Working Paper No. 176

Beyond Windfall Gains: The Redistribution of Apprenticeship Costs and Vocational Education of Care Workers

Eric Schuss

Universität Zürich
IBW – Institut für Betriebswirtschaftslehre

UNIVERSITÄT BERN

Working Paper No. 176

Beyond Windfall Gains: The Redistribution of Apprenticeship Costs and Vocational Education of Care Workers

Eric Schuss

May 2023 (previous versions: January 2021, September 2021)

Published as: "Beyond windfall gains: The redistribution of apprenticeship costs and vocational education of care workers." *Economica* (2023). By Eric Schuss.
DOI: https://doi.org/10.1111/ecca.12474

Beyond Windfall Gains: The Redistribution of Apprenticeship Costs and Vocational Education of Care Workers

Eric Schuss* (BIBB)

May 4, 2023

Abstract

In many countries, training subsidies and levy schemes are used to tackle the problem that company-based provision of apprenticeship training is low. In this paper, we consider the introduction of a levy scheme in the care sector and estimate the causal effect exerted by substantial redistribution of care worker apprenticeship costs on the training activity of care facilities. We exploit the fact that the underlying apprenticeship levy was introduced across the German federal states at different points in time. For ambulatory care, we find a positive effect on the probability of hiring new apprentices and on the number of new apprentices. Inpatient care facilities only react at the intensive margin. This suggests that the positive effects in this sector are mainly driven by facilities that have already provided training slots before the reform.

Keywords: Apprenticeship training · Care workers · Training levy schemes · Labor shortage

JEL-Classification: J23 · J24 · I18 · C21

*All correspondence to Eric.Schuss@bibb.de, Federal Institute for Vocational Education and Training (BIBB), Robert-Schuman-Platz 3, 53175 Bonn, Tel.: +49 (228) 107 1937

1 INTRODUCTION

In many countries, policymakers use training subsidies to increase the supply of company-based training and to counter the problem of underinvestment in the provision of training slots (for an overview, see Kuczera, 2017). The same applies to levy-grant schemes that redistribute apprenticeship costs between firms that provide training and firms that do not provide training.[1]. Nevertheless, empirical evidence on the causal effects of such instruments on the provision of training slots is very scarce (Bassanini et al., 2007).

This paper tackles the question as to whether training levies increase the training activity of firms by considering the introduction of a levy in the apprenticeship market of care workers in Germany as a case study. By doing this, we provide several contributions that are generally relevant for labor and public economics. Firstly, training levies are used and discussed in many countries and for different occupations and economic sectors (see Kuczera, 2017). Our analysis therefore is not only relevant for the care sector but for other sectors and countries as well.

Secondly, levy schemes are often organized at the level of economic sectors. As a consequence, previous research often compares the sector where the levy was introduced to other sectors not affected by the reform. However, as the literature review below illustrates, the choice of such a control sector is often problematic because of the different composition of the staff and because of diverging pre-reform trends in training activity. In this context, our case study is helpful because the underlying institutional setting provides a new approach by examining the introduction of a training levy within one sector.

To stimulate incentives for company-based training, the German federal government has created the possibility of introducing an obligatory training levy that finances the apprenticeship of geriatric nurses in inpatient and ambulatory care.[2] As a consequence, five federal states introduced such a levy that redistributes the apprentice salary of around €17,000 per apprentice per year between facilities that train and facilities that do not train. We use this exogenous variation in apprenticeship costs and take advantage of the fact that this substantial redistribution of costs was introduced across the federal states at different points in time. The variation in time and regions solves the problem that in related studies an appropri-

ate control group is often missing because levies are usually introduced country-wide and in industries with a labor shortage.

Thirdly, the sector under study is of increasing economic importance. Demographic development increases demand for social care in many countries of middle and high income (for an overview on Europe, see Cangiano, 2014). Many countries therefore face the challenge of increasing the labor supply of nurses. In this paper, we focus on geriatric nurses, an important group of skilled workers in the care sector.

Fourthly, geriatric nurses are furthermore interesting to consider from a broader perspective because of the quasi-competitive organization of the labor market. In Germany, care providers cannot differentiate themselves much with respect to quality and qualification because nursing charges and nurses' wages are rather sticky. Nursing charges are mutually determined by care providers and representatives of care insurance and social security. Charges and wages therefore are not determined by competitiveness and care facilities cannot pass apprenticeship costs on to prices for nursing services. This creates disincentives in investing in apprenticeship training and is a source of underprovision of training slots. Our case study therefore examines whether the introduction of a training levy can correct such a situation of market failure.

By estimating dynamic treatment effects as proposed by Sun and Abraham (2021), we find a robust positive effect on the probability of hiring new apprentices and on the number of new apprentices in ambulatory nursing services. In the ambulatory sector, initial training activity before the introduction of the levy was rather low. In inpatient care, effects are smaller and less clear. Whilst the probability of providing apprenticeship training is not affected, the number of new apprentices is positively affected. This sector-specific analysis therefore demonstrates that effects from levy schemes may be very heterogeneous, even in similar sectors. Further analyses confirm that effects are heterogeneous regarding the number of employees in care facilities and local labor shortage. Furthermore, several robustness checks show that these effects are due to the introduction of the levy scheme and are not attributable to other reforms regarding the care sector.

These findings and the quasi-experimental approach extends the current state of research.

Alongside some studies that compare training activity of firms belonging to sectors with a training levy and of firms that do not (van den Berg et al., 2006; Kamphuis et al., 2010), three papers attempt to tackle the problem of (un-)observed heterogeneities and selection.[3] Dohlmann Weatherall (2009) evaluates a Danish subsidy introduced in 1997. This subsidy finances a wage based on regular employment to apprentices from the age of 25. Although the positive effects in her difference-in-differences approach are presumably driven by young people under 25 who wait until they become eligible for this program, her paper emphasizes the need to distinguish between the immediate effect in the year of introduction of the reform and the effect in the following few years.

Pfeifer (2016) finds heterogeneous effects between different industries by estimating negative effects from abolishing subsidies for new apprentices and completed apprenticeships in Australia. Although the effects may be partially driven by reverse trends between occupations on the National Skill Needs List and other occupations, his paper underlines the role of heterogeneities with respect to firm size. In accordance with this, Westergaard-Nielsen and Rasmussen (2000) show that effects vary by industry by using institutional variation in the amount of relative refunding of apprenticeship costs in different sectors in Denmark. Whilst these empirical papers suffer from the lack of an optimal control group and endogeneity, neither is the theoretical framework able to give a clear response to the question regarding the effectiveness of subsidies. Instead, Acemoglu and Pischke (1999) emphasize the necessity of evaluating the design of training subsidies and levies on a case-by-case basis. Acemoglu and Pischke (1999) also underline the risk of windfall gains, which produce large deadweight losses without affecting training supply provided by companies (see also Bonin et al., 2013; Muehlemann and Wolter, 2014).[4]

Next to studies that explicitly consider levy-schemes and subsidies, the second relevant literature strand are papers that consider apprenticeship regulation and other forms of financial incentives. Caicedo et al. (2022) consider the introduction of apprentice quotas in Columbia that define minimum and maximum numbers of apprentices that vary by firm size. Furthermore, the reform lowers the minimum wage for apprentices and firms are fined by a fee if they do not hire the required number of apprentices. Based on their structural model,

they simulate the separate effect of the three reforms and alternative forms of apprenticeship regulation. Due to variations in apprenticeship costs, firms in low-skill sectors increase the number of apprentices and tend to hire the maximum number of apprentices allowed. High-skill firms instead reduce the number of apprentices in order to avoid higher apprentice quotas and often pay the fee in order to avoid the required training activity. In another relevant study, Dostie (2015) examines the effects of a train-or-pay scheme in Canada. He finds no effects on training activity, but firms are substituting classroom training by on-the-job training.

The structure of the paper is as follows. In the next section, we describe the underlying levy and the apprenticeship market of geriatric nurses in greater detail. Section 3 illustrates data and empirical strategy, with the empirical results being presented in Sections 4 and 5. Finally, Section 6 concludes.

2 INSTITUTIONAL BACKGROUND

As populations age, a labor shortage for care workers in hospitals and care homes emerged in many countries. In Germany, the Federal Employment Agency identifies signs of labor shortage for skilled geriatric nurses in each of the 16 federal states and shows that the shortage is even larger in care homes and home care than it is in hospitals.

The *German Geriatric Nursing Care Act (GGNCA)* re-organized the apprenticeship system in geriatric nursing. Since 2003, apprenticeships have been regulated at the national level and require an appropriate apprentice salary. Apprenticeship training takes three years and includes 2,500 hours of practical training in care facilities and 2,100 hours of theoretical classes at school. Graduates from middle schools or from other forms of ten-year school education that extends to high school are eligible to begin apprenticeships.[5] Apprentices attend practical training in inpatient care facilities or ambulatory nursing services. In 2017, 86.5 percent of apprentices in inpatient care facilities and 85.0 percent of apprentices in ambulatory nursing services were apprentices in geriatric nursing (Federal Office of Statistics, 2018b,a).

In the *German Long-Term Care Insurance (LTCI)*, nursing charges are mutually deter-

mined by providers of care insurance, providers of care facilities, and providers of social security (for details on the general system of LTCI, see Geyer and Korfhage, 2018). This makes charges and nurses' wages sticky and impedes care facilities from passing apprenticeship costs on to prices for nursing services. This circumstance and the high apprenticeship costs generate a competitive disadvantage in the case of supplying apprenticeships and thus creates a disincentive against apprenticeships (Bogai, 2017).

To counteract the shortage of skilled geriatric nurses, the GGNCA enables federal states to introduce a training levy. According to this, all inpatient and semi-residential care facilities and ambulatory nursing services pay mandatory contributions, regardless of whether they engage in apprenticeships or not. These regular contributions are used to finance apprentice salaries and costs of continuing vocational education and training (CVET).

Following the introduction of the GGNCA, five federal states introduced compensation payments in the form of the underlying *Apprenticeship Levy in Geriatric Nursing (ALGN)*. These treatment states introduced the ALGN at different points in time, a circumstance which is useful for the sake of building up the quasi-experimental setting. At first, the underlying law became effective in Rhineland-Palatinate in 2005 and in Baden-Wuerttemberg in 2006. North Rhine-Westphalia and Saarland introduced the ALGN in 2012 and Hamburg followed in 2014.[6] One main important fact is that (except in two states) the levy re-finances 100 percent of apprentices salary.[7] The sum that is redistributed between facilities that are engaged in apprenticeship and those who are not is therefore substantial.

There are several arguments and counterarguments as to whether levy schemes can stimulate training activity of care facilities. Firstly, Bassanini et al. (2007) demonstrate that the optimal instrument only compensates for the gap between firm's marginal costs and marginal benefits and that the investment decision of firms is only affected if the marginal costs and benefits are affected. If the subsidy exceeds the actual costs, firms are only interested in receiving the subsidy and see no intrinsic value in training (Dohlmann Weatherall, 2009). Such a mechanism would weaken the quality of training but is unlikely in our case because the curriculum is set at the national level and is supervised by quality controls. Furthermore, the sum to be redistributed does not exceed the full amount of overall apprenticeship costs.

Secondly, previous research indicates that tax-funded one-time payments per apprentice that amount only to a small fraction of apprenticeship costs merely creates windfall gains without affecting company-based training supply (Muehlemann and Wolter, 2014). However, in our case study, apprentices salary, which are about €17,000 per apprentice per year, are redistributed. The sum of redistribution is therefore substantial. This levy scheme is thus likely to produce incentives to increase the training activity of firms. Moreover, in contrast to subsidies financed by public means, care facilities that provide training derive a benefit from the levy in this instance. However, the levy also penalizes facilities that do not provide training.

Thirdly, Kuczera (2017) concludes that the larger the apprenticeship costs and the labor shortage are, the more likely a levy will be to affect company-based training. In our case, both the apprenticeship costs and the labor shortage are large. Positive impacts of training levies are also more likely if poaching is more common in the sector, and this is the case in the sector of care workers due to a labor shortage and poor working conditions in many care facilities. Last but not least, levies are effective if both the employee's and employer's side are involved in the construction of the levy system, which was the case in our setting.[8]

3 EMPIRICAL STRATEGY AND DATA

3.1 Empirical Strategy

In order to identify the effect of the introduction of the ALGN on training activity of care facilities, we exploit the fact that the reform was implemented across the federal states at different points in time. In our empirical analysis, we consider recent developments in difference-in-differences (DID) techniques and in two-way fixed effects (TWFE) designs. de Chaisemartin and D'Haultfœuille (2020), Goodman-Bacon (2021) and others explicitly consider the case if there is treatment heterogeneity and variation in treatment timing. They show that the treatment effect in event study designs can be biased if the effect is heterogeneous between groups and over time. de Chaisemartin and D'Haultfœuille (2020) derive that the average treatment effect is a weighted sum of the treatment effects in each group at each period.

In order to take this into account and to examine whether our average treatment effect is biased by effects from other periods, we estimate dynamic treatment effects by using the interaction weighted estimator proposed by Sun and Abraham (2021). We use the interaction weighted estimator with binary indicators. The binary treatment indicator $ALGN_{jt}^{\tau}$ indicates whether a care facility is located in a treatment state and τ indicates relative time to treatment over the time period from $\underline{\tau}$ until $\bar{\tau}$. $\tau = 0$ indicates the period of treatment and the period two years before the treatment ($\tau = -2$) is used as the reference period:

$$y_{ijt} = \alpha_i + \sum_{\tau=\underline{\tau}}^{\bar{\tau}} \beta_\tau ALGN_{jt}^{\tau} + X_{it}'\gamma + R_{kt}'\delta + \theta_j + \lambda_t + \varepsilon_{ijt} \tag{1}$$

The outcome y_{ijt} indicates whether care facility i located in federal state j provides training to at least one new apprentice (extensive margin) and how many new apprentices are employed at the facility (intensive margin) in year t.[9] For y_{ijt}, we use flow variables because these map the immediate effect of the introduction of the levy scheme more accurately than the stock of apprentices (see Schumann, 2017). Note here again that apprenticeship training in geriatric nursing takes three years.

Equation 1 also controls for characteristics of facilities X_{it}' and regional characteristics R_{kt}' at the level of counties (k) provided by the Federal Statistical Office and the Federal Employment Agency. According to Schumann (2017), we control for the number of school graduates per county k.[10] Furthermore, R_{kt}' includes the regional number of care-dependent persons per 1,000 inhabitants above the age of 64, the number of nurses per 100 care-dependent persons in inpatient and ambulatory facilities, and the number of slots in care facilities per 1,000 inhabitants above the age of 64.[11] The set R_{kt}' further controls for local unemployment rate in order to capture the general economic development across counties. Time fixed effects λ_t control for general trends common in all states and federal state fixed effects θ_j account for time-invariant factors that affect the apprenticeship market differently by state. Finally, we cluster standard errors at the level of the underlying treatment, which is the level of federal states.

Although there are several approaches that tackle the problem of effect heterogeneity, we focus on the approach by Sun and Abraham (2021). Firstly, Sun and Abraham (2021)

explicitly estimate the dynamic path of treatment effects. By doing this, they consider the problem, when treatment effects are contaminated by effects from other periods. Thus, their estimator fits well to our underlying questions. Secondly, the interaction weighted estimator allows the use of never-treated groups as a control group and therefore rules out using already-treated groups as controls. This is important because we have a long observation period. Thirdly, our application considers a binary treatment whose treatment intensity does not change over time and where several states are never treated. However, to account for other recent approaches, we also verify our results by applying the imputation estimator proposed by Borusyak et al. (2022).

3.2 Data

We use data from the weakly anonymous Establishment History Panel (BHP 7521) for the period 2002–2018 (Ganzer et al., 2022).[12] The BHP is a 50 percent sample of all establishments located in Germany with at least one employee subject to social security or, since 1999, one marginal part-time employee as of 30 June of a given year. The main advantages are the high degree of quality and reliability, the panel character, and the large sample size (e.g., with 1.5 million establishments captured in 2018). The five-digit classification of economic activities (WZ08 classification) identifies inpatient and semi-residential care facilities (WZ08: 87100, 87300) and ambulatory nursing services (WZ08: 88101). The working sample is large enough to examine heterogeneous effects regarding characteristics of establishments and regional conditions at the level of counties. Furthermore, sampling ensures that small care facilities are also part of the sample (Spengler, 2008).

For each care facility, the core file of BHP 7521 and the extension file on worker flows provide information on the number of apprentices (stock) and on the number of new apprentices (flow). The administrative character of the data set ensures that this information is very accurate. Consequently, the share of apprentices relative to the whole number of employees (around 3 percent in ambulatory nursing services and 7 percent in inpatient care facilities) are very similar compared to the administrative statistics on caring provided by the Federal Office of Statistics (2018a,b).

3.3 Descriptive Evidence and Threats to Identification

Table 1 provides a summary of establishment characteristics and regional variables. Firstly, the table legitimizes separate analysis of ambulatory and inpatient facilities. There are large differences in training activity between these two sectors. Furthermore, the composition of ambulatory and inpatient facilities varies in accordance with several characteristics, e.g. with regard to wages, number of employees, and form of employment. Secondly, descriptive statistics highlight a number of typical features of the labor market of care workers, e.g. a large share of women and of part-time employment.

(Table 1 about here)

Figure 1 illustrates the share of care facilities that hire at least one new apprentice per year. In ambulatory nursing services (Panel A), this share is at a rather low level of about 13 percent five years before the treatment. Until the introduction of the ALGN, this initial level is followed by a smooth positive trend in the share of facilities providing training. The introduction of the levy creates a significant jump in the share of care facilities that hire at least one new apprentice. Such a jump can not be seen in control states where a smooth positive trend in the share is present during the whole observation period. However, the jump mainly occurs one year after the reform. In the year of the treatment, the share increases by 2.5 percentage points. One year after the reform, the increase amounts to 11.8 percentage points compared to the last year before the treatment.

(Figure 1 about here)

Panel B of Figure 1 clarifies that the initial level of training activity differs by sector. While in ambulatory nursing services the pre-treatment level does not exceed 15 percent in treatment states, the initial training activity is around 55 percent in inpatient care facilities. Another fact to note is that the trend in the share of inpatient care facilities that hire at least one new apprentice is more fuzzy in both treatment and control states. However, a jump around the treatment can also be seen in this sector. This increase is of lower magnitude than in ambulatory nursing services but is nevertheless present. One year after the treatment the

share increased by 5.3 percentage points compared to last year before the introduction of the levy.

Regarding the intensive margin in Figure 2, the graph for ambulatory nursing services is well comparable to the extensive margin in Figure 1. A smooth positive trend before the reforms is followed by a significant jump around the treatment. Also, there is a clearer jump in the inpatient sector. The number increases by 19.9 percent from 1.4 apprentices one year before the treatment to 1.7 one year after the treatment.

(Figure 2 about here)

The descriptive figures give cause to suppose that the introduction of the levy positively affected training activity, in particular in ambulatory nursing services. The effect seems to be larger in the year after the reform. One reason for this circumstance is that some federal states introduced the levy in the middle of the year (e.g., North Rhine-Westphalia). It is therefore likely that, in the year of the reform, some care facilities made their hiring decisions in spring before the levy came into force. Another reason is that previous research supposes that firms sometimes firstly await the functionality of the levy system and do not adjust their recruitment policy immediately. Bosch (2010) assumes that firms observe whether the levy scheme is sustainable, for instance, whether the levy is not abolished after the next election in the federal state. This reflects the need of estimating dynamic treatment effects and the importance of considering how treatment effects evolve over time.

The identification strategy is based on the common trend assumption. Whilst the initial training activity of ambulatory nursing services is rather comparable between treatment and control federal states in Figures 1 and 2, the same applies to the trend before the reform.[13] The application of the event study design in Section 4 supports this descriptive evidence. The treatment effects in the pre-treatment periods are all insignificant. This supports our argument that estimation of treatment effects do not suffer from general time trends in training activities or diverging trends in training activity by treatment status.

A further threat to the identification strategy would be if labor shortage for skilled geriatric nurses developed in a different way in treatment states than in control states. The Regional Database of the German Federal Statistical Office provides two useful indicators

for labor shortage for skilled geriatric nurses at the county level: the number of persons in need of care related to the number of caring slots and the inverse number of employees in ambulatory or inpatient care facilities related to the number of care-dependent persons. Both indicators include a number capturing the demographic change and labor supply measured in skilled staff or caring slots. Both indicators increase if the need for skilled nurses increases.

Figures A1 and A2 in the Appendix demonstrate that labor shortage develops in a U-shaped pattern during the observation period by using the first indicator (the number of persons in need of care related to the number of caring slots).[14] Although some slight differences in the initial level of labor shortage appear, the development between the treatment and the control group is rather similar.[15]

An explanation why some federal states introduced the levy scheme and some did not is the political agenda of the governments of the states. Generally, social democratic and left-wing parties are less skeptical toward redistribution than liberal or conservative parties. However, only three treatment states are governed by the German social-democratic party (SPD). One further difference is that all treatment states are located in West Germany.[16] Whether an exclusive focus on West Germany changes our estimation results is examined in detail in Section 5.2.

Finally, to exclude anticipation effects, it is required that the time lag between the decision to introduce the levy scheme and the first contribution to pay is not too long. In each treatment state, this was the case. To illustrate this, we can take the largest federal state as one example. Although the first draft of the law was finalized in July 2011 in North Rhine-Westphalia, the enactment of the law has been unsettled for a long time. Firstly, parliamentary hearings with 16 different organizations attending took place in 2011. Secondly, the election of the parliament in North Rhine-Westphalia in May 2012 interrupted the enactment process, whilst the law became effective shortly after the re-election of the government.

4 EMPIRICAL RESULTS

Figure 3 and 4 illustrate our baseline results based on applying the interaction weighted estimator by Sun and Abraham (2021). The two figures respectively display pre-treatment and post-treatment estimates of β_τ after controlling for facility-level characteristics and regional variables summarized in Table 1 and fixed effects for time and federal states.

The probability of hiring at least one new apprentice is significantly affected in ambulatory nursing services (Panel a of Figure 3). The introduction of the levy scheme increases the probability of hiring at least one new apprentice by about 1.4 percentage points in the year of the reform and by 8.0 percentage points in the first year after the reform. This effect is smaller than the descriptive effect in Panel A of Figure 1. Comparing the effect size of 8.0 percentage points to the mean share of ambulatory nursing services training new apprentices during 2002–2018 (16.8 percent) illustrates that the effect size is substantial. In the subsequent periods, the effect size stays at this high level. Pre-treatment estimates are not significantly different from zero which confirms that the introduction of training levy could not be anticipated and the assumption of parallel trends holds.

(Figure 3 about here)

The reform also significantly increases the number of new apprentices in Panel b and c of Figure 3. If we exclude ambulatory nursing services without any training activity in Panel c, the introduction of the training levy significantly increases the number of new apprentices by 0.43 apprentices in the first year after the reform. Relative to the mean number of new apprentices in ambulatory nursing services during 2002–2018 (1.2 new apprentices), this is an effect of 35.9 percent. These results illustrate that the introduction of the levy scheme affects both the extensive and the intensive margin of the provision of training slots in the sector of ambulatory nursing services. Furthermore, the effect in the first year after the reform is larger than the immediate effect. In the subsequent years, effect size stays significant and at a similar level as in the first year after the reform.

(Figure 4 about here)

Effects for inpatient care facilities are different. In Panel a of Figure 4, there is no significant treatment effect on the probability of hiring at least one new apprentice in the short and in the longer run. Regarding the intensive margin, there appears a significant effect in the first year after the reform. One year after the reform, the number of new apprentices is increased by 0.23 apprentices if we exclude inpatient care facilities without any training acitivty (Panel c of Figure 4). Relative to the mean number of new apprentices in inpatient care facilties during 2002–2018 (1.89 new apprentices), this is an effect of 11.9 percent. This effect stays significant and of similar size in the subsequent years. Results of Figure 4 therefore suggest that the positive effects at the intensive margin are mainly driven by inpatient care facilities that have already provided training slots before the reform. Similar as in ambulatory nursing services, the effect mainly appears in the first year after the reform and in the subsequent years. This is consistent with descriptive evidence in Figures 1 and 2. We explain this by the implementation of the levy and by the fact that employers do not immediately react to the reform (see Section 3.3).[17]

Tables A3 and A4 in the Appendix show how estimates change if we gradually add care facility and county characteristics. In ambulatory nursing services, the effect on the probability of hiring new apprentices in the first year after the reform decreases from 12.0 to 7.9 percentage points after adding facility characteristics. Regarding regional differences, Model (3) of Table A3 shows that the effect is barely effected after adding regional characteristics. This is also true for the intensive margin in both sectors in ambulatory and inpatient care facilities. Although apprentices account only for a small share of the overall staff of a care facility, it may be that some covariates such as mean age or mean education are also affected by introducing the training levy (through spillover effects). In order to check whether the decrease in the treatment effect after adding covariates is affected by this circumstance, we re-estimate equation 1 by using the first lag of care facility and regional covariates instead of contemporaneous values of covariates. However, the treatment effects stay robust. In ambulatory nursing services, the significant positive effect on the probability of hiring new apprentices in the first year after the reform changes from 8.0 to 7.4 percentage points. In the inpatient sector, the significant positive effect on the number of new apprentices is also

barely affected (0.19 vs. 0.20).

5 FURTHER ANALYSES

Previous research underlines that the effect of levy schemes can be heterogeneous with respect to firm size. In addition, it is sensible to expect that the effects vary by the degree of local labor shortage in geriatric nursing. Those questions are tackled in greater detail in Section 5.1. Furthermore, Section 5.2 considers several sensitivity analyses. In the following, we examine the robustness and the heterogeneity of our results by considering our outcomes in the first year after the reform ($\tau = 1$).

5.1 Heterogeneities

We examine whether the treatment effect masks heterogeneities across the distribution of labor shortage of care workers. This is important to ask, since additional apprenticeship slots are more desirable where the need for skilled geriatric nurses is larger. To approximate the need for nurses, we again use the number of persons in need of care related to the number of caring slots. Because of the endogeneity of this number, we use the values of the last pre-treatment year 2004.[18] We presume that the effects of the levy scheme are stronger where the number of persons in need of care related to the number of caring slots is larger.

We separate estimation by quartiles regarding the number of persons in need of care related to the number of caring slots. In ambulatory nursing services, the levy scheme significantly affects the probability of hiring new apprentices in all quartiles (Panel A of Table 2). Regarding the intensive margin, effects are present in all quartiles, except for the first quartile. The positive effects of the levy scheme are therefore not driven by particular regions and are instead found for the majority of the sample. Moreover, in the third and fourth quartile, the effect size is the larger than in the first two quartiles. Although it is not a linear relationship, this shows that the results are larger where the number of persons in need of care related to the number of caring slots is larger.

The stratification with respect to the number of persons in need of care related to the

number of caring slots is also informative for inpatient care facilities. The effects at the intensive margin (Model 5 and 6) are present in almost all quartiles. However, the effect sizes cannot confirm our expectation that the effects are larger where the number of persons in need of care related to the number of caring slots is larger. Regarding the extensive margin, there are no hints at any positive effects on the probability of hiring new apprentices. The insignificant treatment effect at the extensive margin presented in Figure 4 is therefore not the result of uncovered heterogeneity in this case.

(Table 2 about here)

The size of care facilities is the second characteristic that potentially masks heterogeneity in the average treatment effect. In the ambulatory sector, significant effects on the probability of hiring new apprentices are found for each group (Panel B of Table 2). However, the effect size differs by size of care facilities and ranges from 4.5 to 15.9 percentage points. The results for the intensive margin verify that results are not driven by very small facilities. Instead significant effects on the number of apprentices are found for care facilties with less than ten employees and with 25–99 employees. In inpatient care facilities, the positive effects regarding the number of new apprentices are mainly driven by medium-size facilities with 25–99 employees.

5.2 Sensitivity Tests

Five econometric issues are addressed in this section. Firstly, in 2010, a minimum wage in the caring sector was introduced. The wage was set at €8.50 in federal states of West Germany and €7.50 in East Germany. Although the low level of minimum wage is only likely to affect wages of auxiliary nurses and not those of skilled nurses, this reform affects the budget of care facilities. An effect of this reform on the training activity of care facilities is therefore possible.

(Table 3 about here)

The data surveyed by Boockmann et al. (2011) and Harsch and Verbeek (2012) show that in West Germany, the minimum wage was binding only for a very low share of below ten percent.

In East Germany, 28.4 percent of employees in ambulatory nursing services and 17.6 percent of employees in inpatient nursing services were affected by the minimum wage. Because our data at the level of establishments only give information about gross daily wages of full-time employed persons, we cannot identify which persons and establishments are affected by the minimum wage introduction. However, because the minimum wage was only binding for a large share of workers in East Germany, the pure consideration of West Germany is an appropriate robustness check. Furthermore, this focus on West Germany is helpful because the levy scheme was exclusively implemented in federal states of West Germany. Panel A of Table 3 shows that the positive effect on the probability of hiring new apprentices and on the number of new apprentices is robust in ambulatory nursing services. For inpatient care facilities, the coefficients are also comparable to those displayed in Figure 4. There is furthermore a weakly significant positive effect on the probability to train new apprentices (Model 4 of Table 3).

The 'Training and Qualification Campaign for Geriatric Care' during 2012 and 2015 is the second political intervention (for more details, see Slotala, 2020) that may confound the estimates. The program promoted continuing training in geriatric nursing provided by the Federal Employment Agency. However, this program was implemented in all federal states and Slotala (2020) provides descriptive statistics demonstrating that the use of CVET subsidies was below average in North Rhine-Westphalia, the largest federal state in the treatment group that implemented the ALGN around the program implementation. This scheme is thus unlikely to drive the results presented.

Secondly, in Panel B, we use stocks of apprentices instead of flows. The significant positive effects for ambulatory nursing services remain. However, standard errors are larger. Presumably, this is consistent with the thoughts expressed in Section 3.1 and shows that using flow variables is more appropriate and gives more precise estimates. This reason also explains the changed estimates for inpatient care facilities.

Thirdly, we examine whether the effects are driven by selective market entry and exit. The introduction of the levy scheme may cause financially weak facilities to leave the market whilst other facilities enter. In particular, the ambulatory care sector is characterized by

high volatility and by a high number of newly emerging facilities. To examine the pattern of attrition, the administrative character of the BHP data is very useful because participation in the survey is obligatory. The average number of years that care facilities are part of the data set is larger in inpatient care facilities (about 12.7 years) than in ambulatory nursing facilities (11.2 years). However, in both sectors, the average number of participation years does not significantly differ between treated and control care facilities. In Panel C, we exclusively consider care facilities that have been part of the market for at least ten years.[19] The treatment effect stays very robust in significance, and the magnitudes only change very slightly.

Fourthly, although the descriptive statistics do not hint at a violation of the common trend assumption, we perform additional checks. In Panel D, we added interactions between a time trend and pre-reform controls of care facility characteristics and counties. Again, we choose 2004 as the pre-reform year. However, the results do not change if we choose any other pre-reform year. In both sectors, the estimates regarding the number of new apprentices slightly increase.

Finally, Panel E tackles again the issue that our sample is heterogeneous with respect to firm size. Table 2 uncovered heterogeneous effects with regard to the number of employees. In particular, there is a substantial share of facilities with fewer than ten employees in ambulatory nursing services (see Table 1). If we assign an equal weight to all care facilities, it may be that the effects are driven by very small care facilities if those care facilities are the most likely to react to the introduction of the levy scheme. However, if we weight our estimations by the number of employees of care facilities, the effects for both sectors stay significant and the magnitude of the effects increases.

6 CONCLUSION

Although training subsidies and levies are part of labor market policy in many countries (see, e.g., Gasskov, 1998; Müller and Behringer, 2012; Kuczera, 2017), evidence on the empirical effects of such instruments is sparse. We provide evidence that the redistribution of apprenticeship costs can stimulate the training activity of care facilities. For ambulatory

care, we find a robust positive effect on the probability of hiring new apprentices and on the number of new apprentices. By accounting for the dynamic path of the treatment effect, we demonstrate that those effects appear from the first year after the reform. Inpatient care facilities adjust their recruitment strategy less strongly. While the probability of providing apprenticeship training is not affected in this sector, positive effects on the number of new apprentices emerge in the first year after the reform. This sector-specific analysis therefore demonstrates that effects from levy schemes can be very heterogeneous, even in related sectors. The initial level of training activity affects our results. While in the ambulatory sector, the share of facilities hiring at least one new apprentice does not exceed 15 percent before the introduction of the levy, the initial level is above 50 percent in inpatient care facilities. The potential of increasing training activity was therefore larger in the ambulatory than in the inpatient sector. Another perspective of heterogeneity is provided by the stratifications with respect to facility size and regional labor shortage. As far as ambulatory nursing services are concerned, we find that the results are confirmed for the majority of groups. In inpatient care facilities, heterogeneity is larger. Our focus on the effects on training activity prevented considering the question as to whether the training levy created spillover effects and affected the overall size of staff and staff composition with respect to qualification. This important question deserves more attention by future research in order to get full understanding of the effects of introducing a training levy.

This paper shows that a levy scheme targeted at a sector with a large need to boost training supply can be useful. These implications go beyond the German context. Alongside the fact that our research tackles a research gap, where previous studies were inconclusive, the sector under consideration is of large and increasing economic relevance worldwide. In many countries of middle and high income, increasing the labor supply of caregivers became an important task due to population aging. Furthermore, there are discussions in many countries and economic sectors as to whether levy schemes can increase the provision of company-based training slots. Such levies are often organized at the sector level. Our institutional setting provides a new methodological approach in this context. Because some federal states introduced the levy and some did not, we consider causal effects within one sector.

Our paper also clarifies several issues that should be considered when recommending a training levy to other sectors and countries. Firstly, in this paper, we considered a specific training levy targeted at one single sector characterized by large labor shortage. Secondly, the amount of apprenticeship costs which is redistributed is substantial in our case. Both features make a levy more likely to produce the intended effects (Kuczera, 2017). Thirdly, in the pre-reform periods, the large majority of employers' associations agreed with the fact that care facilities that do not train should contribute to the apprenticeship costs. The levy was therefore not introduced in the face of general resistance from employers' associations. Finally, in contrast to subsidies financed by public means, the levy rewards care facilities that provide training slots but also penalizes facilities that do not provide training. This is also one further interesting feature of the underlying reform. The reimbursements of apprentice salaries are only financed by care facilities without any additional public funds. This therefore provides one useful example to show that no public funds are required to create financial incentives for providing additional training.

ACKNOWLEDGMENTS

I thank the responsible editor Stephen Machin and two anonymous reviewers for very useful remarks. I furthermore appreciate helpful comments by Regina Dionisius, Margit Ebbinghaus, Wilbert van der Klaauw, Elisabeth Krekel, Maarten Lindeboom, Moritz Niemann, Harald Pfeifer, Kosali Simon, and Felix Wenzelmann on an earlier version of this paper. In addition, I am grateful for discussions with conference participants at the Annual Meeting of the Society of Labor Economists (SOLE 2021), the Annual Meeting of the European Society for Population Economics (ESPE 2021), the Annual Meeting of the German Society of Health Economics (DGGÖ 2021), the Friday Lunch Talk at the Swiss Leading House "Economics of Education" and in internal seminars. I thank the Institute for Employment Research (IAB) for providing the data.

Notes

[1]Throughout the paper, we use the term levy-grant scheme in accordance with Bassanini et al. (2007): Levy schemes "require firms to pay a tax and obtain resources to award grants to support training (levy-grant schemes)". Levy-grant schemes are different to train-or-pay schemes ", which impose a tax on firms if they do not meet a pre-determined level of training" (Bassanini et al., 2007).

[2]In the following, inpatient and semi-residential care facilities and ambulatory nursing services are summarized as care facilities.

[3]Empirical studies on the effects of training levies and subsidies mainly focus on continuing vocational education and training (CVET) because of useful discontinuities in different programs. For instance, Görlitz (2010) considers voucher programs for employees in Germany and uses variation in eligibility with respect to time, region, and firm size. A similar instrument used in Switzerland is used by Messer and Wolter (2009) and Schwerdt et al. (2012). Further studies that consider financial incentives for CVET are Leuven and Oosterbeek (2004), Görg and Strobl (2006), and Hidalgo et al. (2014). Apprenticeship training of young school graduates cannot not always be defined strictly separately from CVET. This is the case when firms provide training to low-skilled workers already employed at the firm (e.g., see Abramovsky et al., 2011). Another strand of literature with minor relevance for our sake are experiments where the effect of participating in training on employment, wages, and further labor market outcomes is estimated. For recent evidence and current literature reviews, see Crepon and Premand (2019) and Alfonsi et al. (2020).

[4]One example of this is the German apprenticeship bonus introduced in 2008 that pays a one-off lump sum of €4,000–6,000 to firms that provide additional apprenticeship places to young people in need of support.

[5]Alternatively, graduating from high school is sufficient to reach eligibility if the person has completed a two-year apprenticeship or is authorized to work as auxiliary nurse (for more details, see Zöller, 2017).

[6]We exclude two federal states from our analysis. Bremen primarily introduced compensation payments for the apprenticeship in auxiliary nursing. Saxony introduced the ALGN, however, the Federal Administrative Court declared its law void because of an absence of evidence of shortage of skilled geriatric nurses (German Federal Parliament, 2010).

[7]Whereas Hamburg, North Rhine-Westphalia, and Saarland refund the full amount of apprentice salary including social security contributions, Baden-Wuerttemberg and Rheinland-Palatinate refund only a fraction and exhibit differences in the relative refunding between inpatient and ambulatory facilities. The second difference is that Hamburg, Rhineland-Palatinate, and Saarland introduced compensation payments for both training geriatric nurses and auxiliary nursing. These and more details about how the levy works and how it is implemented in practice can be found in Table A1 in the Appendix.

[8]During the construction of the ALGN, delegates from care facilities and ambulatory services attended parliamentary hearings. A further aim was to create trust in the ALGN via transparent communication by the authority responsible; e.g. by annual reports on the utilization of the financial funding and on effective

administration in managing the levy. In this context, numerous studies suggest that training levies can stimulate company-based training if the levy is not considered as a pure tax from the perspective of firms and if the firms feel that they have been incorporated in setting up the levy scheme (e.g., van den Berg et al., 2006; Kuczera, 2017).

[9]To keep analysis simple without compromising the general validity of the results, we apply ordinary least squares instead of logit or probit to model the probability of hiring new apprentices.

[10]Itemizing this number by type of school does not affect the empirical results in a noteworthy way.

[11]Note that we extrapolate these three variables because they are only captured biennially.

[12]Data access to BHP 7521 (DOI: 10.5164/IAB.BHP7521.de.en.v1) was provided via on-site use at the Research Data Centre (FDZ) of the German Federal Employment Agency (BA) at the Institute for Employment Research (IAB) and via remote data access.

[13]In inpatient care facilities of the control group, training activity seems to considerably increase from 2003 to 2004. This increase is only absent for the treatment group in Figures 1 and 2 because we organize descriptive statistics for the treatment states with respect to time to/since treatment. However, this initial increase in 2004 is also visible in treatment states when we organize descriptive statistics for the treatment group with respect to years. This is therefore no issue regarding parallel trends. Those results are available upon request.

[14]This finding can be confirmed by using the inverse number of employees in ambulatory or inpatient care facilities related to the number of care-dependent persons. Results are available upon request from the author.

[15]Although initial differences are no threat to our empirical strategy as long as their trend is comparable between treatment and control states, we provide further evidence on initial differences. In Table A2 in the Appendix, we regress a time-invariant treatment dummy for the pre-reform periods 2002–2004 on characteristics of care facilities and regions. The dummy equals one if the facility is located in one of the federal states that introduced the levy scheme after 2004. Results illustrate that the pre-reform composition of ambulatory nursing services in the treatment group does not significantly differ from the composition of the control group. An exclusion are the average size of care facility and the daily pay rate, which can be presumably attributed to the fact that the levy scheme has not been introduced in any federal state in East Germany.

[16]One reasons for this may be that East Germany is more affected by the sector-specific minimum wage introduced to the care sector in July 2010 and that policymakers in East Germany could interpret the levy scheme and the minimum wage as a double burden to care facilities.

[17]Other estimators, e.g. proposed by de Chaisemartin and D'Haultfœuille (2020), Callaway and Sant'Anna (2021), Goodman-Bacon (2021), and Borusyak et al. (2022) do not change our results in a noteworthy way. For instance, the imputation estimator proposed by Borusyak et al. (2022) does not significantly change the effect size and the confidence intervals are only a bit tighter. For instance, the treatment effect at the

extensive margin in the ambulatory sector in the first year after the reform of 8.2 percentage points is slightly larger compared to the interaction weighted estimator (8.0 percentage points). When using the estimator of Borusyak et al. (2022), the precision gains decrease in the longer run compared to the interaction weighted estimator.

[18]The following conclusions can be confirmed by using the second indicator for labor shortage (inverted number of employees in ambulatory or inpatient care facilities related to the number of care-dependent persons).

[19]Alternative regressions use the average number of years of being part of the data set as the threshold. However, those estimates do not noteworthy change the following findings.

References

Abramovsky, L., Battistin, E., Fitzsimons, E., Goodman, A., and Simpson, H. (2011). Providing Employers with Incentives to Train Low-Skilled Workers: Evidence from the UK Employer Training Pilots. *Journal of Labor Economics*, 29(1):153–193.

Acemoglu, D. and Pischke, J.-S. (1999). Beyond Becker: Training in Imperfect Labour Markets. *The Economic Journal*, 109(453):112–142.

Alfonsi, L., Bandiera, O., Bassi, V., Burgess, R., Rasul, I., Sulaiman, M., and Vitali, A. (2020). Tackling Youth Unemployment: Evidence from a Labor Market Experience in Uganda. *Econometrica*, 88(6):2369–2414.

Bassanini, A., Booth, A., Brunello, G., De Paola, M., and Leuven, E. (2007). Workplace Training in Europe. *In: Brunello, G., Garibaldi, P., and Wasmer, E. (eds.): Education and Training in Europe*, Oxford University Press.

Bogai, D. (2017). Der Arbeitsmarkt für Pflegekräfte im Wohlfahrtsstaat [The Labor Market for Care Workers in the Welfare State]. *De Gruyter Oldenbourg, Berlin.*

Bonin, H., Fries, J., Hillerich, A., Maier, M. F., Walter, T., Neureiter, M., Oschmiansky, F., Hofmann, N. W. M., and Schneider-Haase, T. (2013). Begleitforschung „Auswirkungen des Ausbildungsbonus auf den Ausbildungsmarkt und die öffentlichen Haushalte“ [Accompanying Research “Effects of the Apprenticeship Bonus on the Apprenticeship Market and

Public Households"]. *Research Report 438, Federal Ministry of Labour and Social Affairs, Berlin*.

Boockmann, B., Kirchmann, K. H. H., Klee, G., Kleimann, R., Klempt, C., Koch, A., Krumm, R., Neumann, M., Rattenhuber, P., Rosemann, M., Sappl, R., Späth, J., Strotmann, H., and Verbeek, H. (2011). Evaluation bestehender Mindestlohnregelungen. Branche: Pflege [Evaluation of Existing Minimum Wage Regulations. Sector: Caring]. *Final Report to the Federal Ministry of Labour and Social Affairs (BMAS), Berlin, Institute for Applied Economic Research (IAW)*.

Borusyak, K., Jaravel, X., and Spiess, J. (2022). Revisiting Event Study Designs: Robust and Efficient Estimations. *Working Paper, arXic preprint*.

Bosch, G. (2010). In Qualifizierung investieren - ein Weiterbildungsfonds für Deutschland. *WISO-Diskurs, Expertisen und Dokumentationen zur Wirtschafts- und Sozialpolitik, Expertise im Auftrag des Gesprächskreises Arbeit und Qualifizierung der Friedrich-Ebert-Stiftung, Bonn*.

Caicedo, S., Espinosa, M., and Seibold, A. (2022). Unwilling to Train?—Firm Responses to the Colombian Apprenticeship Regulation. *Econometrica*, 90(2):507–550.

Callaway, B. and Sant'Anna, P. H. C. (2021). Difference-in-Differences with Multiple Time Periods. *Journal of Econometrics*, 225(2):200–230.

Cangiano, A. (2014). Elder Care and Migrant Labor in Europe: A Demographic Outlook. *Population and Development Review*, 40(1):131–154.

Crepon, B. and Premand, P. (2019). Direct and Indirect Effects of Subsidized Dual Apprenticeships. *IZA Discussion Paper No. 12793*.

de Chaisemartin, C. and D'Haultfœuille, X. (2020). Two-Way Fixed Effects Estimators with Heterogeneous Treatment Effects. *American Economic Review*, 110(9):2964–2996.

Dohlmann Weatherall, C. (2009). Do Subsidized Adult Apprenticeship Increase the Vocational Attendance Rate? *Applied Economics Quarterly*, 55(1):61–82.

Dostie, B. (2015). Do Train-or-Pay Schemes Really Increase Training Levels? *Industrial Relations*, 54(2):240–255.

Federal Office of Statistics (2018a). Pflegestatistik. Pflege im Rahmen der Pflegeversicherung. Ländervergleiche – Ambulante Pflegedienste.2017. *Statistisches Bundesamt, Wiesbaden*.

Federal Office of Statistics (2018b). Pflegestatistik. Pflege im Rahmen der Pflegeversicherung. Ländervergleiche – Pflegeheime. 2017. *Statistisches Bundesamt, Wiesbaden*.

Ganzer, A., Schmucker, A., Stegmaier, J., and Wolter, S. (2022). Establishment History Panel 1975–2021. *FDZ-Datenreport Nr. 12/2022 (en)*, Institute for Employment Research (IAB), Nuremberg. DOI: 10.5164/IAB.FDZD.2212.en.v1.

Gasskov, V. (1998). Levies, Leave and Collective Agreements Incentives for Enterprises and Individuals to Invest in Training. *European Journal of Vocational Training*, 13(1):27–36.

German Federal Parliament (2010). Finanzierung der Kosten der Ausbildungsvergütung in der Altenpflege durch ein Umlageverfahren nach derzeitigem Bundes- und Landesrecht. *Scientific Service of the German Federal Parliament, WD 9 - 003/10*.

Geyer, J. and Korfhage, T. (2018). Labor Supply Effects of Long-Term Care Reform in Germany. *Health Economics*, 27:1328–1339.

Goodman-Bacon, A. (2021). Difference-in-Differences with Variation in Treatment Timing. *Journal of Econometrics*, 225(2):254–277.

Görg, H. and Strobl, E. (2006). Do Government Subsidies Stimulate Training Expenditure? Microeconometric Evidence from Plant-Level Data. *Southern Economic Journal*, 72(4):860–876.

Görlitz, K. (2010). The Effect of Subsidizing Continuous Training Investments – Evidence from German Establishment Data. *Labour Economics*, 17(5):789–798.

Harsch, K. and Verbeek, H. (2012). Der Mindestlohn in der Pflegebranche – Die Folgen eines Mindestlohns in einer Wachstumsbranche. *Journal for Labour Market Research*, 45:355–378.

Hidalgo, D., Oosterbeek, H., and Webbink, D. (2014). The Impact of Training Vouchers on Low-Skilled Workers. *Labour Economics*, 31:117–228.

Kamphuis, P., Glebbeek, A. C., and van Lieshout, H. (2010). Do Sectoral Training Funds Stimulate Training? *International Journal of Training and Development*, 14(4):273–290.

Kuczera, M. (2017). Incentives for Apprenticeship. *OECD Education Working Papers No. 152*.

Leuven, E. and Oosterbeek, H. (2004). Evaluating the Effect of Tax Deductions on Training. *Journal of Labor Economics*, 22(2):461–488.

Messer, D. and Wolter, S. C. (2009). Money Matters: Evidence from a Large-Scale Randomized Field Experiment with Vouchers for Adult Training. *IZA Discussion Paper No. 4017*.

Muehlemann, S. and Wolter, S. C. (2014). Return on Investment of Apprenticeship Systems for Enterprises: Evidence from Cost-Benefit Analyses. *IZA Journal of Labor Policy*, 3:1–22.

Müller, N. and Behringer, F. (2012). Subsidies and Levies as Policy Instruments to Encourage Employer-Provided Training. *OECD Education Working Papers No. 80*.

Pfeifer, H. (2016). Firms' Motivation for Training Apprentices: an Australian-German Comparison. *The National Centre for Vocational Education Research (NCVER), Adelaide*.

Schumann, M. (2017). The Effects of Minimum Wages on Firm-Financed Apprenticeship Training. *Labour Economics*, 47:163–181.

Schwerdt, G., Messer, D., Woessmann, L., and Wolter, S. C. (2012). The Impact of an Adult Education Voucher Program: Evidence From a Randomized Field Experiment. *Journal of Public Economics*, 96(7–8):569–583.

Slotala, L. (2020). Stellschrauben mit großer Wirkung. Ansätze zur Gewinnung neuer Auszubildender in der Altenpflege. *In: Jacobs, K.; Kuhlmey, A.; Greß, S.; Klauber, J.; Schwinger, A. (eds.): Pflege-Report 2019. Mehr Personal in der Langzeitpflege – aber woher? Chapter 5, Springer, Berlin*, 71-83.

Spengler, A. (2008). The Establishment History Panel. *Schmollers Jahrbuch*, 128:501–509.

Sun, L. and Abraham, S. (2021). Estimating Dynamic Treatment Effects in Event Studies with Heterogeneous Treatment Effects. *Journal of Econometrics*, 225(2):175–199.

van den Berg, N., Meijers, F., and Sprengers, M. (2006). More Vocational Education and Supplementary Training Through Equalization of Costs? An Analysis of a Training and Development Fund in The Netherlands. *Human Resource Development International*, 9(1):5–24.

Westergaard-Nielsen, N. and Rasmussen, A. R. (2000). The Impact of Subsidies on Apprenticeship Training. *Research in Labor Economics*, 18:359–375.

Zöller, M. (2017). Ausbildung in der Pflege. Strukturelle und inhaltliche Weiterentwicklungen durch das Pflegeberufereformgesetz. *Berufsbildung in Wissenschaft und Praxis (BWP)*, 46(5):50–52.

Figures and Tables

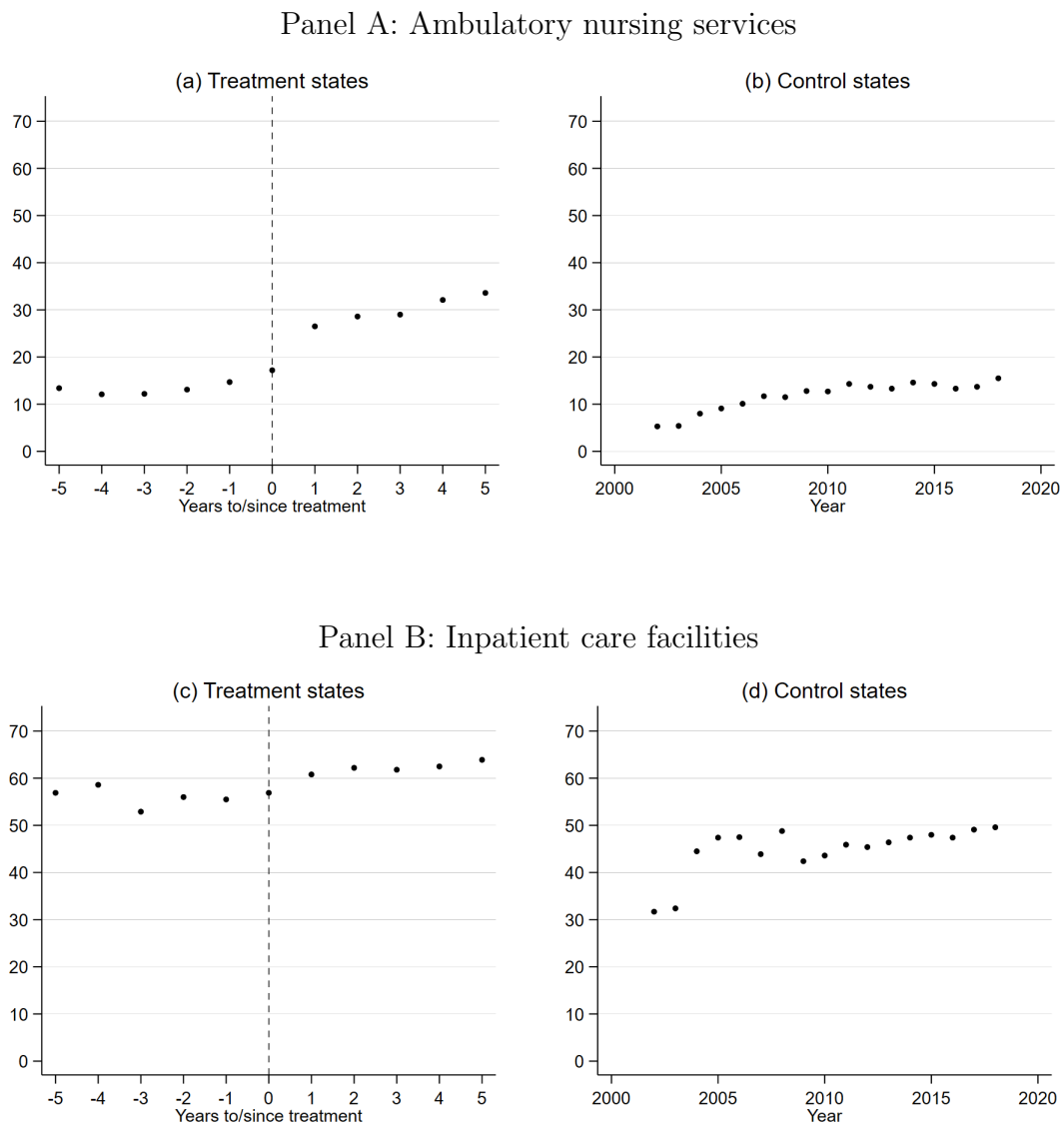


Figure 1 – Share of care facilities that hire at least one new apprentice (in percent) by treatment status. *Notes:* The graphs display the share of care facilities that hire at least one new apprentice (in percent). The left-hand graph shows this number for the treatment states with respect to the years to or since the treatment. Because no levy was introduced in control states, the share of care facilities that hire at least one new apprentice is displayed with respect to years. In the left-hand graph, the vertical dashed line shows time of introducing the ALGN in treatment states. *Source:* Establishment-History-Panel 1975–2021 (BHP 7521); own illustration.

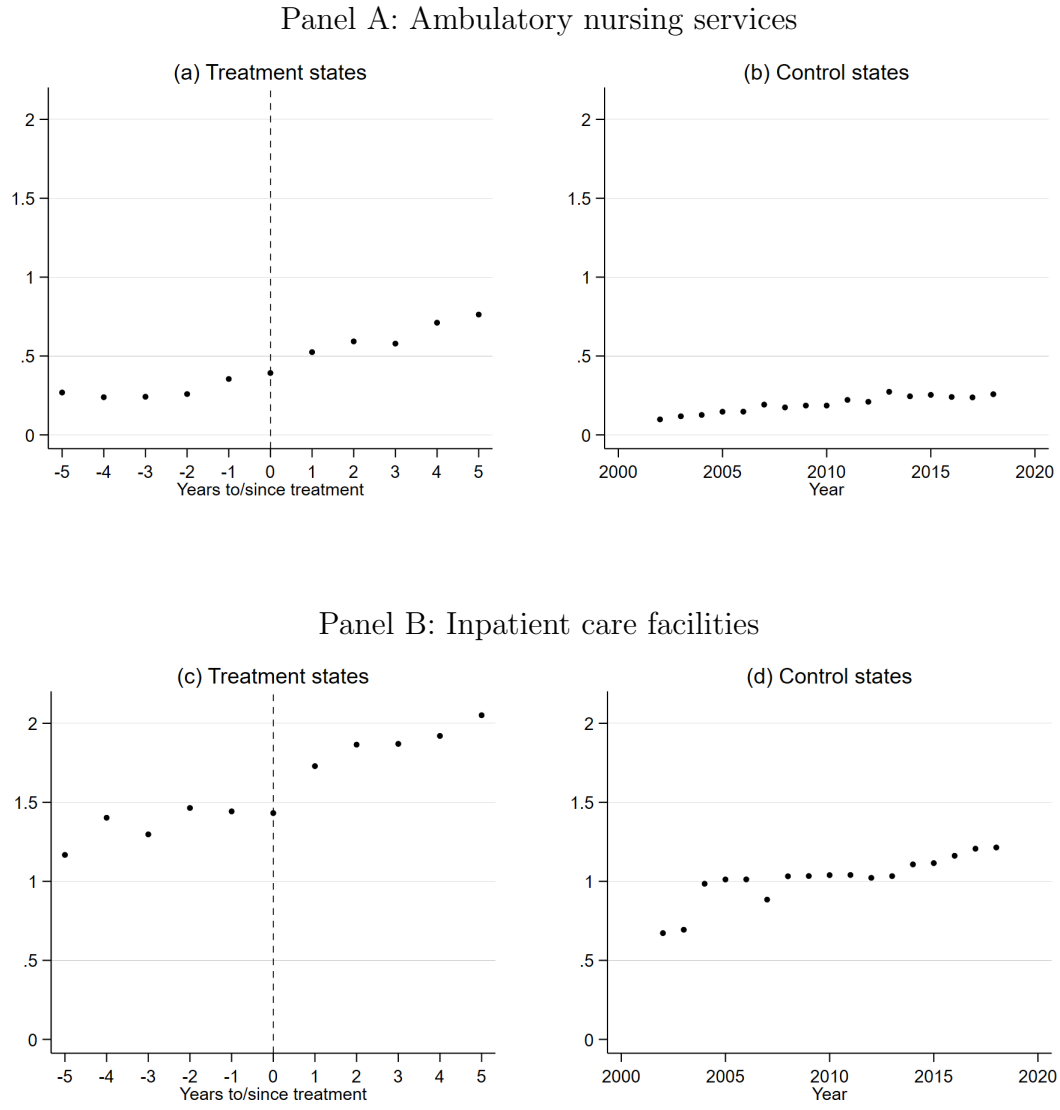
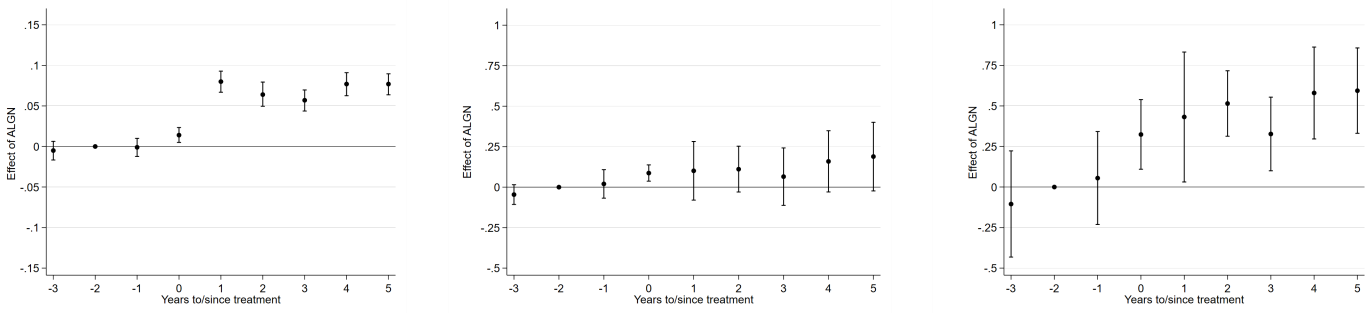
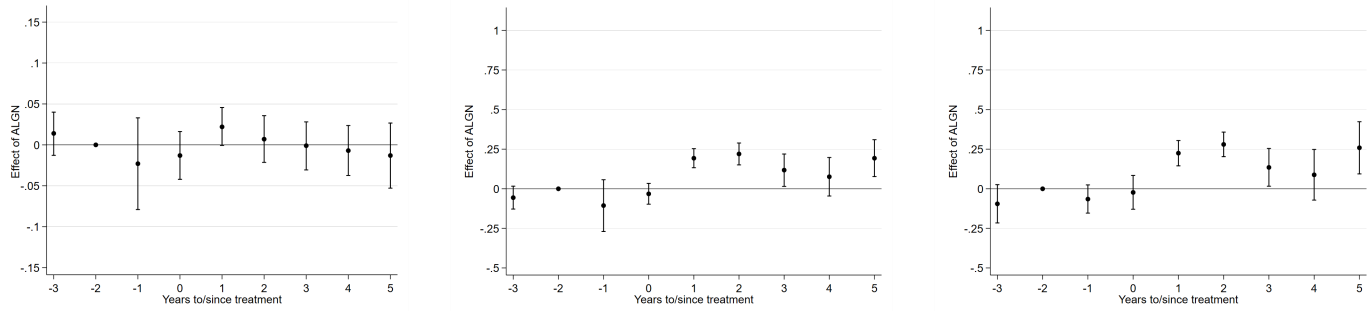


Figure 2 – The number of new apprentices per care facility by treatment status. *Notes:* The graphs display the number of new apprentices per care facility. The left-hand graph shows this number for the treatment states with respect to the years to or since the treatment. Because no levy was introduced in control states, the number of new apprentices is displayed with respect to years. In the left-hand graph, the vertical dashed line shows time of introducing the ALGN in treatment states. *Source:* Establishment-History-Panel 1975–2021 (BHP 7521); own illustration.



(a) Prob. to train new apprentices (b) Number of new appr. (incl. 0) (c) Number of new appr. (excl. 0)

Figure 3 – Treatment Effects by Time Horizon for Ambulatory Nursing Services. *Notes:* The figure displays dynamic treatment effects of introducing the ALGN in period $\tau = 0$ on training activity of care facilities in pre-reform and post-reform periods by using the interaction weighted estimator by Sun and Abraham (2021). Never-treated groups are used as control group and the period two years before treatment is used as reference period. Confidence intervals are calculated for the 95 percent level. Each estimate presented here controls for variables at the facility level and regional variables at the level of counties given in Table 1. Moreover, time and federal states fixed effects are included and clustered standard errors at the level of federal states are used. *Source:* Establishment-History-Panel 1975–2021 (BHP 7521); Regional Database of the Federal Statistical Office and the Federal Employment Agency.



(a) Prob. to train new apprentices (b) Number of new appr. (incl. 0) (c) Number of new appr. (excl. 0)

Figure 4 – Treatment Effects by Time Horizon for Inpatient Care Facilities. *Notes:* See Figure 3.

.

Table 1 – DESCRIPTIVE STATISTICS OF CARE FACILITIES BY TREATMENT STATUS

	Ambulatory				Inpatient			
	Treatment		Control		Treatment		Control	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Panel A: Training activity								
Share of facilities hiring new apprentices	22.3	(41.6)	12.4	(33.0)	58.9	(49.2)	45.4	(49.8)
Number of new apprentices (including zero)	0.5	(1.5)	0.2	(1.4)	1.7	(2.7)	1.0	(2.3)
Number of new apprentices (excluding zero)	1.4	(2.3)	1.0	(3.0)	2.2	(3.0)	1.6	(2.7)
Panel B: Characteristics of care facilities								
Care facility size (in %):								
max. 9 employees	17.7	(38.2)	22.1	(41.5)	3.7	(18.9)	4.3	(20.2)
10–24 employees	37.0	(48.3)	39.3	(48.8)	12.1	(32.7)	15.3	(36.0)
25-49 employees	26.8	(44.3)	23.7	(42.5)	24.5	(43.0)	30.8	(46.2)
50–99 employees	12.5	(33.1)	10.2	(30.2)	37.6	(48.4)	34.7	(47.6)
min. 100 employees	5.9	(23.6)	4.7	(21.2)	22.1	(41.5)	14.9	(35.6)
Average age	42.2	(4.9)	42.9	(5.0)	42.7	(3.8)	43.1	(3.9)
Share of women (in %)	83.3	(14.8)	84.7	(15.2)	82.3	(11.4)	81.9	(11.8)
Share of employees with German citizenship (in %)	33.6	(22.5)	34.2	(25.5)	33.9	(19.1)	39.1	(22.3)
Staff composition by formal education (in %):								
Low/intermediate secondary degree	8.9	(10.0)	7.1	(9.3)	14.9	(8.7)	11.0	(8.7)
Upper secondary/vocational degree	80.2	(17.2)	81.5	(17.7)	75.7	(11.5)	80.1	(11.9)
University/college degree	8.7	(13.1)	9.3	(14.0)	8.0	(9.8)	7.5	(9.8)
Gross median daily pay rate of full-time employees (in €)	77.6	(27.7)	70.9	(28.1)	87.6	(23.1)	77.5	(22.9)
Staff composition by form of employment (in %):								
Regular	66.2	(18.5)	73.1	(19.2)	77.9	(13.1)	83.0	(12.5)
Full-time	36.0	(23.2)	36.9	(26.0)	36.3	(20.1)	41.6	(23.3)
Part-time	30.9	(22.9)	36.8	(26.5)	42.3	(20.7)	41.8	(24.3)
Marginal part-time	30.3	(18.6)	24.7	(19.2)	14.7	(13.1)	12.1	(12.2)
Panel C: Regional variables of counties								
Number of school graduates	4729.7	(3655.4)	5423.0	(8896.0)	4175.0	(2985.2)	3940.4	(7109.1)
Number of care-dependent persons per 1,000 inhabitants above the age of 64	155.1	(32.8)	164.8	(37.7)	154.7	(32.7)	162.8	(36.6)
Number of nurses per 100 care-dependent persons in inpatient/ambulatory facilities	49.8	(10.9)	50.1	(13.6)	96.8	(10.8)	85.5	(11.5)
Number of slots in inpatient facilities per 1,000 inhabitants above the age of 64	50.2	(7.5)	53.2	(12.0)	50.7	(8.2)	56.5	(12.5)
Unemployment rate (in %)	7.4	(3.1)	7.9	(3.9)	6.7	(2.8)	7.3	(3.7)
Observations	27,721		35,311		32,118		42,740	
Number of facilities	3,313		4,553		3,043		4,321	

Notes: Care facilities in the treatment group are facilities located in federal states that introduced the ALGN (Baden-Wuerttemberg, Hamburg, North Rhine-Westphalia, Rhineland-Palatinate, and Saarland). Facilities in the control group are facilities located in federal states that did not introduce the ALGN (Bavaria, Berlin, Brandenburg, Hessen, Lower Saxony, Mecklenburg-Hither Pomerania, Saxony-Anhalt, Schleswig-Holstein, Thuringia). *Source:* Establishment-History-Panel 1975–2021 (BHP 7521); Regional Database of the Federal Statistical Office and the Federal Employment Agency.

Table 2 – HETEROGENEITIES WITH RESPECT TO LABOR SHORTAGE OF CARE WORKERS IN COUNTIES AND SIZE OF CARE FACILITIES

	Ambulatory			Inpatient		
		Number of new apprentices			Number of new apprentices	
	(1) Prob. of hiring new apprentices	(2) including zero	(3) excluding zero	(4) Prob. of hiring new apprentices	(5) including zero	(6) excluding zero
Panel A: Number of persons in need of care related to the number of caring slots in counties						
First quartile	0.024*	-0.092	-0.036	0.045*	0.200**	0.299***
	(0.011)	(0.074)	(0.304)	(0.021)	(0.075)	(0.084)
Second quartile	0.051**	0.155***	0.560*	-0.034	0.064	0.117**
	(0.022)	(0.041)	(0.265)	(0.023)	(0.077)	(0.047)
Third quartile	0.145***	0.265***	0.273	0.013	0.252***	0.326**
	(0.025)	(0.052)	(0.240)	(0.015)	(0.065)	(0.147)
Fourth quartile	0.065***	0.341***	0.730**	-0.012	−0.170**	-0.107
	(0.017)	(0.057)	(0.269)	(0.019)	(0.058)	(0.070)
Panel B: Number of employee per care facility						
max. 9 employees	0.045***	0.086***	0.400**	0.015	0.122	-0.134
	(0.008)	(0.020)	(0.138)	(0.019)	(0.100)	(0.411)
10–24 employees	0.094***	-0.174	-0.550	0.008	0.055	0.163*
	(0.015)	(0.232)	(0.522)	(0.016)	(0.034)	(0.088)
25–49 employees	0.062***	0.243***	0.512***	0.014	0.158***	0.207***
	(0.012)	(0.027)	(0.094)	(0.018)	(0.039)	(0.038)
50–99 employees	0.125**	0.556***	0.987***	0.022	0.287***	0.369***
	(0.043)	(0.098)	(0.249)	(0.023)	(0.056)	(0.059)
min. 100 employees	0.159**	-0.108	-0.198	0.034	0.066	0.103
	(0.053)	(0.252)	(0.651)	(0.028)	(0.126)	(0.146)

Notes: Stars denote significance of coefficients: $^{*}p < 10\%$, $^{**}p < 5\%$, $^{***}p < 1\%$; standard errors clustered at the level of federal states in parentheses. The table displays treatment effects of introducing the ALGN on training activity in the first year after the treatment by using the interaction weighted estimator by Sun and Abraham (2021). Never-treated groups are used as control group and the period two years before treatment is used as reference period. Each model controls for variables at the facility level and regional variables at the level of counties given in Table 1. Moreover, time and federal states fixed effects are included. In Panel A, regressions are stratified with regard to the number of persons in need of care related to the number of caring slots. In the first row, the first quartile of this indicator of labor shortage is considered. In Panel B, regressions are stratified with regard to the number of employees in care facilities. *Source:* Establishment-History-Panel 1975–2021 (BHP 7521); Regional Database of the Federal Statistical Office and the Federal Employment Agency.

Table 3 – SENSITIVITY CHECKS

	Ambulatory			Inpatient		
		Number of new apprentices			Number of new apprentices	
	(1) Prob. of hiring new apprentices	(2) including zero	(3) excluding zero	(4) Prob. of hiring new apprentices	(5) including zero	(6) excluding zero
Panel A: Only West Germany						
ALGN	0.081***	0.084	0.384**	0.022*	0.188***	0.206***
	(0.006)	(0.100)	(0.171)	(0.011)	(0.031)	(0.039)
Panel B: Stock variables						
ALGN	0.052***	0.137	0.686***	-0.036	0.125	0.005
	(0.008)	(0.114)	(0.120)	(0.023)	(0.123)	(0.120)
Panel C: Attrition ($\geq$ 10 years part of the panel)						
ALGN	0.089***	0.061	0.371*	0.015	0.198***	0.227***
	(0.010)	(0.105)	(0.199)	(0.012)	(0.028)	(0.034)
Panel D: Interactions between time trend and pre-reform controls						
ALGN	0.080***	0.082	0.356*	0.026**	0.202***	0.237***
	(0.007)	(0.088)	(0.194)	(0.011)	(0.030)	(0.039)
Panel E: Estimates weighted by firm size						
ALGN	0.112***	0.196	0.580**	0.020	0.377***	0.294**
	(0.018)	(0.293)	(0.244)	(0.012)	(0.104)	(0.125)

Notes: Stars denote significance of coefficients: $^{*}p < 10\%$, $^{**}p < 5\%$, $^{***}p < 1\%$; standard errors clustered at the level of federal states in parentheses.
The table displays treatment effects of introducing the ALGN on training activity in the first year after the treatment by using the interaction weighted estimator by Sun and Abraham (2021). Never-treated groups are used as control group and the period two years before treatment is used as reference period. Each model controls for variables at the facility level and regional variables at the level of counties given in Table 1. Moreover, time and federal states fixed effects are included. The table performs sensitivity analyses considering the sample of 7,866 ambulatory nursing services in Table A3 and of 7,364 inpatient care facilities in A4. In Panel A and C, the sample is reduced. If East Germany is excluded (Panel A), we consider a sample of 6,771 ambulatory nursing services and 6,530 inpatient care facilities. If care facilities are excluded that were only part of the panel of 9 years or less (Panel C), the sample is reduced to 2,897 ambulatory nursing services and 4,301 inpatient care facilities. In Panel A, estimation is only performed for care facilities in West Germany. In Panel B, the outcome that describes the training activity of care facilities are used as stock variables instead of flow variables. In Panel C, we account for selective attrition. This panel only considers care facilities that have been part of the data set for at least ten years. In Panel D, we added interactions between a time trend and pre-reform (year 2004) controls of care facility characteristics and counties to the regression. In Panel E, we re-estimate the effect of the levy scheme by weighting our estimates by the number of employees per care facility. *Source:* Establishment-History-Panel 1975–2021 (BHP 7521); Regional Database of the Federal Statistical Office and the Federal Employment Agency.

Appendix

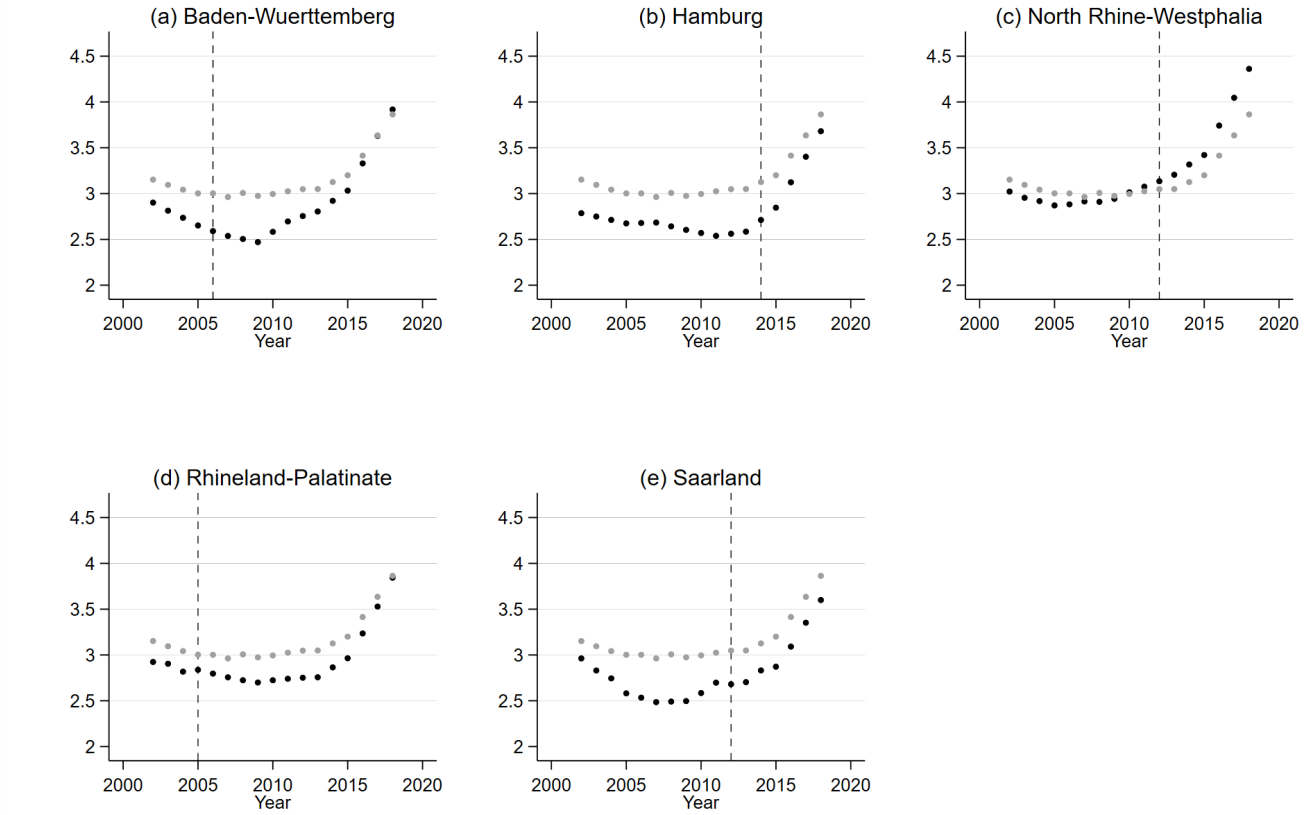


Figure A1 – Ambulatory nursing services: the number of persons in need of care related to the number of caring slots between treatment states (black) and control states (gray). *Notes:* The graphs display the number of persons in need of care related to the number of caring slots for sample considering on ambulatory nursing services. The black dots give the number in the underlying treatment state and the gray dots give the number in the control states. The vertical dashed line shows time of introducing the ALGN in treatment federal states. *Source:* Establishment-History-Panel 1975–2021 (BHP 7521); Regional Database of the Federal Statistical Office and the Federal Employment Agency; own illustration.

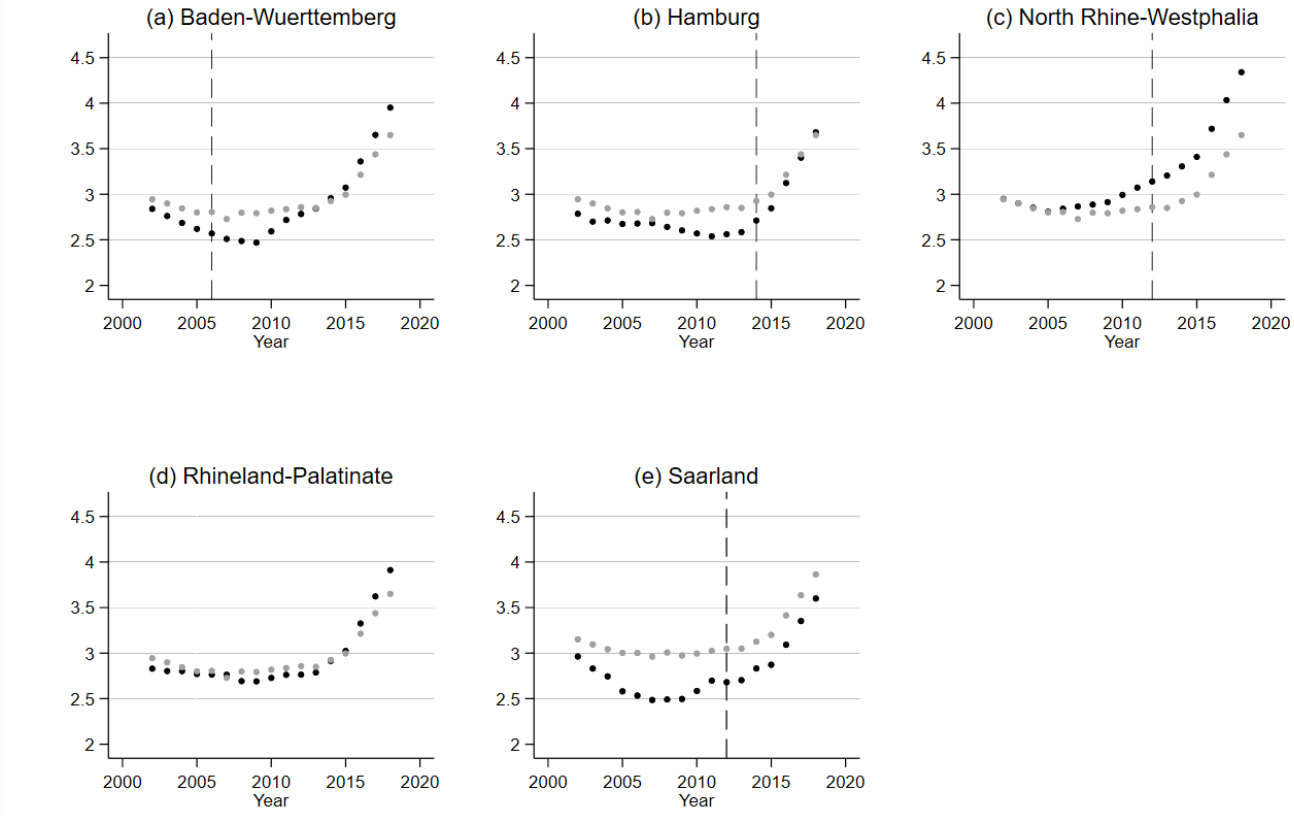


Figure A2 – Inpatient care facilities: the number of persons in need of care related to the number of caring slots between treatment states (black) and control states (gray). *Notes:* The graphs display the number of persons in need of care related to the number of caring slots for sample considering on inpatient care facilities. The black dots give the number in the underlying treatment state and the gray dots give the number in the control states. The vertical dashed line shows time of introducing the ALGN in treatment federal states. *Source:* Establishment-History-Panel 1975–2021 (BHP 7521); Regional Database of the Federal Statistical Office and the Federal Employment Agency; own illustration.

Table A1 – FEATURES OF THE APPRENTICESHIP LEVY OF GERIATRIC NURSES BY FEDERAL STATES

(1) Federal State	(2) Year of Introduction	Basis of levy contribution		Amount of refunding (in %)[1]		(7) Auxiliary nursing levy
		(3) Inpatient	(4) Ambulatory	(5) Inpatient	(6) Ambulatory	
Baden-Wuerttemberg	2006	annual number of persons cared for	annual number of home visits including body-related nursing procedures due to §§ 36, 38, and 39 SGB XI	35	70	No
Hamburg	2014	annual revenue due to §§ 41–43 and 45b §§ 64g, 64h, 64i, 65, 66 SGB XII	annual revenue due to §§ 36, 45b SGB XI and §§ 64b, 66 SGB XII	100	100	Yes
North Rhine-Westphalia	2012	per year averagely number of full inpatient slots	annual nursing points due to SGB XI	100	100	No
Rhineland-Palatinate	2005	full inpatient slots on August the 1^{st}	operational revenue due to § 89 (1) SGB XI	50	80	Yes
Saarland	2012	full inpatient slots on October the 31^{st}	operational revenue due to § 89 (1) SGB XI	100	100	Yes

Notes: 1) The relative amount of refunding refer to the refunding of apprentice salary. Regarding the refunding of continuing training costs, each federal state refunds 100 percent.
Before contributions have to be paid, the amount of apprenticeship and CVET costs are assessed by the responsible administration. This levy pot is determined by the number of apprentices in geriatric care, their annual apprentice salaries according to the collective agreement, and the amount of CVET costs. After the sum of the levy pot has been determined, the pot is distributed to the two care sectors of inpatient/semi-residential care facilities and ambulatory nursing services according to the ratio of (auxiliary and skilled) nurses in the sector to the overall number of employed nurses. Afterwards, every care facility pays a contribution according to the basis variable and its sector. For instance, in North Rhine-Westphalia, the largest federal state in Germany, the contribution depends on the number of caring slots for inpatient and semi-residential facilities filled on average per year and on the amount of nursing points gathered for ambulatory service facilities per year. Nursing points are an indicator to capture nursing services which considers the kind of service and the degree of care dependency of the patient. To determine the contribution per facility, the underlying basis variable is related to the respective number of the whole care sector.

Table A2 – BALANCE OF THE TREATMENT: THE PROBABILITY OF TREATMENT STATUS BY CHARACTERISTICS OF CARE FACILITIES AND REGIONS

	Ambulatory		Inpatient	
	Coeff.	SE	Coeff.	SE
Panel A: Characteristics of care facilities				
Care facility size (reference: min. 100 employees):				
max. 9 employees	−0.135**	(0.056)	-0.054	(0.075)
10–24 employees	-0.059	(0.065)	-0.042	(0.045)
25-49 employees	-0.044	(0.074)	−0.072*	(0.036)
50–99 employees	-0.031	(0.040)	-0.010	(0.025)
Average age	-0.010	(0.006)	-0.004	(0.004)
Share of women	0.024	(0.055)	0.159	(0.116)
Share of employees with German citizenship	0.188	(0.299)	0.418	(0.429)
Staff composition by formal education:				
Low/intermediate secondary degree	0.052	(0.187)	0.721*	(0.350)
Upper secondary/vocational degree	-0.107	(0.254)	0.326	(0.444)
University/college degree	-0.141	(0.266)	0.648	(0.497)
Gross median daily pay rate of full-time employees	0.003***	(0.001)	0.005*	(0.003)
Staff composition by form of employment:				
Regular	0.062	(0.267)	-0.818	(0.555)
Full-time	-0.095	(0.752)	-0.004	(1.405)
Part-time	-0.248	(0.441)	0.227	(1.278)
Marginal part-time	0.172	(0.535)	-0.143	(1.164)
Panel B: Regional variables of counties				
Number of school graduates*1000	-0.003	(0.006)	0.006	(0.007)
Number of care-dependent persons per 1,000 inhabitants above the age of 64	−0.006***	(0.002)	−0.005**	(0.002)
Number of nurses per 100 care-dependent persons in inpatient/ambulatory facilities	0.005	(0.005)	0.017**	(0.007)
Number of slots in inpatient facilities per 1,000 inhabitants above the age of 64	-0.002	(0.005)	-0.003	(0.004)
Unemployment rate (in %)	-0.010	(0.023)	0.012	(0.027)
Year FE	Yes		Yes	
R^2	0.152		0.287	
Observations	7,443		8,758	
Number of facilities	2,907		3,165	

Notes: Stars denote significance of coefficients: $^{*}p < 10\%$, $^{**}p < 5\%$, $^{***}p < 1\%$; standard errors clustered at the level of federal states in parentheses. By applying linear regression, the table regresses a time-invariant treatment dummy on characteristics of care facilities and regions for the period 2002–2004. During this observation period, the levy scheme had not been introduced to any of the federal states. The outcome equals one if the care facilities are located in a federal state that introduced the levy scheme after 2004. Thus, it is one if the care facilities are located in Baden-Wuerttemberg, Hamburg, North Rhine-Westphalia, Rhineland-Palatinate, or Saarland. *Source:* Establishment-History-Panel 1975–2021 (BHP 7521); Regional Database of the Federal Statistical Office and the Federal Employment Agency.

Table A3 – EMPIRICAL EFFECTS OF THE ALGN ON TRAINING ACTIVITY OF AMBULATORY CARE FACILITIES

	Probability of hiring new apprentices			Number of new apprentices					
				including zero			excluding zero		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\tau = -3$	-0.004	-0.005	-0.005	-0.012	-0.049	-0.046	-0.103	-0.112	-0.105
	(0.006)	(0.005)	(0.005)	(0.034)	(0.031)	(0.031)	(0.176)	(0.167)	(0.167)
$\tau = -1$	0.00004	-0.001	-0.001	-0.004	0.017	0.020	0.071	0.156	0.055
	(0.006)	(0.005)	(0.005)	(0.031)	(0.044)	(0.045)	(0.167)	(0.206)	(0.146)
$\tau = 0$	0.027***	0.014***	0.014***	0.130***	0.089***	0.087***	0.397**	0.339**	0.324***
	(0.006)	(0.004)	(0.004)	(0.013)	(0.023)	(0.023)	(0.085)	(0.100)	(0.099)
$\tau = 1$	0.120***	0.079***	0.080***	0.230***	0.101	0.101	0.607***	0.430**	0.432**
	(0.004)	(0.005)	(0.006)	(0.062)	(0.081)	(0.084)	(0.161)	(0.173)	(0.185)
$\tau = 2$	0.136***	0.065***	0.064***	0.339***	0.114*	0.111	0.892***	0.535***	0.515***
	(0.006)	(0.007)	(0.007)	(0.029)	(0.064)	(0.065)	(0.075)	(0.092)	(0.093)
$\tau = 3$	0.143***	0.058***	0.057***	0.337***	0.068	0.065	0.799***	0.351***	0.327***
	(0.009)	(0.006)	(0.006)	(0.033)	(0.080)	(0.082)	(0.058)	(0.092)	(0.105)
$\tau = 4$	0.183***	0.078***	0.077***	0.492***	0.164*	0.159*	1.124***	0.612***	0.580***
	(0.007)	(0.006)	(0.007)	(0.029)	(0.086)	(0.088)	(0.109)	(0.122)	(0.131)
$\tau = 5$	0.191***	0.079***	0.077***	0.544***	0.195*	0.189*	1.174***	0.641***	0.594***
	(0.009)	(0.007)	(0.006)	(0.039)	(0.100)	(0.098)	(0.087)	(0.107)	(0.122)
Observations	63,032	63,032	63,032	63,032	63,032	63,032	16,783	16,783	16,783
Number of care facilities	7,866	7,866	7,866	7,866	7,866	7,866	3,480	3,480	3,480
Year & federal states FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Care facility size	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls		Yes	Yes		Yes	Yes		Yes	Yes
Regional variables			Yes			Yes			Yes

Notes: Stars denote significance of coefficients: $^{*}p < 10\%$, $^{**}p < 5\%$, $^{***}p < 1\%$; standard errors clustered at the level of federal states in parentheses. The table displays dynamic treatment effects of introducing the ALGN in period $\tau = 0$ on training activity of care facilities in pre-reform and post-reform periods by using the interaction weighted estimator by Sun and Abraham (2021). Never-treated groups are used as control group and the period two years before treatment is used as reference period. In Columns, 1–3, the dependent variable is a binary indicator as to whether the care facility provides apprenticeships or not. In Columns 4–10, the number of apprentices (excluding and including facilities that do not train) is used as the outcome. Table 1 gives an overview on control variables at the facility level and regional variables at the level of counties. *Source:* Establishment-History-Panel 1975–2021 (BHP 7521); Regional Database of the Federal Statistical Office and the Federal Employment Agency.

Table A4 – EMPIRICAL EFFECTS OF THE ALGN ON TRAINING ACTIVITY OF INPATIENT CARE FACILITIES

	Probability of hiring new apprentices			Number of new apprentices					
				including zero			excluding zero		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\tau = -3$	0.010	0.014	0.014	-0.075	0.072	-0.056	-0.118^{*}	-0.094	-0.095
	(0.016)	(0.013)	(0.012)	(0.044)	(0.052)	(0.033)	(0.057)	(0.054)	(0.056)
$\tau = -1$	0.027	-0.030	-0.023	0.088	-0.109	-0.106	-0.021	-0.071	-0.065
	(0.046)	(0.032)	(0.029)	(0.115)	(0.071)	(0.083)	(0.036)	(0.042)	(0.041)
$\tau = 0$	-0.019	-0.013	-0.013	-0.049	-0.028	-0.032	0.013	-0.016	-0.023
	(0.014)	(0.014)	(0.014)	(0.035)	(0.030)	(0.030)	(0.054)	(0.045)	(0.049)
$\tau = 1$	0.019	0.009	0.022^{*}	0.247^{***}	0.203^{***}	0.193^{***}	0.411^{***}	0.284^{***}	0.225^{***}
	(0.013)	(0.010)	(0.011)	(0.025)	(0.016)	(0.028)	(0.036)	(0.029)	(0.037)
$\tau = 2$	0.022	-0.0001	0.007	0.321^{***}	0.227^{***}	0.220^{***}	0.486^{***}	0.305^{***}	0.280^{***}
	(0.014)	(0.012)	(0.013)	(0.029)	(0.023)	(0.032)	(0.040)	(0.033)	(0.036)
$\tau = 3$	0.004	-0.011	-0.001	0.186^{***}	0.123^{***}	0.118^{**}	0.331^{***}	0.160^{***}	0.135^{**}
	(0.013)	(0.012)	(0.014)	(0.035)	(0.027)	(0.047)	(0.040)	(0.044)	(0.055)
$\tau = 4$	0.002	-0.018	-0.007	0.167^{***}	0.083^{**}	0.076	0.302^{***}	0.115^{*}	0.088
	(0.014)	(0.012)	(0.014)	(0.037)	(0.031)	(0.056)	(0.051)	(0.060)	(0.074)
$\tau = 5$	-0.007	-0.022	-0.013	0.264^{***}	0.201^{***}	0.193^{***}	0.462^{***}	0.277^{***}	0.259^{***}
	(0.019)	(0.016)	(0.018)	(0.043)	(0.030)	(0.054)	(0.058)	(0.063)	(0.076)
Observations	74,858	74,858	74,858	74,858	74,858	74,858	51,884	51,884	51,884
Number of care facilities	7,364	7,364	7,364	7,364	7,364	7,364	5,786	5,786	5,786
Year & federal states FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Care facility size	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls		Yes	Yes		Yes	Yes		Yes	Yes
Regional variables			Yes			Yes			Yes

Note: See Table A3.