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Empirical Evidence on the Effectiveness of Social Public Procurement Policy: The Case of the Swiss Apprenticeship Training System

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Abstract

This paper assesses the effectiveness of a social public procurement policy in Switzerland that gives firms that train apprentices' a preferential treatment. We estimate the effectiveness of this social procurement policy on a firm's training participation, training intensity, and training quality using information from a representative and large firm survey. The results show that although the policy increases the number of training firms, the effect is limited in size, as only small firms and firms operating in sectors where public procurement represents a large share of the business, are affected positively. As a robustness check we further exploit a natural variation in the incidence of public procurement policies across Cantons and apply a difference-in-differences strategy. The results from this robustness check lie within the range of the effect estimated exploiting the cross-sectional data. Furthermore, we find no evidence that firms offering training due of public procurement policies provide training of a below-average quality.

JEL-Code: H320, I280, J080.

Keywords: apprenticeship training, difference-in-differences, matching, public procurement policy, social public procurement.

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1 Introduction

Social public procurement policies have long been used as an instrument to reach social goals (McCrudden, 2004 and McCrudden, 2007). Already in the 19th century public contracts were linked to labor and employment standards in some countries like the US or in England. Later on governments attempted to use public contracting to reduce discrimination against women, racial minorities or disabled (McCrudden, 2004). A wide range of literature focusing mainly on programs in the US promoting labor market chances for minority groups shows that social public procurement policy can successfully reach the social goals set by the government (see for example Holzer and Neumark, 2000 for the effect of affirmative action programs in the US). However, the literature suggests that there are also potential drawbacks of the policy instrument like higher costs (Marion, 2009) or fraudulent firm behavior (Holzer and Neumark, 2000). We use the case of Switzerland, where public procurement policy aims to increase the number of training places provided by private firms, to analyze the effectiveness of social public procurement policy.

In Switzerland most public purchasers can nowadays account for training activities when awarding public contracts. Most of these regulations were introduced into public procurement laws in the last decade as a result of a shortage of training places. Promoting the supply of training places is particularly important because apprenticeship training is the most important educational pathway in Switzerland. Two-thirds of Swiss youths enter 2- to 4-year apprenticeship training programs after completing compulsory schooling, in which apprentices receive firm-based training and education at a vocational school. A well-functioning apprenticeship training system with a balanced demand and supply of training places is therefore crucial for the professional careers of young adults in Switzerland. However, for various reasons, such as demographic changes or the business cycle (see Muehleemann, 2009) imbalances are quite frequent. There has been a scarcity of training places in the 90s and at the beginning of the last decade (e.g. Schweri and Mueller, 2007), whereas today, there is an over-supply of training positions. As a reaction to the shortage in training positions in the 90s, the government attempted to increase the supply of

training places using for example public procurement policy. The aim of this social public procurement policy is to use a government's market power to achieve social goals such as increasing the number of apprenticeship training places.

The training literature¹ indicates that a firm's training decision is also an economic decision. Firms compare the costs and benefits of training when they decide to employ and train apprentices. Easier access to public contracts could serve as a training benefit and therefore increase firms' incentives to offer training programs. From a theoretical perspective, it is unclear whether this policy instrument can create sufficient incentives to change firms' training behavior. Muehleemann et al. (2007) demonstrate that the average non-training firm in Switzerland would face training costs of approximately 40,000 Swiss francs (or approximately 40,000 USD at the current exchange rate) if it were forced to provide training (see also Wolter et al., 2006, who show that non-training firms are subject to high net training costs). In contrast, for the average Swiss firm offering training, training is profitable. These empirical results raise the question of whether there are enough non-training firms that expect sufficiently high benefits from preferential treatment in public procurement to outweigh their potential training costs. Thus the policy instrument only creates training incentives for firms in which public contracts play a substantial role. Moreover, the policy affects only firms in industries where public contracts exist. Therefore, the policy can only be successful if there are a substantial number of such non-training firms in these industries.

In Switzerland, the most important public purchasers are cantons (similar to states in the US) and communities. Their contracts account for approximately 80 percent of public contracts in Switzerland (Felder and Podgorski, 2010). Cantons pass public procurement laws for public contracts at the canton and community level. Over the last two decades, nearly all cantons have modified these laws and allowed training firms to receive preferen-

¹For a comprehensive overview of the training literature, see Leuven (2005) and for apprenticeship training in particular Wolter and Ryan (2011).

tial treatment when awarding public contracts.² Most cantonal procurement laws contain a non-exhaustive list of potential criteria (additional to the price) for the reward of public contracts. Training apprentices might be one of these potential criteria. Therefore, the existence of this “apprenticeship training” criterion in the law does not mean that all cantons and communities grant training firms preferential treatment in all public contracts. First, the laws allow public purchasers to apply the criterion, but it is not mandatory to provide preferential treatment for training firms.³ Second, in accordance with international laws (WTO-GPA), the criterion can only be applied to contracts below a certain contract volume threshold. Large projects above this threshold for which international firms compete for the contract are excluded, as foreign firms are not allowed to be discriminated against Swiss firms.

The present paper analyzes whether providing preferential treatment to training firms in the public procurement process increases the number of training firms and thus the number of training places and a firm’s training intensity. In addition to the effect on training quantity, this study investigates the effect of such a policy on training quality. Analyzing the effect on training quality is crucial to assess the suitability of the instrument, as only high-quality training provides young individuals with the necessary skills for a successful professional career.

To estimate the effect of the “apprenticeship training” criterion in public procurement laws on the number of training places, we first exploit that such a criterion exists in almost all Cantons in 2009, and use cross-sectional survey data that includes subjective information on whether a firm is affected by the criterion. As robustness check we use the introduction of the criterion in a number of cantons between 2004 and 2009 to estimate the causal effect of the “apprenticeship training” criterion on a firm’s training propensity.

²By 2009, 22 of 26 cantons had introduced an “apprenticeship training” criterion in their legal frameworks.

³Furthermore, as the list is non-exhaustive, public purchasers could theoretically also use the “apprenticeship training” criterion in cantons and communities that do not explicitly mention this possibility in their legal foundations. However, the existence of the criterion is assumed to increase the propensity that such training will be rewarded in public contracting.

The results reveal that allowing for the preferential treatment of training firms in the public procurement process increases the number of training firms and therefore the number of training places. However, the instrument only affects a very small number of firms in certain industries where public contracts play a substantial role. Moreover, as the instrument primarily changes the training behavior of small firms (i.e., at the extensive margin) and does not affect the number of apprentices within a training firm (i.e., at the intensive margin), the overall increase of apprenticeship training places is rather small. The results derived from the cross-sectional analysis are confirmed by the difference-in-differences analysis as the ranges of the effects strongly overlap. The result that training quality remains high for firms that offer apprenticeship places because of the public procurement policy is a promising finding for the apprenticeship training system and the policy instrument.

The paper is structured as follows. Section 2 summarizes the literature and derives the research hypotheses. Section 3 describes the data. Section 4 explains the empirical strategy. Section 5 presents the results, and section 6 concludes.

2 Literature and Hypotheses

There is no scientific study of the effect of public procurement policy on firm training incentives. Nevertheless, the instrument is related to other social public procurement policy instruments. The following studies examine public procurement as an instrument to achieve social goals and contribute to the development of our research hypotheses. McCrudden (2004, 2007) demonstrates that public procurement has long been used as an instrument to achieve social goals.⁴ Empirical assessments of the impact of public procurement policies on social outcomes generally focus on the US, where such programs seek to increase labor market success for minorities. Several programs at the federal, state or local level have existed since the early 1970s. Most of them set aside or set percent-

⁴McCrudden (2007) provides a comprehensive overview of the use of public procurement policies worldwide as an instrument to achieve social goals.

age goals for public contracts for minority-owned firms (and subcontractors). Further programs compelled contractor firms to introduce antidiscrimination policies. Empirical findings suggest that the employment of black males rose more rapidly in contractor firms than non-contractor firms as a result of affirmative action in contracting and procurement (Ashenfelter and Heckman, 1976; Chatterji et al., 2013; Goldstein and Smith, 1976; Heckman and Payner, 1989; Heckman and Wolpin, 1976; Leonard, 1984a,b, 1990).⁵ Moreover, several empirical studies reveal an increase in the number of public contracts involving minority-owned firms as a result of affirmative action programs (e.g., Bates and Williams, 1996)

Although a number of studies suggest that affirmative action policies⁶ are successful in achieving social goals, the policies also have disadvantages. Marion (2009), for example, presents evidence of higher costs in public works projects as a result of affirmative action. Moreover, the potential for fraudulent behavior cannot be excluded (Holzer and Neumark, 2000), and there is a risk that firms will be more likely to fail (Bates and Williams, 1996), as the policy might create weak companies that are highly dependent on government contracts (Holzer and Neumark, 2000).

Besides the literature on social public procurement policy, the training literature serves for building hypotheses. The “apprenticeship training” criterion introduced in the most public procurement laws is also related to other policy instruments designed to provide incentives for firms to train apprentices, such as subsidies. The training literature provides empirical evidence demonstrating that subsidies influence the training decision and increase the number of training places (see, for example, Westergaard-Nielsen and Rasmussen, 1999 for Denmark or Muehleemann et al., 2007, for Switzerland). However, introducing subsidies to promote the creation of new training places may be a very expensive policy, if not only “new” training places but also “old” ones are subsidized, thereby creating

⁵However, whether all of these studies truly capture the causal effects of affirmative action is a matter of dispute.

⁶For an overview of the literature (theoretical and empirical) on affirmative action before 2000, see Holzer and Neumark (2000).

windfall gains. Distinguishing between “new” and “old” training firms seems practically and politically unfeasible. Therefore, although subsidies are highly effective in creating new training places, such a policy is very costly and thus not efficient. The empirical evidence reveals that the average non-training firm in Switzerland would change its training behavior if it were to receive a subsidy of approximately 40,000 Swiss francs (Muehleemann et al., 2007). As the surcharge for training firms in public contracts is rather low (in most cases not more than five percent), it is unclear whether including this criterion in public procurement laws can create benefits sufficient to change the training behavior of a substantial number of non-training firms.

In summary, two strands of literature are considered for deriving hypotheses on the effectiveness of the “apprenticeship training” criterion in public procurement policy. Similar to affirmative action in contracting and procurement in the US, the “apprenticeship training” criterion in Swiss public procurement policy is intended to advantage firms that act according to the goals established by the government (increasing the number of training places). Although the designs and goals of the policies differ, the results from studies on the US suggest that public procurement policies can change firm behavior. However, evidence on non-training firms in Switzerland suggests that the effect size of such a policy may be rather small because of the significant potential net training costs for non-training firms. While training firms are more likely to be awarded a public works contract and can charge higher prices⁷ than non-training firms, these expected benefits must outweigh the net costs of training to change a firm’s training behavior. Therefore, the policy will only be successful if a sufficient number of such non-training firms exist.

A firm’s training propensity increases strongly in firm size. Large firms train more often because they may benefit more from training: First, the probability that a firm employs workers in at least one training occupation increases in firm size. Second, small firms are often specialized, which makes it more difficult (and thus costly) to provide the

⁷Several court decisions (for example, VB.2002.00255 from the Canton of Zurich) fixed the maximum weight given to apprenticeship training below ten percent.

apprentice with the required training content and simultaneously reduces the opportunity to allocate productive tasks to the apprentice. However, large firms have a broader range of tasks for apprentices and can therefore better integrate them into the production process, where apprentices create benefits for firms. Third, larger firms with numerous employees need to fill more vacancies than small firms. Blatter et al. (2012) demonstrate that hiring costs increase in the number of hires. It is therefore beneficial for large firms to diversify their recruitment strategies and use training as a recruitment device to satisfy their future need for skilled workers.

Therefore, we can assume that the inclusion of the criterion in legal frameworks increases the probability that training firms will be treated preferentially in the public procurement process, and as a consequence, the policy creates training incentives at the margin, affecting only a small number of small-sized, non-training firms with positive but relatively low (expected) net training costs. Furthermore, because public contracts should be more prevalent in certain industries, we expect heterogeneous effects across industries.

Training firms could also create additional apprenticeship training places if the policy were able to incentivize training firms to increase the number of training places. The requirements for the preferential treatment of training firms in many cantons, however, are applied with respect to firm size and according to the customary number of apprentices in the industry. Furthermore, the majority of Swiss training firms are small firms with one or two apprentices. Therefore, we assume that the policy does not increase the number of training places in training firms.

In addition to the effect on training quantity, this study provides an analysis of the effect on training quality. In the context of training, quality aspects are very important, as only high-quality training provides young individuals with the skills required for a successful professional career. There could be a trade-off between creating additional training places and training quality, as firms that only provide training to obtain preferential treatment in the public procurement process might be less prone to provide high-quality

training. Nevertheless, a decrease in quality may be unlikely due to legal constraints and the reputational considerations of training firms (Wolter and Ryan, 2011). Therefore, we assume that the public procurement policy has no negative effect on training quality.

3 Data

To analyze the effect of a public procurement policy on a firm’s training behavior, this paper uses a representative firm-level cross-sectional dataset that was collected in 2009 to analyze the costs and benefits of apprenticeship training in Switzerland. To account for the stratified sampling the results presented in this article are weighted by sampling weights.⁸ For the robustness check, we additionally use the same type of dataset collected in 2004. The survey on training and non-training firms collected in 2009 comprises information on the existence of the “apprenticeship training” criterion for public contracts in the firm’s field of activity (canton, industry). As a robustness check we exploit a natural variation between cantons in Switzerland and estimate a difference-in-differences model. The cost-benefit survey is a representative national survey and comprises information on 2,580 training firms and 10,116 non-training firms in 2009 and 2,413 training firms and 1,863 non training firms in 2004. In addition to detailed information on costs and benefits of apprenticeship training, the data contain comprehensive information on firm characteristics and training behavior. Moreover, in 2009, firms indicated in the survey whether in their field of activity (canton, industry), public purchasers apply an “apprenticeship training” criterion for the award of the contract.

As the focus of this analysis is on the impact of the “apprenticeship training” criterion on private firms, public institutions are excluded from the dataset. Moreover, only non-training firms that are theoretically capable of offering training are considered in the

⁸For more details on the sample design and the calculation of weights were provided by the Federal Statistical Office.

analysis.⁹ Finally, Ticino canton is excluded from the analysis.¹⁰

After the exclusion of public firms, firms that theoretically cannot train, and firms located in the Ticino canton, a total of 7,115 firms remain in the sample for the 2009 survey. Among those firms, 17 percent indicated that there exists a criterion “apprenticeship training” in their field of activity (yes or partially). In contrast, 68.2 percent of the firms are not at all affected by such a criterion.

Table 1 shows that the share of firms indicating that such a criterion exists in their field of activity is larger for training firms than for non-training firms.

Table 1: “Apprenticeship training” criterion in public procurement

<i>Answer</i>	<i>Total Share</i>	<i>Share training firms</i>	<i>Share non-training firms</i>
Yes	6.5%	12.4%	2.8%
Partially	10.3%	16.4%	6.5%
No	68.2%	64.7 %	70.4%
No answer	14.9%	6.5%	20.3%
Observations	7,115	1,760	5,355

Question: Are training firms in your field of activity (canton, industry) treated preferentially when applying for public works or services?

The large number of firms (two-thirds) not being affected by the policy combined with the fact that almost all cantons knew such an ”apprenticeship training” criterion by 2009 indicates that public procurement policy affects only a small fraction of firms in particular industries. Public contracts are typically concentrated in certain industries, such as construction, while public contracts are almost non-existent in other industries.

⁹Firms that theoretically cannot provide training are generally very small and specialized. Their size and specialization prevent them from training because they cannot provide the apprentice with all necessary training content or do not employ workers in any training occupation.

¹⁰The Ticino canton differs in many aspects from the other cantons in Switzerland. Moreover, the firms from this canton account only for less 5 percent of all firms in the sample. However, estimations including the canton of Ticino do qualitatively not differ from the presented results.

The present analysis addresses this fact by first identifying the affected firms in industries with public contracts (Table A1 in the Appendix shows the share of affected firms by a two-digit industry level). Therefore, we exclude all firms in industries that are unaffected by public contracts, i.e. have a very small share of firms indicating that they are affected by such a policy.^{11, 12} Moreover, export-oriented firms (only 2.6 percent of all firms) are excluded as they are assumed to have no public contracts in Switzerland. Thus, 1,744 firms remain for the further analysis: 48 percent of these firms indicated that public purchasers in their field of activity consider apprenticeship training when awarding the contract (see Table 2).

Table 2: Criterion apprenticeship training in public procurement; industries with public contracts

<i>Answer</i>	<i>Total Share</i>	<i>Share training firms</i>	<i>Share non-training firms</i>
Yes	20.7%	31.4%	8.6%
Partially	27.2%	34.1%	19.5%
No	41.7%	30.8 %	53.9%
No answer	10.4%	3.7%	18.0%
Observations	1,744	596	1,148

Question: Are training firms in your field of activity (canton, industry) treated preferentially when applying for public works or services?

The descriptive statistics in Table 1 and Table 2 suggest that there exists a positive relationship between the “apprenticeship training” criterion in public procurement and the training probability. However, firms affected and not affected by the policy may differ in many other characteristics. Therefore, this result does not reveal a causal effect of public procurement policy on training behavior.

¹¹For the further analysis we consider firms in the industries manufacture of wood, wicker, cork products and of fabricated metal products and of electrical equipment, energy supply, sewerage and waste management, recycling, construction of buildings, civil engineering and other construction activities, architectural and engineering activities as well as insurance, reinsurance, pension funding.

¹²This exclusion is not crucial for our estimation of the average treatment effect on the treated (ATT) as there are almost no “treated” firms in the excluded industries.

The survey information on the preferential treatment of training firms is subjective. However, it is difficult to collect information about the firms' objective affectedness of the criterion because even if the criterion exists in the legal foundations of a canton, public purchasers are free to apply them and, particularly at the community level, political borders do not demarcate the market for public contracts. Therefore, subjective information directly from a firm is the best available of information that can be used to analyze this topic in the absence of panel data or other information.¹³ Table 2 shows that some firms did not answer the question on the "apprenticeship training" criterion. To take these non-responses into account and avoid a non-response bias, we estimate several scenarios (see section 5).

In addition to estimating the effect of public procurement policy on the number of training places (quantity), the cost-benefit data makes it possible to investigate potential effects on training quality.¹⁴ Training quality is multidimensional and thus difficult to measure. The advantage of the present data is that they contain comprehensive information on apprenticeship training within the firm and comprise two indicators of training quality. The first indicator is the average number of weekly training hours per apprentice, and the second is the relative productivity of the apprentice in the last year of training, compared to the productivity of the average skilled worker in the same trade within the firm. Training hours indicate how many hours instructors and other workers in the firms invest in training the apprentice. A negative effect on training hours implies that the additionally created training places provide less training and therefore provide training of below-average quality. The second quality measure, the relative productivity of the apprentice in the last year of training, is an output-oriented measure and indicates how well apprentices are prepared for their career as skilled workers after receiving training. A lower value for the relative productivity due to the public procurement policy would indicate that apprentices receiving training as a result of such a policy are not as well

¹³However, we provide a robustness check exploiting the introduction of the "apprenticeship training" criterion in certain cantons to overcome this problem.

¹⁴For the analysis on training quality we use only firms that answer the question on the existence of a "apprenticeship training" criterion in public procurement with "yes" or "no". However, results remain qualitatively the same when other firms are considered, too.

prepared for their future professional careers than other apprentices. Descriptive statistics for the quality measures are provided in Table A2 in the Appendix.

4 Empirical Strategy

To calculate the average treatment effect and to control for differences between firms affected and not affected by the criterion, this paper adopts a matching strategy. The applied nearest neighbor matching (Abadie et al., 2004) ensures that only firms with similar (observable) characteristics are compared. The effect of the treatment can be defined in a potential outcome framework (Rubin, 1974). $Y_i(1)$ denotes the outcome (training behavior or training quality) of firm i when exposed to the treatment, and $Y_i(0)$ is the outcome for firm i when not exposed to the treatment. Y_i is equal to one for training firms and zero for non-training firms, for the training quality Y_i denotes to the quality measures training hours or relative productivity of the apprentice in the last year of training. The treatment D_i represents preferential treatment of training firms in the public procurement process. D_i takes the value one if an “apprenticeship training” criterion exists in the firm’s field of activity and zero otherwise. As never both, $Y_i(1)$ and $Y_i(0)$ are observable for one firm, the unobserved potential outcome for each firm i has to be estimated.

Let the observed outcome Y_i be denoted by:

$$Y_i = Y_i(D_i) = \begin{cases} Y_i(0) & \text{if } D_i = 0 \\ Y_i(1) & \text{if } D_i = 1 \end{cases} \quad (1)$$

For the estimation of the unobserved potential outcome (counterfactual), the matching method imputes the missing counterfactual by averaging outcomes of similar firms (with the same observable characteristics) in the sample but who were exposed to the other treatment. To ensure that the estimator identifies a causal and consistent treatment effect two assumptions have to hold: The first underlying assumption for an unbiased estimate of

the causal effect is that there are no unobservables that affect the training decision and the choice of the firm to be active in an industry and canton where training firms are treated preferentially in the public procurement process at the same time (unconfoundness).

$$Y_i(1), Y_i(0) \perp D_i | X = x \tag{2}$$

where X represents a set of observable characteristics. This unconfoundness assumption would be violated if firms would first choose to train or not and then, as a function of the first decision, choose their field of activity and the canton of location. As apprenticeship training is never the core business of a firm we can safely assume that firms first choose their field of activity and make their location decision and subsequently make their training decision. The location decision is independent of the existence of the training criterion in cantonal laws, and therefore, the treatment is random for firms with the same observables and the unconfoundness assumption holds.

The second assumption

$$0 < P(D_i = 1 | X) < 1 \tag{3}$$

holds when the probability of assignment is restricted between zero and one (Abadie et al., 2004). This assumption holds for the sample of firms in industries with a considerable amount of public contracts, as there are enough firms with similar characteristics that are (not) affected by preferential treatment of training firms in public contracting (see Table A1 in the Appendix).

For the unobserved potential outcome the simple matching estimator (Abadie et al., 2004) is:

$$\hat{Y}_i(0) = \begin{cases} Y_i & \text{if } D_i = 0 \\ \frac{1}{\#\mathcal{J}_M(i)} \sum_{l \in \mathcal{J}_M(i)} Y_l & \text{if } D_i = 1 \end{cases} \quad (4)$$

$$\hat{Y}_i(1) = \begin{cases} \frac{1}{\#\mathcal{J}_M(i)} \sum_{l \in \mathcal{J}_M(i)} Y_l & \text{if } D_i = 0 \\ Y_i & \text{if } D_i = 1 \end{cases} \quad (5)$$

where $\mathcal{J}_M(i)$ denotes the set of indices for the matches for a firm i and $\#\mathcal{J}_M(i)$ the number of elements of $\mathcal{J}_M(i)$. l represents the observations of the control group.

The matching estimator for the average treatment effect on the treated is then:¹⁵

$$ATT = \frac{1}{N_1} \sum_{i:D_i=1} \{Y_i - \hat{Y}_i(0)\} \quad (6)$$

5 Results

Table 3 presents the average treatment effect on the treated (ATT) for different firms being considered as treated firms. The results show bandwidths for the effect as different answering scenarios are assumed for the non-responses.¹⁶ The results show that the ATT is positive for all scenarios. The effect is larger for firms that are in all their fields of activities affected by the policy (“yes” firms) compared to firms that are only in parts of their activities affected by the criterion (“partially” firms). Thus the criterion creates more incentives for firms being more heavily affected by the policy. This result underlines the

¹⁵For additional details see Abadie et al. (2004)

¹⁶Non-responses are once considered as firms affected, once partially affected and once not affected by the policy.

existence of a causal effect of the public procurement instrument on training behavior. For all firms affected by the policy (“yes” and “partially” firms), the bandwidth of the effects on their training probability is between 19 to 32 percentage points.¹⁷

Table 3: Bandwidth for the effect of the “apprenticeship training” criterion on training probability

	effect		95%-confidence interval
	<i>lower bound</i>	<i>upper bound</i>	
“yes” firms	0.15	0.37	0.08
“partially” firms	0.11	0.28	0.04
“yes” and “partially” firms	0.19	0.32	0.13

Note: Matching variables: Industry (two-digit-level) and firm size. Estimates for different answering scenarios for “no answer” firms. Robust standard errors. “Yes” firms: firms that are affected by the policy in their whole field of activity. “Partially” firms: firms that are in some fields of activity affected by the policy

This increase seems to be very high. However, one has to bear in mind that this effect considers only a very small fraction of firms in industries where public contracts are very important. Therefore, the effect size does not represent a large overall increase of training places. The present data does not allow identifying the effect on the whole apprenticeship market. However, we know that from all firms answering the question about the “apprenticeship training” criterion in our survey only about 20 percent were at least partially affected by the policy. 80 percent of the firms were not affected by the policy. Weighing the average treatment effect on the treated (ATT) presented in Table 3 for these 20 percent reveals an overall effect on training probability of about 3.8 to 6.4 percentage points. However, the number of training firms does not represent the number of training places. The number of newly created training places primarily depends on the size of the incentivized firms. If additional training places are created in small firms, then an additional training firm typically only provides one additional training position. If large firms were

¹⁷The 95%-percent confidence intervals show that estimated effects are significantly higher than zero.

more likely to be incentivized by such a policy, then an additional training firm could create more than one additional training position. Moreover, additional training places could be created in training firms, increasing the number of apprentices. Table 4 shows average treatment effects on the treated by firm size. The results in Table 4 demonstrate that only small and medium firms with less than 50 employees are affected by the instrument, whereas large firms are not incentivized by the criterion. This result is in line with our hypotheses; large firms have higher training probabilities independent of the existence of the criterion as large firms train apprentices to a larger extent for investment reasons, i.e., to retain apprentices as skilled workers after training, they are less responsive to additional monetary incentives than smaller firms that predominantly have a production-oriented training motive (i.e., training creates a net benefit by the end of the program). Moreover, the probability of employing workers in at least one training occupation increases in firm size. Therefore, larger firms have more productive tasks for apprentices and can better integrate them into their production process, where apprentices create benefits for firms. Conversely, small and specialized firms face greater difficulties in providing the required training content and are less able to allocate productive tasks to an apprentice.

Table 4: The effect of the “apprenticeship training” criterion on the training probability by firm size

Firm size (Number of employees)	Coefficient	Standard error	Observations
1-9	0.38	0.054***	647
10-49	0.35	0.078***	289
50-99	0.09	0.090	101
>100	0.16	0.113	72

Note: Matching variables: Industry (two-digit-level). ATT for firms affected by the “apprenticeship training” criterion in the public procurement process compared to those than are unaffected. Missing values and firms partially affected are excluded. Robust standard errors. Significance level: * $p < .1$, ** $p < .05$, *** $p < .01$

Beside the effect at the extensive margin, the criterion could also affect the number of apprentices in training firms. Some cantons consider the number of apprentices as a function of the total number of workers in the firm and the industry standard number of apprentices, when applying the “apprenticeship training” criterion. However, for the majority of rather small firms, one apprentice is standard. The results in Table 5, therefore, show no effect of the criterion and are in line with the hypotheses that training intensity is not affected by the criterion.

Table 5: Effect of the “apprenticeship training” criterion on training intensity; training firms only

	Coefficient	Standard error	Observations
Training intensity	-0.15	0.324	379

Note: Matching variables: Industry (two-digit) and firm size. ATT for firms affected by the “apprenticeship training” criterion in the public procurement process compared to those that are unaffected. Missing values and firms partially affected are excluded. Robust standard errors. Significance level: *p < .1, **p < .05, ***p < .01

The results demonstrate that public procurement policy can create additional training places by incentivizing non-training firms to train. However, only small firms operating in industries with public contracts are affected by the policy. Although the policy is successful in creating training incentives for these particular firms, the overall effect on the number of training firms is limited. A back-on-the-envelope calculation of the effect of the criterion on the apprenticeship market¹⁸, which is the main target of politicians claiming such a policy, shows an increase of about 2 to 4.9 percent in the number of training places as a result of this public procurement policy.

For a comprehensive assessment of the instrument, it is crucial to analyze the effect on training quality. The instrument is only successful if the additional training places provide

¹⁸The present data does not allow estimating the effect on the number of apprenticeship training places. The back-on-the-envelope calculation assumes that every additional training firm creates one additional training place and compares this number to the total number of training places in 2009 in Switzerland.

sufficiently high training quality. Table 6 reports the effects of the instrument on training quality.¹⁹ In line with our hypotheses we cannot find any trade-off between training quantity and training quality, as there are no differences in the number of training hours and the relative productivity of apprentices in the last year of training between firms that are affected and those that are not affected by the criterion.

Table 6: Effect of the “apprenticeship training” criterion on training quality; training firms only

	Coefficient	Std. err.	Observations
Number of training hours	0.03	0.22	379
Relative productivity in the last year of training	-1.01	1.81	379

Note: Matching variables: Industry (two-digit) and firm size. ATT for firms affected by the “apprenticeship training” criterion in the public procurement process compared to those that are unaffected. Missing values and firms partially affected are excluded. Robust standard errors. Significance level: *p < .1, **p < .05, ***p < .01

5.1 Robustness Checks

The results elicited from the cross-section analysis reveal a positive effect of the social public procurement policy on training probability. However, whether these effects are truly causal or the result of unobserved heterogeneity between treated and non-treated firms cannot be answered with a cross-sectional comparison alone. Therefore, we additionally estimate the effect of this policy on training behavior exploiting that some cantons mentioned in their legal frameworks the possibility to treat training firms preferentially before 2004, while other cantons only introduced the “apprenticeship training” criterion between 2004 and 2009.²⁰ Before 2004, eleven cantons²¹ already introduced regulations that al-

¹⁹Firms partially affected by the policy are excluded. However, the results do not change qualitatively when accounting for these firms.

²⁰Unfortunately, the administrative records of the Swiss establishment register are not updated annually. As the census years do not fit well with the introduction of the “apprenticeship training” criterion we therefore have to rely on the survey data from 2004 and 2009.

²¹These cantons are Aargau, Appenzell Innerrhoden, Berne, Fribourg, Geneva, Glarus, Jura, Neuchâtel, St. Gallen, Vaud, Zurich.

lowed public purchasers to treat training firms preferentially. Two of them²² introduced the criterion between 2000 and 2004, while all others did so before 2000. To estimate the causal effect, we use the introduction of such a criterion in ten Cantons between 2004 and 2008.²³ Apprentices in Switzerland are typically recruited at least half a year before the beginning of the training in August.²⁴ Therefore, the introduction of the criterion in 2004 does not affect the number of training places in 2004 but only in 2005. Four cantons had no such regulations even by 2009 and are consequently dropped from the analysis.²⁵ 37 percent of the private firms that theoretically can train participated in training in 2004 in cantons knowing the “apprenticeship training” criterion already before 2004 (“no change” cantons). In cantons not mentioning such a criterion in their public procurement laws the according share was 38 percent. For both groups training probability increased between 2004 and 2009, however, with 8 percentage points compared to 3 percentage points this increase was much stronger in cantons introducing the “apprenticeship training” criterion between 2004 and 2009.²⁶ The considerable increase in training probability in cantons that introduced the criterion between 2004 and 2009 suggests that this policy instrument was very successful. However, the increase in the share of training firms in cantons with a change in their public procurement laws could be the result of reasons other than a change in public procurement policy. Therefore, to control for trends in training conditions, this section compares firms in cantons with and without a legislative change and applies a difference-in-differences strategy. The treatment group consists of all firms in cantons with changes in the relevant legislation between 2004 and 2009. The control group comprises firms in cantons that introduced the “apprenticeship training” criterion in their legal frameworks before 2004. The two years of data (2004 and 2009) allow controlling for

²²Only two rather small Cantons (Appenzell Innerrhoden and Neuchâtel) introduced the criterion between 2000 and 2004.

²³Appenzell Ausserrhoden, Grisons, Luzern, Obwalden, Schaffhausen, Solothurn, Schwyz, Thurgau, Uri, Zug

²⁴For example by April 2012 72 percent of the potential apprentices already had a training contract signed for an apprenticeship starting in August 2012. Source: SBFI Lehrstellenbarometer, <http://www.sbf.admin.ch/berufsbildung/01587/01607/index.html?lang=de>, 27.5.2013

²⁵The dropped cantons are Basel Stadt, Basel Land, Valais and Nidwalden. About 10 percent of the observations are dropped due to the exclusion of these cantons.

²⁶For the control group of firms in cantons knowing the criterion before 2004 the share of training firms increased from 37 to 40 percent.

systematic time-invariant differences between control and treatment group.

The effect is estimated with a linear regression model (for more details see for example Angrist and Pischke, 2009):

$$Y_{ict} = \beta_1 + \beta_2 D09_t + \beta_3 Change_c + \delta(D09_t \cdot Change_c) + X'_{ist}\beta + \varepsilon_{ist} \quad (7)$$

where $D09_t$ denotes a dummy for the post-treatment period (cross-section 2009) and $Change_c$ is a dummy that takes the value one for firms in cantons with changes in procurement legislation and zero otherwise. The vector X represents firm characteristics (firm size, language region, occupation, industry, and canton).²⁷

Table 7 presents the results of the difference-in-differences (see equation 7) estimation exploiting the fact that some cantons introduced the “apprenticeship training” criterion in their legal frameworks between 2004 and 2009, whereas the criterion was already in force in another group of cantons. The results suggest that the “apprenticeship training” criterion has a positive effect on training probability, however, estimation is not very precise and therefore the estimate no statistically significant. The results suggest that the introduction of the criterion increases training probability by 5.8 percentage points. This estimate remains relatively stable across all specifications and suggests that public purchasers use the criterion in contracting. The estimate lies within the range of the effect size identified in the first part of this paper and therefore confirms the results obtained by analyzing the cross-sectional data.

The effect identified in Table 7 is not estimated very precisely. There are several reasons for this: First, the difference-in-differences estimator identifies the effect of the introduction of the “apprenticeship training” criterion and not its application, whereas the result from the cross-section represents the effect of the application of the criterion

²⁷For descriptive statistics see Table A3.

Table 7: The effect of the introduction of the criterion “apprenticeship training” on the number of training firms (DID)

<i>Dep. Var:</i>	<i>LPM</i>				
<i>Training probability</i>	(1)	(2)	(3)	(4)	(5)
Treatment	0.057	0.058	0.065	0.067	0.058
(D09 x change)	(0.039)	(0.037)	(0.036)*	(0.036)*	(0.036)
Post treatment period	0.025	0.016	0.006	0.004	0.006
(year 2009)	(0.021)	(0.020)	(0.020)	(0.020)	(0.020)
Cantons introducing this	0.009	0.002	-0.002	-0.002	-0.103
legislation after 2004 (change)	(0.030)	(0.029)	(0.029)	(0.029)	(0.059)*
<i>Controls</i>					
Occupation	No	Yes	Yes	Yes	Yes
Industry	No	No	Yes	Yes	Yes
Firm size (and firm size sqr.)	No	No	No	Yes	Yes
Canton	No	No	No	No	Yes
Constant	0.372	0.252	0.355	0.352	0.365
	(0.015)***	(0.021)***	(0.035)***	(0.035)***	(0.042)***
Observations	9,052	9,052	9,052	9,052	9,052
R^2	0.003	0.078	0.105	0.115	0.13

Note: * p < 0.10, ** p < 0.05, *** p < 0.01. Robust standard errors in parentheses.

in the majority of cantons. Second, it may not be the case that all public purchasers apply the criterion within a canton. Furthermore, cantonal borders do not perfectly reflect procurement markets. Firms can also apply for public works contracts outside their canton of residence. The existence of the criterion only increases the probability that a firm in the given canton is affected by the criterion. Moreover, local contracts are more important for small projects below the WTO-threshold^{28, 29}.

6 Conclusion

The present paper analyzes the effectiveness of social public procurement policy on apprenticeship training in Switzerland. By allowing public purchasers to provide preferential treatment for training firms for certain types of public contracts, this procurement policy aims to reach social goals by using public contracts as an incentive for firms to offer training positions.

The results show that a public procurement policy can create incentives for non-training firms and therefore generate additional training places. However, training firms do not increase the number of apprenticeship training places as a result of the policy. The results suggest that the “apprenticeship training” criterion primarily affects small non-training firms in particular industries where public contracts play an important role (e.g., construction). Therefore, the number of potential firms that can be incentivized by such a policy is limited. The overall effect of the criterion on the national training probability is rather modest, with an increase in the range of about 3.8 to 6.4 percentage point.

Although there is a potential risk that firms incentivized by the policy do not provide training of adequate quality, our estimations show that there is no trade-off between additional training places and training quality. The quality for the newly created training places is of the same standard as that offered in other firms.

²⁸As mentioned above, the “apprenticeship training” criterion does not apply to contracts above a certain threshold.

²⁹Unfortunately, no information exists on the share of contracts with firms in a given canton.

The results in this paper suggest that a public procurement policy successfully increased the number of training places in Switzerland. However, this public procurement policy also entails potential drawbacks. The analysis relies only on firms with a potential to train apprentices. However, there are a substantial number of very small and/or highly specialized firms that cannot train because there is no suitable training occupation in their (specialized) field of activity, or they cannot provide the apprentice with the required training content (or only at a very high cost). The preferential treatment of training firms entails the risk that such firms are discriminated against larger and/or less specialized firms.

Moreover, in periods in which apprentices are scarce (an issue in contemporary Switzerland due to demographic changes and competition for talented school-leavers with other educational tracks), the policy can lead to further discrimination and distortions in the apprenticeship market. In periods of shortages of apprentices, small firms in particular experience difficulties finding suitable apprentices, as large firms are more attractive for apprentices because they offer a wider variety of career opportunities after training. Therefore, such a public procurement policy could discriminate against small firms in periods when they are unable to find suitable apprentice as a result of the scarcity of apprentices. Discrimination can also occur between small firms: When there is an oversupply of apprenticeship training places, most firms experience difficulties finding suitable apprentices. Thus from the point of view of an individual firm that would like to hire an apprentice, successfully filling a training position (conditional on recruitment effort) becomes a random event. A public procurement policy would, in this case, discriminate against firms that intended to offer training in the first place. Therefore, governments should only apply such an instrument when there is a substantial need of additional training places.

Moreover, the policy can lead to allocative distortions between industries with and without public contracts. The preferential treatment of training firms affects only firms operating in industries with public contracts and therefore only affects certain training

occupations. A public procurement policy, therefore, only creates advantages for firms in corresponding industries. In periods of shortages of apprentices, firms that benefit from the preferential treatment in public procurement may increase their recruitment effort to find apprentices, thereby increasing the scarcity of apprentices in other industries - even though career perspectives might be better in those other industries. Short-run aims, such as the award of a public contract, would then outweigh the long-run need for skilled workers and lead to allocative distortions.

In summary, this comprehensive assessment of the preferential treatment of training firms in public procurement demonstrates that the instrument is well-suited to create additional high-quality training places in periods when they are in short supply. However, the impact of the policy is limited to a very particular and small group of (small) firms. Furthermore, when there is a shortage of apprentices the disadvantages of the instruments outweigh the benefits.

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A Tables

Table A1: Shares of firms affected by public procurement policy, by industry

<i>Industry</i>	<i>Yes</i>	<i>Partially</i>	<i>No</i>	<i>No answer</i>
Mining and quarrying	0.0	24.7	41.4	34.0
Manufacture of food products	0.0	11.7	71.3	17.0
Manufacture of beverages	0.0	21.7	64.0	14.4
Manufacture of tobacco products	0.0	0.0	100.0	0.0
Manufacture of textiles	0.0	8.9	69.3	21.8
Manufacture of apparel	7.9	0.0	51.8	40.3
Manufacture of leather and related products	0.0	0.0	87.4	12.6
Manufacture of wood, wicker, cork products (without furniture)	24.5	25.4	41.0	9.1
Manufacture of paper products	1.9	18.8	68.6	10.8
Printing	1.9	29.8	63.2	5.1
Manufacture of coke, and refined petroleum products	0.0	0.0	100.0	0.0
Manufacture of chemicals and chemical products	0.0	0.0	80.1	19.9
Manufacture of pharmaceuticals, medicinal chemical and botanical products	0.0	0.0	86.7	13.3
Manufacture of rubber and plastics products	3.7	10.1	73.3	12.9
Manufacture of glassware, ceramic and other non-metallic mineral products	4.2	16.6	49.7	29.5
Manufacture of basic metals	4.4	8.6	78.4	8.6
Manufacture of fabricated metal products	14.1	18.9	56.5	10.6
Manufacture of computer, electronic and optical products	0.8	11.9	74.6	12.8
Manufacture of electrical equipment	8.5	13.8	68.8	8.9
Manufacture of machinery and equipment n.e.c.	2.6	7.8	79.0	10.6
Automotive Industry	0.0	0.0	94.1	5.9
Manufacture of other transport equipment	0.0	0.0	60.8	39.3
Manufacture of furniture	3.9	27.8	65.7	2.6
Other manufacturing	0.5	2.3	82.9	14.2
Repair and installation of machines and equipment	6.4	11.0	63.1	19.4
Energy supply	10.8	13.6	46.6	29.0
Water supply	0.0	0.0	0.0	100.0
Sewerage management	11.8	2.9	17.7	67.7
Waste management and recycling	6.4	38.2	39.2	16.2
Remediation activities and other waste management services	0.0	0.0	100.0	0.0
Construction of buildings	22.2	29.5	36.8	11.5
Civil engineering	26.9	39.4	25.2	8.6
Specialized construction activities	20.5	29.2	36.5	13.8
Wholesale and retail trade and repair of motor vehicles and motorcycles	3.2	5.6	75.3	16.0

Table A1 - continued

Wholesale trade, except of motor vehicles and motorcycles	3.9	6.5	62.9	26.6
Retail trade, except of motor vehicles and motorcycles	4.1	4.0	73.2	18.7
Land transport and transport via pipelines	0.8	6.2	77.0	15.9
Water transport	0.0	0.0	91.0	9.0
Air transport	0.0	0.0	44.8	55.2
Warehousing and support activities for transportation	0.6	2.3	79.6	17.4
Postal and courier activities	0.0	2.0	98.0	0.0
Accommodation	2.3	0.5	81.2	16.1
Food and beverage service activities	1.5	1.6	72.5	24.4
Publishing activities	0.0	10.9	74.6	14.5
Motion picture, video and television program production, sound recording and music publishing activities	0.0	9.3	76.3	14.4
Programming and broadcasting activities	0.0	0.0	52.8	47.2
Telecommunications	0.0	0.0	90.6	9.4
Computer programming, consultancy and related activities	2.9	9.4	75.6	12.1
Information service activities	0.0	10.0	90.0	0.0
Financial service activities, except insurance and pension funding	0.4	2.1	90.4	7.1
Insurance, reinsurance and pension funding, except compulsory social security	18.8	11.0	60.1	10.2
Activities auxiliary to financial services and insurance activities	0.7	4.7	80.4	14.2
Real estate activities	1.7	10.5	66.8	21.0
Legal and accounting activities	0.8	0.8	83.9	14.5
Activities of head offices; management consultancy activities	0.0	4.1	83.1	12.8
Architectural and engineering activities; technical testing and analysis	21.2	25.7	43.0	10.2
Scientific research and development	0.0	0.0	75.0	25.0
Advertising and market research	1.3	17.7	64.9	16.2
Other professional, scientific and technical activities	1.9	4.2	87.0	7.0
Veterinary activities	0.0	2.5	74.3	23.1
Rental and leasing activities	0.0	5.3	57.7	37.0
Employment activities	2.4	0.0	81.0	16.7
Travel agency, tour operator reservation service and related activities	2.7	8.4	65.0	23.9
Security and investigation activities	8.5	5.6	53.9	32.0
Services to buildings and landscape activities	3.4	20.5	61.6	14.6
Office administrative, office support and other business support activities	0.0	3.1	88.1	8.8

Table A1 - continued

Public administration and defense; compulsory social security	0.0	0.0	21.3	78.7
Education	1.4	1.7	43.5	53.5
Human health activities	1.2	2.7	74.5	21.7
Residential care activities	3.1	1.8	47.3	47.7
Social work activities without accommodation	3.4	0.5	16.6	79.5
Creative, arts and entertainment activities	0.0	0.0	61.1	38.9
Libraries, archives, museums and other cultural activities	0.0	0.0	0.0	100.0
Gambling and betting activities	0.0	25.0	0.0	75.0
Sports activities and amusement and recreation activities	0.0	0.0	69.9	30.1
Activities of membership organizations	0.0	4.5	17.7	77.8
Repair of computers and personal and household goods	0.0	0.0	50.0	50.0
Other personal service activities	1.2	1.2	77.7	19.9

Table A2: Measures for training quality (only training firms)

	Mean	Std. Dev.	Min	Max	Observations
Number of training hours	4.55	1.64	0.33	11.11	596
Relative productivity compared to a skilled worker in the last year of training	0.74	0.15	0.20	1.00	596

Table A3: Descriptive statistics 2004 and 2009 for treatment and control group

<i>Occupation (Share)</i>	<i>2004</i>		<i>2009</i>		<i>Dif</i>	<i>no change*</i>	<i>change*</i>	<i>Dif</i>	<i>no change*</i>	<i>change*</i>	<i>Dif</i>
	<i>no change*</i>	<i>change</i>	<i>no change*</i>	<i>change</i>							
Commercial employee	17.8	19.1	20.1	18.2	*						*
Electrician	2.8	1.4	1.9	2.2	*						
Mechanical engineer	2.1	2.1	1.8	2.1							
Retail employee	8.3	4.6	7.5	9.7	***						***
IT specialist	3.4	3.6	3.7	2.0							***
Cook	5.5	11.8	6.9	6.7	***						***
Cabinetmaker	2.5	3.3	1.9	2.1							
Automotive technician	1.6	1.1	1.6	2.0							
Automotive mechanic	2.0	2.7	1.3	1.5							
Construction designer	4.2	2.0	2.8	2.0	**						*
Bricklayer	1.6	1.2	1.5	1.9							
Health care worker	5.5	1.3	1.1	0.8	***						
Dental assistant	1.6	1.8	1.5	1.0							
Others	41.3	44.2	46.6	48.0							
Observations	1,752	582	5,105	1,613							
<i>Industry (Share)</i>											
Mining and quarrying; energy and watersupply, construction	12.7	12.1	12.3	13.2							
Manufacture of food products, beverages and tobacco products	1.4	1.8	1.0	1.2							
Manufacture of textiles and apparel	0.3	0.2	0.4	0.4							
Manufacture of wood and paper products, and printing	2.1	2.9	3.0	2.9							
Manufacture of coke, chemicals and chemical products, rubber and plastics	1.1	1.9	1.2	1.1							
Manufacture of metal products	3.0	2.7	2.6	3.5							*
Manufacture of machinery and equipment n.e.c. and transport equipment	1.5	1.4	1.5	1.6							

Table A3 - continued

Manufacture of electrical equipment, electronic and optical products, watches and clocks	1.4	1.8	1.3	1.7
Other manufacturing	2.2	2.7	1.5	1.4
Trade and repair	27.1	26.7	27.3	28.5
Food and beverage service activities, accomodation	10.7	15.3	***	10.5 *
transport, telecommunications	2.5	1.5	3.7	3.6
Financial service activities and insurance	4.1	2.0	**	3.8
Real estate activities	0.8	0.4	6.1	4.2 ***
IT, publishing, audiovisual and broadcasting activities, R&D, other economic services	18.8	12.8	***	14.9 ***
Education	1.8	2.5	1.9	2.6
Human health activities, social work activities	5.5	7.0	5.6	5.0 **
Other service activities	3.1	4.4	3.3	3.9
Firm size (Share)				
1-9 employees	67.7	67.9	63.8	67.3 **
10-49 employees	26.8	25.4	28.2	24.3 ***
50-99 employees	2.9	3.2	3.9	4.1
100+ employees	2.6	3.6	4.1	4.3
Firm size (No. of employees)	24.6	19.2	33.4	28.4

*no change are firms in cantons that introduced the “apprenticeship training” criterion before 2004.

Note: * p < 0.10, ** p < 0.05, *** p < 0.01. for difference.

Table A4: Share of firms by cantons 2004 and 2009

<i>Canton</i>	<i>2004</i>	<i>2009</i>
Aargau (AG)	7.95	7.52
Appenzell Innerrhoden (AI)	0.22	0.2
Appenzell Ausserrhoden (AR)	1.13	0.98
Bern (BE)	14.99	14.97
Fribourg (FR)	3.08	3.39
Geneva (GE)	6.33	6.05
Glarus (GL)	0.82	0.64
Grisons (GR)	4.27	4.12
Jura (JU)	1.21	1.09
Luzern (LU)	4.91	5.71
Neuchâtel (NE)	2.25	2.66
Obwalden (OW)	0.79	0.67
St. Gallen (SG)	7.82	8.25
Schaffhausen (SH)	1.11	0.97
Solothurn (SO)	4.14	3.11
Schwyz (SZ)	2.46	2.18
Thurgau (TG)	4.25	3.72
Uri (UR)	0.37	0.63
Vaud (VD)	9.6	10.87
Zug (ZG)	2.53	2.54
Zurich (ZH)	19.76	19.7
Observations	2,334	6,718

Note: Only cantons that are used for the analysis