/Borlänge	-0.0024	(-2.33)	-0.0025	(-2.14)	-0.0025	(-1.97)	-0.0001	(-0.07)
Gävle/Sandviken	-0.0018	(-1.75)	-0.0016	(-1.07)	-0.0030	(-2.38)	0.0003	(0.21)
Sundsvall/Härnösand	-0.0032	(-3.12)	-0.0028	(-1.97)	-0.0034	(-2.91)	0.0000	(0.01)
Östersund	-0.0014	(-1.10)	-0.0015	(-1.15)	-0.0002	(-0.11)	0.0016	(0.62)
Old university, Lund	-0.0029	(-1.49)	-0.0026	(-1.03)	0.0003	(0.10)	0.0035	(0.74)
Old university, Uppsala	0.0001	(0.07)	0.0001	(0.10)	0.0020	(1.12)	0.0042	(1.36)
Selection variables								
Taxation 68/72	0.0099	(2.62)	0.0077	(0.99)	0.0004	(0.06)	-0.0062	(-0.51)
Election 1973	0.0007	(2.13)	0.0010	(0.80)	0.0034	(2.82)	0.0015	(1.06)
Adj. R^2	0.1485		0.1375		0.1429		0.1377	
No. of observations	34,711		27,953		28,169		27,631	

Note: t-values are in parentheses. Standard errors have been calculated using the White estimator for the variance-covariance matrix.

Table 6.3 Ordered probit estimates of the relationship between high skilled employment growth and university

	Ref: All non-college regions	**Ref: south non-college region**	**Ref: middle non-college region**	**Ref: north non-college region**
Intercept, positive growth	-0.6835**	-1.1642**	-0.3506*	-1.1262**
Intercept, unchanged	1.0858**	0.5844*	1.3806**	0.6207
ln(employment)	0.3079**	0.3083**	0.2983**	0.3004**
Multi-unit	-0.1317**	-0.1342**	-0.1205**	-0.1120**
Existed 1987	**Reference**			
Completely new	0.3769**	0.3640**	0.3656**	0.3489**
Mergers	-0.1235	-0.1198	-0.1528	-0.1566
Dispersals	0.2546**	0.2500**	0.2450**	0.2729**
Industry dummies:				
Mining, manufacturing	**Reference**			
Agriculture	-0.1202**	-0.0941**	-0.1094**	-0.1230**
Not defined	-0.0912	-0.0665	-0.0608	-0.0917
Motor vehicle trade	-0.1496**	-0.1316**	-0.1306**	-0.1541**
Other corporate services	0.1572**	0.1698**	0.1540**	0.1554**
Trade	-0.1368**	-0.1080**	-0.1194**	-0.1494**
Transport and storage	-0.1545**	-0.1343**	-0.1503**	-0.1713**
Real estate	0.0475**	0.0795	0.0735	0.0537
Hotel and restaurant	-0.3504**	-0.3280**	-0.3410**	-0.3571**
Computer	0.4014**	0.4168**	0.4379**	0.3941**
Other services	-0.0804	-0.0596	-0.0811**	-0.0900**
Financing, insurance	0.2791**	0.2873**	0.2833**	0.2342**
Electricity, water, waste	0.3631**	0.4084**	0.3635**	0.3392**
Care	-0.4963**	-0.5120**	-0.5136**	-0.5335**
Education and R&D	-1.3002**	-1.2582**	-1.2285**	-1.2934**
Communication	-0.1651**	-0.1332*	-0.1475*	-0.1728**
University regions				
Borås	0.0248	0.0212	0.0792	0.00964
Eskilstuna/Västerås	-0.0124	-0.0464	-0.0256	-0.0698
Jönköping.	-0.0621*	-0.0619	-0.00912	-0.0743
Växjö	-0.00592	-0.0218	0.0586	-0.0348
Kalmar	-0.0742	-0.0480	-0.0435	-0.0588
Kristianstad	-0.1201**	-0.1054**	-0.0801	-0.1165
Karlstad	0.0422	0.0367	0.0993*	0.0245
Örebro	-0.0517	-0.0611	0.00863	-0.0736
Falun/Borlänge	-0.0419	-0.0453	-0.0278	-0.0630
Gävle/Sandviken	-0.0275	-0.0472	-0.0534	-0.0684
Sundsvall/Härnösand	-0.0139	-0.0524	-0.00397	-0.0735
Östersund	-0.0503	-0.0592	0.0104	-0.0718
Old university, Lund	-0.0677	-0.1707**	0.0646	-0.1852
Old university, Uppsala	-0.1392**	-0.1765**	-0.0556	-0.1885*
Selection variables				
Taxation 68/72	-0.0818	0.3817	-0.4427**	0.3894
Election 1973	-0.0483*	-0.0129	0.0178	-0.00320
No. of observations	34,711	27,953	28,169	27,631
No. of parameters	36	36	36	36
Likelihood ratio	4,789.3	3,834.4	3,701.8	3,732.6

NOTE: * Significant at 5 % level, ** Significant at 1 % level

Table 6.4 OLS-estimates of the relationship between employment growth in knowledge intensive industries and university. A broad definition and the OECD definition.

	Reference category:		**All non-college regions**	
	Computer, care, education and R&D		**Electrical machinery and optical goods, computer, education and R&D**	
Constant	-0.0046	(-0.53)	-0.0064	(-0.53)
ln(employment)	-0.0036	(-7.19)	-0.0008	(-1.35)
Multi-unit	0.0070	(3.62)	0.0025	(1.09)
Existed 1987	**Reference**			
Completely new	0.0796	(12.66)	0.0927	(9.47)
Mergers	0.0002	(0.88)	0.0775	(1.40)
Dispersals	0.0136	(1.60)	0.0248	(1.91)
Industry dummies:				
Computer	**Reference**		**Reference**	
Education and R&D	-0.0043	(-0.99)	-0.0031	(-5.01)
Care	-0.0095	(-2.22)	-	
Electrical machinery	-		-0.0043	(-0.95)
University regions				
Borås	0.0053	(1.34)	-0.0001	(-0.02)
Eskilstuna/Västerås	-0.0006	(-0.30)	0.0026	(0.79)
Jönköping.	-0.0049	(-1.76)	-0.0070	(-1.76)
Växjö	-0.0024	(0.74)	0.0056	(1.36)
Kalmar	-0.0002	(-0.09)	-0.0021	(-0.54)
Kristianstad	-0.0041	(-1.23)	-0.0011	(-0.22)
Karlstad	-0.0010	(-0.32)	-0.0042	(0.88)
Örebro	-0.0035	(-1.55)	-0.0100	(-2.52)
Falun/Borlänge	-0.0051	(-2.28)	-0.0037	(-1.27)
Gävle/Sandviken	-0.0014	(-0.65)	-0.0006	(-0.27)
Sundsvall/Härnösand	-0.0021	(-0.69)	-0.0027	(0.58)
Östersund	-0.0020	(-0.89)	-0.0010	(-0.27)
Old university, Lund	-0.0122	(-2.17)	0.0014	(0.20)
Old university, Uppsala	-0.0055	(-1.78)	-0.0016	(-0.33)
Selection variables				
Taxation 68/72	0.0154	(2.17)	0.0098	(0.90)
Election 1973	0.0026	(1.39)	0.0006	(0.24)
Adj. R^2	0.2292		0.2547	
No. of observations	4,836		2,341	

Note: t-values are in parentheses. Standard errors have been calculated using the White estimator for the variance-covariance matrix. The second column includes only those industries in our data set that are identical to the OECD definition of knowledge intensive industries.

APPENDIX

Table A1 Income taxes in the municipality related to average income taxes of all municipalities and net migration in the region related to the size of the population 1968-1982.

	INCOME TAXES			NET MIGRATION		
REGION	**1968-1972**	**1973-1976**	**1978-1982**	**1968-1972**	**1973-1976**	**1978-1982**
Borås	1.027	0.953	0.955	-0.0010	-0.0077	-0.0060
Eskilstuna	0.987	0.925	0.939	0.0024	-0038	-0.0042
Västerås	1.040	1.033	1.053	0.0060	-0.0067	-0.0029
Jönköping	1.020	0.954	0.964	0.0030	-0.0039	-0.0036
Växjö	1.054	0.970	0.991	0.0145	0.0007	0.0039
Kalmar	0.960	0.923	0.955	0.0028	-0.0017	0.0032
Kristianstad	0.986	0.930	0.942	0.0037	0.0034	0.0036
Karlstad	1.032	1.003	1.038	0.0027	-0.0020	0.0017
Örebro	1.040	0.987	1.002	0.0048	-0.0032	0.0009
Falun	1.015	0.982	1.006	0.0026	0.0085	0.0065
Borlänge	0.970	0.955	0.973	0.0083	0.0031	0.0016
Gävle	0.992	0.988	1.030	0.0001	0.0079	0.0016
Sandviken	0.968	0.929	0.952	0.0024	-0.0023	-0.0039
Sundsvall	1.055	0.993	1.007	0.0031	0.0048	0.0001
Härnösand	1.011	0.986	0.993	0.0007	-0.0019	0.0044
Östersund	1.040	0.962	0.989	0.0076	0.0114	0.0011
Södertälje	1.208	1.085	1.070	0.0232	-0.0093	-0.0014
Uppsala	1.102	1.018	1.008	0.0099	0.0033	0.0056
Norrköping	0.990	0.944	0.965	0.0039	-0.0031	-0.0032
Hässleholm	0.980	0.855	0.855	0.0030	0.0039	0.0016
Oskarshamn	0.831	0.878	0.896	0.0093	0.0031	-0.0030
Lund	1.243	1.144	1.094	0.0209	0.0016	0.0014
Helsingborg	1.083	1.019	1.015	0.0061	-0.0001	0.0048
Lidköping	0.855	0.855	0.896	0.0011	-0.0039	0.0026
Örnsködsvik	0.933	0.848	0.903	-0.0061	0.0021	-0.0020
Skellefteå	0.895	0.868	0.912	-0.0063	0.0042	0.0021
Piteå	0.818	0.867	0.890	0.0025	0.0143	0.0042
Average	1.000	1.000	1.000	0.0051	0.0012	0.0010

NOTE: Bold names indicate municipalities that got a university in 1977. *Source* is Statistics Sweden.

Table A2 The political majority in municipalities with and without universities

	1970		1973		1976		1979	
	RIGHT	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	LEFT
Borås	50.2	49.1	53.8	45.8	52.5	47.3	51.1	48.6
Eskilstuna	42.3	57.6	43.4	56.2	44.0	55.6	41.8	57.4
Västerås	44.0	55.7	46.7	52.6	47.1	52.3	46.7	52.4
Jönköping	53.1	46.8	54.0	45.7	53.9	45.8	52.8	46.1
Växjö	55.2	43.0	56.7	42.7	57.4	41.4	57.3	42.2
Kalmar	20.1	51.1	51.0	48.7	51.5	48.3	50.1	49.5
Kristianstad	48.2	51.9	52.0	47.8	53.4	46.4	52.7	46.6
Karlstad	48.4	51.6	49.9	49.3	53.1	46.4	49.7	48.3
Örebro	48.3	51.0	50.3	48.9	49.9	49.4	49.5	49.4
Falun	54.5	45.1	55.3	44.3	56.4	43.1	54.9	44.6
Borlänge	40.0	60.0	39.1	56.8	38.3	58.0	36.7	58.4
Gävle	38.7	60.5	40.9	58.5	41.6	57.9	39.8	59.7
Sandviken	34.1	65.8	35.7	63.9	36.0	64.0	34.1	65.3
Sundsvall	43.1	56.8	43.2	56.1	45.1	54.3	43.3	55.9
Härnösand	50.2	49.6	50.8	49.1	52.5	47.3	51.4	48.5
Östersund	50.3	49.2	50.7	48.7	50.7	48.6	46.4	53.2
Södertälje	43.9	55.2	48.4	50.7	49.7	49.4	45.8	53.3
Norrköping	42.2	57.1	46.5	52.7	48.6	51.0	46.6	52.3
Hässleholm	54.8	15.1	60.5	38.3	62.4	37.3	60.6	38.6
Oskarshamn	43.9	56.0	45.9	53.7	47.8	51.9	45.5	54.1
Helsingborg	48.8	51.0	50.4	49.1	48.8	47.3	139.3	48.4
Lidköping	54.9	44.3	55.4	44.5	51.2	42.5	45.6	43.0
Örnsködsvik	44.3	55.6	47.1	52.2	48.1	51.4	48.4	50.7
Skellefteå	44.2	55.5	47.6	51.9	46.9	52.6	45.4	54.0
Piteå	34.0	65.9	37.7	62.3	36.2	63.6	33.9	64.9
Uppsala	52.7	45.9	53.1	45.5	51.7	47.2	50.6	48.6
Lund	50.5	48.0	52.9	46.5	52.0	47.4	50.7	48.5
The parliament	49.4	50.1	50.6	48.9	52.2	47.5	50.4	48.8

NOTE: Bold names indicate municipalities that got a university in 1977. *Source* is Statistics Sweden.