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Abstract

The authors compare a firm's costs and benefits of providing apprenticeship training in Austria and Switzerland, using two original micro data sets. While both countries share a number of similarities, including an extensive vocational education and training (VET) system, and a common border, there are some important institutional differences. On average, a Swiss firm generates a net profit of 3400 Euro per apprentice and per year of training, while an Austrian firm incurs net costs of 4200 Euro. Applying matching models, we find that this difference is largely driven by a higher relative apprentice pay in Austria, which in turn is associated with collective bargaining agreements and competition with alternative school-based VET pathways. However, Austrian firms can still generate a return on their training investment, partly due to wage subsidies, but mostly by retaining a high share of apprentices as skilled workers, and thereby save on future hiring costs.

JEL-Codes: J240, J310, J440.

Keywords: apprenticeship training, cost-benefit analysis, initial VET, hiring costs.

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1 Introduction

Although apprenticeship training received a lot of interest from policy makers in recent years, particularly because it is a promising educational pathway to ensure a smooth transition from school to work, there is still a paucity of research that addresses the underlying mechanisms of how exactly apprenticeship systems generate positive outcomes for individuals, firms, and the broader society.

Central for the well-functioning of an apprenticeship system are the firms' willingness to train apprentices. While firms incur costs for instructors, training facilities, materials, and machinery, the most important cost factor is typically an apprentice's wage. To the extent that apprentice wages are subject to collective bargaining agreements or youth minimum wages, higher wages clearly affect a firm's cost-benefit ratio. By focusing on a particular country, however, it is difficult to assess any consequences of minimum wages for apprentices, because country likely moves towards an equilibrium state where a certain number of firms is willing to participate in the training system, given the exogenous constraints. As a result, it will be very difficult to identify a counterfactual situation, unless there is, e.g., a sharp change in the minimum apprentice wage from one year to the next in some industries, or certain regions of a country.

Cross-country comparisons, however, may also be suitable to identify institutional effects on a firm's training behavior. Such an analysis requires that the two countries are rather similar in a number of characteristics, such as the overall importance of its vocational education and training (VET) system, training curricula, location, and culture. Moreover, another necessary requirement for cross-national research is the availability of comparable data, in our case with regard to the training processes in a firm, including information on the corresponding training costs and benefits. While cross-sectional data on the costs and benefits have been available for Austria, Germany, and

Switzerland for some time, a cross-country analysis at the firm level was so far limited to a comparison of Germany and Switzerland (Dionisius et al. 2009 and Jansen et al. 2015).

We contribute to this rather small literature by comparing a firm's costs and benefits to provide apprenticeship training, analyzing similar firms in Austria and Switzerland. We can isolate institutional effects that influence important parameters of the training process, including minimum apprentice pay, the availability of training opportunities outside the firm, and the situation on the market for skilled labor in general. We apply nearest-neighbor matching techniques to compare Austrian and Swiss firms. Thus, we essentially simulate a situation where an Austrian firm faces the institutional environment of a Swiss firm, while holding many other Austrian factors constant.

Our main result shows that comparable Austrian firms on average make a significant net investment of more than 4200 Euro per year and apprentice, while comparable Swiss firms generate a net benefit of 3400 Euro per year and apprentice. We find that much of this difference in net training costs can be explained by a different wage structure, essentially a higher apprentice wage in relation to both unskilled and skilled worker wages. Moreover, we find that in comparison to their Swiss colleagues, Austrian apprentices spend more time with unskilled tasks, but less time away in vocational school or external training centers. Conversely, as apprentices in Austria spend more time in the workplace, they also receive more workplace training, as measured in hours of weekly instruction time. The relatively high apprentice wage in Austria, however, likely contributed to the survival of apprenticeship training, because in Austria there is a direct competition of dual VET with a school-based VET system (which is fully subsidized by the state). To the extent that training firms were to set apprentice pay at a very low level, the outside option for Austrian apprentices is to enroll in school-based VET programs, which puts an upward pressure on wages. In Switzerland, even though some school-based VET program exist, their limited supply forces the large majority of apprentices to enroll in dual apprenticeship programs. Moreover,

turnover after apprenticeship training is lower in Austria than in Switzerland. As a result, we can show that despite the high initial net costs an Austrian firm faces during training, they are willing to make an investment in apprenticeship training because they can subsequently reap the returns on their investment in the form of saved hiring costs for skilled workers.

The next section discusses the relevant theoretical and empirical literature. Section 3 describes the Austrian and the Swiss VET system. Section 4 describes our identification strategy. Section 5 provides descriptive statistics, and section 6 discusses the empirical results. Section 7 concludes.

2 Relevant literature

This section provides a brief review of the relevant literature of a firm's training decisions, which is primarily the human capital theory (Becker 1962) and its more recent extensions that account for various market imperfections (cf. Wolter and Ryan, 2011 and Leuven 2005 for a detailed reviews).

2.1 Human capital theory

The starting point for every economic discussion about training activities is the human capital theory (Becker, 1962). Central to his theory is the view that training represents an investment in future productivity. Under the assumption of competitive product and capital markets, a worker's salary is equal to his or her marginal productivity. Thus, from an employee's perspective, an investment in training results in a higher future income. At the same time, a firm may need a skilled workforce to remain competitive in the product market and to keep up with technological change. Becker (1962) draws a distinction between general (or transferable) human capital and firm-specific skills. The former represents skills that increase the productivity of a worker in general skills, and therefore increase future wages independently of a particular firm. Firm-specific skills,

however, only increase the productivity of the worker in the training firm.

Under the assumption of competitive markets, it is self-evident that employees finance the investment in general human capital, because market forces ensure that individuals are paid according to their marginal productivity. Consequently, a worker is willing to finance training up to the point where the marginal productivity is equal to the marginal costs of training, while a firm has no incentives to make such an investment. Conversely, for firm-specific skills, both the employee and the firm would have to share the initial cost and the future benefits.

Although Becker's focus was not on apprenticeships when he formalized the human capital theory, two distinct characteristics of apprenticeship training enforce his arguments. First, in continental European countries apprentices are mostly young adolescents who often still live with their parents, which means that they may be less liquidity constrained than later on in their life. Second, in most countries, the duration of an apprenticeship is pre-determined. Apprentices who quit before the end of training will typically not obtain a certificate attesting their skills.[1] As training often requires an up-front investment which only pays off in later stages, such a contractual setting is important so that a firm can recover (at least part of) its initial training investments before the end of the apprenticeship.

Human capital theory is useful to predict a firm's willingness to bear net costs of apprenticeship training, depending on the type of training it conveys. To the extent that apprenticeship training conveys mainly general skills, a training firm should not incur any net costs, because it cannot expect to generate post-training benefits to recoup its initial investment. Conversely, if apprenticeship training conveys mainly firm-specific skills, then the firm will be

[1] A notable exception is Germany, where high-performing apprentices can take the final exams half a year earlier prior to the standard program length.

willing to bear at least part of this net cost.

Thus, it remains to be determined whether apprenticeship training contains a significant share of firm-specific skills, or whether skills are largely general and thus useful in other firms, which could be expected given that individual firms in Austria and Switzerland face standardized training curricula for a particular training occupation. Recent research for Germany and Switzerland suggests that apprenticeship contains a large share of transferable skills, as graduated apprentices who move to another firm do not experience large wage losses compared to stayers (Dustmann and Schoenberg 2012, Fitzenberger et al. 2015, Mueller and Schweri 2015), even when accounting for the possibility that movers are a selective group in terms of unobserved ability.

As a result, a different explanation is required to understand why firms are willing to make substantial investments in apprenticeship training, i.e., essentially general human capital. As extensively summarized in Wolter and Ryan (2011) or Leuven (2005), there are a number of reasons why labor markets are not competitive, including asymmetric information, industry- or occupation-specific monopsonies, search costs for skilled workers, product market competition, or reputation effects (cf., among others, Acemoglu and Pischke 1998, Acemoglu and Pischke 1999a, Acemoglu and Pischke 1999b, Bassanini and Brunello 2011, Stevens 1994). Thus, to the extent that there are frictions in the labor market, firms are able to capture at least part of their initial net investment in (general) apprenticeship training by subsequently retaining their graduated apprentices as skilled workers.

Moreover, minimum wages for employees in general can have opposing effects on a firm's incentive to train. While minimum wages lead to wage compression and thus increases a firm's ability to generate post-training benefits, minimum wages may also reduce the profitability of

employees and thus negatively affects training investments (Lechthaler and Snower 2008).[2] However, a paucity of studies analyzes the effects of minimum wages of apprentices. Minimum wages for apprentices have a different effect a firm's training decision, because apprenticeship contracts are relevant only during the training period itself, and thus do not directly affect a firm's post-training benefits.

The remainder of our paper focuses on identifying such frictions, and whether they can indeed explain the behavior of firms that offer apprenticeship training. The following subsection briefly discusses the empirical evidence on the costs and benefits of apprenticeship training in Austria, Germany and Switzerland.

2.2 Empirical evidence on the costs and benefits of apprenticeship training

The methodology to conduct a cost-benefit analysis for apprenticeship training programs was first proposed in the 1970ies in Germany (Sachverständigenkommission 1974). While the first surveys focused on the cost components, subsequent surveys also included training benefits, and later also post-training benefits, such saved hiring costs when retaining former apprentices as skilled workers.[3]

In Switzerland, the first representative survey using a very similar methodology as in German surveys was conducted in 2000 (Schweri et al. 2003), followed up by survey in 2004 (Muehlemann et al., 2007) and 2009 (Strupler and Wolter, 2012). All three surveys found that apprenticeship training, on average, does not result in a net investment for training firms. In fact,

[2] Indeed, a number of studies find negative effects of minimum wages on firm-sponsored training, e.g. Arulampalam et al. (2004), Hara (2017), Neumark and Wascher (2001), Neumark and Wascher (2003), or Schumann (2017).

[3] In Germany, survey estimates consistently found that training firms bear significant net training costs. For the three most recent German surveys, see Schönfeld et al. (2016), Wenzelmann et al. (2010), and Beicht et al. (2004).

firms could generate a short-term rate of return to their initial training investment close to 10 percent.[4] In line with this finding, turnover of graduated apprentices in Switzerland is high, as almost two third of apprentices leave the training with within a year after completing training.

The Austrian cost-benefit study that was conducted prior to the survey that we use for our paper relied on a somewhat different methodology compared to Switzerland and Germany (Lassnigg and Steiner, 1997), making comparisons more difficult. The results nonetheless indicated that Austrian firms on average made a net investment in training, but it was somewhat lower in magnitude compared to German firms. The latest cost-benefit survey for Austria (Schlögl and Mayerl, 2016), however, used exactly the same methodological approach as the latest Swiss survey (Strupler and Wolter, 2012), thereby making it possible for the first time to conduct a cross-country analysis at the firm level, which is the aim of this paper.

3 Austria and Switzerland's vocational education and training systems

In this section, we briefly outline the similarities and differences of the two countries' vocational education and training systems.

In Austria, compulsory schooling has a duration of nine years. However, the subsequent educational track is chosen after eight years of compulsory schooling. This means that pupils who chose to enroll in an apprenticeship must attend an additional year of school before entering apprenticeship training. This is typically done in pre-vocational schools (*Polytechnische Schule*), although the ninth school year may be completed to an increasing extent in other types of schools

[4] It is important to note, however, that net training costs vary strongly depending on the training occupation, firm size, industry and various other factors. Training an industrial mechanic apprentice is associated with an average net investment of 32,000 Swiss francs, while training a carpenter yields on average a net benefit of 22,000 Swiss francs (Strupler and Wolter, 2012). These results stress the importance of comparing training costs and benefits within occupations across countries, and not just across countries in general.

as well (Schmid and Hafner, 2011).

In Austria, the vocational education path offers a wide variety of choices, as outlined in Table 1. In addition to dual apprenticeships with a substantial (formal) work-based learning component (*Duale Berufsausbildung),* the Austrian VET system features two types of full-time VET schools, the VET college (*Berufsbildende höhere Schule*) and the VET school (*Berufsbildende mittlere Schule*). The duration of the VET college is five years, leading to a higher-level vocational qualification and full access to universities. Conversely, VET schools last between one to four years, and when completing at least a three-year program, students earn an initial occupational qualification. To gain full access to universities, graduates from VET schools and apprenticeship can take an examination providing general access to higher education (*Berufsreifeprüfung*).

Table 1: Initial VET programs at upper secondary level in Austria

Program	ISCED equivalent	Ratio VET/general Education	Ratio school/practice
VET college	4A	60/40	90/10
VET school	3B	60/40	90/10
VET Apprenticeship	3B	90/10	20/80

Notes: Adapted from Graf et al. (2012), p.152, based on Tritscher-Archan (2009).

The duration of a dual apprenticeship is between two to four years, with the most common duration being three years. A successful completion results in an initial VET qualification. Moreover, since 2008, apprentices can now also gain full access to universities by taking the corresponding examinations (*Lehre mit Matura*, cf. Graf et al. 2012).

In the late 1990s, Austria experienced a shift from an oversupply of apprenticeship positions

to a supply shortage. This prompted various types of subsidies. Initially, the focus was on a purely quantitative increase in apprenticeship positions. Over the last two decades, more and more qualitative aspects became important and the policy instruments were adjusted on several occasions (Dornmayr et al., 2016). Currently, the most important subsidy is an apprentice wage subsidy (*Basisförderung*), which applies to all apprenticeship contracts in the non-public sector. Firms receive a subsidy equivalent to three monthly (gross) wage payments for an apprentice in the first year, two monthly wages in the second year, one monthly wage in the third and the fourth year (but only during the first half of the fourth year if the apprenticeship lasts 3.5 years). In 2014, a total of 150 Million Euro in subsidies were paid to training firms (Schlögl, 2016).[5]

Vocational schools are financed by the public (Achleitner and Wallner, 2012). According to the Austrian economic chamber, around 76% of 15-year old students chose the vocational education path, and roughly half of them decided to pursue an apprenticeship in the year 2015/16. The other half enroll either in a VET college or a VET school.

At the end of the predetermined apprenticeship duration, the contract is terminated automatically and has to be renegotiated in case the training firms wants to retain a former apprentice as a skilled worker. In our sample, we find that about 60% of Austrian apprentices remain in the training firm within one year of completing their training (Table A.3).

[5] A yearly apprentice salary is on average close about 10,000 Euro, thus the subsidies are equivalent to about 15,000 yearly apprentice salaries. Given a total 115,000 apprentices in Austria in 2014, the subsidies make up for roughly 13% of total apprentice wage payments in 2014 (or 1300 Euro per apprentice).

Table 2: Students in secondary education in Switzerland 2014/15

Bridge-year courses Secondary I to Secondary II	16 881	4,61%
Apprenticeship	230 534	62,96%
Professional baccalaureate	8 968	2,45%
General education	96 477	26,35%
Additional training in Secondary II	13 280	3,63%
Total	366 140	100,00%

Source: Swiss Federal Statistics Office.

Just as in Austria, compulsory schooling in Switzerland has a duration of 9 years. After compulsory schooling, there are two major educational pathways: pupils choose either the general education path or the vocational education path (Table 2). About two thirds of a cohort choses the vocational education path, and within that path, a large majority of about 90% pursue a dual apprenticeship program, which consists of work-based learning and productive work in the firm and, depending on the training occupation, one to two days per week of vocational school (State Secretariate for Education, Research and Innovation, 2017). Apprenticeship training is further supplemented by external training courses (*Überbetriebliche Kurse*) in which job-specific skills are taught. The duration of an apprenticeship ranges from two to four years, resulting in a nationally recognized diploma that certifies the corresponding professional skills. Apprentices have the possibility to acquire the vocational baccalaureate (*Berufsmaturität*) during, or after their apprenticeship, which provides access to universities of applied sciences. In order to enroll in a regular university, apprentices have to pass an additional examination (*Passerellenprüfung*).

Vocational schools are financed by the federal government, states and municipalities. External training courses are mainly financed by employers' associations and employee

organizations, while federal government funds approximately 5%, and states between 15% and 30% of the corresponding costs. The remaining costs are paid by training firms (Schweizerisches Dienstleistungszentrum Berufsbildung, 2016).

As is the case in Austria, the apprenticeship contract is automatically terminated by the end of training. On average, almost two thirds of graduated apprentices leave the firm within one year after completion of training (Strupler and Wolter 2012).

In Switzerland, different types of subsidies are in place, including the possibility for employers to create funds to promote apprenticeship training (*Berufsbilungsfonds*). Participation in those funds can be made compulsory by the Federal Council for all firms of a corresponding sector. In 2008, a total of 49,000 firms were subject to participate in a total of 13 compulsory funds, representing 16% of all firms in Switzerland. The annual revenue of these funds was between 140,000 and 3.2 Million Swiss francs (Kägi and Frey, 2008), and therefore rather low in comparison to other countries.[6]

Contrary to Austria, however, apprentice wages in Switzerland are not subject to collective bargaining agreements, although in some sectors employers' associations make (non-binding) recommendations for apprentice wages in a particular occupation.[7]

[6] There is also the possibility for states to initiate such funds that are compulsory all firms located within a particular state (rather than sectors), and often such funds are partly financed by municipalities and the state itself (Kägi and Frey 2008).

[7] Muehlemann et al. (2013) provide a detailed treatment of apprentice pay in Switzerland, and show that while firms have some degree of monopsony power over apprentices, it is limited for firms in more rural areas with thin local labor markets. Thus, in Switzerland, apprentice wages are largely subject to market forces.

4 Cost-benefit methodology and data

All of the surveys presented here are based on the cost-benefit methodology developed by the German Expert Commission on Costs and Financing of Vocational Education and Training (Sachverständigenkommission 1974), also known as the “Edding Commission". This section explains the detailed methodology of our cost-benefit surveys and describes the data from the latest Austrian and Swiss surveys.

4.1 The cost-benefit model

A firm bears average yearly cost c for training an apprentice i. These costs largely consist of an apprentice’s annual wage w_i^a, and the wage costs for the training personnel. The latter is divided into six categories j, which are: full-time trainers, management, skilled workers in the commercial sector, skilled workers in the technical sector, skilled workers in the service sector and unskilled workers. For each category, the average yearly instruction hours h_{ij} are multiplied with the corresponding within-firm wage of that worker category w_j^t. As apprentices may spend a significant amount of time at the workplace observing their training instructor perform skilled work, the time that an apprentice is instructed (i.e., accumulates human capital) may be considerably higher compared to the time when workplace training actually prevents an instructor from carrying out his or her regular tasks.[8] In the cost-benefit analysis, only the latter costs (i.e., opportunity costs) are considered. Furthermore, X_i includes the remaining training costs, such as expenses for infrastructure, material, external courses, administration and other costs. The total

[8] Training instructors in Austria and Switzerland often only spend a (small) fraction of their time with apprentices, thus an instructor can be a full-time or a part-time skilled worker in the corresponding training occupation.

gross costs to train an apprentice in a particular year of training are thus given by:

$$c_i = w_i^a + \sum_{j=1}^{6} h_{ij} * w_j^t + X_i \quad (1)$$

The average annual benefits b_i are calculated in a similar fashion. An apprentice spends the productive working hours h_i twofold, either with unskilled tasks, valued at the wage of an unskilled worker w_u, or with skilled tasks, valued at the wage of a skilled worker w_s. For the latter tasks we must into account that an apprentice's productivity is only a fraction γ of the productivity of a skilled worker. In our survey, γ is an estimate by the training instructor that works with the corresponding apprentices at the workplace. Following Dionisius et al. (2009), we denote the fraction of productive hours that an apprentice spends with unskilled labor with α:

$$b_i = h_i * [\alpha * w_u + (1-\alpha) * \gamma_i * w_s] \quad (2)$$

Finally, the net cost of apprenticeship training C_i is the difference between the average yearly benefits and the average yearly costs:

$$C_i = c_i - b_i. \quad (3)$$

4.2 Data

Our analysis is based on the surveys by Strupler and Wolter (2012) for Switzerland, and by Schlögl and Mayerl (2016) for Austria. The Swiss data was collected by the Centre for Research in

Economics of Education at the University of Bern, although the questionnaires were sent to the firms by the Swiss Federal Statistical Office.[9] The Austrian data was collected by the Austrian Institute for Research on Vocational Education and Training via an online tool. The Austrian survey consists of 581 establishments that train apprentices in at least one of the twenty most frequent professions. Although the Austrian sample is not representative, key distribution of firms in the sample is very similar compared to the population distribution of the Austrian firms.

The Austrian survey is based on the Swiss questionnaire, with minor lingual adaptations that were necessary in the context of the Austrian education system. The combined sample initially contains 1280 Swiss and 450 Austrian establishments in 15 different apprenticeship occupations. Due to a small number of within-occupation observations, we did not analyze occupations that last 3.5 years in Austria and 4 years in Switzerland. In order to ensure that Swiss occupations were comparable to those in Austria, we sent the curricula of the Austrian training occupations to the corresponding Swiss employers' associations. As a result, our analysis is based on 306 Austrian firms that offer three-year apprenticeships in 10 difference occupations, which we compare with 730 Swiss firms that offer training in the same occupation.[10]

4.3 Descriptive statistics

In this subsection, we provide descriptive statistics based on our restricted sample of Austrian and Swiss firms for the 10 training occupations that are comparable between the two countries.

[9] More information about the Swiss survey, including how to obtain access to the data, is provided by FORS, the Swiss data repository hosted by the University of Lausanne, and supported by the Swiss National Science Foundation: https://forsbase.unil.ch/project/study-public-overview/12533/0/.

[10] The 10 occupations are administrative clerk, car mechanic, cook, hairdresser, hotel and restaurant clerk, mason, pharmaceutical assistant, plumber, retail clerk, heating and ventilation systems technician. We also conducted our analysis for the full sample and obtained qualitatively similar results, which are available upon request.

Therefore, the results are not identical (although qualitatively similar) compared to the results based on the full sample of the corresponding countries (i.e., Strupler and Wolter 2012, and Schlögl and Mayerl, 2016). The descriptive statistics of the key variables are reported in Table A.3. To account for differences in the firm structure between Austria and Switzerland, the remaining statistics that we report in this section represent observed averages for the Austrian sample and matched averages for Switzerland within the corresponding training occupation and firm size cells.

We find that apprenticeship training in Austria and Switzerland differs substantially in at least for main domains: (i) the wage structure, (ii) the time that apprentices spend at the workplace, (iii) hours of formal training for apprentices at the workplace, and (iv) the allocation of productive and non-productive tasks at the workplace.[11]

Table 3: Apprenticeship wages and their relation to skilled workers' wages

	1st year	2nd year	3rd year
Apprentice wage			
Austria	604.24	791.13	1042.02
Switzerland	626.65	811.00	1079.92
Pay ratio			
Austria	27.4%	34.8%	45.7%
Switzerland	13.6%	17.0%	23.4%

Notes: Matching based on firm-size and training occupation. Prices denoted in Euro at the exchange rate on October 1st, 2014. N=306.

Table 3 shows that Austrian and Swiss apprentices receive almost the same wages, despite the fact that the price level is significantly lower in Austria than in Switzerland.[12] Austrian skilled

[11] As the Swiss survey was conducted in 2009, but the Austrian survey in 2015, we adjust the Swiss cost parameters for inflation by using the Consumer Price Index, and we adjust wages using the Swiss Wage Index. Moreover, we converted Swiss Francs to Euro based on the exchange rate on October 1st, 2014, which is the reference date for the Austrian survey. At that time, 1 CHF traded for 0.8284 Euro.

[12] In 2015, Switzerland's overall price level was 63% above the EU-28 average while the price level in Austria was

workers, however, only earn 2331 Euro compared to the corresponding wage of 4671 Euro in Switzerland. Thus, apprentice pay as a fraction of skilled worker pay is almost twice as high in Austria compared to Switzerland. In the first training year, an Austrian apprentice earns 27%, and in the last year already 46% of a skilled worker's wage. For Swiss apprentices, however, the corresponding percentages are only 14% in the first year, and 24% in the last year of training.

Table 4: Days at the firm, in vocational school and external courses

	1st year	2nd year	3rd year
Vocational School			
Austria	46.34	46.17	46.40
Switzerland	54.87	52.95	46.09
External Courses			
Austria	1.10	1.46	1.63
Switzerland	9.40	8.68	9.12
Total days at firm			
Austria	167	166	165
Switzerland	149	151	157

Notes: Matching based on firm-size and training occupation. N=306.

Austrian apprentices also spend more time in the workplace than Swiss apprentices (Table 4). During a three-year apprenticeship, an Austrian apprentice spends about 41 days more in the workplace compared to a Swiss colleague. The effects of this difference on net training costs, however, is ambiguous. While an extended time spent in the workplace may result in a higher productive contribution of an apprentice, a firm may also have to invest more resources in work-based training.

only 4% above the average (Eurostat (prc'_ppp'_ind)).

Table 5: Average hours of firm-based training per year

	1st year	2nd year	3rd year
Austria	293	264	247
Switzerland	190	161	154

Notes: Matching based on firm-size and training occupation. N=306.

Indeed, Table 5 shows that Austrian apprentices receive significantly more instruction when they are in the workplace. The difference diminishes slightly from 103 hours to 93 hours per year over the span of an apprenticeship.

Table 6 shows that relative importance of various tasks while apprentices are in the workplace. Austrian and Swiss apprentices spend roughly the same share of their time with tasks that do not directly provide a monetary benefit to the training firms, such as exercises. However, Austrian apprentices perform relatively more unskilled tasks compared to Swiss apprentices, i.e., tasks that are typically performed by workers without a VET qualification. Consequently, Austrian apprentices spend relatively less time with skilled tasks compared to Swiss apprentices.

Table 6: Allocation of tasks to apprentices, while at the workplace

	1st year	2nd year	3rd year
Unskilled tasks			
Austria	59.9%	54.7%	45.2%
Switzerland	53.9%	43.8%	31.8%
Skilled Tasks			
Austria	18.6%	29.3%	43.4%
Switzerland	26.3%	41.7%	55.2%
Tasks with no direct productive value			
Austria	21.5%	16.0%	11.5%
Switzerland	19.8%	14.6%	13.0%

Notes: Matching based on firm-size and training occupation. N=306.

5 Identification strategy

We are interested in identifying a treatment effect of having an Austrian training firm operate under the conditions of the Swiss labor market (relative apprentice pay) and Swiss institutions (VET regulations that determine how much time apprentices spend with the firm, and the amount of workplace training), as well as how firms allocate tasks to their apprentices at the workplace (share of productive vs. non-productive tasks). We follow the procedure of Dionisius et al. (2009) and match firms based on firm size and the training occupation. We apply a simple nearest-neighbor estimator to obtain treatment effects for the corresponding cost and benefit parameters of interest (cf. Rubin, 1974). Following Abadie et al. (2004), we denote the observed outcome by Y_i as follows:

$$Y_i = Y_i(W_i) = \begin{cases} Y_i(0), & \text{if } W_i = 0 \\ Y_i(1), & \text{if } W_i = 1 \end{cases} \tag{4}$$

where $W_i \in 0,1$ is the treatment indicator. Furthermore, if a firm i is located in Switzerland, $W_i = 0$, and if it is located in Austria, $W_i = 1$. We are interested in the average treatment effect on the treated (ATT), i.e., $ATT_i = E[Y_i(1) - Y_i(0) \mid W_i = 1]$. We essentially estimate the outcome in the cost and benefit parameters in the hypothetical situation where an Austrian firm faced the institutional setting of an otherwise similar Swiss firm that trains apprentices in the same occupation.

For Austrian firms, we observe $Y(1)$, but not $Y(0)$. Thus, we need an estimate for the latter outcome:

$$\hat{Y}(0) = \frac{1}{\# J_M(i)} \sum_{l \in J_M(i)} Y_l \tag{5}$$

where $J_M(i)$ denotes the set of indices for the matches of firm i.

The critical assumption that we need to make is that W is independent of $(Y(0), Y(1))$ conditional on $X = x$, which is also known as the unconfoundedness assumption. In our case, this assumption holds as long as a firm choose its location (i.e., Austria or Switzerland) independently from unobservable factors influencing the costs and benefits of apprenticeship training. As training apprentices is typically not the core business of an enterprise, we believe it is reasonable to assume that this assumption holds.

Moreover, we also need to assume that the probability of assignment to the treatment group is between zero and one (common support assumption). The assumption holds since we have a wide variety of firms of both countries in our sample.

First, we perform a nearest-neighbor matching procedure to obtain counterfactual values for all relevant parameters in the cost-benefit model.[13] We then recalculate the costs and benefits based on the counterfactual values for Austrian firms in a step-wise procedure to show the importance of the individual parameters, i.e., the counterfactual wage structure, instruction time, time in the workplace, and the allocation of productive and non-productive tasks to apprentices. The next section presents the results of our matching procedures.

[13] We report the ATT for each variable in Table A.4. For reasons of brevity, we do not discuss each individual results in the next section, but instead focus on the overall costs and benefits of apprenticeship training.

6 Results

In this section, we first present the results of our matching procedure for the short-term costs and benefits of apprenticeship training, and subsequently turn our attention to a particular type of post-training benefit, i.e., the costs that a firm can save from not having to hire skilled workers from the external labor market.

6.1 Costs and benefits of apprenticeship training

Table 7 shows the initially observed net training costs for Austria, ranging from 3317 Euro in the first year to 5428 Euro in the third year of training. In a first step, we simulate changes in observed net costs by forcing Austrian training firms to pay apprentices according to the counterfactual value in Switzerland, i.e., what fraction of a skilled worker's wage a Swiss apprentice in the same training occupation and a similar firm would receive. Note that we do not make an assumption with regard to the pay level in Switzerland, but solely simulate how net training costs in Austria were to change if relative apprentice pay was set in a similar fashion as in Switzerland.

The results highlight the importance of apprentice pay, since Austrian firms would (ceteris paribus) be able to offer training profitably given the Swiss apprentice pay structure.[14] However, arguing that by simply adjusting apprentice pay one could increase the demand for apprentices in Austria is too simple of a story to tell. As Austrian apprentices spend more time in the workplace compared to Swiss apprentices, this factor needs adjustment as well. As a result, an Austrian firm would just break even in the first year of training, and generate moderate net benefits in the second and third year (Table 7, line 5).

[14] Note that we did not include the wage subsidies for Austrian firms in these calculations.

Table 7: Development of net costs when adding one treatment after the other

	1st year	2nd year	3rd year
Austria (observed)	3317	3902	5428
Matching parameters:			
Pay ratio	-1496	-2525	-2915
+ Time at firm	-281	-1178	-1734
+ Task allocation	907	4	-748
+ Training	-57	-1086	-1716
+ Productivity	-810	-2145	-2625
Switzerland (observed)	-1052	-3902	-5227

Notes: Matching based on firm size and profession. Prices denoted in Euro at the exchange rate on October 1 2014. One treatment is included subsequently to the prior treatment. N=306.

Additionally, accounting for differences in the tasks allocation and the number of training hours at the workplace in sum do not result in large changes (lines 6, 7 in Table 7), although the individual effects have the expected signs. Finally, allocating more productive tasks to apprentices clearly increases a firm's net benefit, resulting in simulated net costs for Austrian firms that are very close to the observed values for Swiss training firms.

Thus, similar to the comparisons of Germany and Switzerland (Dionisius et al. 2009, Jansen et al. 2015), the four factors outlined in Table 7 also explain most of the rather large differences in net costs between Switzerland and Austria. However, a key difference is that Austrian firms allocated a very similar share of productive tasks to their apprentices compared to Swiss firms, while German apprentices spent a very significant fraction of their time with tasks that did not have a productive value to the firm in 2000 (Dionisius et al. 2009).[15]

To provide some reassurance that the differences between Switzerland and Austria are not

[15] As subsequently shown by Jansen et al. (2015), however, German firms started to use apprentices more productively due to the labor market reforms in Germany, and thereby increased their training benefits in recent years.

caused by differences in the training curricula, we include two robustness checks. First, we restrict our analysis to commercial apprentices (Table 11), as this occupation conveys a very similar set of skills. Second, we restrict our sample to firms that train in occupations that are “almost" identical, rather than just “similar"’, based on the analysis of the Swiss employers’ associations (Table 11). Both robustness checks show that our results remain qualitatively similar compared to using the full sample with 15 training occupations.

So far, we can explain what causes the differences in net training costs between Austria and Switzerland. However, an important issue remains, which is to explain why Austrian firms are willing to make a net investment in apprenticeship training in the first place (while Swiss firms do not). Put differently, it is not clear why Swiss apprentices are willing to accept a much lower relative pay compared to their Austrian colleagues. To answer this question, we first need to address two relevant institutional differences between Austria and Switzerland.

First, in contrast to Switzerland, where the apprenticeship wage is determined bilaterally between the apprentice and the firm, apprentices wages in Austria are subject to collective bargaining, which likely has a positive impact on wages (Medoff and Freeman 1984, or for a recent survey see Bryson 2014), particularly because in Austria, apprenticeships are seen as an employment relationship (Trampusch, 2014).[16] Thus, the stronger presence of unions in Austria compared to Switzerland may at least partly account for the observed differences in apprenticeship wages.

A second important difference between Austria and Switzerland, however, is the fact that the Austrian vocational education path offers additional choices. Graf et al. (2012) and Lassnigg

[16] Collective bargaining agreements in general are much more prevalent in Austria than in Switzerland. The overall coverage rates of collective bargaining agreements in 2013 were 98% in Austria, but only 48.6% in Switzerland (OECD iLibrary, http://dx.doi.org/10.1787/growth-2016-graph54-en).

(2011) argue that VET colleges are most selective with respect to cognitive skills of pupils, followed by VET schools. As apprenticeships in Austria have no formal requirements with regard to school grades, we might expect that apprentices are at the lower end of the distribution of cognitive skills. Consequently, Austrian firms have to pay higher wages to attract talented students that would otherwise choose a full-time vocational school (which is funded with public subsidies). In Switzerland, there is less competition for potential apprentices between full-time vocational schools and apprenticeship, because the supply of full-time apprenticeship opportunities is very limited in general. Only recently, a reform of the Austrian VET system also introduced apprenticeships with the possibility to gain the university entrance diploma, thereby making this path more attractive for motivated and talented individuals in comparison to school-based VET programs.

For Austria, Schlögl and Lachmayr (2005) found in their survey that for 46% of pupils, being able to earn an apprentice wage is an important reason to start an apprenticeship. At the same time, almost 70% of employers reported in a survey that they find it difficult to find suitable applicants for their apprenticeship vacancies (Schneeberger and Nowak, 2007). Thus, it seems plausible that apprentice wages play an important part in the educational decisions of Austrian youngsters.

Table 8: Productivity of apprentices in skilled tasks, relative to a skilled worker

	1st year	2nd year	3rd year
Austria	25.7%	44.2%	67.4%
Switzerland	34.5%	52.4%	72.4%

Notes: N=306.

To the extent that an apprentice's average productivity in skilled tasks compared to a skilled worker in the first year is an appropriate measure for ability, we do have some empirical evidence indicating a negative selection in the Austrian apprenticeship system, compared to Switzerland (Table 8). However, this does not mean that the relatively higher apprentice wages in Austria do not influence educational choices, as the situation might be different if relative wages were indeed as low as in Switzerland.[17] Moreover, the initially lower productivity in the first year might prompt Austrian companies to invest in more hours of work-based training compared to Switzerland. In line with this hypothesis, the estimates in Table 8 provide some evidence that the productivity gap becomes smaller towards the end of the training period.

However, we have to be careful when attributing the additional training solely to the negative selection of apprentices. In particular, the Swiss system makes extensive use of external courses, which teach job related skills, and apprentices in Switzerland spend more time at vocational school. Thus, if Austrian apprentices were to achieve a similar level of education compared to Swiss apprentices, firms would need to at least partly be compensated for the difference in external learning opportunities. A possible strategy to do so would be to increase workplace learning accordingly, which also has implications for the funding of training. In Switzerland and Austria, the public finances vocational schools. External courses in Switzerland are financed only least partly by the public. To the extent that vocational schools and external courses are a substitute for workplace training, then Swiss firms profit from a type of subsidy, which might not initially be recognized as such.

[17] The results of Schmid and Hafner (2011) also support a negative selection into apprenticeship training in Austria. They compared PISA results of students on the different paths and found that underachieving students visit mostly pre-vocational schools, followed by apprenticeships and VET schools. VET colleges, conversely, have a significantly lower fraction of underachieving students. Conversely, in Switzerland, about half of all apprentices have similar PISA results as pupils attending academic upper-secondary programs.

Until now, we only looked at direct benefits during the apprenticeship. Yet, there are potential post-training benefits that can arise to cover a firm's initial training investment.

6.2 Saving future hiring costs as a post-training benefit

First, a firm can use apprenticeship as screening device by only retaining suitable apprentices after training. As a firm obtains valuable information about an apprentice's cognitive and non-cognitive skills during a three-year training period, the risk of a bad hire is substantially lower in comparison to an external hire. Moreover, the company saves potential hiring costs for finding, recruiting and training a new hire (Stevens, 1994, Blatter et al. 2016).

While there are certainly other possibilities to screen potential workers, e.g. through temporary work contracts or probationary periods, workers may be able to mimic good behavior for a limited period. Riphahn and Thalmaier (2001) and Ichino and Riphahn (2005) found a sharp increase in absenteeism after the transition from temporary into permanent employment in Germany, where dismissal is considerably more difficult for permanently employed individuals. As mimicking good behavior might be difficult to sustain over a three-year period, apprenticeship training is likely a superior screening device compared to temporary work contracts.

Our data do not contain a measure of firing costs. However, based on the OECD employment legislation index (Table 9) we can infer that dismissal of both regular and temporary workers is more heavily regulated and thus more costly in Austria, compared to Switzerland.

Table 9: Strictness of employment protection legislation 2013

	Austria	Switzerland
Individual dismissal	2.1	1.5
Temporary employment	2.2	1.4

Source: OECD Employment Protection Database.

However, we have data on the costs a firm incurs to successfully fill a skilled worker vacancy in a particular occupation. Hiring costs include a pre-match and a post-match hiring component. The pre-match component includes the costs for job advertisement, selecting applicants and conducting interviews. The post-match component include the productivity loss during the adaptation period, costs for external training courses, but also disruption costs due to incumbent employees providing informal training to new hires.[18]

In order to account for structural differences by firm size and training occupations, the average costs presented in Table 10 again restricts the Swiss sample such that it only includes comparable firms to the Austrian sample (i.e. in the 10 training occupations, as discussed in section 4.2). Thus, these results differ somewhat from those reported in Muehlemann and Strupler Leiser (2015).

It is important to note, however, that some apprentices leave the training firm voluntarily, so the hiring costs for an external hire overestimate this type of benefit.[19] Moreover, some apprentices might drop out before graduation, leaving the firm without the possibility to recoup its training investment. Thus, we denote opportunity costs as

$$c^o = c^h(1-d)[r/(1-s)] \qquad (6)$$

[18] As explained in detail by Muehlemann and Strupler Leiser (2015, selection and interview costs are obtained by multiplying the corresponding time spent for the recruitment process with the wage, while the productivity loss is estimated based on the duration of the adaptation period and a relative productivity measure of a new hire compared to incumbent workers. Finally, disruption costs capture the value of the time spent by incumbent employees for informal training of a new hire.

[19] E.g., if a firm can expect to retain one out of every two apprentices it trains, then post-training benefits only amount to half of the costs to fill a skilled worker vacancy with an external hire

Where c^h refers to hiring costs, d is the fraction of dropouts during apprenticeship training, r is the fraction of former apprentices who remain with the firm for at least one year after training, and s is the one-year separation rate of external hires. Thus, clearly, low dropout rates and high retention rates increases a firm's opportunity costs (and thus post-training benefits). Moreover, opportunity costs also increase with the risk that an external hire results in an early separation (s), i.e., a "bad hire". In the last row of Table 10, we report the corresponding opportunity costs, i.e., the benefit that firms on average realize by retaining former apprentices.

Overall, our survey evidence indicates that hiring costs are higher in Switzerland than in Austria, which may seem counter-intuitive at first. However, because much of hiring costs are essentially wage costs, this difference can be explained by the overall higher wage level in Switzerland. In fact, hiring costs in Austria are even higher than in Switzerland relative to skilled worker wages.

Table 10: Hiring costs by country

	Austria	Switzerland
Job advertisement	497	1231
Selection and interview costs	983	1553
External consulting agencies	153	745
Productivity loss	5509	6429
External training courses	593	1008
Disruption costs	2628	3553
Average hiring costs to fill a vacancy	10362	14518
Average hiring costs / monthly skilled worker wage	4.44	3.11
Opportunity costs	8474	5041
Opportunity costs / monthly skilled worker wage	3.64	1.08

Notes: Matching based on firm size and profession. Prices denoted in Euro at the exchange rate on October 1 2014. The top and bottom 5% dropped to account for outliers. N=302.

In Austria, hiring costs amount to 4.44 times a monthly skilled worker wage (which is 2331 Euro), whereas in Switzerland they amount to 3.11 times a monthly skilled workers wage (which is 4671 Euro).

Moreover, opportunity costs are also considerably higher in Austria than in Switzerland, largely because retention rates are higher in Austria. Consequently, an Austrian training firm with the intention to retain graduated apprentices can expect to recoup about 8500 Euro from saved future hiring costs (about 3.6 months of skilled worker wages). Given that training costs in Austria average 12,650 Euro (Table 7, training firms can roughly recoup two thirds of their initial net training investment. Moreover, training subsidies for apprentices wages cover a further 5 months of wage payments over a three-year period (3 months of wage payments in year 1, 2 months in year 2, and 1 month in year 3), which amounts on average to 4400 Euro (based on Table 3), thereby covering the remaining part of an average firm's initial training investment.

7 Conclusions

Our comparative analysis focuses on the importance of institutional settings on a firm's willingness to make a net investment in apprenticeship training. We compare Austrian firms that train apprentices in the 10 most important three-year training occupations in Austria with similar Swiss firms that train apprentices in the same occupation. We find that apprenticeship training in Austria constitutes a significant net investment for a training firm by the end of the training period. Conversely, comparable Swiss firms, on average, are able to generate a return on their training investment of almost 10 percent.

We find that a relatively high Austrian apprentice wage compared to a skilled worker's wage, and more intensive workplace training in Austria lead to higher training costs compared to

Switzerland. Moreover, Austrian firms also use apprentices more intensively for tasks that do not require a VET qualification and Austrian apprentices show a somewhat lower productivity in skilled tasks compared to Swiss apprentices, leading to lower training benefits in Austria compared to Switzerland. Consequently, higher costs and lower benefits results in substantially higher net training costs in Austria compared to Switzerland.

Our findings highlight the importance of institutions, and how they influence important parameters of a firm's (net) training investments. In Austria, collective bargaining is associated with higher apprentice wages, and the existence of a competing school-based VET system that is publicly financed puts an upward pressure on wages. Conversely, substantial public apprentice wage subsidies compensate training firms for several months of apprentice wages.

Thus, our findings suggest that to the extent a government finances a school-based VET system that allows individuals to acquire the same qualification as in a dual apprenticeship system, wages are likely a deciding factor for a successful apprenticeship system. Firms, however, also have an interest to make a net investment in training, as long as post-training benefits are sufficiently high. Indeed, Austrian firms often find it difficult and costly to hire skilled workers externally. In turn, many training firms are successful in retaining former apprentices, and thereby generate a return on their training investment in the long run.

In contrast, the Swiss VET system is a more market-driven approach in the sense that firms do not receive direct subsidies (except for a co-funding of external training courses). Moreover, while a school-based VET system also exists in Switzerland, its importance is largely limited to relatively few training occupations. As a result, firms need and can recoup their initial investments the end of training. Even though Swiss apprentice wages are low compared to skilled worker wages, accepting low pay during training eventually pays off for individuals. As the skills they acquire during an apprenticeship are largely general and useful in other firms as well, future earnings

increase accordingly.

Building on the prior literature of cost-benefit comparisons between German and Swiss firms, we can demonstrate that firms in countries with very similar apprenticeship training systems face dissimilar institutions that in turn affect a firm's incentive structure. Consequently, institutions influence a firm's decision with regard to workplace training, and thus the decision to participate in apprenticeship training. For countries that are currently in the process of setting up or expanding apprenticeship systems, our comparative analysis clearly shows that policy makers should look at more than just one country's particular apprenticeship model.

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A Tables

Table A.1: Matching, robustness check 1

	1st year	2nd year	3rd year
Austria	2929	2813	568
Pay ratio	-1483	-3328	-6487
+ Time at firm	901	-895	-5672
+ Task allocation	2661	832	-3427
+ Training	2148	742	-2942
+ Productivity	-1311	-395	-3570
Switzerland	2878	240	-5268

Notes: Only commercial apprentices. Matching based on firm-size and profession. Prices denoted in Euro at the exchange rate on October 1, 2014.One treatment is added after the other. N=86.

Table A.2: Matching, robustness check 2

	1st year	2nd year	3rd year
Austria	3437	3390	5124
Pay ratio	-1241	-3029	-3489
+ Time at firm	210	-1460	-2186
+ Task allocation	1898	76	-734
+ Training	573	-801	-1671
+ Productivity	-221	-1965	-2715
Switzerland	-176	-3346	-4831

Notes: When professional associations did not find any important differences in the curriculum it was defined as an exact correspondence of the Austrian and Swiss profession. Matching based on firm-size and profession. Prices denoted in Euro at the exchange rate on October 1, 2014. One treatment is added after the other. N=225.

Table A3: Descriptives of three-year apprenticeships

	Austria				Switzerland			
	Mean	Std. dev.	Min	Max	Mean	Std.dev.	Min	Max
Gross monthly wage - Full-time instructor	2311.6	848.5	1100	5200	5203.6	608.5	3966	7208
Gross monthly wage - Management	3771.7	1838.5	1100	11000	7372.6	1247.4	5639	9405
Gross monthly wage - Commercial sector	2234.7	678.1	1100	5558	4718.1	399.0	3993	5490
Gross monthly wage - Technical sector	2576.7	833.8	1100	7417	5155.1	772.6	3942	6269
Gross monthly wage - Service sector	2085.3	669.2	1100	5700	4591.3	498.3	3366	5595
Gross monthly wage - Unskilled worker	1765.3	428.2	1100	3900	3627.7	276.6	3097	4186
Associated employer outlay (in %)	31.0	0.0	31	31	23.7	5.3	17	39
Typical work hours per week	39.2	0.8	35	40	41.9	0.8	40	45
Average monthly wage in the apprentice's profession in that firm	2330.7	840.4	1100	7417	4671.2	567.6	3366	5805
Job advertisement (for skilled workers)	470.1	698.3	0	5000	1026.8	742.0	0	2675
Expenses for interviews (for skilled workers)	933.0	1449.5	0	11752	1684.4	895.1	0	3481
External consulting (for skilled workers)	243.9	876.1	0	6000	760.0	1022.4	0	3320
Cost of initial reduced productivity of newly hired skilled workers	4553.4	4479.9	0	28726	6042.0	2849.4	658	1550
Training courses (for newly hired skilled workers)	573.5	1177.0	0	6290	929.2	497.2	255	2919
Cost for other employees	2826.0	3820.3	0	22712	3677.3	1418.4	916	6041
Fraction of newly hired skilled workers that leave within one year	24.3	29.0	0	100	12.6	7.7	5	38
Fraction of apprentices that drop out of apprenticeship	8.6	17.0	0	98	6.6	3.6	1	20
Fraction of apprentices that remain within the firm after one year	59.9	38.6	0	100	33.4	15.6	1	70

Table A.4: Average treatment effects on the treated (ATT)

	ATT	Std. Err.
Pay ratio (first year)	0.129***	0.006
Pay ratio (second year)	0.168***	0.010
Pay ratio (third year)	0.212***	0.010
Vacation days (first year)	-3.037***	0.225
Vacation days (second year)	-3.061***	0.254
Vacation days (third year)	-2.916***	0.248
Vocational school days (first year)	-8.564***	1.171
Vocational school days (second year)	-6.693***	1.117
Vocational school days (third year)	0.297	0.879
Days of external externships (first year)	-1.887***	0.462
Days of external externships (second year)	-1.499***	0.532
Days of external externships (third year)	-1.289**	0.533
Sick days (first year)	3.640***	0.673
Sick days (second year)	2.424***	0.739
Sick days (third year)	2.045***	0.775
Days of external courses (first year)	-7.782***	0.626
Days of external courses (second year)	-6.682***	0.658
Days of external courses (third year)	-7.178***	0.770
Productivity compared to skilled workers (in %) (first year)	-9.846***	2.113
Productivity compared to skilled workers (in %) (second year)	-9.661***	1.775
Productivity compared to skilled workers (in %) (third year)	-6.666***	1.723
Share of unskilled tasks (in %) (first year)	5.894***	2.019

Share of unskilled tasks (in %) (second year)	11.180***	1.775
Share of unskilled tasks (in %) (third year)	13.937***	1.969
Share of skilled tasks (in %) (first year)	-8.813***	1.711
Share of skilled tasks (in %) (second year)	-13.463***	1.698
Share of skilled tasks (in %) (third year)	-13.022***	2.086
Share of unproductive time (in %) (first year)	2.918	1.831
Share of unproductive time (in %) (second year)	2.283*	1.277
Share of unproductive time (in %) (third year)	-0.915	1.043
Instruction hours per week - Full-time instructor (first year)	0.538***	0.184
Instruction hours per week - Full-time instructor (second year)	0.397**	0.168
Instruction hours per week - Full-time instructor (third year)	0.288**	0.143
Instruction hours per week - Management (first year)	0.586**	0.231
Instruction hours per week - Management (second year)	0.489**	0.204
Instruction hours per week - Management (third year)	0.555***	0.214
Instruction hours per week - Commercial sector (first year)	0.227	0.199
Instruction hours per week - Commercial sector (second year)	0.133	0.158
Instruction hours per week - Commercial sector (third year)	-0.091	0.160
Instruction hours per week - Technical sector (first year)	1.565***	0.240
Instruction hours per week - Technical sector (second year)	1.771***	0.224
Instruction hours per week - Technical sector (third year)	1.521***	0.232
Instruction hours per week - Service sector (first year)	-0.585**	0.230
Instruction hours per week - Service sector (second year)	-0.592***	0.203
Instruction hours per week - Service sector (third year)	-0.425**	0.198

Notes: *Statistically significant at the .10 level; ** at the .05 level; *** at the .01 level.