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The Importance of Universities of Applied Sciences for Regional Development – Theory and empirical Evidence for the German Middle Lower Rhine Area

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**THE IMPORTANCE OF UNIVERSITIES OF APPLIED
SCIENCES FOR REGIONAL DEVELOPMENT –
THEORY AND EMPIRICAL EVIDENCE
FOR THE GERMAN MIDDLE LOWER RHINE AREA**

0. Introduction

The Middle Lower Rhine Area (in the following: MLRA) is part of Northrhine-Westphalia. It is situated in the west of Düsseldorf between the river Rhine and the Dutch German border. The region - consisting of the two counties of Neuss and Viersen and the two cities Mönchengladbach and Krefeld - has about 1.25 mill. inhabitants; the number of employees amounts to 375.000 and the unemployment rate augments to 11%. Though there has taken place a considerable structural change from the secondary into the tertiary sector during the last 20 years the secondary sector in the MLRA is of greater importance than in the north-rhine-westphalian average. Most important branches of regional industry are “skeleton construction, mechanical engineering and motor vehicles” as well as the chemical industry, while “textile mill products” and “apparel and other textile products”, which have been dominant in the past, meanwhile only play a minor part.

The „University of Applied Sciences Lower Rhine“ (in the following: UASLR) with its departments in Krefeld and Mönchengladbach is the only public university in the MLRA. The following analysis deals with the importance of this University of Applied Sciences (UAS) for the regional development of the MLRA. First of all some general theoretical considerations concerning the ways in which a UAS can influence the economic development of its location will be presented (part 1). After this the most important of these effects have been tested empirically to see whether and if so to what extent the UASLR fulfils the theoretical expectations (part 2). Finally the main results are summarized and some propositions to strengthen the role of the UASLR for the regional economy are presented.

1. Regional Economic Effects of Universities of Applied Sciences

Some theoretical considerations

A UAS can influence regional economic development via demand and supply. (J. WALTER a.o. 1997, S. 20ff). In the first case the existence of a UAS causes an increase of regional demand. In the second case the UAS contributes to an improvement of the regional conditions for the private enterprises' production of goods and services.

1.1. Demand side effects

An increase of regional demand can be caused by different ways:

- **Income expenditure:** The UAS pays salaries to its employees. Normally most of these employees live at or nearby the location of the UAS; so most of their incomes are spent in the region. This results in an increase of demand for consumer goods and services the production of which leads to sales, value added, further income and employment.
- **Expenditure for intermediate goods and services:** For fulfilling its tasks the UAS needs a lot of intermediate goods and services. As far as regional firms are used as suppliers of these intermediate goods and services, this results in positive regional income and employment effects.
- **Investment expenditure:** In addition to its expenditure for intermediate goods and services a UAS has to invest in buildings and equipment. If regional firms profit by this demand an increase of regional sales, value added and employment will be the consequence.
- **Expenditure of the students:** For studying students change their residence to or they keep it at the location of the UAS. They have receipts from different sources at their disposal and they spent them at the UAS-location. Again this will lead to sales and value added for regional firms and it will secure regional employment.

Via all the four chains of impulse the activity of a UAS results in an increase of regional value added. This increase of value added is combined with a further demand for intermediate goods and services by the firms favoured by the impulse. As far as this demand for intermediates can be satisfied by regional firms it leads to further regional value added - a process that runs off for several rounds. In addition to that firms favoured by the demand side impulses pay income to its labour force. In the case that these employees live at the location of the UAS it can be supposed that they spend most of their incomes in the region. An increase of regional value added and employment will be the consequence; this, too, is a multistage process.

1.2. Supply Side Effects

Besides the described demand side effects UAS also have a lot of supply side effects:

1. As an element of infrastructure a UAS contributes to productivity increase of private factors of production.

Education of qualified workforce: The UAS educates high-qualified labour with a highly practical orientation. So the UAS contributes to improve the regional equipment of human capital and to increase labour productivity. These contributions will be the more important the better the courses of studies match the needs of regional enterprises.

Further Education and advanced training of workforce: Besides the education of qualified workforce UAS also have to take over tasks in advanced training of workforce. The effects of this are quite similar to those of education.

Transfer of knowledge: Moreover, UAS can help to increase productivity of private enterprises by a transfer of knowledge from the scientific space to the space of entrepreneurial practice. This increase of productivity can be achieved by the graduates of the university's normal courses of studies as well as by the graduates of its courses in further education. It also can be reached by cooperation of professors and business, by students working as practitioners or passing a practical semester and by a practically oriented diplom thesis.

2. A UAS is a determinant of the firms' locational decision and of the households' residential choice.

Determinant of the firms' locational decision: Because of their productivity increasing effects the UAS can become a substantial factor of the firms' locational decision. Furthermore a UAS can contribute to an upgrading of other regional factors of location and by this it can improve the locational conditions of a region. This especially is possible by the availability of qualified workforce, by the transfer of knowledge and technology, by an improvement of the regional image and by the formation or further strengthening of urban living conditions (urbanity).

Determinant of households' residential choice: A UAS is a factor that can influence the actual residential choice of households (students). Its existence can prevent young people who are interested in a good qualification from leaving a region after they have finished school. Furthermore, young people who want to be qualified immigrate to the region of the UAS and it is possible that they stay there after the end of their studies thus strengthening the regional resources of human capital.

3. A UAS contributes to an increase of the regions' adjustment flexibility to structural change.

Facilitation of structural change: Structural change requires a high adjustment flexibility of the regional economy. Regional flexibility of adoption is the higher the better regional labour

force is qualified, the faster knowledge is transferred from the scientific space to the firms and the faster this knowledge can be transposed to products which can compete on national and international markets. All three mentioned aspects can be positively influenced by the existence of a UAS in a region and thus the regional adjustment flexibility to structural change can be strengthened. This argument is of special importance to old industrialised areas like parts of the MLRA are.

Strengthening the innovative potential of the region: A UAS is an element of the regional innovation potential. Furthermore they facilitate the regional firms' access to the research capacities and by this increase the regional capability to innovate. Finally a UAS is a source of start-up-enterprises - on the one side because they can offer help and information to people interested in the foundation of a start-up, on the other side because the students of the UAS form a potential for start-up-enterprises by its own.

Making full use of the regional funds of talents: A UAS has a highly regional orientation. They offer their courses of study especially to young people living at or nearby its location. By the contribution of a UAS the region can succeed in making optimal use of the regional funds of talents.

Globalisation of markets has led to an intensification of competition on the level of firms and regions. It can be expected that this process will continue in the future. The presented considerations concerning the supply side effects of a UAS should have made clear, that a UAS can contribute to an improvement of the competitiveness of its location and of the firms producing at this location on different chains of cause. The higher the competitiveness of regional private firms, the lower is the risk for regional unemployment and income losses.

2. Regional Economic Effects of the University of Applied Sciences Lower Rhine Empirical Analysis

In the following the theoretical considerations concerning the regional economic effects of a UAS presented in the first part of this paper are analysed empirically for a special UAS, namely the "UAS Lower Rhine" (UASLR) with its two locations in Krefeld and Mönchengladbach. To deal with the demand side effects a regional multiplier analysis has been used, the results are described in the next section. A written survey of firms should help to find out, whether and to what extent the described supply-oriented chains of cause can actually be

proved right for the UASLR. Section 2.2 contains the most important results of this firm survey. Region of analysis is the MLRA.

2.1. Demand Side Effects

Regional multiplier analysis is the methodological instrument for the estimation of the illustrated demand side effects. By the means of comparative static regional multiplier analysis compares a situation after an impulse with that before under “ceteris-paribus-conditions”. Regional multipliers set into relation the total effect caused by an autonomous impulse to the autonomous impulse itself.¹ For calculating the demand side effects of the UASLR an iterative model of regional multiplier analysis has been used. This model is distinguishing twelve branches of industry (sectors) and it is connected with information about the intersectoral forward and backward linkages stemming from the national input-output-table of the German economy. Theoretical considerations suggest that UAS can have demand side effects by the following chains of impulse:

1. Income expenditure of the UASLR: In 1999 the sum of gross income and earning of the UASLR came up to 52 mill. DM, 37 mill. DM of which were spent in the MLRA. These income payments result in a regional private consumption of 22.5 mill. DM. The regional private consumption leads - at first directly, second indirectly by an increasing demand for intermediate goods and third by income cycle induced effects - to a rise of production, value added and income. Setting plausible assumptions about the regional and sectoral structure of private consumption the income payments of the UASLR result in a regional increase of value added of between 12.5 (lower variant) and 17.3 mill. DM (upper variant). Transforming this value added to employment it means a number of 128 to 176 employees. Considering that the UASLR totally has about 600 employees the regional multiplier lies between 1.21 and 1.29.

2. Expenditure for intermediate goods and investment of the UASLR: According to the annual report of the UASLR (REKTORAT DER FACHHOCHSCHULE NIEDERRHEIN (ED.), 1999) about 2.9 mill. DM have been spent in 1999 to purchase intermediate goods and services. In addition to this the building investment expenditure of the UASLR has been included into the calculations. Between 1995 and 1999 the annual average of building invest-

¹ The following considerations neither deal with the different methodological possibilities nor with the problems involved in these methods. See e.g. R. HAMM, 1999, S. 303ff.; RHEINISCH-WESTFÄLISCHES INSTITUT FÜR WIRTSCHAFTSFORSCHUNG (HRSG.), 1987; R. KAMPMANN, 1988; H. W. HOLUB, 1996, S. 1110ff.

ment expenditure amounted to more than 7.7 mill. DM. So total annual expenditure for intermediate goods and investment of 10.6 mill. DM has been assumed. According to information of the UASLR administration the greatest part of this demand (about 80 percent) has favoured firms in the MLRA. This would mean that a size of orders of 8.5 mill. DM has flown to regional firms. The necessary assumptions concerning the sectoral structure of this demand have been coordinated with the UASLR administration. Using these assumptions the regional value added effect caused by the expenditures for intermediate goods and building investment sums up from 6.3 to 7.1 mill. DM. Transformed to employment effects between 70 and 80 jobs in the MLRA depend on the demand for intermediate goods and investment of the UASLR.

3. Expenditures of the students: About 8 300 students have been matriculated in the UASLR in the winter-semester 2000/2001; 4 879 (58.7 percent) of them were registered under a semester-address in the MLRA. Assuming

- that none of these students would live in the MLRA without the existence of the UASLR,
- that the expenditures of the students - apart from regional imports – flow into the analysed region all the year round, and
- that the per capita expenditure of the students corresponds to the northrhine-westphalian average (1 291 DM),

the students of the UASLR in total spend more than 75 mill. DM in the MLRA. Considering all relevant chains of effects this impulse leads to an increase of regional value added of 42 to 58 mill. DM. Transforming the value added effects to employment effects the UASLR secures between 430 and 590 jobs in the MLRA.

Table 1: Summary of Demand Side Effects (Employment)

Effect	Upper Variant	Lower Variant
Direct Effect	604	604
Indirect Effect	49	49
Effects of income expenditure	176	128
Effects of expenditure for intermediates and investment ¹	82	73
Effects of students' expenditure	590	428
Total Effect	1452	1233
Multiplier ²	1,43 (2,40)	1,33 (2,04)

¹ includes indirect effects; ² Values in brackets include students' expenditure

Table 1 summarizes the results of the regional multiplier analysis. The UASLR has about 600 employees (direct effect). Expenditure for intermediate goods and investment of the UASLR secure some 50 further jobs in the MLRA (indirect effect). The income expenditure as well as the demand for intermediate goods evokes further (income cycle induced) effects in the region. Following the calculations this secures between 150 and 210² jobs in the MLRA. Considering these two chains of causes the regional (employment) multiplier amounts to values between 1.33 and 1.43.

Additional consideration of the students' expenditures leads to the result that between 430 and 590 more jobs are secured in the region. Corresponding to this, total employment effects of the UASLR sum up to values between 1 230 and 1 450 jobs in the MLRA. For this case regional multipliers are calculated at 2.04 to 2.40. At first sight the total regional effect seems to be considerable. But considering that in the MLRA in 1998 about 375 000 employees have been registered in the social insurance system the total employment effect of the UASLR would be less than 0.4 percent of total regional employment. So the demand side effects of the UASLR should not be overestimated at all.

2.2. Supply Side Effects

As explained in the first part of this paper the supply side effects of a UAS can as well directly influence the factor productivity of private firms as they can indirectly improve the regional adjustment flexibility. As these effects can hardly be measured by exact indicators surveys of firms are often used instruments for testing them. Following a similar firm survey, which has been done for the UAS Gelsenkirchen some years ago (J. WALTER a.o., 1997), firms in the MLRA were asked about the listed topics:

- Perceptibility, estimation and knowledge of the structures at the UAS;
- Forms and channels of cooperation with the UAS;
- Private firms' innovation behaviour and the role of the UAS;
- Problems in cooperating with the UAS;
- Possibilities to improve the cooperation between private firms and the UAS.

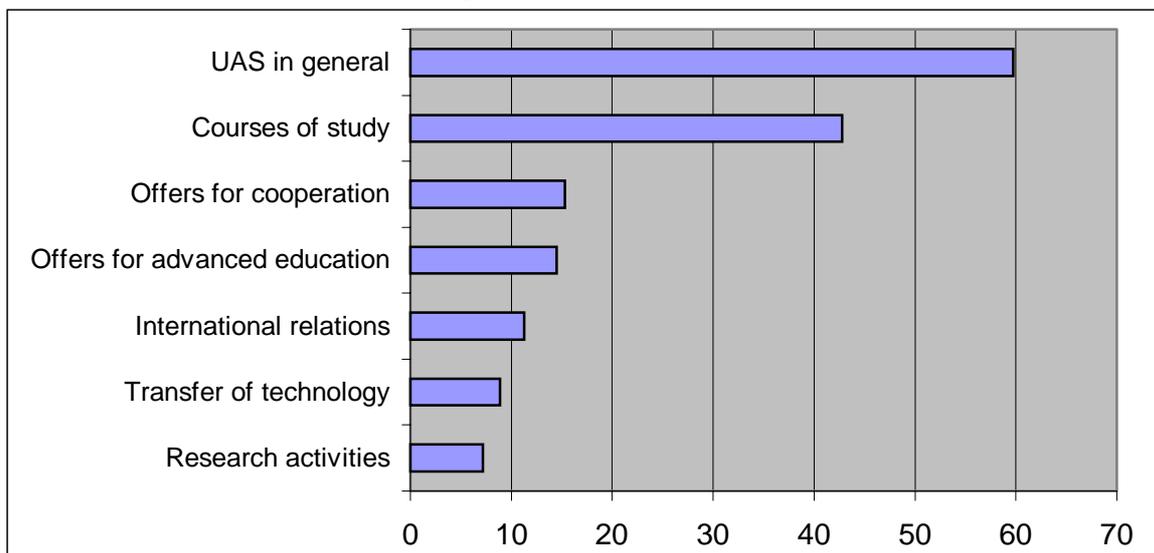
² These values follow if the indirect effects are subtracted from the effects assigned to the income and intermediate goods expenditures.

About 800 private enterprises in MLRA have been asked in the written survey; the quota of replies amounted to 15 percent, which is a sufficient, and for similar surveys usual result.

2.2.1. Perceptibility, estimation and knowledge of the structures at the UAS

To develop supply side impulses at all the UAS must be noticed by regional enterprises. After existing nearly 30 years it could be expected, that the UAS is at least a well-known element of educational infrastructure in the MLRA. The results of the survey show, that 60 percent of the firms possess some general knowledge of the existence of the UAS; only 40 percent have knowledge of the special courses of study provided by the UAS (diagram 1).

Diagram 1: Private Firms' Knowledge of the UAS
(in percent of all answers)

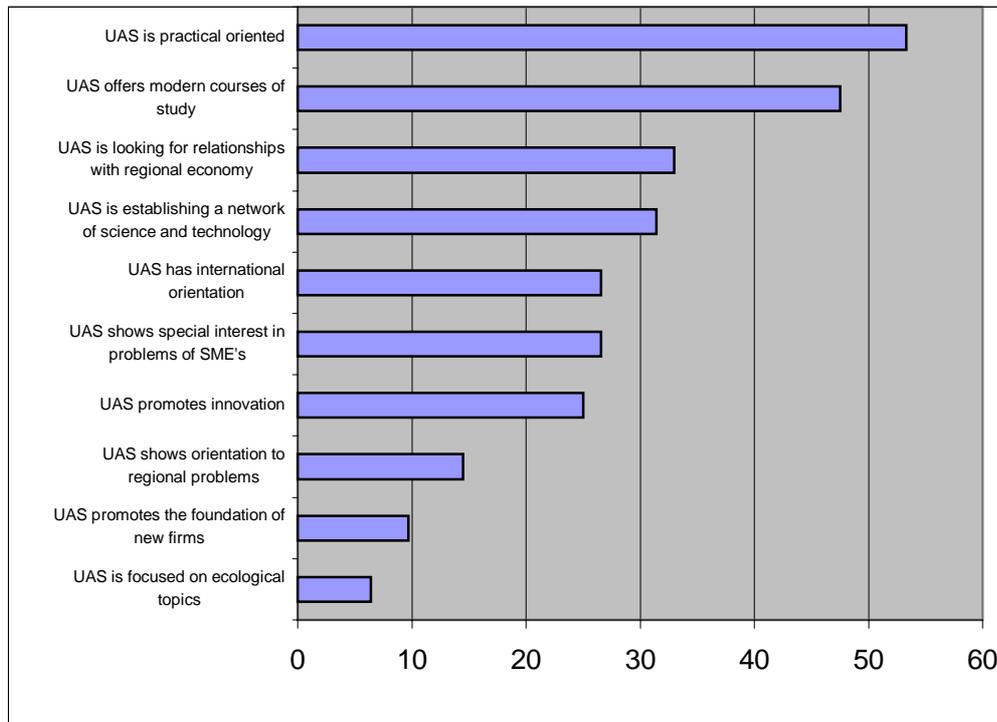


So it must be stated, that 40 percent of the regional enterprises not even have general knowledge of the UAS - even as far as its „traditional“ tasks in education are concerned; almost two thirds of the regional firms have no detailed information about the courses of study. You can get an even more disadvantageous image if other services of the UAS like offers for cooperation, offers for further education, international relations, transfer of technology or research activities are considered. Only between 5 (research activities) and 15 percent (offers for cooperation) of all firms declared to possess information corresponding to these aspects.

More than 50 percent of the firms, which took part in the survey estimate, the UAS to be practically orientated, almost 50 percent think that the UAS is offering modern courses of study (diagram 2). Between 25 and 30 percent of the enterprises agree with the statements that the

UAS is engaged in looking for relationships with the representatives of the regional economy, that it is establishing a network of science and technology, that it pursues an international orientation, that it shows special attention to the interests of small and medium enterprises and that it promotes innovation.

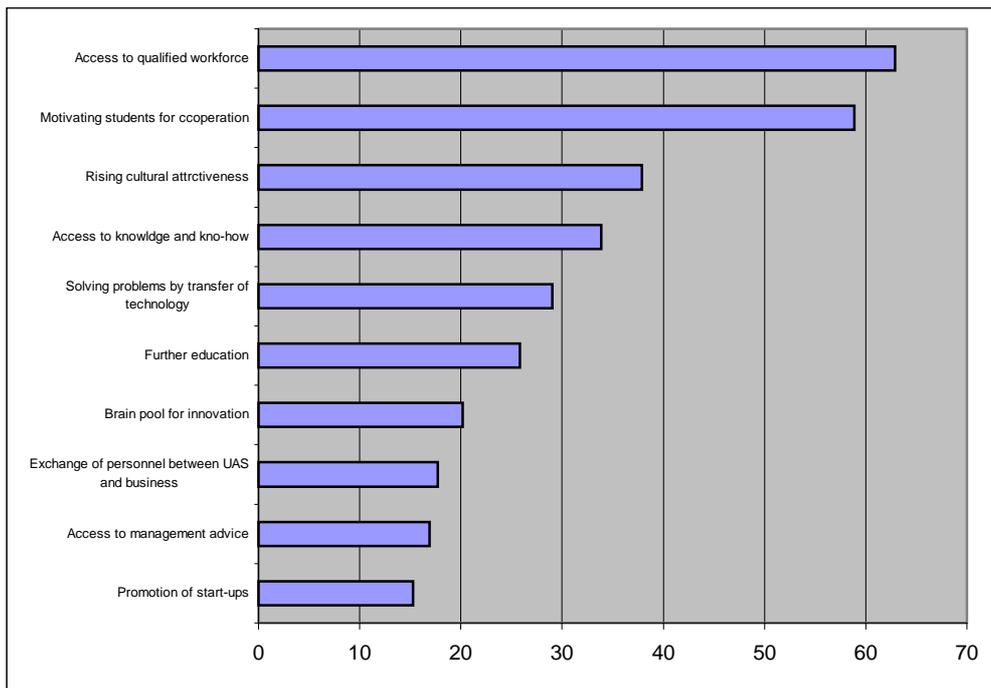
Diagram 2: Firms' Estimation of the UAS (in percent)



The fact, that only 20 percent of the firms participating in the survey classify the UAS as noticeable, shows that its perceptibility could be improved. This is valid for its educational tasks, but it is even more valid for its other functions especially for its activities in the field of research and development, for its orientation to regional problems and for the promotion of start-up-enterprises.

The limited perceptibility of the UAS by private firms is obviously co-determined by the firms' expectations in the UAS (diagram 3). For about 60 percent of the enterprises that realize the UAS at least in its traditional role as an element of educational infrastructure think that access to qualified workforce and the motivation of students for cooperation belong to the main tasks of the UAS. On the other hand promotion and support of start-ups, easier access to management advice, or the role of the UAS as a brain pool for innovations are hardly expected.

Diagram 3: Expectations of private firms in the UASLR - in percent



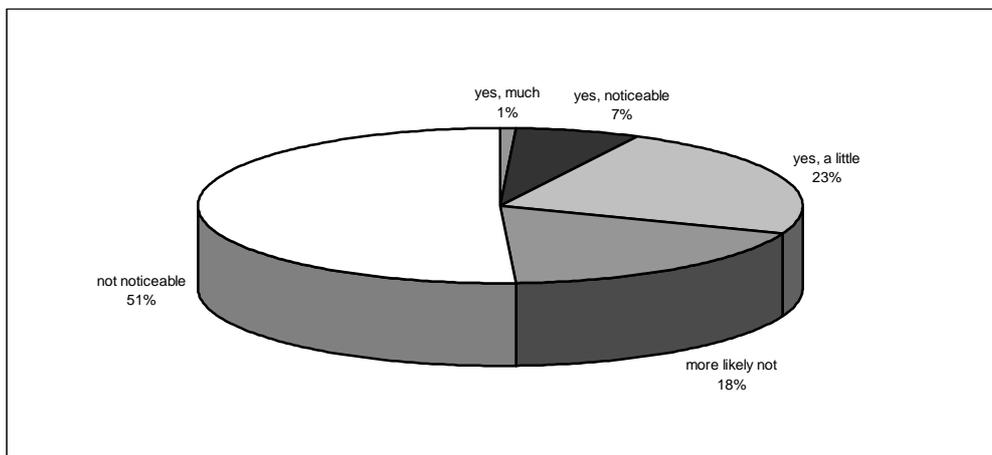
2.2.2. Influences on Innovation Behaviour and Regional Structural Change

Most of the firms participating in the survey classify the influences of the UASLR on innovation behaviour and regional structural change as not (51 percent), or more likely not noticeable (18 percent). Almost 25 percent stated a small influence, but only 7 percent could realize a noticeable and merely 1 percent a high influence (diagram 4). It must be stressed, however, that the university's potential for these impulses is estimated remarkably higher than it has turned out until now.

From the firms' point of view a better supply of services relevant for start-up-enterprises is most promising for an increasing influence of the UASLR. Examples for this mentioned by the enterprises are business plans, advice in questions of financing and coaching of start-up-enterprises. The firms judge regular circles of conversation between business and university, the intensification of educational training schemes, which are relevant for the foundation of enterprises, and the initiation of a stock market for ideas positively, too. In contrast to this, part time jobs for start-up-entrepreneurs at the university are thought to be of minor necessity. A very important question from the university's point of view is, how to get into contact with innovation oriented firms. Corresponding to the results of the survey workshops offering information for single branches or on a specific topic could receive the firms' highest attention.

The organization of regular study groups, the supply of purposeful information about new developments and general information about the UAS are ranked next. Finally courses in further education are seen as a good possibility for strengthening the transfer of knowledge.

Diagram 4: The UAS Influence on Innovation Behaviour and Regional Structural Change (in percent)



2.2.3. Cooperation and potentials for cooperation

In the middle of 2000 about 38 percent or 45 firms in number already cooperated with the UASLR. The contact for cooperation in equal parts proceeded from the university and from the firms. As far as the university is concerned especially personal contact of students and professors led to cooperation with regional firms. Far less as often thought the contact was initiated by the graduates of the UASLR or by the university's transfer agency.

Solving a firm's specific problems by a practically oriented thesis for diploma or by students working as practitioners in this firm still is the classical way of cooperation between the UAS and private enterprises. According to the results of the survey the participation of the firms' personnel in courses of further education can be a promising way of cooperation, too. Other forms of cooperation have been mentioned far less by the enterprises.

Measurements, tests and similar works have been the most frequent content of cooperation, followed by technical advice and the delivering of expert opinions. Advice in business and management problems, consulting on software development and implementation as well as information regarding the EDP-equipment has been mentioned in very few cases only.

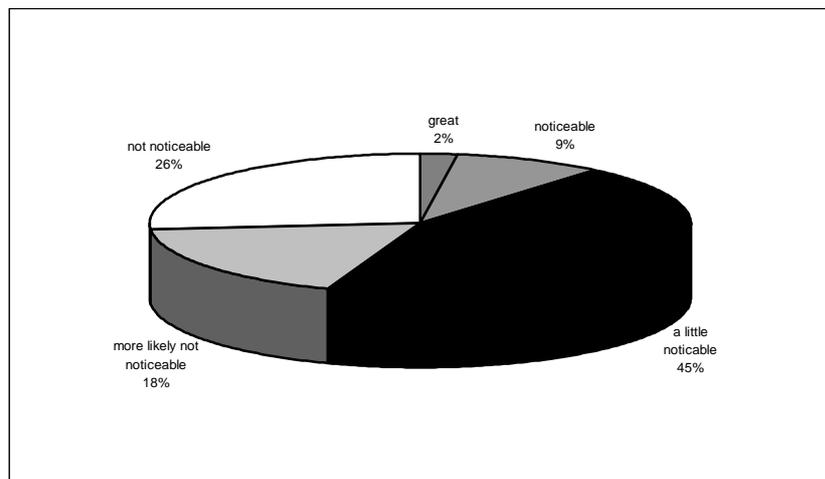
But how do the potentials for future cooperation look like in comparison to cooperation in the past? According to the results of the survey most of those firms, which until now did not cooperate with the UASLR expect that the university - more intensively than in the past - will take its own initiative, while the firms themselves want do so only in a reserved manner.

Considering the most favoured channels of cooperation a change seems to take place: Solving firms' problems by a diplom thesis or by employing students as practitioners in this firm seems to be of decreasing interest, but the firms want to use the possibilities for further education offered by the UASLR more intensively and they would like to force up an exchange of ideas by informal cooperation. As in the past little interest in research and development projects can be recognized on the firms' side. Fortunately there will be considerably more enterprises that want to use the services of the UASLR in the future than they have done in the past.

2.2.4. Experiences and Problems of Cooperation

Those enterprises still cooperating with the UASLR have been asked for the university's contribution to innovation (diagram 5). 11 percent of these firms see great or noticeable contributions to innovation by the cooperation with the UASLR, 45 percent think those contributions to be of only little importance. For all the remaining enterprises (44 percent) the university's impulses for innovation are more likely not or not noticeable.

Diagram 5: The University's Contribution to Innovation



The greatest part of the solutions of problems obtained by cooperation with the UASLR referred to improvements of procedures and processes as well as products (35 percent). Process or product innovations as aim of cooperation have been mentioned by 20 percent of the firms. Only 14 percent of the firms mention the renewal of the firm's organisational structures or improvements on the fields of cost accounting, controlling and financing. Cooperation on the fields of management, marketing and sale has been of minor importance. A pleasant result from the university's point of view is that more than 50 percent of all firms thought the cooperation with the UASLR going off smoothly. Only 8 percent of the enterprises saw considerable problems of cooperation.

Diagram 6: Proposals for Improving the Cooperation (in percent)

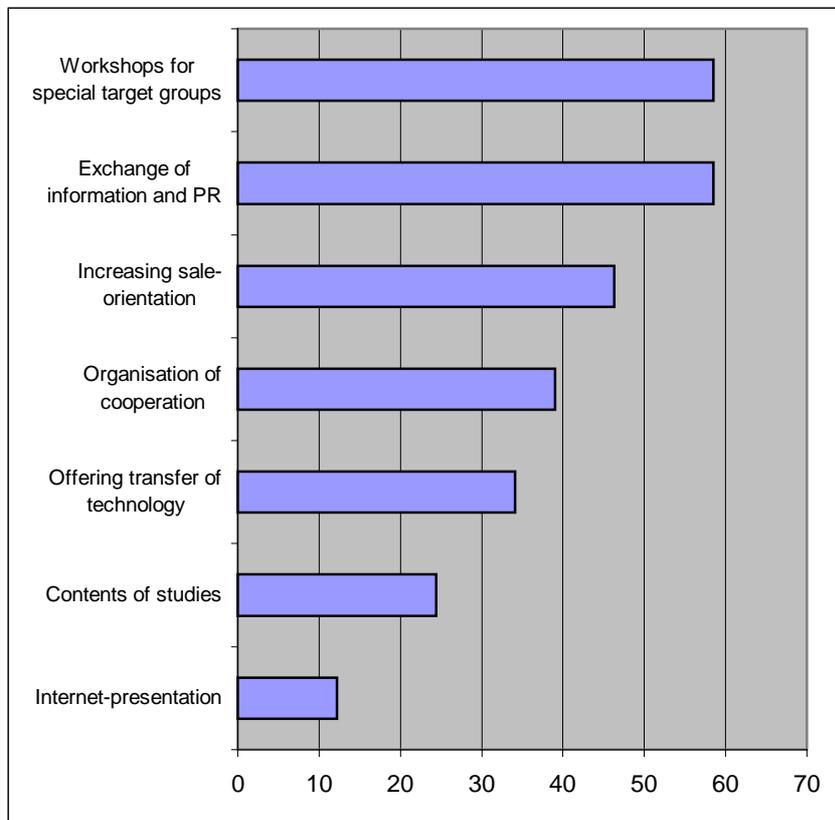


Diagram 6 shows how the enterprises think cooperation with the UASLR could be intensified. From their point of view workshops for special target groups, an intensified exchange of information between regional firms and the UASLR as well as more offensive public relations will be best suited for this. Further on the university should come into contact with the enterprises in a more sale-oriented way and it should show its whole spectrum of capacity. As less important starting points changes in the organisation of cooperation, in the transfer of technology and in the contents of the courses of studies are mentioned by the firms.

It is encouraging after all that 56 percent of the firms want to extend the cooperation with the UASLR; the remaining firms at least intend to keep the intensity of cooperation at the previous level. None of the enterprises want to reduce or to give up the cooperation with the UASLR.

3. Concluding Remarks

The UASLR definitely has an image problem. In spite of its existing since more than 30 years the university is noticed by only two third of the enterprises located in the MLRA. Only 40 percent of the regional firms possess specific knowledge of the courses of studies offered by the UASLR. Activities in research and development, in further education and other potentials of cooperation are hardly recognized by the firms. So it must be said that only few regional firms have realized the university's structural change, which has taken place during the last years.

Although nearly 40 percent of the enterprises participating in the survey already have cooperated with the UASLR, the university's influence on the firms' innovation behaviour and on regional structural change is classified hardly or not noticeable. As this study is the first analysis of its kind for the UASLR it cannot be said whether and to what extent an intensification of cooperation has taken place since the university's coming into existence. It must be emphasized, however, that the newly founded UAS "Gelsenkirchen" and "Rhein-Sieg", which at least partly must be seen as competing institutions for students and business contacts, could increase the share of cooperating firms from 15 to 30 percent since their foundation five years ago (see K. CHRISTOF a.o., 2000).

The result that all firms, which have cooperated with the UASLR in the past, want to continue or even intensify cooperation shows the university's capability. According to the results of the survey especially innovative firms, firms that give notice of a patent or use licenses and firms with a high quota of academic staff in relation to all employees are looking for cooperation with the UASLR. As a correlation between size and propensity to innovate can be realized for the firms that have participated in the survey this might be a hint that the university's offer for cooperation can hardly have reached a "natural" clientele, namely the small and medium en-

terprises (SME). Therefore the university's public relations, information policy and efforts in marketing have to define the SME located in the MLRA as one of its special target groups.

A more intensive promotion of start-up-enterprises in the MLRA is another possibility to intensify the cooperation between business and university. At least half of all firms that have been asked in the survey think the UASLR to be capable of giving considerable impulses in this field. Special services for start-ups, the intensification of corresponding training programs or the installation of a stock market for ideas are instruments that should be tested for its usefulness. In addition to these measures concerning the university itself improvements of the university frame for action should be considered. Institutions in the MLRA - like communities, organizations, chambers etc. - should emphasize the (possible) positive location effects of the only public university in the region in a more intense manner than they have done in the past.

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