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Engineering Colleges and the Economy's Skill Needs

Analysis of the Labour Market Situation and a European Comparison

The business sphere's qualification needs and connected expectations in the labour market are major indicators serving as orientation for engineering colleges. This study aims to provide empirical information about the demand for qualifications in the sector of technological occupations that are of relevance for educational providers also in a long-term perspective. In the face of the creation of a European Qualifications Framework (EQF) as a transparency-enhancing "instrument of translation" for labour-market actors in the European Economic Area, this should also include a discussion of the issues related to referencing and comparing the colleges of engineering (HTLs).

Analysis of job advertisements, data provided by Public Employment Service Austria (AMS), results of a company survey and publications of relevant research findings in particular served as the empirical basis of the study with a view to labour market demand in Austria. In addition, job ads from the print media for HTL graduates were evaluated. The analysis of literature included publications about demand for technicians particularly in the provinces of Vienna, Styria and Vorarlberg. Information about new qualifications on offer is provided by data from school statistics and the current population projection by Statistics Austria.

Demand for HTL qualifications as reflected by job ads

In 2007, a total of 13,800 vacancies were published in the print media in technical occupational sectors for the AMS qualifications category "Matura / College". The provinces with the strongest demand are Vienna with almost 3,300 job ads, followed by Upper Austria with 3,100 vacancies, Styria with approx. 2,500 posts, and Lower Austria with 1,600 vacancies.

When singling out two major occupational groups – defined by technical qualifications – of the AMS recording and placement classification compared with job advertisements in print media, this shows the quantitatively

high importance of demand for HTL qualifications (see Table 1).

For the study, job ads in print media were selected for which formal qualification could be identified as medium or upper level. Clearly more than 50 percent of all relevant posts, i.e. double as many posts as for graduates, come under the category "Matura / College", which is used by AMS for documentation and concrete placement services. The analysis of demand shows that the knowledge-based economy is characterised by a vertically structured need for staff with a strong upper-intermediate segment also in technical occupations. A one-sided orientation towards HE qualifications (at diploma level) does not meet the business sphere's structured need for staff.

Favourable labour market situation in 2007 and 2008

The analysis of data related to the labour market and the structure of the demand for qualifications reveal a positive balance for the educational work done at HTLs in 2007 and 2008.

When taking the effect of "double qualification" (i.e. vocational qualification plus general HE study qualification) into account, it can be assumed that some 5,200 holders of HTL qualifications enter the labour market every year. In this context, the annual demand for replacements

amounts to as many as about 3,500 people in employment with this vocational qualification.

Therefore merely some 1,700 new workers with HTL qualifications, or 1.2 percent compared to the basis, remain to cover the annual additional demand. This explains the favourable ratio of applicants to job vacancies

as a result of the continuing additional demand by the business sphere. For every vacancy advertised in 2007 in the print media for technical occupations with Matura/College level there is less than one person who enters the labour market for the first time.

TABLE 1:

Job vacancies in major technical occupational sectors broken down by upper secondary qualification, job ads in print media, 2007, in %

Occupational sector acc. to AMS classification	Apprenticeship / master craftsperson examination	VET school	Matura / College	HE institution	Total	
					in percent	absolute
Science, research and technology	22.6	2.0	53.8	21.6	100.0	13,845
EDP, telecommunication and new media	13.1	2.7	55.4	28.7	100.0	3,249

Source: AMS, March 2008; in-house calculation

Registered vacancies from industry and business-related services

An in-depth analysis by ibw of 1,000 HTL job vacancies for 2008 reveals that almost half of the vacancies were posted by industrial enterprises. The construction sector comes to 15 percent, energy and water supply to slightly less than 7 percent, and the services to about one third. Conspicuous is the higher share of registered vacancies for technicians with HTL qualifications in the services in Vienna than in the other Austrian provinces (44 vs. 26 percent). The main reason is the high concentration of business-related services in the capital city.

Complex qualification requirements

The majority of employers also expect HTL graduates to have communications and team-working skills, and in case of positions requiring professional experience they expect additional technical qualifications, good command of English, good EDP skills, and the willingness to be mobile. This underlines the HTL's significance as a learning platform for part-time and career-accompanying continuing training.

Overlapping demand for HTL and FH qualifications

The overlapping demand for technical qualifications from HTL and universities of applied sciences (FH) is empirically evident as early as today and will increase further due to the expansion of the share of bachelor degrees. The analysis of job ads conducted in 2008 further reveals that the growth of learning due to professional experi-

ence must be taken sufficiently into account in order to realistically map the labour market situation of different types of training paths.

In 69 percent of cases, posts published for HTL graduates with compulsory professional experience were also offered for FH graduates. The results of a study on the alternative energy production sector, for example, also show that HTL graduates with previous professional experience have good chances compared to FH (Heckl et al. 2008).

Positioning of HTL on the European labour market

In the long term there is an overall growth of the share of workforce with technical qualifications from about 5.5 percent in 1996 to 6.8 percent of people in employment in 2006 and to 6.9 percent in 2015 (cf. CED-EFOP 2008, p. 48, 100) at an overall employment growth. What is essential in this context is the shifting of technicians' employment towards the level of "Ingenieur".

The international comparison of the economies' technical and scientific human capital has frequently been the subject of debates related to educational economics and policy. Due to the high diversity of education systems (which are rightly termed "learning cultures"), however, the criteria used as the basis are not standardised sufficiently to allow for realistic comparisons. This fact makes it more difficult, in particular, to appropriately present HTLs internationally, as the majority of countries have "tertiarised" their comparable training paths.

This has not been the case in Austria: In 1994, technical Fachhochschule programmes - as institutional new creations - were set side by side with HTL, which continued to exist independently (with continued high labour-market acceptance) and conferred a graduation objective aiming to correspond with the international master level. Subsequently, importance was attached to graduates being entitled to A-posts in the public service and access to doctoral studies - primarily to compete with universities. In the European Qualifications Framework, the master level corresponds to the seventh of eight possible qualification levels.

From ISCED to the EQF

Due to major differences existing between the countries' qualification systems, criteria of comparison or rather a classification system for education (formal qualification) basing on them are needed. For this purpose, ISCED (International Standard Classification of Education) was developed. As there is no "tertium comparationis" or standards of comparison, the education systems' structural differences are extremely prevalent in case of ISCED-based comparisons and outcomes are hardly plausible, among other things leading to "backlogs" in the tertiary rates of Germany or Austria (cf. e.g. OECD 2008, p. 93).

The European Qualifications Framework (EQF) aims to overcome ISCED's deficits by means of outcome-oriented levels and descriptors as a basis for comparison. Also the study of the Bologna descriptors is tantamount to a modernisation for the Austrian qualification

system, as it overcomes the definition criteria of scientific pre-professional qualification stemming from the 19th century in favour of realistically graded transitions between professional and academic qualifications by taking into account gradual stages of research-based and research-conducting teaching activity.

This obviously represents a much bigger and institutional challenge for the educational transitions in German-speaking countries than for Anglophone learning cultures with their highly diversified postsecondary sector.

It is possible to prove the hypothesis that ISCED-based representations underestimate our learning culture: When selecting technology-relevant indicators for human capital that are not specified by the ISCED classification, this does not show any backlog for Austria but a position in the upper range of the country comparison. In 2006, the share of researchers within the meaning of the Frascati Manual amounted to 1.2 percent of the workforce compared to 0.8 percent in a European country mean; only the Scandinavian countries boasted higher values; for Ireland, 0.9 percent are listed (Eurostat database).

Preview and conclusions

In late 2007, the Austrian Institute of Economic Research (WIFO) calculated an additional demand for technical occupations at Matura level totalling 1.6 percent p.a. for the period between 2006 and 2012. With overall employment increasing, the share of technicians is expected to rise from 5.6 to 5.8 percent (see Table 2).

TABLE 2:

Last population census and occupational projection of people in an employment relationship (WIFO) in technical occupations at the upper skill levels, Austria

Major occupational group (Skill level)	2001, census*		2006	2012
	absolute	in %	WIFO %	WIFO %
Technical and scientific occupations for university graduates combined	71,607	2.0	2.8	3.3
Physical, mathematical and engineering professionals (skill level 4)	43,124	1.2	-	-
Life science and health professionals (skill level 4)	28,483	0.8	-	-
Physical and engineering science associate professionals (skill level 3)	165,939	4.7	5.6	5.8
In absolute figures	3,541,877	100.0	3,147,200	3,329,600

* including marginal part-timers and unemployed

Source: Statistics Austria; WIFO 2008; own calculations

This calculation is clearly confirmed in company surveys. Thus, for example, on the occasion of a company survey (May/July 2008), 65 percent of respondents from the electrical / electronics industry stated that they frequently encounter difficulties in the recruitment of staff holding HTL qualifications (Schneeberger et al., 2008).

For the projections related to the development of the demand for qualifications, a general reservation has applied without any doubt since the autumn of 2008 due to the financial and economic crisis as far as short-term conclusions are concerned. From the dynamic of the technologically founded economy in the production and growing services sector however it can be expected that the trend related to qualification demand will continue in the medium and long term for elementary reasons of a functional type. In the short term, by contrast, a more pronounced trend towards HE studies might occur while (attractive) job offers for new graduates decline, but in the medium and long term the imperatives of technological change and globalisation should take effect.

In the medium term, a demand in the higher technical qualification area of some 7 percent of the workforce can be expected on the European labour market, with the share of HE graduations increasing. In Austria, a shortage of skilled labour in the technical field can be proven in recent years by using different surveys. After overcoming the current financial and economic crisis, due to the technological foundation of production and growing services sector, a continuation of favourable employment prospects for technicians can be expected.

But there are some demographic challenges. Pursuant to existing projections, the Austrian population will dwindle over the next one to two decades in the age groups enrolled in the school system. According to current projections by Statistics Austria (the calculation's main variant), the number of 15-year-olds will decline (for example, from about 100,000 in 2007 to approx. 86,000 in 2020). With the exception of Vienna, it must be assumed that the number of youth at HTL entry age will decline in all Austrian regions. What can be done to meet the business sphere's demand for qualifications nevertheless?

Essentially it will be important ...

1. to make better use of the demographic potential by taking pedagogical measures (individualisation, etc.),

2. to convince even more young women to opt for the HTL route in its full-time form or the forms for people in employment,
3. to keep the HTL forms for people in employment and create a credit system for bachelor studies (EQF level 6),
4. to adequately represent the "Ingenieur" qualification at the international level by applying the EQF,
5. to extend the part-time study provision for people in employment with HTL qualification,
6. to discuss and develop an integrated level concept for the schools and colleges of engineering that provides for different intermediate and add-on qualifications.

In relation to the schools and colleges of engineering it can be assumed that it will be indispensable for a prosperous development in the European education and employment area that the training levels between the diploma and the "Ingenieur" qualification are made transparent for the EQF. The 2008 company survey has revealed that the schools and colleges of engineering are accepted by employers to a high degree.

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The entire study can be [downloaded](#).