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**Investigating the image deficit of VET:
Occupational prestige ranking depending
on the educational requirements and the
skill content of occupations**

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Abstract

Vocational education and training (VET) often suffers from a lack of social standing among students and their families. Parents have been shown to discard vocational education because of social status maintenance considerations. How adults perceive the social prestige of occupations might therefore be key in understanding the reasons of the image deficit of VET. While the existing literature on occupational prestige ranking stresses the role of the salience in science or the training intensiveness of occupations for the perception of their social prestige, it fails at accounting for the distinct types of knowledge involved and the variety of the skill content of occupations. More precisely, differences in the salience of physical tasks and cognitive skills should be particularly relevant. We contribute to the literature by analyzing a unique data set in Switzerland, a country characterized by a well-established and -functioning vocational education and system, based on a survey of adults' perception of the social prestige of occupations requiring academic or vocational education. Using several dimensions of the skill content of occupations, we find that the sophistication of skills performed within occupations, whether manual or intellectual, clearly improve the social prestige of the occupations investigated. However, the negative or positive effect of the previous dimensions of the skill content of occupations is small to inexistent at lower levels of educational requirements and becomes stronger as occupations become more training intensive. The desirability of occupations requiring vocational education depends therefore less on the skill content of occupations than on the level of education that is required.

Keywords: Vocational education and training, Occupational prestige ranking, Academic vs. vocational knowledge, Skill content of occupations, Educational requirements.

Introduction

Vocational education, in particular apprenticeship training has gained a lot of political attention in the aftermath of the economic and following fiscal crises a decade ago. International organizations are promoting it (e.g. OECD, 2010) as a powerful educational alternative to general education that would help overcoming youth unemployment and skill mismatches on the labor market. However, adolescents are reluctant in enrolling into vocational education and training (VET) programs in most countries. One explanation being that in most countries, VET suffers from a lack of social standing in comparison with academic education among students and their families (e.g. Billett 2014; Koulaidis et al. 2006; Wolf 2011). Even in Switzerland, where the lifetime earnings of individuals with vocational training exceed those with an academic education (Hanushek et al. 2017), and despite most native adults in Switzerland indicating a preference for vocational education and valuing the labor market benefits associated with it, the social prestige assigned to vocational education remains lower than the one assigned to academic education, especially among immigrants (Cattaneo and Wolter 2013, 2016; Abrassart et al. 2018). According to the literature (Di Stasio 2017; Stocké 2007), preferences and decisions for academic vs. vocational education are partly driven by the parents' motive to maintain or improve the family's social status. The social prestige of occupations accessed through vocational education might therefore be the main driver of the image deficit of the VET system. However, while the literature focuses extensively on the determinants of educational preferences (Abrassart et al. 2018; Busemeyer, Cattaneo and Wolter 2011; Busemeyer and Garritzmann 2017; Busemeyer and Jensen 2010), it has to our knowledge devoted little attention to the study of the perception of the social prestige of occupations accessed through either academic or vocational education.

As we argue, this is an important research gap for two main reasons. First, differences in the perception of the prestige of occupations depending on their educational requirements could impact the educational decisions of students and their parents. After all, the social prestige

of occupations reflects the level of goodness or desirability of the occupation in question (Goldthorpe and Hope 1972). If occupations requiring vocational education prove less attractive to students and their families, all other things being equal, this should influence their preferences for academic vs. vocational education. Promoting vocational over academic education would then become less effective, as individuals learn to discriminate between various educational options depending on the characteristics of the occupations they give access to.

Second, the political support for educational and social policy might depend on the level of social prestige assigned to occupations. This is because social prestige is assigned to those groups whose work we value and deem as beneficial for the functioning and advancement of society, independent of the associated monetary reward. This social recognition, in turn, is expected to confer occupational groups a particular status at the political level because of the symbolic power or deference they produce (Bourdieu 1985; Weber 1946; see also Corneo and Grüner 2002, for a test of the effect of the prestige of income categories on attitudes towards redistribution, and Cutler 1973, for the influence of the perceived social prestige of older individuals on the political support for the aged). Or as Weber (1946) suggested, social prestige may be “the basis of political or economic power, and very frequently has been” (p. 180). Therefore, in order to build or maintain political support for VET, understanding how individuals perceive the social prestige of occupations depending on their educational requirements becomes essential.

Recent attempts to uncover the logic behind the cognitive mapping of occupations depending on their social prestige have paved the way for further investigations, notably, by demonstrating the importance of the formal knowledge and science component or training intensiveness of occupations for their prestige ranking (e.g. Lynn and Ellerbach 2017; Zhou 2005). These studies, however, fail to account for differences in the type of knowledge required and the variety of the skill content that can be found in modern occupations. More particularly,

they tend to ignore the often disputed¹ but important distinction between academic vs. vocational education, theoretical vs. practical knowledge, that is created by the education system before being reproduced through differences in the skill content at the workplace, such as manual vs. intellectual tasks.

In this study, we therefore contribute to the previous body of knowledge by investigating the role of the education system and several dimensions of the skill content of occupations for the perception of their social prestige, all other things being equal. The Swiss case is, in that regard, an interesting test case because of its well-established dual training system that provides students with both good general and vocational skills (see e.g. Hoffman and Schwarz 2015). Authoritatively certifying the acquisition of students' skills during their educational cursus legitimizes the transfer of theoretical and practical knowledge achieved in the education system to the labor market. The resulting important variety in the skill content of occupations makes the Swiss case therefore very interesting for the comparison of the prestige of occupations with distinct educational requirements.

Against this background, we wish to answer the following research questions:

- How do various dimensions of the skill content of occupations influence the prestige of occupations?
- How does this influence vary depending on the educational requirements of occupations?

The study is structured as follows. In the first section, we review the appropriate literature and develop hypotheses regarding the role of the skill content of occupations in the perception of the prestige of occupations depending on educational requirements. In the third section, we describe the data and methods used. In the fourth section, we present and comment on our results through descriptive statistics and complex statistical analyses. In the final section,

we discuss our findings and their implications for further research on occupational prestige ranking and the future of VET, as well as the limitations of our study.

Theoretical framework

Undoubtedly, one of the most relevant theoretical contributions to improve the understanding of the logic of social recognition of occupations comes from Zhou (2005). His departure from the literature expresses itself in the proposition of an alternative to the idea that prestige ratings of occupations are mostly dependent on the authority and economic power they confer to people. One essential element, according to Zhou (2005:95), is that “to acquire prestige or status, all social positions, roles, and behavior must justify their claims on the basis of legitimacy and appropriateness in reference to the institutional realm of shared values and beliefs. [...]. In contemporary societies, claims of legitimacy and appropriateness tend to rest on nature and reason, which are seen as providing “objective” bases immune from artificial manipulation motivated by self-interests”. According to Zhou (2005), these bases are best exemplified by the formal knowledge and science components of occupations that are determinant for the perception of the social order.

Considering our research question, the implications of the previous theory are that institutional arrangements can influence the prestige ratings of occupations by legitimizing their role in the “natural” order of things. Schools are expected to contribute greatly to the rationalization of the various areas of social life through the production of specialists (i.e., teachers) and learners (i.e., students) (Stinchcombe 1986). By rationalizing formal knowledge, these institutions teach individuals to place occupations in a social order and attribute prestige based on these mechanisms, through the rules, understandings, and the meanings that convey norms of rationality and function as “highly rationalized myths” (Meyer and Rowan 1977:343).

As Stevenson (2001) claims, education systems created distinctions in knowledge, which influenced the public and its perception of the social prestige of occupations. Distinctions

such as academic versus vocational emerged from distinct approaches to knowledge within education systems, the former being mostly research-based and the latter linking its curricula to given occupational fields and involving public and private stakeholders from the same field (Young 2004)². The distinctive character of vocational knowledge originates, however, in “the nature of connections between the codified knowledge of college-based curricula and the tacit and often uncodifiable knowledge of the workplace” (Broad 2016:144). The main sources of distinction between academic and vocational knowledge, as identified in the literature, are linked to the “tacit, non-formal and largely uncodified” nature of the latter as opposed to the former (Broad 2016:146) and the lack of contextualization of “workplace content to allow VET students the chance to see beyond ‘how it is’ either through disciplinary connections or through putting empirical knowledge in societal, historical, political or other contexts” (Nylund, Rosvall and Ledman 2017:803). In Sweden, the vertical components of knowledge, that is, the theoretical, abstract, and conceptual elements linking the empirical to higher levels of thinking, and more particularly critical thinking, are, according to the authors, largely absent in VET programs, whereas these components constitute the main foundation in academic programs (Nylund, Rosvall and Ledman 2017). Such dualisms, as Stevenson (2001:650) argues, “seem to serve to reinforce not only supposed differences in knowledge, but differences in the value afforded the educational experiences, qualifications, learning outcomes and even the learners themselves [...]. In all of this we seem to place a higher value on knowledge that we can state or specify in symbolic (especially verbal) form, than knowledge that appears to be more implicit, tacit, procedural, physical, manual, ‘technical’, ‘specific’ or ‘vocational’”.

As a result, occupations requiring vocational education are more salient in manual, repetitive and procedural tasks and are generally expected to be ranked systematically lower than occupations relying more on academic knowledge and creativity. Knowledge work or work intensive in academic knowledge indeed enjoy a glamorized image among individuals, despite an important disconnection with the sometimes disappointing, boring reality of such work

(Costas and Kärreman 2016). Yet it is still unclear whether the lower prestige assigned to occupations requiring vocational knowledge is due to the lower salience in knowledge of these occupations or to differences in the type of knowledge required and the distinction between manual vs. intellectual tasks. Moreover, there are good reasons to believe that the social prestige of occupations with lower educational requirements might differ greatly depending on the institutional context (see, e.g., Nakao and Treas [1994] on the puzzling increase in the prestige of manual occupations over time in the US; but also Penn [1975] on the differences between the U.S.A. and Czechoslovakia in the valuation of manual work).

Important differences exist across VET systems. More particularly, knowledge-based dual systems such as in Switzerland, combining workplace-based training and general education, integrate theoretical knowledge into the educational cursus as opposed to skill-based systems (Brockmann, Clarke and Winch 2008; Graf 2016). In addition, the Swiss VET system has been shown to remain attractive among high-ability students (Bolli, Rageth and Renold 2018) and mixed educational paths are highly valued in the Swiss labor market (Tuor and Backes-Gellner 2010). Thus, a thorough investigation of the influence of various components of the skill content of occupations, as well as their interaction with the level of knowledge required, is warranted in order to better understand occupational prestige ranking in Switzerland. In this paper, we focus on three aspects: the physical aspects of tasks, the role of cognitive skills, and how the physical and intellectual aspects of occupations affect social prestige along the knowledge spectrum.

First, the physical aspects associated with the manipulation and transformation of material things that are associated with vocational knowledge should enjoy a lower prestige, all other things being equal. While the physical aspects might be valued for their social contribution and the traditional values, such as dignity and hard work, they convey (Nakao and Treas 1994; Penn 1975), they are also less likely to be desirable and entail a high social prestige because they cannot be expressed as symbolic, theoretical, knowledge. Yet the dexterity

component of tasks should be more positively perceived by individuals, as it involves the acquisition and use of fine and sophisticated manual skills that increase the complexity of work (Parcel and Mueller 1983). By contrast, the use of brute strength to perform tasks at work should be assigned a low prestige because of the lack of sophistication of those skills and the detrimental negative consequences in terms of health of such work.

H1a: The strength component of tasks is expected to lower the perceived social prestige that is attributed to occupations, all other things being equal.

H1b: The dexterity component of tasks is expected to increase the perceived social prestige that is attributed to occupations, all other things being equal.

Second, the growing role of cognitive skills for labor market success and social behavior in developed economies should have significantly influenced the view of the social world, as it reflects the new skill demands of occupations following technological change and tertiarization (Abrassart 2013; Autor, Levy and Murnane 2003; Farkas et al. 1997; Michaels, Natraj and Van Reenen 2014). These cognitive skills, which are associated with academic knowledge independent of the level of education required to perform the tasks of an occupation, are general and analytical in nature and relate to the processing of information and abstract reasoning at the workplace (Eurofound 2016). Moreover, the introduction of new scales such as the Programme for International Student Assessment (PISA) or the Programme for the International Assessment of Adult Competencies (PIAAC), that offer new objective measures on which individuals can compare various educational options and occupations (as well as various schools and regions), might have introduced new criteria according to which individuals allocate status to occupations. In accordance with Sauder (2006) in the case of the intervention of a third party in the ranking of law schools, despite some contestation within the system, if the rules introduced by the new ranking are deemed legitimate by a sufficient number of actors,

providing a new schema by which all agents perceive, think and behave is sufficient. Because PISA scores or the measure of literacy skills present in the PIAAC study estimate the level of cognitive skills developed by, respectively, pupils and adults, occupations linked to vocational education and relying more on job- or industry-specific skills are less likely to be perceived at the top of the scale introduced by these studies. However, again in this case, one needs to differentiate the impact of those skills by their degree of complexity. The processing of verbal and numeric information (e.g. reading and writing letters/texts, processing business and administrative information, understanding and communicating statistical and mathematical information) is less likely to be valued as it is more likely to relate to more basic and repetitive cognitive skills than understanding complex problems and finding adequate solutions in a flexible and creative manner.

H2a: Occupations requiring higher levels of information-processing skills are expected to suffer from a lower perceived social prestige, all other things being equal.

H2b: Occupations requiring higher levels of problem-solving skills are expected to enjoy a higher perceived social prestige, all other things being equal.

Third, we expect all the effects of the previous dimensions of the skill content of occupations to be magnified by the educational requirements. In other words, we expect the impact of the physical and intellectual aspects of occupations to become stronger with increases in the level of education required to perform an occupation. Thereby, we posit that occupations requiring more years of education will be expected to result in a higher payoff in terms of prestige, which should in turn lead to a higher valuation of those dimensions of the skill content having a positive impact on the social prestige of occupations, while those having a negative effect will be more likely to be discarded. This is because the opportunity cost of education

becomes greater the larger the time investment and the less favorable the resulting skill content of occupations.

More precisely, the negative effects of the manual and information-processing components of tasks should be larger at higher levels of training intensiveness because of the resulting lower prestige payoff of important investments in education. Inversely, rewarding higher investments in education with a greater salience in positive dimensions of the skill content of occupations, such as dexterity and problem-solving, should lead to a higher perceived social prestige. In sum, changes in the skill composition of tasks should have little to no effect in the case of occupations requiring secondary vocational education, whereas occupations requiring higher academic education should benefit from an increase in positive aspects of the skill content of occupations.

H3: We expect the effect of various dimensions of the skill content of occupations, whether negative or positive, to become larger the higher the required duration of education of occupations

Data and method

Presentation of the main data and dependent variable

The main data used in this research are from the third wave (2015) of an original survey on the individual attitudes of adults toward education in Switzerland. This survey was elaborated by the Swiss Leading House on Economics of Education³ and conducted by the LINK Institute. More precisely, 6,262 adult residents of Switzerland were asked to rank a list of ten occupations according to their social prestige as follows:

“10 distinct occupations are listed below. How do you assess the social prestige of these occupations? Rank to this end the listed occupations from 1 (= this occupation has the highest social prestige) to 10 (= this occupation has the lowest prestige).”

Notably, what we measure through this question is occupational prestige ranking, instead of rating, as is more often the case in the literature, in order to avoid as much as possible ties. The main advantage of this measure is that respondents are forced to compare occupations against one another based on specific pre-established dimensions, instead of comparing all items “against an external set of criteria (e.g., originality, significance)” (Lamont 2012:211). This question also pushes respondents to carefully consider their choices as they establish a hierarchy and assess the relative prestige of occupations, rather than the absolute prestige. The ranking, thereby, reflects more the perception of the social order than the intrinsic perceived value of each individual occupation.

In this survey, four random samples of almost equal size were presented with ten occupations, five occupations requiring academic education, five occupations requiring upper secondary vocational education, chosen based on their representativeness in older surveys in terms of ranking⁴ and in terms of required intellectual competencies in the case of VET occupations. In Switzerland, nationally recognized vocational education and training certificates provide graduates access to some occupations that cannot normally be accessed through academic education. This is because firms are strongly involved in the design and operation of vocational education programs and have an interest in recouping their investment, thereby preventing access to the concerned occupations from workers without the required and certified qualifications (Wolter and Ryan 2011).

The list of occupations presented differed according to the sample (see Table 1). More precisely, the five occupations requiring vocational education were replaced by five alternative occupations requiring vocational education in the second sample; the five occupations requiring

academic education remaining the same. Conversely, the third sample differed from the first in that the five occupations requiring academic education were replaced by five alternative occupations with similar educational requirements, whereas the five occupations requiring vocational education were the same in both samples. Finally, the fourth sample combines the five alternative occupations requiring vocational education from the second sample and the five alternative occupations requiring academic education from the third sample. Because the differences in the framing of the list of occupations across the samples are of no interest for our research questions, the four samples were pooled in the analysis. The coefficients at the occupational level therefore reflect the average effect of the occupational attributes over the samples.

Table 1. List of occupations to rank depending on the sample

1st sample	2nd sample	3rd sample	4th sample
Retail employee	Commercial employee (EFZ)	Retail employee	Commercial employee (EFZ)
Mechanical Engineer (ETH)	Mechanical Engineer (ETH)	Physicist	Physicist
Electrician	Health professional	Electrician	Health professional
Sociologist	Sociologist	Biochemist	Biochemist
Hairdresser	Goldsmith	Hairdresser	Goldsmith
Actuary	Actuary	Judge	Judge
Carpenter	Graphic designer	Carpenter	Graphic designer
Primary school teacher	Primary school teacher	High school teacher	High school teacher
Care professional	Polymechanic	Care professional	Polymechanic
Lawyer	Lawyer	Pediatrician	Pediatrician

Note: occupations accessed through vocational education are highlighted in grey, occupations accessed through academic education in white.

Because some respondents assigned the same ranking to distinct occupations more than once, we run the main analyses after dropping the cases where the same rank was given more than once to several occupations⁵. After the plausibility analysis, 5,035 respondents remained in our main sample, each one ranking ten distinct occupations (ties were excluded).

Specification of the statistical model

We apply a rank-ordered logit model (also known as exploded logit model) by maximum likelihood estimation to analyze variation in our dependent variable. This model is a generalization of the conditional logit model introduced by McFadden (1974) and has mostly been applied in economic and marketing literature before Allison and Christakis (1994) saw its potential for sociological research⁶. The rank-ordered logit model applied to our data estimates the likelihood of attributing an occupation i the rank j , conditional on a set of variables at the occupational level. The basic model assumes that all respondents have the same probability distribution of occupation preferences and that individual variation in the ranking only results from random variation (Allison and Christakis 1994). For reasons of space, and because the present study focuses on the role of the type of knowledge and the associated skill content of occupations for the overall public perception of the social order, only occupational attributes are included in these analyses, while individual variation in the effect of occupational attributes for the perception of the social order will be addressed in a further study. As shown by pre-analyses (models available upon request), the presence of individual variation along definite characteristics does not, however, in any way, affect the findings of the present study.

Following Allison and Christakis (1994), the model can be formally expressed as follows:

$$\mu_{ij} = \beta_j x_i + \gamma z_j + \theta w_{ij}$$

where μ_{ij} is the rank assigned by respondent i to occupation j ; x_i , z_j , and w_{ij} are column vectors of the observed variables, respectively, at the individual level, occupational level, and across levels; and β_j , γ and θ are row vectors of the coefficients we wish to estimate. In our specification where only occupation-level variables are introduced, the model is simplified:

$$\mu_{ij} = \gamma z_j$$

where z_j stands for the variables that vary across occupations but remain identical for all respondents. Only a maximum of nineteen (20 occupations – 1) can be included in the model to avoid linear dependence. Finally, robust standard errors were computed in each model.

Independent and control variables

Our main independent variables consist of a set of indicators on skill content at the EU-15 and US level (ISCO-08 2-digit). These indices were retrieved from Eurofound (2016) and constructed from variables included in the 2010 European Working Conditions Survey (EWCS), PIAAC, and Occupational Information Network data set data that were standardized and used to extract scores for each occupation–sector combination⁷. Next, we assigned the resulting indices obtained for each category of the ISCO-08 2-digit⁸ classification to the occupations included in the present analysis⁹. We selected, more particularly, the following indices of skill demand and content based on their relevance for our research question:

- strength: task involving the exertion of energy and strength;
- dexterity: task involving a fine physical skill and coordination, particularly using hands;
- information-processing: manipulation and transformation of codified information;
- problem-solving: finding solutions to complex and new issues.

In order to test for the variation in the influence of the skill content of occupations depending on the training intensiveness, we also include interaction effects between the previous indices and the level of education required by occupations. In a country like Switzerland, where the link between the education system and the labor market is strong (Buchmann and Sacchi 1998; Buchmann et al. 2016), the level of the educational qualifications required by occupations is a good measure of the training intensiveness of occupations. Accordingly, we use the average number of years of education of the workers in each occupational group¹⁰ as our indicator for the training intensiveness of occupations. The maximum number of years required to graduate for occupations accessed through vocational education was retrieved from the State Secretariat for Education, Research and Innovation

professional register¹¹. This was done in order to avoid including respondents in an occupational group that had higher qualifications than the nationally defined value.

We control for the routine (repetitiveness and standardization) and autonomy aspects of occupations, also retrieved from the previous set of indicators, as they could influence the effect of the various dimensions of the skill content of occupations. Other control variables include the standard errors of the average years of education, the size of the occupational group as the number of workers in thousands (including a quadratic term to consider the non-linear effect), and the proportion of foreigners and women in each occupational group (also as a non-linear effect). The previous control variables at the occupational level were generated using the Swiss Labour Force Survey and sampling weights¹². Here, these variables are mostly used to account for the effect of social closure, in the sense of Weeden (2002), on occupational prestige ranking, whereby the size, composition (both in terms of average level and homogeneity), and labor market reward of the various occupational groups are expected to positively influence the ranking of occupations according to their social prestige.

Descriptive statistics

Before presenting and discussing the results of our main analyses, we first proceed with the description of our data, starting with our dependent variable. In **Table 2**, we present some descriptive statistics of the rank assigned to occupations according to their social prestige and the type of education required. As expected, we can easily observe that occupations requiring vocational education are on average ranked lower than occupations with academic requirements, although the significant amount of dissension among respondents illustrates well the variety of schemata used by respondents in their perception of the social order.

Table 2. Descriptive statistics of the dependent variable

Type of education required	Occupation	Mean rank	Median rank	Standard deviation	Minimum	Maximum
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Academic education	Lawyer	3.06	1	3.27	1	10
	Paediatrician	3.40	2	2.63	1	10
	Judge	3.44	2	3.00	1	10
	Mechanical engineer	3.70	3	2.64	1	10
	Physicist	4.20	4	2.57	1	10
	Biochemist	4.67	4	2.17	1	10
	Primary school teacher	4.96	5	2.08	1	10
	High school teacher	4.97	5	1.91	1	10
	Actuary	5.26	5	2.55	1	10
	Sociologist	5.26	5	2.52	1	10
Vocational education	Care professional	6.05	6	2.01	1	10
	Electrician	6.10	6	1.81	1	10
	Commercial employee	6.41	7	2.56	1	10
	Health professional	6.41	7	2.87	1	10
	Carpenter	6.45	7	2.07	1	10
	Graphic designer	6.50	7	2.20	1	10
	Goldsmith	6.69	7	2.58	1	10
	Polymechanic	6.80	7	2.56	1	10
	Retail employee	7.55	9	2.64	1	10
	Hairdresser	8.10	10	2.97	1	10

Whether several dimensions of the skill content of occupations influence individuals' perception of the social world independently of the requirements in terms of educational level, however, remains to be seen and can only be determined with the help of a multivariate analysis. **Table 3** presents the values for each occupation of the independent variables included at the occupational level, as well as the means of these variables depending on the type of education required by occupations (see **Table A1** in the appendix for the values of the other occupational attributes). As can be observed, occupations requiring academic education are in average more training intensive and more salient in information-processing and problem-solving skills and less salient in strength and dexterity than occupations requiring vocational education. T-tests for differences in means with unequal variance confirmed the significance of this observation.

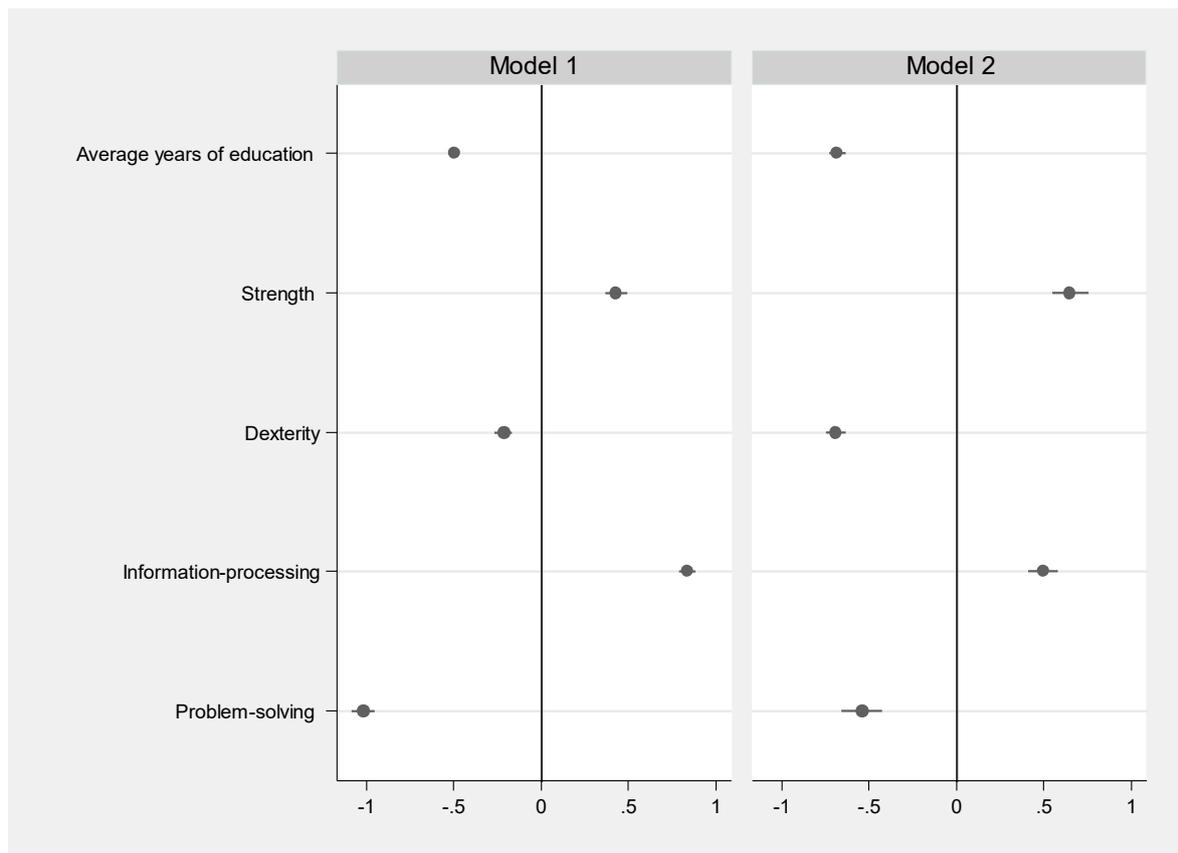
Table 3. Values of the dependent and independent variables at the occupational level

Occupation	Mean rank	Years of education	Strength	Dexterity	Information-processing	Problem-solving
Lawyer	3.06	20.53	12	16.7	45.3	67.8
Paediatrician	3.40	21.67	29	42.6	49	68.8
Judge	3.44	19.28	12	16.7	45.3	67.8
Mechanical engineer	3.70	18.96	10	25	59.4	71.4
Physicist	4.20	21.29	10	25	59.4	71.4
Biochemist	4.67	20.46	10	25	59.4	71.4
Primary school teacher	4.96	16.75	17.3	14.9	49.4	66.8
High school teacher	4.97	19.42	17.3	14.9	49.4	66.8
Actuary	5.26	19.97	10	25	59.4	71.4
Sociologist	5.26	20.35	12	16.7	45.3	67.8
<i>Occupations requiring academic education</i>	<i>4.29</i>	<i>19.87</i>	<i>14.0</i>	<i>22.3</i>	<i>52.1</i>	<i>69.1</i>
Care professional	6.05	13.01	37.4	37.2	31.8	55.3
Electrician	6.10	14.74	35.3	46.8	39.6	61.8
Clerk	6.41	13.84	32.3	42.5	41.3	59
Health professional	6.41	13.70	13.9	25.7	42.6	52.0
Carpenter	6.45	14.37	44	42.4	31.6	55.1
Graphic designer	6.50	14.57	10	25	59.4	71.4
Goldsmith	6.69	15.00	31.5	48.3	36	55
Polymechanic	6.80	14.55	38.6	46.9	35	55.3
Retail employee	7.55	13.49	29.2	32.9	39.7	51.6
Hairdresser	8.10	13.86	32.5	38.3	31.3	50.1
<i>Occupations requiring vocational education</i>	<i>6.71</i>	<i>14.11</i>	<i>30.5</i>	<i>38.6</i>	<i>38.8</i>	<i>56.7</i>

Findings

We now present and discuss our first findings at the occupational level in **Figure 1**, in which we simultaneously estimate the effect of educational requirements and various dimensions of the skill content of occupations, all other things being equal. The coefficients of the variables included in the models must be interpreted as follows: a positive effect reflects a decline in the rank, that is, closer to 10, whereas a negative effect indicates an increase in the rank, that is, closer to 1. All variables have been standardized so that the unit of analysis is the respective standard deviation of each variable included.

Figure 1. Average prestige effect of educational requirements and the skill content of occupations



Model 1 shows the average prestige effect of educational requirements and the skill content of occupations without controlling for the autonomy and routine aspects of occupations, while the latter are included in Model 2. All the independent variables are significant and the direction of the various effects as expected... More precisely, in accordance with the complexity argument, the salience in basic physical and cognitive tasks is found to have a negative impact on the social prestige assigned to occupations, hence confirming H1a and H2a, whereas dexterity and problem-solving skills have a positive impact, thereby validating H1b and H2b. With regard to the size of the effects, in Model 1, the training intensiveness, as well as the salience in information-processing and problem-solving skills have a stronger impact on the social prestige of occupations than the physical aspects of tasks, namely strength and dexterity. However, once we control for the autonomy and routine aspects of occupations in Model 2 (see

also **Table A2** in appendix), the influence of the salience in strength and dexterity on occupational prestige ranking is now stronger than before whereas the role of cognitive skills is diminished by the introduction of these new variables. The lower autonomy and greater repetitiveness and standardization of tasks in manual occupations might therefore increase the penalty in terms of social prestige of these occupations. The core of our findings remains, however, very similar across models. While both the strength and dexterity dimensions of the skill content are strongly correlated, some key differences are noticeable in the previously shown Table 3. Occupations requiring academic education such as in the science and engineering or health sectors are characterized by the salience of fine manual skills, whereas requirements in terms of strength are limited. Thus, the distinction between brute strength and fine manual skills appears, here, determinant for the perception of the social order. In Model 2, a one-standard deviation increase in the salience in strength would lead to a lower rank of .652 whereas a one-standard deviation increase in the salience in dexterity would improve the rank by .693.

With regards to the role of cognitive skills, namely information-processing and problem-solving skills, we can observe the same pattern, in that the complexity of the skill appear to be a key distinction for the perceived social prestige of occupations. More precisely, a one-standard deviation increase in the salience of information-processing skills leads to a lower rank of .495, whereas a one-standard deviation increase in the salience of problem-solving skills improves the rank by .542.

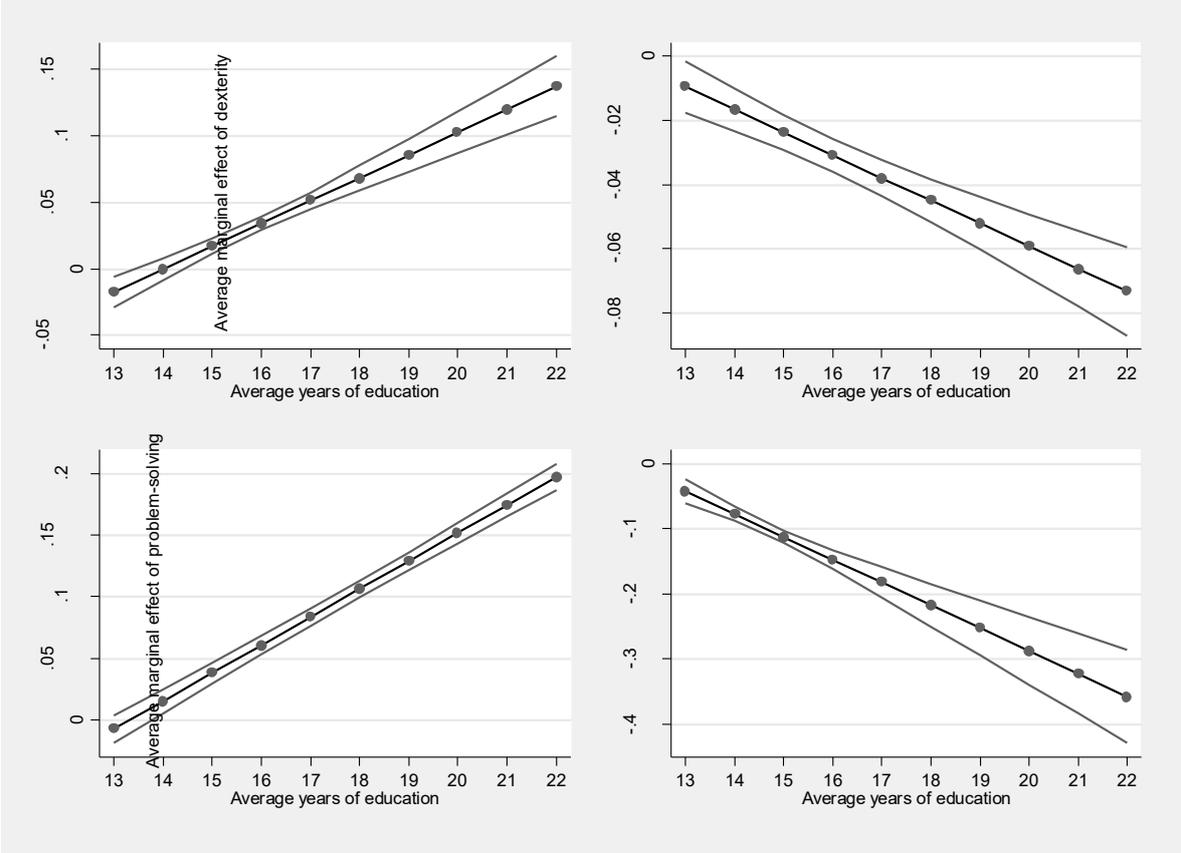
Finally, a one-standard deviation increase in the average years of education required by occupations would improve the prestige rank of occupations by .682 in Model 2. It has, with dexterity, one of the strongest positive effect on the social prestige of occupations.

How the previous effects of the skill content of occupations vary depending on the level of education required remains however to be tested. The four interaction effects are visible in **Figure 2** (see also **Table A3** in the appendix for the detailed results). As hypothesized, the

effects of both the physical and intellectual aspects of occupations are magnified by the training intensiveness of occupations. In other words, the positive effect of the salience in strength and in information-processing skills on the prestige rank of occupations, or their negative effect on the perceived social prestige, grows stronger the greater the average years of education required. Similarly, the negative effect of the salience in dexterity and problem-solving skills on the prestige rank of occupations becomes even stronger at higher levels of educational requirements. Our third hypothesis is therefore also confirmed.

Concretely, this means that the salience in strength and information-processing have no influence on the social prestige of occupations at lower levels of educational requirements, and their negative effect increases with the training intensiveness of occupations. By contrast, the salience in dexterity and problem-solving skills have almost no impact at lower levels of education but their positive effect becomes increasingly strong the higher the level of education required by occupations. Among occupations requiring as much as 22 years of education in average, the penalty associated with a one percentage point increase in the salience of strength and of information-processing skills is, respectively, around .14 and .2 on the prestige rank scale. At the same level of educational requirements, a one percentage point increase in the salience of dexterity and of problem-solving skills lowers the prestige rank by, respectively, almost .08 and .4. As hypothesized, the opportunity cost of investments in education will depend on the skill composition of occupations, whereby changes in the skill content of occupations will have greater consequences for their social prestige when individuals decide to pursue longer educational careers instead of entering the labor market more quickly. For VET, this means that improving the composition of the skill content of occupations will have little to no impact on the social prestige of occupations requiring vocational education.

Figure 2. Interaction effects between educational requirements and the skill content of occupations



Conclusion and discussion

To summarize, while the distinction between academic and vocational knowledge might at first make sense, a more detailed investigation of the dimensions of the skill content that are valued hints at a more intricate picture. All the previous results indeed demonstrate the importance of the finesse and the complexity of the skill performed for the valuation of occupations, both at the manual and intellectual levels. This is also confirmed by the effect of other dimensions of the task content of occupations, such as the autonomy and routine nature of tasks, whereby more repetitive, standardized and supervised modes of work are associated with a lower perceived social prestige. While this argument is not completely new (Parcel and Mueller 1983; Sandefur 2001), the term “complexity” in the previous literature refers to distinct concepts and is defined as the extent of specialization of a job with regards to the tasks assigned

or professional purity. Here, our understanding of complexity refers more to the sophistication of the manual or cognitive skills needed to perform the tasks required by the occupation than the composition of the tasks that need to be performed. Moreover, we have shown in this study that this aspect is also valid for the physical aspect of occupations. As such, fine manual skills might have the same positive impact on the perceived social prestige of occupations as complex problem-solving skills, whereas tasks involving brute strength and basic cognitive skills are less likely to be perceived as prestigious. However, interaction effects between the skill content of occupations and their educational requirements have shown that intellectual and manual aspects of tasks are only relevant for the social prestige of occupations at higher levels of educational requirements.

The previous findings at the occupational level have several practical implications for the future of VET. First, we confirm that occupations requiring vocational education are in average ranked lower in terms of social prestige than occupations requiring academic education. Since the social prestige of occupations informs about their desirability, this is problematic for the attractiveness of VET for students and parents. Moreover, if educational decisions are indeed driven by social status concerns, parents who wish their children to attain a higher social status will also be more likely to push for academic education, regardless of students' scholastic performance. This optimism bias, which has already been documented in the case of immigrant families (see, e.g., Abrassart et al. 2018), could lead to an overestimation of children's chances to succeed in academic education and be more detrimental than beneficial for their educational career in the end. Whether the social prestige of occupations is more important than other intrinsic and extrinsic characteristics for actual educational choices remains however uncertain.

Probably one of the most consistent and strongest effect in this study but also in the literature pertains to the positive impact of the average years of education required by an occupation on its perceived social prestige. More importantly, in our case, this effect holds once we include the various dimensions of the skill content of occupations and even moderate their

effect, which becomes trivial at lower levels of educational requirement. As a result, encouraging the expansion of vocational education and training at the tertiary level could improve the social prestige of occupations requiring vocational education. By contrast, acting on the skill content of occupations requiring upper secondary vocational education is unlikely to improve the perceived social prestige of these occupations.

Finally, the scope of our study was somewhat limited by the number of occupations included in the analysis (20) and the skill content of occupations being only available at the ISCO 2-digit level. A larger number of occupations and more precise information at the occupational level could improve the robustness of our findings in the future.

Endnotes

1. See, for instance, Stevenson (2001) for a criticism of the various differentiations of knowledge.
2. Some exceptions exist, however, in fields like law, medicine and engineering where “these two approaches became virtually indistinguishable; both have strong roots in the universities and links with professional bodies” (Young 2004:109–110).
3. The Swiss Leading House of Economics of Education is a research program of the Swiss State Secretariat for Education, Research and Innovation and a joint project between the University of Bern and University of Zurich.
4. For the selection of occupations we consulted the existing literature on occupations and social status, such as Parker and Van Praag 2010). For the precise selection of occupations, we also based our decision on two previous surveys among teachers and high-school students (Strupler 2013).
5. Sensitivity analyses were also conducted by retaining, instead of excluding, those respondents who gave the same rank twice to different occupations, and replacing, alternatively, one of both redundant ranks by the one missing among the ten that should have been assigned. This resulted in two additional distinct samples that were then used to test for the robustness of our results (available upon request).
6. See Zhou (2005) for an application of this model to the ranking of occupations according to their social prestige.
7. For more information on the exact methodology, see Eurofound (2016)
8. Unfortunately, information at a more detailed level of occupational grouping was not available in the EWCS and PIAAC databases.
9. Since Switzerland did not participate in PIAAC and did not include enough observations at the occupational level to conduct the appropriate analyses, we were unable to derive indices only for Switzerland. This should however not be a problem, as Taylor et al. (2008) have shown

that the skill content of tasks is rated similarly across countries.

10. Because only the level of education was available in the SLFS data set, each level had first to be transformed into the corresponding years of education based on official sources (retrieved from: <http://www.edk.ch/dyn/11586.php>).

11. Available (only in German, Italian or French) at:
<http://www.bvz.admin.ch/bvz/index.html?lang=de>

12. Some occupations from the ranking list in our main data set were not present in the SLFS data as such because of a less detailed variable in the latter. As a result, in some cases, more general categories were used to compute the needed variables.

References

- Abrassart, A. (2013). Cognitive skills matter: The employment disadvantage of low-educated workers in comparative perspective. *European Sociological Review*, 29(4), 707-719.
- Abrassart, A., Busemeyer, M. R., Cattaneo, M. A. and Wolter, S. C. (2018). Do adult foreign residents prefer academic to vocational education? Evidence from a survey of public opinion in Switzerland. *Journal of Ethnic and Migration Studies*, DOI: 10.1080/1369183X.2018.1517595
- Allison, P. D., and Christakis, N. A. (1994). Logit models for sets of ranked items. *Sociological methodology*, 24, 199-228.
- Angrist, J. D., and Pischke, J. S. (2009). *Mostly harmless econometrics: An empiricist's companion*. Princeton: Princeton University Press.
- Autor, D. H., Levy, F., and Murnane, R. J. (2003). The skill content of recent technological change: An empirical exploration. *The Quarterly journal of economics*, 118(4), 1279-1333.
- Billett, S. (2014). The standing of vocational education: Sources of its societal esteem and implications for its enactment. *Journal of Vocational Education and Training*, 66(1), 1-21.
- Bolli, T., Ragoth, L., & Renold, U. (2018). The social status of vocational education and training in Switzerland: Information brochure for professionals in vocational education and training. KOF Studies 110, Zurich: KOF Swiss Economic Institute, ETH Zurich.
- Bourdieu, P. (1985). The social space and the genesis of groups. *Information (International Social Science Council)*, 24(2), 195-220.
- Broad, J. H. (2016). Vocational knowledge in motion: rethinking vocational knowledge through vocational teachers' professional development. *Journal of Vocational Education and Training*, 68(2), 143-160.

Brockmann, M., Clarke, L., & Winch, C. (2008). Knowledge, skills, competence: European divergences in vocational education and training (VET)—the English, German and Dutch cases. *Oxford review of education*, 34(5), 547-567.

Buchmann, M., Kriesi, I., Koomen, M., Imdorf, C., and Basler, A. (2016). Differentiation in secondary education and inequality in educational opportunities: The case of Switzerland. In *Models of Secondary Education and Social Inequality – An International Comparison*, edited by H.-P. Blossfeld, S. Buchholz, J. Skopek, and M. Triventi, 111-128. Cheltenham: Edward Elgar

Buchmann, M., and Sacchi, S. (1998). The transition from school to work in Switzerland: Do characteristics of the educational system and class barriers matter. In *From school to work. A comparative study of educational qualifications and occupational destinations*, edited by Y. Shavit and W. Müller, 407-442. Oxford: Clarendon Press.

Busemeyer, M. R., Cattaneo M. A., and Wolter S. C. (2011). Individual policy preferences for vocational versus academic education: Microlevel evidence for the case of Switzerland. *Journal of European Social Policy*, 21(3), 253-273.

Busemeyer, M. R., and Garritzmann, J. L. (2017). Academic, vocational or general? An analysis of public opinion towards education policies with evidence from a new comparative survey. *Journal of European Social Policy*, 27(4): 373-386.

Busemeyer, M. R., and Jensen, C. (2012). The impact of economic coordination and educational institutions on individual-level preferences for academic and vocational education. *Socio-Economic Review*, 10(3), 525-547.

Cattaneo, M. A., and Wolter, S. C. (2013). *Nationale Eigenheiten von Bildungssystemen in Zeiten der Globalisierung*. SKBF Staff Paper 10, Aarau: SKBF.

Cattaneo, M. A., and Wolter, S. C. (2016). Die Berufsbildung in der Pole-Position. Die Einstellungen der Schweizer Bevölkerung zum Thema Allgemeinbildung vs. Berufsbildung. SKBF Staff Paper 18, Aarau: SKBF.

Corneo, G., and Grüner, H. P. (2002). Individual preferences for political redistribution. *Journal of public Economics*, 83(1), 83-107.

Costas, J., and Kärreman, D. (2016). The bored self in knowledge work. *human relations*, 69(1), 61-83.

Cutler, S. J. (1973). Perceived prestige loss and political attitudes among the aged. *The Gerontologist*, 13(1), 69-75.

Di Stasio, V. (2017). 'Diversion or safety net?' Institutions and public opinion on vocational education and training. *Journal of European Social Policy*, 27(4), 360-372.

Ebner, C., Graf, L., and Nikolai, R. (2013). New institutional linkages between dual vocational training and higher education: A comparative analysis of Germany, Austria and Switzerland. In *Integration and Inequality in Educational Institutions*, edited by Michael Windzio, 281-298. Dordrecht: Springer Netherlands.

Eurofound (2016). What do Europeans do at work? A task-based analysis: European Jobs Monitor 2016. Publications Office of the European Union, Luxembourg.

Farkas, G., England, P., Vicknair, K., and Kilbourne, B. S. (1997). Cognitive skill, skill demands of jobs, and earnings among young European American, African American, and Mexican American workers. *Social Forces*, 75(3), 913-938.

Goldthorpe, J. H., and Hope, K. (1972). Occupational grading and occupational prestige. *Information (International Social Science Council)*, 11(5), 17-73.

Graf, L. (2016). The rise of work-based academic education in Austria, Germany and Switzerland. *Journal of Vocational Education & Training*, 68(1), 1-16.

Guppy, N., and Goyder, J. C. (1984). Consensus on occupational prestige: A reassessment of the evidence. *Social Forces*, 62(3), 709-725.

Hanushek, E. A., Schwerdt, G., Woessmann, L., and Zhang, L. (2017). General education, vocational education, and labor market outcomes over the lifecycle. *Journal of Human Resources*, 52(1), 48-87.

Hoffman, N., & Schwartz, R. (2015). Gold standard: The Swiss vocational education and training system. *International Comparative Study of Vocational Education Systems*, Washington, DC: National Center on Education and the Economy.

Lamont, M. (2012). Toward a comparative sociology of valuation and evaluation. *Annual Review of Sociology*, 38, 201-221.

Lynn, F. B., and Ellerbach, G. (2017). A position with a view: Educational status and the construction of the occupational hierarchy. *American Sociological Review*, 82(1), 32-58.

McFadden, D. (1974). Conditional logit analysis of qualitative choice behavior. In *Frontiers in Econometrics*, edited by Paul Zarembka, 105-142. New York: Academic Press.

Meyer, J. W., and Rowan, B. (1977). Institutionalized organizations: Formal structure as myth and ceremony. *American journal of sociology*, 83(2), 340-363.

Michaels, G., Natraj, A., and Van Reenen, J. (2014). Has ICT polarized skill demand? Evidence from eleven countries over twenty-five years. *Review of Economics and Statistics*, 96(1), 60-77.

Nakao, K., and Treas, J. (1994). Updating occupational prestige and socioeconomic scores: How the new measures measure up. *Sociological methodology*, 24, 1-72.

Nylund, M., Rosvall, P. Å., and Ledman, K. (2017). The vocational–academic divide in neoliberal upper secondary curricula: the Swedish case. *Journal of education policy*, 32(6), 1-21.

- OECD (2010). Learning for jobs. OECD Reviews of Vocational Education and Training, OECD, Paris.
- Parcel, T. L., and Mueller, C. W. (1983). Occupational differentiation, prestige, and socioeconomic status. *Work and Occupations*, 10(1), 49-80.
- Parker, S. C., and Van Praag, M. (2010). Group status and entrepreneurship. *Journal of Economics & Management Strategy*, 19(4), 919-945.
- Penn, R. (1975). Occupational prestige hierarchies: a great empirical invariant?. *Social Forces*, 54(2), 352-364.
- Sandefur, R. L. (2001). Work and honor in the law: Prestige and the division of lawyers' labor. *American Sociological Review*, 66(3), 382-403.
- Sauder, M. (2006). Third parties and status position: How the characteristics of status systems matter. *Theory and Society*, 35(3), 299-321.
- Stevenson, J. (2001). Vocational knowledge and its specification. *Journal of Vocational Education and Training*, 53(4), 647-662.
- Stinchcombe, A. L. (1986). Reason and rationality. *Sociological Theory*, 4(2), 151-166.
- Strupler, M. (2013). Determinants of social status, mimeo, University of Bern, Department of Economics.
- Taylor, P. J., LI, W. D., Shi, K., and Borman, W. C. (2008). The transportability of job information across countries. *Personnel Psychology*, 61(1), 69-111.
- Tuor, S. N., & Backes-Gellner, U. (2010). Risk-return trade-offs to different educational paths: vocational, academic and mixed. *International journal of Manpower*, 31(5), 495-519.
- Weber, M. (1946). From Max Weber: Essays in sociology. Translated and edited by H. Gerth and C. Mills. New York: Oxford.

Weeden, K. A. (2002). Why do some occupations pay more than others? Social closure and earnings inequality in the United States. *American Journal of Sociology*, 108(1), 55-101.

Wolf, A. (2011). *Review of vocational education*. London: Department of Education.

Wolter, S. C., and Ryan, P. (2011). Apprenticeship. In *Handbook of Economics of Education*, Volume 3, edited by E. A. Hanushek, S. Machin, and L. Woessmann, 521-576. Amsterdam: Elsevier.

Young, M. (2004). Conceptualising vocational knowledge: Some theoretical considerations. In *Work-based learning in context*, edited by H. Rainbird and A. Fuller. London: Routledge.

Zhou, X. (2005). The institutional logic of occupational prestige ranking: Reconceptualization and reanalyses. *American Journal of Sociology*, 111(1), 90-140.

Appendix

Table A1. Value of the other occupational attributes

	Autonomy	Routine: repetitiveness	Routine: standardization	SE of years of education	Gross income FTE	SE of gross income FTE	Proportion of women	Proportion of immigrants	Size
Lawyer	70.5	25	52.8	0.13	172 449	13 548	37%	28%	16 260
Paediatrician	58	35.4	61.4	0.21	179 019	8 170	54%	57%	14 683
Judge	70.5	25	52.8	0.38	140 189	8 227	22%	30%	5 499
Mechanical engineer	71.2	31.2	68.4	0.16	121 031	3 789	10%	44%	20 990
Physicist	71.2	31.2	68.4	0.44	105 255	8 267	29%	76%	4 739
Biochemist	71.2	31.2	68.4	0.37	117 164	5 766	25%	53%	9 751
Primary school teacher	56.4	24.5	55.2	0.09	106 622	1 624	86%	14%	56 022
High school teacher	56.4	24.5	55.2	0.12	126 596	3 601	53%	24%	28 091
Sociologist	70.5	25	52.8	0.41	144 894	9 516	19%	38%	3 374
Actuary	71.2	31.2	68.4	0.34	102 082	10 674	39%	43%	4 242
Care professional	51.3	35.7	45.3	0.05	61 327	1 151	90%	37%	121 968
Electrician	60.8	38.9	69.1	0.12	83 249	2 825	8%	26%	8 244
Health professional	52.2	34.1	56.1	0.02	79 180	1 020	83%	26%	234 639
Clerk	56.5	44.4	53.3	0.17	87 741	5 401	86%	36%	3 973
Carpenter	55.2	56.1	67.6	0.16	70 232	1 465	3%	22%	27 486
Graphic designer	71.2	31.2	68.4	0.24	72 791	6 882	31%	24%	9 103
Goldsmith	57.2	48.1	73.7	0.00	69 647	11 245	49%	37%	1 355
Polymechanic	50.2	49.8	74.6	0.06	77 798	2 839	4%	35%	78 659
Retail employee	53.6	44.5	46.4	0.04	62 582	1 239	68%	35%	169 024
Hairdresser	53	50.4	49.5	0.06	54 146	3 127	85%	38%	16 002

Table A2. Estimates of the effect of educational requirements and the skill content of occupations

	Model 1	Model 2
<i>Main occupational attributes (standardized)</i>		
Average years of education	-0.496*** (0.0138)	-0.682*** (0.0249)
Strength	0.434*** (0.0315)	0.652*** (0.0541)
Dexterity	-0.213*** (0.0247)	-0.693*** (0.0287)
Information-processing	0.838*** (0.0233)	0.495*** (0.0439)
Problem-solving	-1.014*** (0.0323)	-0.542*** (0.0593)
<i>Other occupational attributes (unstandardized)</i>		
Autonomy		-0.0815* (0.0441)
Routine: repetitiveness		0.105*** (0.0215)
Routine: standardization		0.380*** (0.0262)
SE of average years of education	1.406*** (0.0871)	1.767*** (0.102)
Size	0.000492 (0.000500)	-0.00183*** (0.000561)
Size ²	-1.86e-05*** (2.43e-06)	1.82e-06 (3.01e-06)
Proportion of women	0.0178*** (0.00102)	0.0311*** (0.00125)
Proportion of women ²	-0.000200*** (1.09e-05)	-0.000266*** (1.36e-05)
Proportion of foreigners	0.00133 (0.00193)	0.0480*** (0.00264)
Proportion of foreigners ²	-5.68e-05*** (1.82e-05)	-0.000485*** (2.44e-05)
Observations	50,350	50,350
Number of groups	5,035	5,035

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A3. Estimates of the interaction effects between educational requirements and the skill content of occupations

	Model 3
<i>Main occupational attributes and interaction effects (unstandardized)</i>	
Average years of education	0.891*** (0.333)
Strength	-0.241*** (0.0292)
Dexterity	0.0826*** (0.0174)
Information-processing	-0.303*** (0.0178)
Problem-solving	0.413*** (0.0731)
Average years of education x strength	0.0172*** (0.00183)
Average years of education x dexterity	-0.00709*** (0.00107)
Average years of education x information-processing	0.0227*** (0.000998)
Average years of education x problem-solving	-0.0351*** (0.00496)
<i>Other occupational attributes (unstandardized)</i>	
SE of average years of education	2.947*** (0.147)
Size	0.00331*** (0.000587)
Size ²	-2.26e-05*** (2.85e-06)
Proportion of women	0.0223*** (0.00137)
Proportion of women ²	-0.000256*** (1.74e-05)
Proportion of foreigners	0.0376*** (0.00344)
Proportion of foreigners ²	-0.000339*** (2.85e-05)
Observations	50,350
Number of groups	5,035

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: Unfortunately, the inclusion of the autonomy and routine variables was not possible in this model as it resulted in computation failure.

