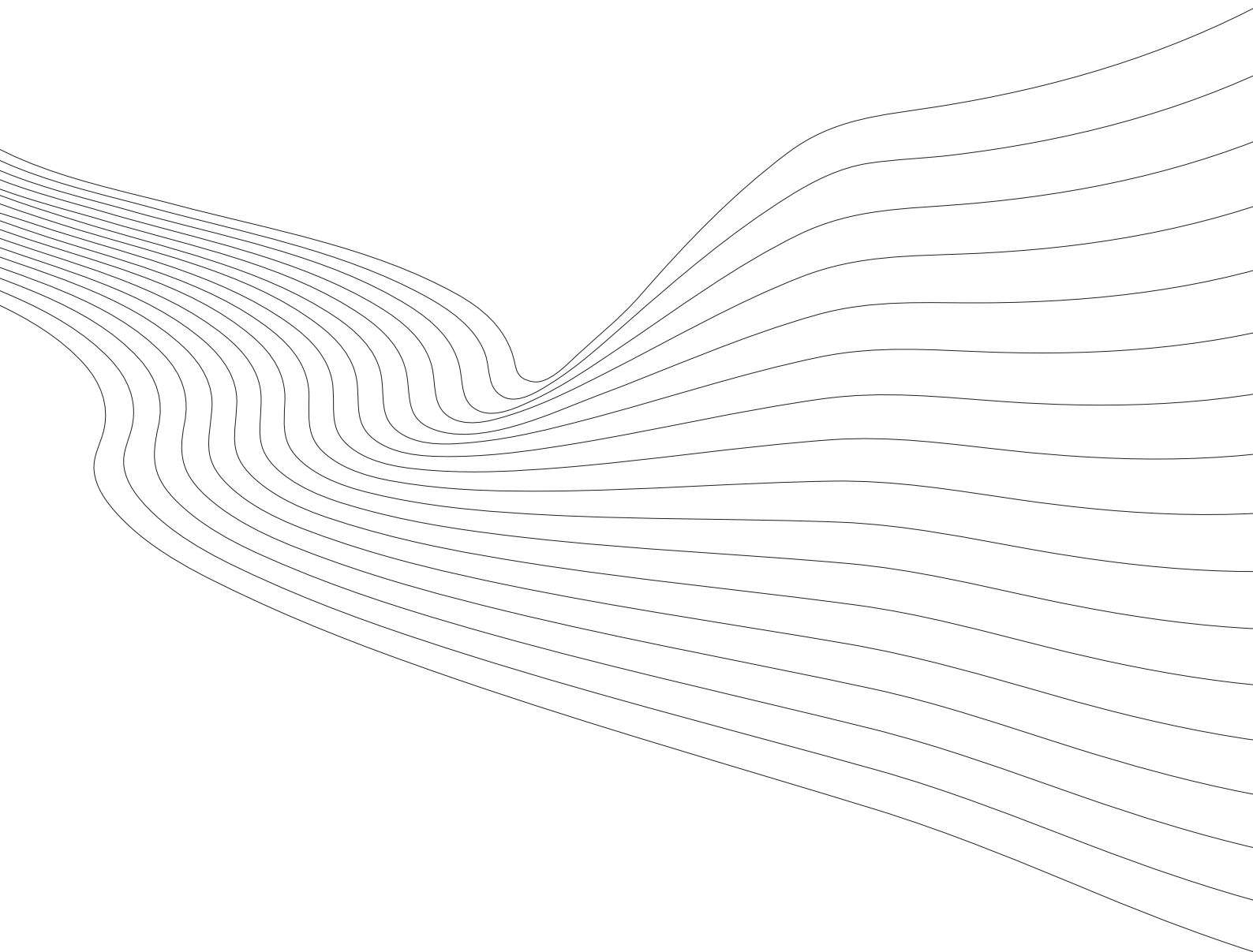


# KOF Working Papers

Comparative Advantages of School and Workplace Environment  
in Competence Acquisition: Empirical Evidence From a Survey Among  
Professional Tertiary Education and Training Students in Switzerland

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# **Comparative Advantages of School and Workplace Environment in Competence Acquisition: Empirical Evidence From a Survey Among Professional Tertiary Education and Training Students in Switzerland**

Thomas Bolli<sup>1</sup> and Ursula Renold<sup>2</sup>

## **Abstract**

This paper sheds light on the questions how important competences are and which competences can best be learned at school and which competences can be acquired better in the workplace. Exploiting data from a survey among professional tertiary education and training business administration students and their employers in Switzerland, we find that competences related to strategic management, human resource management, organizational design and project management processes are most suitable to be taught in school. However, the results further suggest that soft skills can be acquired more effectively in the workplace than at school. The only exceptions are analytical thinking, joy of learning and organizational competences, for which school and workplace are similarly suitable. Thereby, the paper provides empirical evidence regarding the optimal choice of the learning place for both human resource managers as well as educational decision makers who aim to combine education and training, e.g. in an apprenticeship.

JEL: A23, I21

Keywords: Competences, soft skills, school, workplace learning, relevance, learning place

Acknowledgments: We thank the organizing institution of the core curriculum at Colleges of Professional Education and Training in business administration (<http://www.rlp-hfw.ch/>) for support in terms of financing and questionnaire development. Furthermore, we thank Ladina Rageth and Filippo Pusterla for the organization of the survey and the management of the data.

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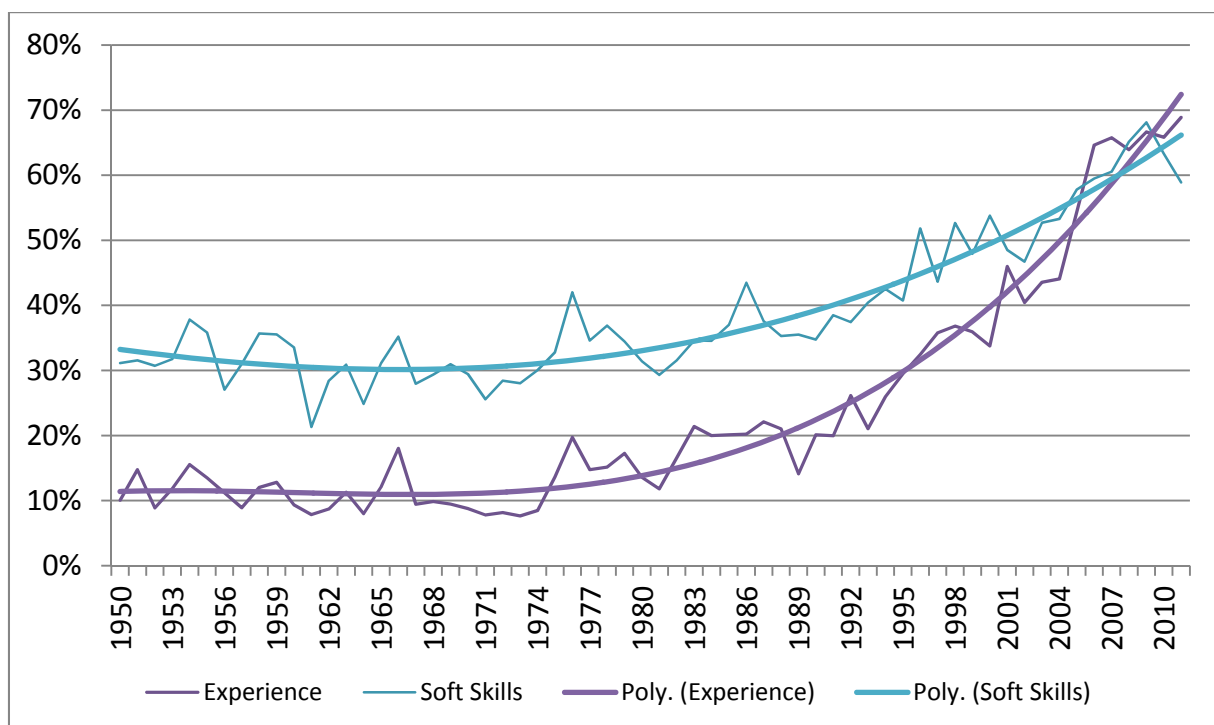
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## 1 Introduction

Soft skills become increasingly relevant in the workplace. Figure 1 illustrates this development for Switzerland by displaying the share of job advertisements that mention soft skills as job requirements between 1950 and 2011 (Salvisberg, 2010). Figure 1 shows that beginning in the 1980s, an increasing share of job advertisements contain soft skill requirements. In 2011, nearly 60% of job advertisements mention some type of soft skills, highlighting the relevance of soft skills in the workplace. Figure 1 further shows that demand for work experience increases since the 1970s, suggesting that learning in the workplace represents an increasingly important source of competences.

Figure 1: Development of the share of job advertisements mentioning soft skills



Source: own graph based on the data given to the authors by the responsible bodies of the "job-market-monitoring", University of Zurich

As a result of the increasing relevance of soft skills, the education system is often blamed to put too little emphasis on soft skill development (see, e.g. Boyce et al., 2001, Kavanagh and Drennan, 2008, Hancock, 2009, Jackson, 2014). However, Aarkrog (2005) points out that school and work-place differ in terms of their ability to convey particular competences and hence have a comparative advantage in teaching particular competences. Since little evidence regarding these comparative advantages exists, this paper aims to provide empirical evidence regarding the questions raised in Aarkrog (2005):

*In order to strengthen the dual training system, continuing education and, in a broader sense, lifelong education it is necessary to clarify the relation between the qualifications needed to solve tasks in*

*workplaces within specific trades and the opportunities for learning in the school and in the workplace, respectively. What qualifications are best obtained in school and in the workplace, respectively?*

This citation illustrates that education system managers and human resource managers aiming to improve the competences of their employees' face three key questions for which this paper provides empirical evidence.

First, they need to decide upon the competences to improve. Second, they need to choose the learning environment, which can be broadly separated into school-based education and work-based training. Because competences differ in the extent to which conceptualizing, experimenting, experiencing and reflecting matter in the learning process (Raelin, 1997), school and work-based learning places differ in their competence-specific comparative advantage. Choosing the optimal learning place for each competence is particularly relevant due to restrictions of time and resources (see, e.g., Woronoff, 2009, Howieson et al., 2014). Third, based on the defined competences and corresponding learning places, education system managers and human resource managers need to define the way in which the two learning places are linked. This can take the form of combining school and work-based education in an appropriate way (see, e.g., Stern et al., 1997, Leong and Kavanagh, 2013). Alternatively, the link between the learning places might be fostered by engaging employers in the education process (see, e.g., Barnett et al., 1987, Howieson et al., 2014) or by employing pedagogic tools aiming to transmute theoretical knowledge into practical competences (see, e.g., Boyce et al., 2001, Shaw, 2007, Schulz, 2008).

Analyzing data based on a survey conducted in 2014 among business administration students of Swiss Colleges of Professional Education and Training during their last year of studies and their corresponding supervisors, this paper extends the extensive evidence regarding the heterogeneous relevance of competences on the labor market. In a first step, we follow the existing literature and evaluate the relevance of 22 types of soft skills, where Figure 1 exhibits the labor market relevance of the evaluated soft skills suggested Salvisberg (2010). Broadly supporting the literature, the results suggest that reliability, trustworthiness, commitment, motivation and efficiency represent the most important competences. In contrast to the existing literature (see, e.g., Gabric and McFadden, 2001, Naidoo et al., 2011), we find that the assessments of students and employers resemble each other strongly. This might be due to the fact that the students on average have more than eight years of working experience.

While broad empirical evidence regarding the relative relevance of soft skills exists, few studies analyze the relevance of competences related to particular processes. Our results suggest that communication

represents the most important process, followed by order processing, production and customer processes. Furthermore, we find that on average, process-specific competences are less relevant than the average of soft skills. This suggests that the soft skill component of process-specific competences is more relevant than the hard skill (definition see chapter 2.2) component. Hence, these results support the literature suggesting that soft skills are more relevant than hard skills (see, e.g., Maes et al., 1997, Bailey, 2014).

The paper further addresses the second question, i.e. what is the optimal learning place for different competences. The results suggest that the workplace has a comparative advantage in terms of most soft skills. These findings question whether improving soft skills should be a primary aim of school-based education as the opportunity costs of doing so might be too high.

On the other hand the findings suggest that the school has a comparative advantage over the workplace in terms of learning project management, organizational design, human resource processes, strategic management, innovation and to a lesser extent, communication. Hence, these processes entail competences that can be learned effectively at school. Leadership, customer, production and order processing processes on the other hand display a strong comparative advantage of the workplace.

The third part of the paper analyses to what extent these comparative advantage assessments depend on the educational experience. A simple multivariate regression analysis reveals that the comparative advantage of the school is positively related to a number of instruction methods, e.g. use of E-learning tools, and transfer tools, e.g. real case study presentation. However, the magnitude of the relationship is relatively small. Therefore, the comparative advantage of school and workplace depends largely on the specific competence. Hence, the optimal choice of the learning place represents the most important decision while the optimal choice of the pedagogic instruments is secondary. Thereby, the paper further adds to the literature analyzing how soft skills can be enhanced in the classroom (see, e.g., Nealy, 2005, John, 2009, De Villiers, 2010, Shah, 2013, Daff, 2013, Gil, 2013, Thomas et al., 2014). However, the simple correlation analysis presented in this paper merely represents a first step in evaluating a causal relationship between pedagogy and learning outcome.

Section 2 of the paper summarizes the existing literature and develops empirical hypothesis. Section 3 describes the data and the empirical methodology. Section 4 presents the results and section 5 concludes the paper.

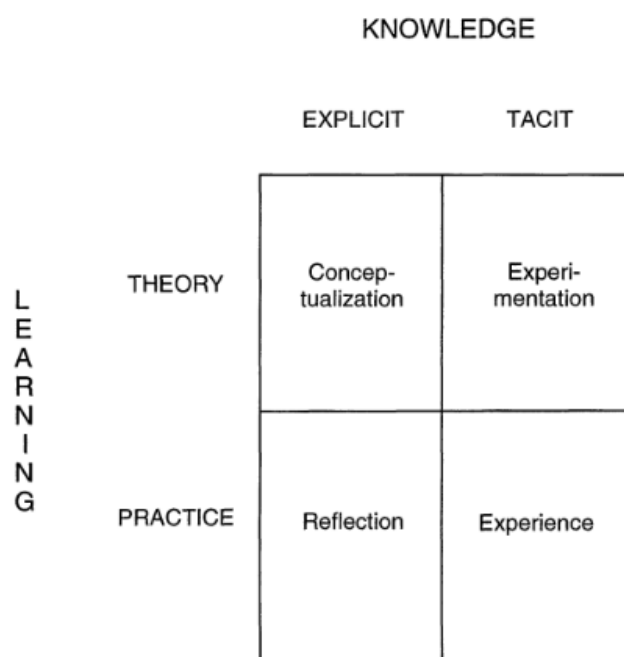
## 2 Literature

### 2.1 Theoretical Framework of School- and Work-Based Learning

Figure 2 displays the four learning phases in the theoretical model of work-based learning suggested by Raelin (1997). This widely cited theoretical model represents an example of models highlighting why the comparative advantage of school and work-based learning varies across competences (see, e.g., Brown, 1993, for an alternative way to model the learning process).

The first step in the learning process is the conceptualization phase in which explicit theoretical knowledge is acquired. This is the phase in which schools have the largest comparative advantage over the workplace as a learning location. This conceptual knowledge becomes contextualized or grounded through experimentation. Thereby, the second learning process phase transforms explicit knowledge into tacit knowledge. The third learning process phase, the experience phase applies this tacit knowledge to idiosyncratic situations. Work-based learning has a comparative advantage over the school in the experimentation and even more so in the experience phase. This is typically the case if learners are exposed to unfamiliar and unexpected situations. However, in the fourth phase, experience needs to be explicitly reflected in the reflection phase, for which the school has some comparative advantage although a reflexive practice exists in workplace learning too.

Figure 2: Learning process phases



Source: Raelin (1997)

This theoretical model clarifies that competences differ regarding the relevance of the conceptualization, experimentation, reflection and experience phases. Therefore, the optimal choice of the mix between school- and work-based learning depends on the particular competence. E.g., successful leaders gained their overall competences during extensive experimentation and experience and not necessarily through a lot of conceptualization. Conversely, keeping the books might require substantial amounts of conceptualization, while experimentation is less relevant. Hence, the school might have a larger comparative advantage regarding accounting processes than for leadership processes.

## **2.2 Empirical Evidence Regarding the Relevance of Competences**

Competences can be classified in many ways (see, e.g., Rychen and Salganik, 2003, Le Deist and Winterton, 2005, Mulder et al., 2007, Salvisberg, 2010). This paper uses two complementing approaches. First, we follow the conventional approach of separating competences into two broad categories, namely hard and soft skills. While the difference between hard and soft skills can be specified in various ways, we follow Robles (2012) and define hard skills as competences that are coming from one's knowledge, practice and aptitude. Conversely, soft skills entail competences that do not depend highly on acquired knowledge. Soft skills include interpersonal skills such as communication skills but also depend on personal attributes such as personality and likeability (see, e.g., James and James, 2004, Perreault, 2004, Robles, 2012).

A number of papers indicate that soft skills may be even more relevant than hard skills in the workplace (see, e.g., Maes et al., 1997, Gabric and McFadden, 2001, Silva and McFadden, 2005, Kesner, 2008, Wats and Wats, 2009, Klaus, 2010, Mitchell et al., 2010, Bailey, 2014). Though Jackson and Chapman (2012) and Ilias et al. (2012) find that hard skills are more important than soft skills, we hypothesize that

*Hypothesis H1: Soft skills are more relevant than hard skills*

While the literature suggests that both students and employers consider soft skills more relevant than hard skills, Gabric and McFadden (2001), Klibi and Oussi (2013) and Naidoo et al. (2011) find that the difference is larger for employers than for students. These findings suggest that students underestimate the relevance of soft skills. Hence, we hypothesize that

*Hypothesis H2: Employers consider soft skills relative to hard skills more relevant than students*



The literature providing evidence regarding the relative relevance of various soft skills is vast. However, identifying a consensus regarding the order of relevance among soft skills in order to postulate hypothesis is difficult. The reason is that no unified framework regarding terminology and definition of soft skills exists. Furthermore, there is no consensus on which soft skills need to be included. In order to summarize the existing literature providing empirical evidence regarding a broad set of soft skills, Table 1 displays papers which deem a particular soft skill to be among the most relevant soft skills. This allows to create a very crude ranking of soft skills in accordance to the number of papers which identify the soft skill as one of the most relevant soft skills. Hence, we hypothesize that

*Hypothesis H3: The most important soft skills are*

*Hypothesis H3a: Communication*

*Hypothesis H3b: Teamwork/Interpersonal skills*

*Hypothesis H3c: Decision-making/Problem-Solving (not tested)*

*Hypothesis H3d: Ethics/Integrity/Responsibility*

*Hypothesis H3e: Time management/Organization*

*Hypothesis H3f: Self-motivation*

*Hypothesis H3g: Willingness to learn*

Table 1: Identification of specific soft skills as most important competence

Soft Skill	Literature
Communication	Maes et al. (1997) Gabric and McFadden (2001) Naidoo et al. (2011) Freudenberg et al. (2011) Robles (2012) Silva and McFadden (2005) Kavanagh and Drennan (2008) Hancock (2009) Tempone et al. (2012) Jackson and Chapman (2012) Ilias et al. (2012) Klibi and Oussi (2013) Bailey (2014)
Teamwork/Interpersonal competences	Gabric and McFadden (2001) Hancock (2009) Freudenberg et al. (2011) Naidoo et al. (2011) Robles (2012) Jackson and Chapman (2012) Ilias et al. (2012) Klibi and Oussi (2013) Bailey (2014)
Decision-Making/Problem-Solving	Maes et al. (1997) Gabric and McFadden (2001) Silva and McFadden (2005) Kavanagh and Drennan (2008) Hancock (2009) Tempone et al. (2012) Jackson and Chapman (2012) Bailey (2014)
Ethics/Integrity/Responsibility	Gabric and McFadden (2001) Kesner (2008) Naidoo et al. (2011) Robles, 2012) Ezzo (2013) Klibi and Oussi (2013)
Time management/Organization	Silva and McFadden (2005) Jackson and Chapman (2012) Ezzo (2013)
Self-motivation	Maes et al. (1997) Gabric and McFadden (2001) Hancock (2009)
Willingness to learn	Kesner (2008) Kavanagh and Drennan (2008) Tempone et al. (2012)

The literature assessing hard skills can be broadly separated into two groups. On the one hand, there are papers which assess the relevance of hard skills as a whole (see, e.g., Naidoo et al., 2011). On the other hand a detailed set of specific competences are assessed (see, e.g., Gabric and McFadden, 2001, Klibi and Oussi, 2013). Following the conceptual framework of the core curriculum of the business administration degree at Colleges of Professional Education and Training (HFW, 2008), we approach the measurement of hard skills by assessing process-specific competences. Thereby, we propose an intermediate approach between assessing hard skills as a whole and assessing a detailed set of specific hard skills. This approach has the benefit that it can be applied to different occupations, allowing some comparison with the existing literature and if used in other studies enables a comparison of process-specific competences across occupations. Since process-specific competences contain both hard and soft skills, the approach further allows to identify the relative value of hard and soft skills.

Concretely, based on Rüegg-Stürm (2002), we distinguish twelve processes, which are associated to four process categories, namely Management Processes, Business Processes, Supporting Processes and Overlapping Processes. Management Processes entail three processes, namely Normative Management, Strategic Management, Leadership Processes. Business Processes consist of Customer Processes, Production, Order Processing and Innovation. Supporting Process entail Human Resources, Infrastructure and Communication. Finally, Organizational Design and Project Management make up the Overlapping Processes.

To our knowledge, no direct evidence regarding process-specific competence relevance exists. However, Gabric and Mcfadden (2005) provide some guidance by reporting evidence regarding the relevance of a broad set of hard and soft skills. Concretely, as mentioned above, they find that communication represents important soft skills, suggesting that communication process competences are among the most important competences. Furthermore, leadership competences, which are related to leadership processes, also have a high relevance, while project management has a mediocre relevance. The mediocre relevance is supported by a similar analysis of Farkas (2008), who further finds that entrepreneurship, which is related to innovation processes is considered medium relevant in the US but highly relevant in Hungary. Based on these patches of evidence, we hypothesize that

*Hypothesis H4: Process-specific competence relevance:*

*Hypotheses H4a: Communication process competences are highly relevant*

*Hypotheses H4b: Leadership process competences are highly relevant*

*Hypotheses H4c: Project management process competences are moderately relevant*

*Hypotheses H4d: Innovation process competences are moderately relevant*

### **2.3 Empirical Evidence Regarding the Comparative Advantage of School and Work-based Learning**

While the literature provides broad evidence regarding the relevance of different competences, relatively little empirical evidence regarding the differences of the comparative advantage of schools across competences exists (see, e.g., Brunello and Schlotter, 2011). The following paragraphs summarize the scant existing evidence, highlighting competences that are related to competences analyzed in this paper to allow the distillation of empirical hypotheses.

Green et al. (2001) assess to what extent education, organizational characteristics and other work-based indicators explain the variance in problem-solving, team-working (related to teamwork capacity), professional communication (related to communication), social and computing competences. The results suggest that organizational characteristics represent the most important predictor of all competences. However, the relative explanatory power varies substantially across competences. For computing competences, education and organizational characteristics have a similar effect magnitude. For competences related to professional communication and social competences, the effect of education is about half the size and for problem-solving and team-working competences, the relative explanatory power is a third and a tenth, respectively. This crude analysis suggests that the comparative advantage of schools is higher for computing than for professional communication and social competences, followed by problem-solving and team-working competences.

Lee (2008) compare the assessment of hospitality students regarding the learning outcomes in the classroom environment and in a work-placement. Among the analyzed 29 competences, he finds nine competences where the workplace has a comparative advantage over school, namely practical knowledge, organization functioning, realistic career expectations, networking, being initiative (related to proactive), ability to adapt to change (related to adaptability), leadership competences, self-confidence (related to assertiveness) and financial management competences. On the other hand, five competences display a comparative advantage of school-based learning, namely oral presentation (related to communication), writing competences (related to communication), ability to design and conduct experiments and awareness of civic responsibilities. Surprisingly, the results further suggest that schools have a comparative advantage regarding the ability to work with others (related to teamwork capacity), though school and workplace are similarly suitable to acquire the ability to contribute to a team effort suggests. For the remaining competences, Lee (2008) finds no statistically significant comparative advantage. Particularly relevant in the present context are the ability to take initiative (related to proactive), the ability to creatively identify, formulate and solve problems (related to creativity), time management competences (related to organizational competences), and motivation to learn in the classroom (related to joy of learning).

Hancock et al. (2009) survey Australian accounting educators about the capacity of universities to develop different competences. The results suggest that capacity is largest for problem solving and communication (related to communication), followed by planning and organizing (related to organizational competences) and technology. The least capacity exists for teamwork (related to teamwork capacity), lifelong learning, initiative (related to proactive), enterprise (related to entrepreneurship and innovation process) and the ability to deal with diversity.

Woronoff (2009) discusses the comparative advantage of law schools, suggesting that universities have a comparative advantage regarding hard skills. Beside of supporting this argument, Howieson et al. (2014) stress the relevance of universities to teach how to learn (related to joy of learning).

#### *Hypothesis 5: School Disadvantage*

*Hypothesis 5a: Schools have a comparative disadvantage regarding adaptability (Lee, 2008)*

*Hypothesis 5b: Schools have a comparative disadvantage regarding assertiveness (Lee, 2008)*

*Hypothesis 5c: Schools have a comparative disadvantage regarding teamwork (Green et al., 2001, Hancock et al., 2009)*

*Hypothesis 5d: Schools have a comparative disadvantage regarding proactive (Lee, 2008, Hancock et al., 2009)*

*Hypothesis 5e: Schools have a comparative disadvantage regarding entrepreneurship (Hancock et al., 2009)*

#### *Hypothesis 6: Absence of Comparative Advantage*

*Hypothesis 6a: School and workplace are similarly suitable to develop creativity (Lee, 2008)*

*Hypothesis 6b: School and workplace are similar suitable to develop joy of learning (Lee, 2008, Howieson et al., 2014)*

#### *Hypothesis 7: School Advantage*

*Hypothesis 7a: Schools have a comparative advantage regarding communication (Green et al., 2001, Lee, 2008, Hancock et al., 2009)*

*Hypothesis 7b: Schools have a comparative advantage regarding organizational competences (Lee, 2008, Hancock et al., 2009)*

*Hypothesis 7c: Schools have a comparative advantage regarding hard skills (Green et al., 2001, Woronoff, 2009, Howieson et al., 2014)*

### 3 Data and Methodology

The data stems from a survey of the KOF Swiss Economic Institute among students in their last year of their business administration studies at Swiss Colleges of Professional Education in autumn and winter 2014 (Renold et al., 2015, provide a detailed description of the survey). During this time, 769 students in the last year of their studies were enrolled at the 14 participating colleges. This roughly represents about 80% of the full population of students (SFO, 2014). Among these, 487 students or about 63% filled in the extensive questionnaire. This high response rate, particularly given that not all schools surveyed all classes, was achieved by surveying students in the classroom setting. This approach further resulted in a very low item-non response rate.

In order to examine the quality of student assessment, participating students were asked to hand a letter to their supervisor that contained a link to the survey. However, unlike in the student sample, non-response rate of employers was very high. 62 employers filled the survey partially, suggesting a response rate of about 13%. Furthermore, item non-response was also higher. Hence, the results presented in the paper are based on about 50 employer responses, of which about 75% stem from direct supervisors and 25% stem from the CEO or the responsible human resource manager.

The questionnaire entailed a number of questions regarding the student, the employer and the studies characteristics. Most important for this paper, the main part of the questionnaire surveyed the assessment of relevance, own competence and suitability of the school as a learning place for a broad set of competences. This allows us to analyze how relevant competences are and whether the school has a comparative advantage over the workplace.

As discussed in Renold et al. (2015), the survey entails information on detailed competences based on the competences in the core curriculum of the business administration degree in Colleges of Professional Education and Training (HFW, 2008), e.g. preparation of appraisal interviews. In order to place the empirical results in a broader context, the paper focuses on competences in two aggregated dimensions that were also surveyed. The first competence dimension consists of 22 soft skills based on Salvisberg (2010). They are based on an empirical analysis of job advertisements in the Swiss labour market and contains data from 1950-2006. Thereby the choice of soft skill dimensions represents an empirically founded set of competences.

The second competence dimension abstracts from the hard versus soft skill distinction and evaluates the competences used in twelve processes, namely Normative Management, Strategic Management, Leadership Processes, Customer Processes, Production, Order Processing and Innovation, Human

Resources, Infrastructure and Communication, Organizational Design and Project Management (Rüegg-Stürm, 2002).

Using the assessment of students to analyze comparative advantages of school and workplace has the drawback that the student evaluations might be colored by their experiences at school. A student exposed to a school environment that fosters the exchange between the school and workplace might assess the comparative advantage of schools differently than a student in a school environment that focuses on traditional education instruments such as teacher-centered instruction.

Hence, the student evaluation of the comparative advantage of schools might reflect their experiences at school. This data feature allows to analyze the relationship between pedagogical instruments and the comparative advantage assessment. The magnitude of the relationship yields insights into how strongly experiences shape the student evaluation, i.e. to which extent the comparative advantage of schools depends on pedagogy. In addition, the relationship provides information on the effectiveness of these pedagogical instruments.

This article analyzes two types of pedagogical instruments. The first instrument type refers to information regarding the method of instruction. Concretely, students were asked whether their studies included group work (Group, 94%), self-study (Self-Study, 71%), elearning (Elearning, 35%), writing a thesis (Thesis, 74%), Case Studies as suggested by Boyce et al. 2001 (Case Studies, 77%), project work (Project Work, 79%) and reflection of work (Work Reflection, 57%), where numbers in brackets represent the share of students indicating that this instruction method has been applied.

The second instrument type particularly aims to capture tools developed for the transfer of knowledge from school to the workplace. The choice of evaluated transfer tools is based on the core curriculum of business administration in Colleges of Professional Education and Training (HFW, 2008). Concretely, the instruments analyzed refer to the presentation of real world examples at school (Example Presentation) and solving real world case studies (Case Studies Presentation), which the median student experienced once per year. The more ambitious instruments presentation of a firm survey at school (Survey) and learning contracts (Learning Contract) on the other hand are relatively scarce as less than 30% of students experienced them. Finally, two instruments that range in between regarding their ambitiousness are competence raster (Competence Grid) and learning documentation of how theory was applied in the real world (Learning Documentation), which was experienced by about half of the students.

In order to analyze the relationship between these pedagogical instruments and the comparative advantage of schools, we estimate simple multivariate regressions where the dependent variables

reflect the mean assessment of the comparative advantage of schools relative to the workplace for process-specific competences and soft skills on a scale from 1=work, 2=don't know to 3=school. Formally, we estimate

$$y_{s,i} = \beta_{s,1}Instrument_i + \beta_{s,2}Control_i + \varepsilon_{s,i} \quad (1)$$

where  $y_{s,i}$  denotes the comparative advantage evaluation of individual  $i$  regarding the  $s^{\text{th}}$  competence dimension. Instrument refers to the pedagogical instrument and Control entails a vector of control variables, i.e. gender, age, work experience, Swiss citizenship, working full-time, being superior and the area of work, e.g. management, controlling.  $\varepsilon$  denotes the normally distributed error term of an OLS regression, clustered at class level. Table A1 in the appendix describes the variable construction and provides summary statistics.

#### **4 The Business Administration Studies at Colleges of Professional Education and Training**

Swiss Colleges of Professional Education and Training provide tertiary (ISCED97 5b) degrees. Awarding about 7600 degrees in 2013 (SFO, 2014), Colleges of Professional Education and Training represent important institutions in the Swiss education landscape. Accounting for about 1600 or 21% of these degrees, Colleges of Professional Education and Training in Business are highly relevant.

The business administration studies at Colleges of Professional Education and Training in Business aim to convey competences needed for a management position. Correspondingly, the average student is more than 28 years old and has more than 8 years of work experience excluding the initial education. The degree takes three years to complete. The schools in our sample only offer the degree while working. Hence, it is not surprising that 99% of students are either employed or self-employed. More astonishing is though that 73% work more than 90% in addition to an average of 14 hours of studying per week. Of these, about two thirds take place during contact hours while one third of the time is private studies.

### **5 Results**

#### **5.1 Competence Relevance and Comparative Advantage of Schools**

Figure 3a displays the student assessments of the process-specific competence relevance and comparative advantage of schools. Similarly, Figure 4a displays the student assessments of relevance and comparative advantage for various soft skills. Correspondingly, Figures 3b and 4b display the evaluations of employers. Blue bars indicate the relevance of competences on a 1 to 5 Likert scale. The



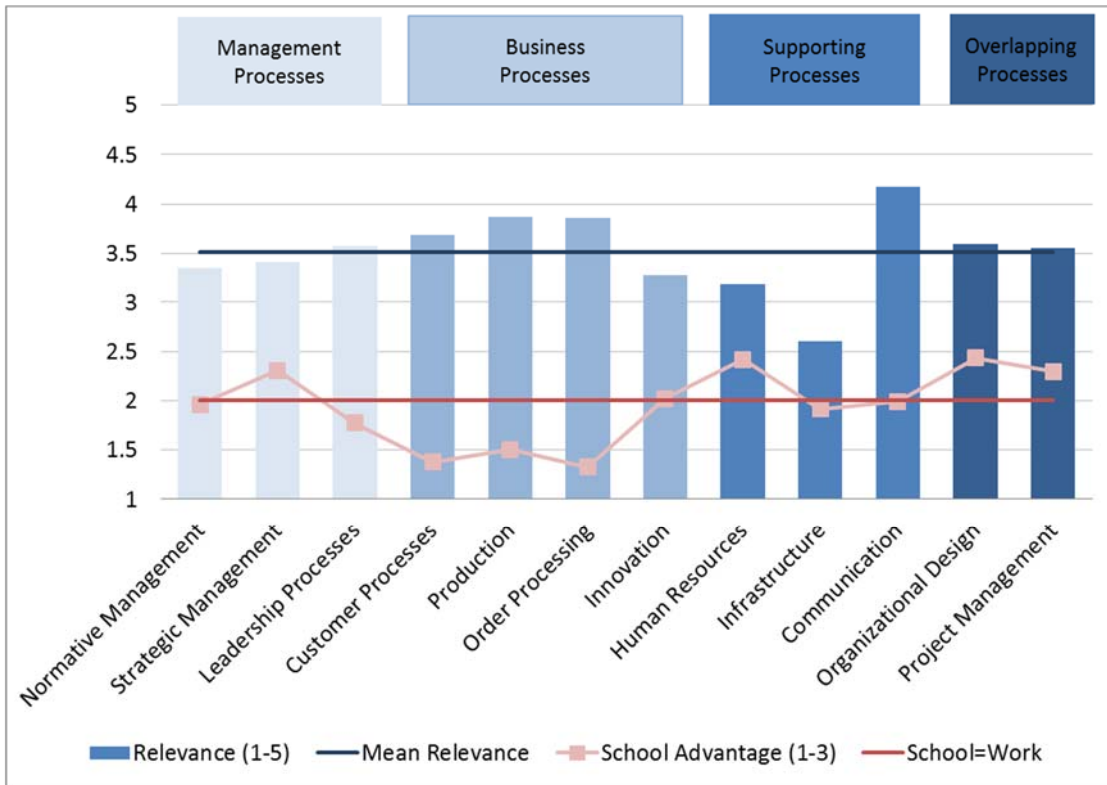
mean relevance across competences appear as blue horizontal lines. The light red line with markers reveals the competence-specific comparative advantage of schools on a 1 to 3 scale. The dark red line highlights the value of 2 indicating that students are indifferent between school and work.

Figures 3a and 3b suggest that communication represents the most important process, thereby supporting hypothesis 4a. Communication is followed by three of the business processes, namely production, order processing and customer processes. Management and overlapping processes score close to the mean relevance, supporting hypotheses 4b and 4c, respectively. The least important processes are infrastructure, human resources and innovation processes, thereby providing evidence against hypothesis 4d suggesting that innovation competences are moderately relevant.

However, while this type of information is important regarding the choice of education and training content, the focus of this paper lies on providing guidance on the choice between education and training by assessing the comparative advantage of schools. Comparing the light red line with markers to the horizontal red line reveals that schools have a comparative advantage, i.e. a value above two, regarding organizational design, human resources, project management and strategic management.

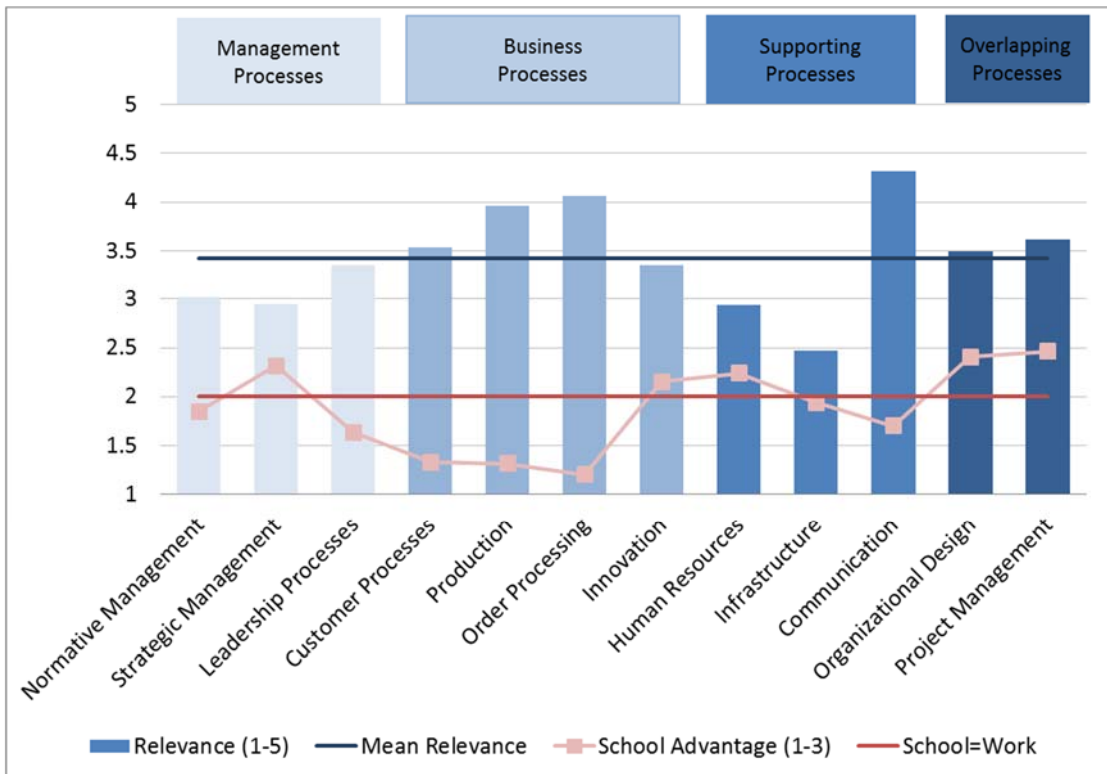
Furthermore, students consider school and workplace similarly suitable to acquire the competences used in communication as suggested by hypothesis 7a, innovation, normative management and infrastructure processes. On the other hand, the school has a comparative disadvantage regarding three business processes, namely customer processes, production and order processes.

Figure 3a: Relevance and Comparative Advantage of Schools by Process: Students



Notes: The number of observations varies between 444 for communication and 464 for normative management.

Figure 3b: Relevance and Comparative Advantage of Schools by Process: Employers



Notes: The number of observations varies between 47 for communication and 53 for normative management and innovation.

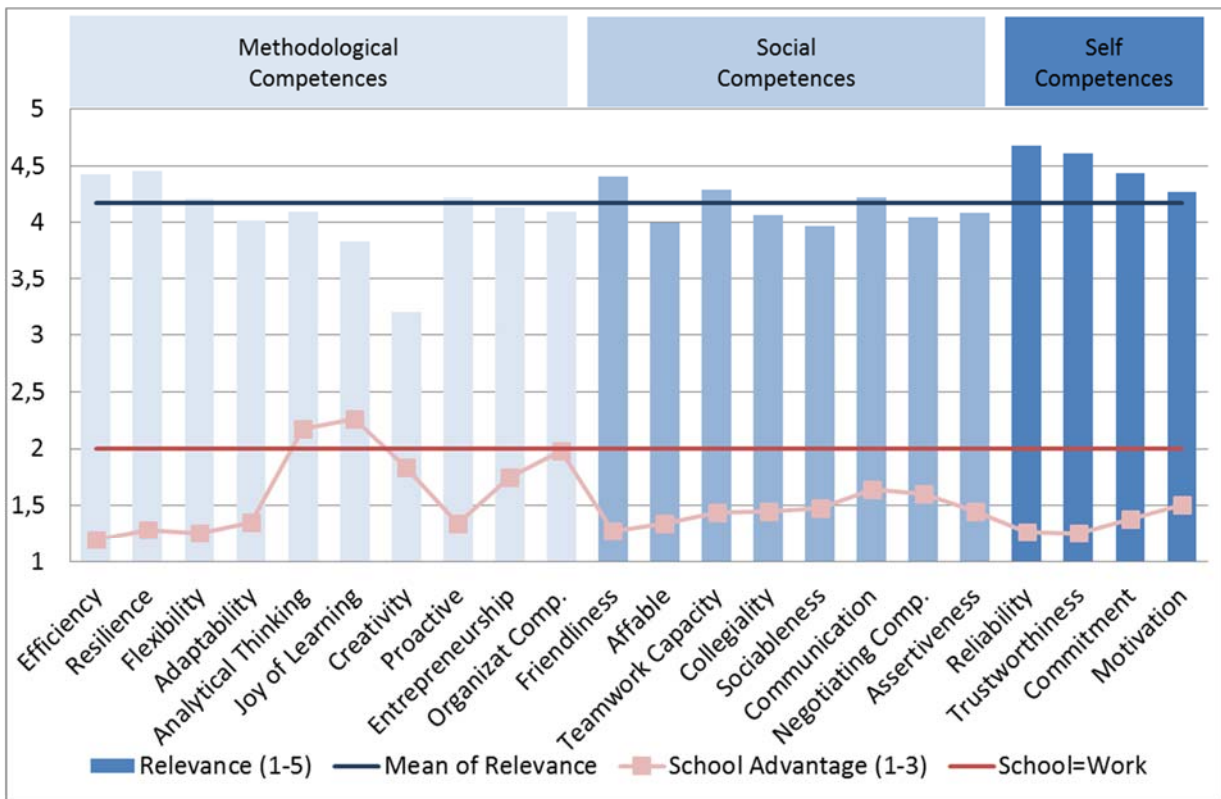
While Figure 3a and 3b shows the evaluations regarding the competences used in different processes, Figures 4a and 4b displays the results for various soft skills. Interestingly, the mean relevance of the soft skills is substantially higher than for the process-specific competences. Since the latter consist of both hard and soft skills, this suggests that soft skills are more relevant than hard skills, supporting hypothesis H1.

Evaluations regarding individual competences show that students consider self-competence the most important soft skill. Particularly reliability and trustworthiness reach very high values, thereby supporting hypothesis H3d. Furthermore, the related methodological competences efficiency and resilience are highly relevant too. Friendliness and teamwork capacity competences rank highest among the social competences, thereby supporting hypothesis H3b. Furthermore, the relatively high relevance of communication supports hypothesis H3a, though the literature would suggest that communication competences rank even higher. The above average relevance of motivation also supports hypothesis H3f. However, the below average relevance of organizational competences and joy of learning provide no support for hypothesis H3e and hypothesis H3g.

However, while soft skills are more relevant than hard skills, Figures 4a and 4b suggest that students and employers alike consider schools to be a suboptimal learning place to acquire soft skills. The only soft skills where schools have a comparative advantage over the workplace are analytical thinking and joy of learning, where the later result supports hypothesis H6b. For organizational competences, school and workplace are considered equal, supporting hypothesis H7b. While schools have a comparative disadvantage in teaching the remaining soft skills, supporting hypotheses H5a to H5d, the comparative advantage is relatively high regarding creativity, thereby supporting hypothesis H6a. Furthermore, entrepreneurship also reaches relatively high values, thereby questioning hypothesis H5e. Finally, the comparative advantage of communication is slightly higher than for other soft skills, providing mild support for hypothesis H7a.

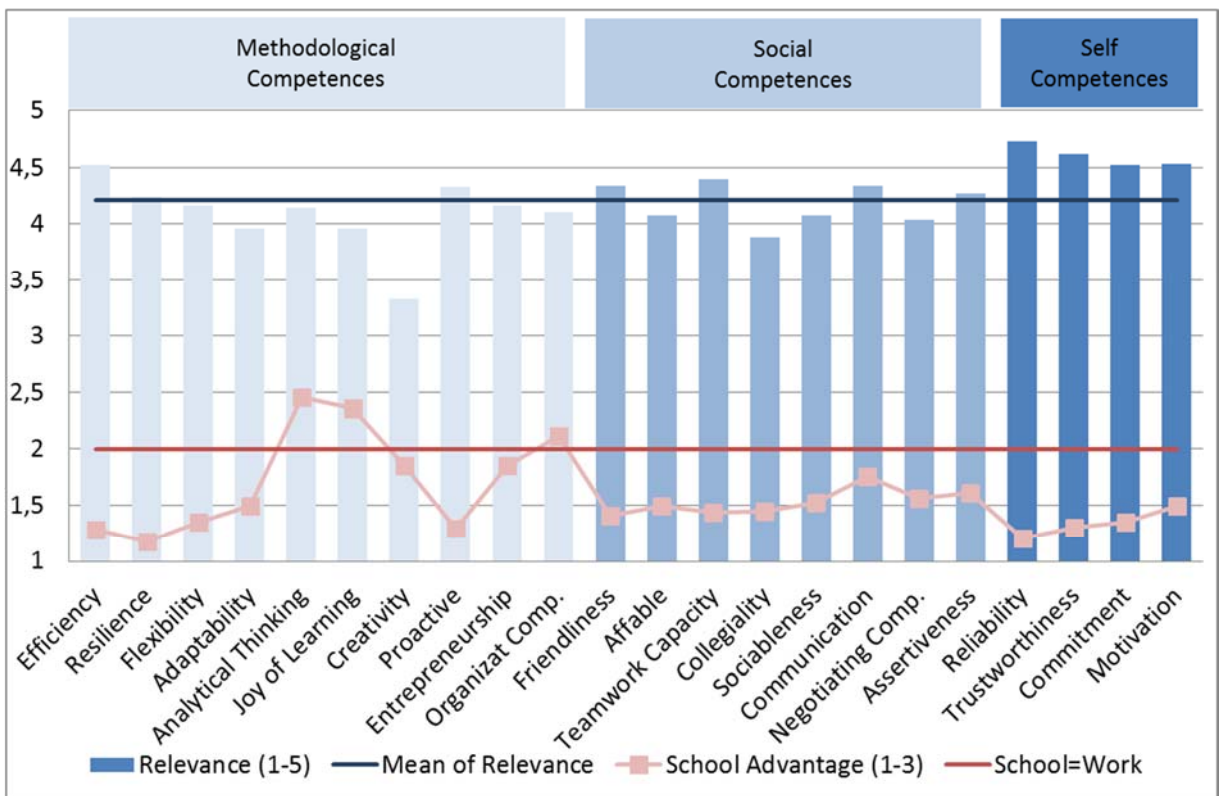
Comparing the assessments of process-specific competences and soft skills shows that the comparative advantage of schools is higher for process-specific competences. Assuming that this reflects the hard skills contained in the process-specific competences, this finding supports hypothesis H7c, i.e. that the comparative advantage of schools is higher for hard skills than for soft skills.

Figure 4a: Relevance and Comparative Advantage of Schools by Competence: Students



Notes: The number of observations varies between 453 for joy of learning to 471 for flexibility and trustworthiness.

Figure 4b: Relevance and Comparative Advantage of Schools by Competence: Employees



Notes: The number of observations varies between 47 for creativity and trustworthiness to 51 for resilience, flexibility, proactive, friendliness and collegiality.

Comparing Figure 3a to Figure 3b and Figure 4a to Figure 4b shows that the results based on student and employer assessment are surprisingly similar. Hence, the data provides no support for hypothesis H2 suggesting that employers consider soft skills relative to hard skills more relevant than students. This is likely due to the fact that the surveyed students on average have more than eight years of work experience. Considering that both students and employers have experienced themselves how relevant hard and soft skills are in the workplace, it is not surprising that their assessments differ so little. This feature highlights the quality of information provided by this paper.

## **5.2 The Influence of Pedagogic Instruments on Comparative Advantage Assessment**

Each column in Table 2a displays the regression results for the relationship between the assessment of the comparative advantage of schools and the application of a particular instruction method. The left-hand panels display the results for the comparative advantage of schools regarding soft skills, while the right-hand panels display the results for the comparative advantage of schools regarding process-specific competences. Correspondingly, each column of Table 2b displays the results for the application of a particular transfer tool.

Tables 2a and 2b allow to improve our understanding of competence acquisition in two directions. First, the analysis allows to assess to what extent the student evaluation of the comparative advantage of schools is related to the experience of students. The left-hand panel of Table 2a shows that the instruction method has no significant relationship with the comparative advantage of schools regarding process-specific competences. However, the right-hand panel of Table 2a suggests that using E-learning, solving case studies and reflecting on work experience in school have a significantly positive relationship with the assessment of comparative advantage of the school.

The results regarding transfer tools shown in Table 2b also support the notion that the comparative advantage of the school is related to the application of pedagogic instruments. All coefficient estimates are positive. In the case of process-specific competences shown in the left-hand panel of Table 2b, presenting examples of the work-place in school (Example Presentation), presenting case studies of the work-place at school (Case Study Presentation), filling a competence grid (Competence Grid) and documenting the learning process in the workplace (Learning Documentation) have a significant positively relationship with the assessment of the comparative advantage of the school. The right-hand panel of Table 2b shows that presenting case studies of the work-place at school (Case Study Presentation), presenting a survey in the workplace at school (Survey), making a learning contract (Learning Contract) and documenting the learning process in the workplace (Learning Documentation)

have a significantly positive relationship with the assessment of the comparative advantage of schools regarding soft skills.

In order to evaluate the malleability of comparative advantage assessment, not only statistical significance, but also the effect magnitude matters. Table 2a and 2b show that the magnitude of the effects are small, even in cases that display a significant relationship. For example, Table 2a shows that using E-learning as an instruction method increases the comparative advantage of schools by merely 0.104. Similarly, Table 2a suggests that increasing the frequency of presenting a survey in the workplace increases the comparative advantage of schools by merely 0.08. Hence, the estimation results suggest that the comparative advantage of schools largely depends on the competence in question and that optimizing pedagogic instruments affects the optimal learning place only marginally.

Secondly, while the main goal of the regression analyses was to assert the malleability of comparative advantages, assessing the relationship between pedagogical instruments and the comparative advantage of schools represents a first attempt to analyze the causal relationship between pedagogical instruments and education outcomes thereby contributing to the literature analyzing how to teach soft skills in the classroom (see, e.g., Nealy, 2005, John, 2009).

However, we caution the reader not to interpret the reported correlations as causal due to a number of problems. First, endogeneity of the estimates might arise because students select into schools, because students might select using particular transfer tools and because students might differ in the effort used for the application of transfer tools. Second, the employed measures are relatively crude, particularly for the instruction tools for which neither information on intensity nor on quality exists. Similarly, no information on the quality of transfer tools exists. Third, the power and hence the precision of the estimates might be too low to capture the effect of pedagogic instruments.

The results for the control variables suggest that women tend to value school lower than men and that supervisors consider the comparative advantage of schools lower than non-supervisors. The remaining control variables have no statistically significant relationship with the comparative advantage assessment.

Table 2a: Estimation Results Instruction Method

	Process							Soft Skills						
	Group Work	Self-Study	Elearning	Thesis	Case Studies	Project Work	Work Reflection	Group Work	Self-Study	Elearning	Thesis	Case Studies	Project Work	Work Reflection
Female	-0.127** (0.047)	-0.128*** (0.046)	-0.130*** (0.046)	-0.129*** (0.047)	-0.127*** (0.045)	-0.132*** (0.047)	-0.131*** (0.046)	-0.091** (0.044)	-0.087* (0.044)	-0.084* (0.045)	-0.088* (0.044)	-0.082* (0.042)	-0.086* (0.043)	-0.091** (0.042)
Age	-0.015 (0.010)	-0.014 (0.010)	-0.015 (0.011)	-0.016 (0.010)	-0.016 (0.010)	-0.015 (0.010)	-0.015 (0.010)	-0.004 (0.009)	-0.003 (0.009)	-0.002 (0.009)	-0.004 (0.009)	-0.005 (0.009)	-0.004 (0.009)	-0.004 (0.009)
Experience	0.011 (0.011)	0.011 (0.011)	0.012 (0.011)	0.013 (0.011)	0.013 (0.011)	0.011 (0.011)	0.012 (0.011)	0.008 (0.009)	0.006 (0.009)	0.005 (0.009)	0.007 (0.009)	0.009 (0.009)	0.008 (0.009)	0.007 (0.008)
Swiss	0.030 (0.096)	0.035 (0.094)	0.031 (0.096)	0.031 (0.095)	0.035 (0.096)	0.037 (0.095)	0.035 (0.095)	-0.057 (0.088)	-0.059 (0.090)	-0.078 (0.086)	-0.060 (0.088)	-0.059 (0.093)	-0.064 (0.092)	-0.056 (0.093)
Fulltime	-0.015 (0.054)	-0.015 (0.052)	-0.015 (0.053)	-0.011 (0.052)	-0.006 (0.055)	-0.012 (0.054)	-0.014 (0.053)	-0.025 (0.043)	-0.027 (0.043)	-0.033 (0.041)	-0.026 (0.043)	-0.012 (0.042)	-0.027 (0.043)	-0.027 (0.043)
Superior	-0.069 (0.042)	-0.071* (0.042)	-0.071 (0.043)	-0.071 (0.042)	-0.069 (0.042)	-0.069 (0.043)	-0.070 (0.042)	-0.092** (0.037)	-0.092** (0.037)	-0.098** (0.037)	-0.092** (0.037)	-0.089** (0.036)	-0.093** (0.037)	-0.092** (0.036)
Group Work	-0.070 (0.055)							0.050 (0.056)						
Self-Study		0.067 (0.041)							0.050 (0.044)					
Elearning			0.018 (0.035)							0.104** (0.048)				
Thesis				-0.041 (0.048)							-0.000 (0.028)			
Case Studies					0.052 (0.043)							0.100** (0.037)		
Project Work						-0.034 (0.037)							0.056 (0.042)	
Work Reflection							0.029 (0.044)							0.096** (0.042)
N	364	364	364	364	364	364	364	364	364	364	364	364	364	364
r2	0.077	0.082	0.075	0.077	0.078	0.076	0.076	0.050	0.054	0.070	0.049	0.064	0.054	0.069

Notes: The table displays OLS coefficients and robust standard errors clustered at class level in parentheses. \*, \*\* and \*\*\* represent significance at the 1%, 5% and 10% level, respectively. The dependent variable reflects the comparative advantage of the school relative to the workplace on a 1=work, 2= don't know, to 3=school scale. Instruction methods represent dummy variables taking the value 1 if the instruction method was used and 0 otherwise Table A1 in the appendix describes variable construction and summary statistics. All estimates include field fixed effects.

Table 2b: Estimation Results Transfer Tools

	Process						Soft Skills					
	Example Presentation	Case Studies Presentation	Survey	Learning Contract	Competence Grid	Learning Documentation	Example Presentation	Case Studies Presentation	Survey	Learning Contract	Competence Grid	Learning Documentation
Female	-0.132*** (0.045)	-0.136*** (0.046)	-0.128*** (0.045)	-0.128*** (0.045)	-0.130*** (0.045)	-0.132*** (0.045)	-0.089** (0.043)	-0.095** (0.043)	-0.072* (0.040)	-0.081* (0.042)	-0.087* (0.043)	-0.090** (0.040)
Age	-0.018* (0.010)	-0.018* (0.010)	-0.016 (0.010)	-0.015 (0.011)	-0.014 (0.011)	-0.015 (0.011)	-0.005 (0.009)	-0.007 (0.009)	-0.007 (0.009)	-0.003 (0.009)	-0.002 (0.009)	-0.003 (0.009)
Experience	0.014 (0.011)	0.015 (0.010)	0.012 (0.011)	0.012 (0.011)	0.011 (0.011)	0.012 (0.011)	0.009 (0.009)	0.010 (0.009)	0.011 (0.009)	0.007 (0.009)	0.007 (0.009)	0.007 (0.008)
Swiss	0.018 (0.090)	0.037 (0.092)	0.031 (0.096)	0.033 (0.095)	0.032 (0.094)	0.034 (0.091)	-0.069 (0.085)	-0.057 (0.084)	-0.083 (0.083)	-0.063 (0.086)	-0.062 (0.084)	-0.060 (0.087)
Fulltime	-0.014 (0.053)	-0.012 (0.054)	-0.014 (0.054)	-0.013 (0.054)	-0.012 (0.053)	-0.014 (0.054)	-0.026 (0.042)	-0.024 (0.043)	-0.028 (0.044)	-0.024 (0.042)	-0.025 (0.042)	-0.027 (0.043)
Superior	-0.078* (0.042)	-0.074* (0.042)	-0.070 (0.042)	-0.070 (0.042)	-0.072* (0.041)	-0.079* (0.042)	-0.096** (0.037)	-0.096** (0.036)	-0.091*** (0.033)	-0.090** (0.035)	-0.094** (0.037)	-0.103*** (0.038)
Example Presentation	0.036*** (0.009)						0.020 (0.013)					
Case Studies Presentation		0.027** (0.012)						0.031** (0.012)				
Survey			0.012 (0.015)						0.080*** (0.019)			
Learning Contract				0.023 (0.026)						0.060* (0.030)		
Competence Grid					0.035** (0.017)						0.031 (0.020)	
Learning Documentation						0.034*** (0.010)						0.046*** (0.012)
N	364	364	364	364	364	364	364	364	364	364	364	364
r2	0.091	0.084	0.076	0.077	0.085	0.091	0.055	0.063	0.109	0.065	0.059	0.084

Notes: The table displays OLS coefficients and robust standard errors clustered at class level in parentheses. \*, \*\* and \*\*\* represent significance at the 1%, 5% and 10% level, respectively. The dependent variable reflects the comparative advantage of the school relative to the workplace on a 1=work, 2=don't know, to 3=school scale. Transfer tools take the values 1=never; 2= once; 3=annually; 4=semiannually and 5=weekly. Table A1 in the appendix describes variable construction and summary statistics. All estimates include field fixed effects.



## 6 Conclusion

This paper provides empirical evidence to education system managers and human resource managers regarding the relative relevance of competences and to what extent the school has a comparative advantage over the workplace to acquire the competences. Thereby the paper prepares the statistical ground to make evidence-based decisions regarding the optimal choice of the learning place for each competence. This aim is further supported by the simple multivariate regressions providing suggestive evidence that the comparative advantage of schools depends on the application of particular pedagogic instruments.

However, while this paper represents a first step to analyze competence relevance, competence-specific comparative advantage of schools and the relationship between pedagogic instruments and the comparative advantage of schools, it faces a number of limitations that should be addressed in future research.

First, the information stems from students in professional tertiary education and training (ISCED97 5b) that aims to equip students with the competences necessary for a management position. Hence, the findings of this paper might not be valid for education and training programs that have a different goal or that address a different student body. Furthermore, the specific orientation of education and training approach requires adaptation of the evaluation tool presented in this paper to the desired context. This is particularly true for the process dimension, while the soft skill dimensions are more general.

However, the specificity of the context has the benefit that it allows to evaluate the competences as they are formulated in the core curriculum of the business administration degree at PET colleges (HFW, 2008). Hence, Renold et al. (2015) report assessments of detailed competences, e.g. preparation of appraisal interviews.

Secondly, the list of pedagogic instruments evaluated in this paper might be incomplete or might not coincide with the instruments used in other education and training programs. In this sense, the list of pedagogic instruments is too narrow. However, the list of pedagogic instruments is also too broad in the sense that the specific implementation of instruments might vary substantially. Furthermore, while the data provides information about the frequency of instrument application, no information regarding the application quality exists.

Thirdly, the analysis of the relationship between pedagogic instruments and the comparative advantage of schools relies on simple conditional correlations. Future research should improve the

identification strategy of causal effects by exploiting panel data or variation arising due to natural experiments.

Nevertheless, the paper provides empirical evidence regarding the important question of the relation between school and workplace learning environment, thereby improving the ability of education system managers and human resource managers to make evidence-based decisions regarding the optimal choice of the learning place.

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## Appendix

Table A1: Variable Descriptions and Summary Statistics

Variable Name	Variable Definition	Mean	Stdv
<b>Dependent Variables</b>			
Processes	Mean comparative advantage of school for competences related to normative management processes, strategic management processes, leadership processes, customer processes, production, order processing, innovation, human resources, infrastructure, communication processes, organizational design and project management (1=work; 2=don't know, 3=school)	1.95	0.36
Soft Skills	Mean comparative advantage of school for the competences efficiency, resilience, flexibility, adaptability, analytical thinking, joy of learning, creativity, being proactive, entrepreneurship, organizational competences, friendliness, being affable, teamwork capacity, collegiality, sociableness, communication competences, negotiating competences, assertiveness, reliability, trustworthiness, commitment and motivation (1=work; 2=don't know, 3=school)	1.53	0.33
<b>Instruction Method</b>			
Group Work	Dummy variable taking the value 1 if group work was used and 0 otherwise	0.94	
Self-Study	Dummy variable taking the value 1 if self-study was used and 0 otherwise	0.71	
Elearning	Dummy variable taking the value 1 if elearning tools were used and 0 otherwise	0.35	
Thesis	Dummy variable taking the value 1 if the student wrote a thesis and 0 otherwise	0.74	
Case Studies	Dummy variable taking the value 1 if the student solved case studies and 0 otherwise	0.77	
Project Work	Dummy variable taking the value 1 if the student was involved in project work and 0 otherwise	0.79	
Work Reflection	Dummy variable taking the value 1 if the student reflected real world problems at school and 0 otherwise	0.57	
<b>Transfer Tools</b>			
Example Presentation	Ordinal variable indicating how often real world examples were presented at school (1=never; 2= once; 3=annually; 4=semiannually; 5=weekly)	2.97	1.33
Case Study Presentation	Ordinal variable indicating how often real world case studies were presented at school (1=never; 2= once; 3=annually; 4=semiannually; 5=weekly)	2.97	1.29
Survey	Ordinal variable indicating how often results from a survey in the firm were presented at school (1=never; 2= once; 3=annually; 4=semiannually; 5=weekly)	1.59	1.05
Learning Contract	Ordinal variable indicating how often learning contracts were made (1=never; 2= once; 3=annually; 4=semiannually; 5=weekly)	1.30	0.73
Competence Grid	Ordinal variable indicating how often competence grids were used (1=never; 2= once; 3=annually; 4=semiannually; 5=weekly)	1.83	1.08
Learning Documentation	Ordinal variable indicating how often the application of the theory in the real world was documented (1=never; 2= once; 3=annually; 4=semiannually; 5=weekly)	2.39	1.36
<b>Control Variables</b>			
Female	Dummy variable taking the value 1 if a student is female and 0 otherwise.	0.37	
Age	Student age in years	28.38	4.79
Experience	Years of work experience excluding initial education	8.71	4.83
Swiss	Dummy variable taking the value 1 if a student is Swiss citizen and 0 otherwise	0.96	
Fulltime	Dummy variable taking the value 1 if a student is employed 90% or more and 0 otherwise	0.73	
Superior Management	Dummy variable taking the value 1 if a student is employed 90% or more and 0 otherwise	0.43	
Marketing/PR	Dummy variable taking the value 1 if a student spends most of his time in management tasks and 0 otherwise	0.09	
Production	Dummy variable taking the value 1 if a student spends most of his time in marketing or public relations tasks and 0 otherwise	0.12	
Provision/Logistics	Dummy variable taking the value 1 if a student spends most of his time in production tasks and 0 otherwise	0.05	
Quality/Environment/Security	Dummy variable taking the value 1 if a student spends most of his time in provision or logistics tasks and 0 otherwise	0.12	
Human Resource Management	Dummy variable taking the value 1 if a student spends most of his time in quality, environment or security related tasks and 0 otherwise	0.02	
Financing/Investment	Dummy variable taking the value 1 if a student spends most of his time in human resource management tasks and 0 otherwise	0.08	
Controlling	Dummy variable taking the value 1 if a student spends most of his time in financing or investment tasks and 0 otherwise	0.19	
Informatics	Dummy variable taking the value 1 if a student spends most of his time in controlling tasks and 0 otherwise	0.14	
	Dummy variable taking the value 1 if a student spends most of his time in informatics tasks and 0 otherwise	0.01	

Organizational Design	Dummy variable taking the value 1 if a student spends most of his time in organizational design tasks and 0 otherwise	0.06
Project Management	Dummy variable taking the value 1 if a student spends most of his time in project management tasks and 0 otherwise	0.12

Notes: N=370