Health Insurance as Economic Stimulus? Evidence from Long-Term Care Jobs*

Martin Hackmann† Joerg Heining‡ Roman Klimke§ Maria Polyakova¶
Holger Seibert‖

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Abstract

The renewed interest in industrial policy is reviving the question of whether government subsidies inefficiently reallocate consumption and workers towards subsidized industries. We combine decades of rich administrative data and the quasi-experimental variation in the introduction of universal long-term care (LTC) insurance in Germany in 1995 to document that an insurance expansion that channeled funds into the LTC sector resulted in a significant growth of LTC jobs, reduction in local unemployment, and increase in local labor force participation. A 10 percentage point expansion in the share of insured elderly led to 4 more LTC workers per 1,000 elderly (13% increase). Wages did not rise. The quality of newly hired LTC workers declined. Our general equilibrium estimates suggest that insurance expansion brought workers from out of unemployment and out of the labor force into new LTC and non-LTC jobs rather than simply reallocating workers across sectors. In contrast to a standard welfare loss from moral hazard, the general equilibrium gains on the labor market lead us to find a positive marginal value of public funds for this insurance expansion. To understand which market primitives drive our findings and to inform their external validity, we develop and estimate a model of product-market subsidies in the presence of wedges in input markets.

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†University of California in Los Angeles, NBER, and CESifo
‡Institut für Arbeitsmarkt- und Berufsforschung (IAB)
§Harvard University
¶Stanford University, NBER, and CESifo
‖Institut für Arbeitsmarkt- und Berufsforschung (IAB)

1 Introduction

Arrow (1963) and Feldstein (1971, 1977) have argued that the rise in healthcare spending and the scope of the healthcare sector are attributable to the growth in demand induced by generous health insurance coverage—or in other words, to moral hazard. These aggregate effects of moral hazard have been difficult to quantify empirically.[1] Most of the recent changes in social insurance programs are marginal expansions that may have fundamentally different, likely much smaller, effects on the healthcare sector (Finkelstein, 2007). Equally sparse is the evidence on the nature and normative implications of these aggregate effects, as the ability to precisely measure how healthcare workers, firms, and capital reallocate in response to insurance expansions is often limited.

In this paper we take advantage of a unique combination of a relatively recent episode of non-marginal social insurance rollout—the introduction of universal long-term care insurance (LTC) in Germany in 1995—and detailed and comprehensive administrative labor market data, to examine how social insurance affects the allocation of health care workers across sectors. Retaining or generating healthcare jobs is a common public policy goal. At the same time, Baicker and Chandra (2012b) argue that thinking about healthcare jobs as the driver of economic growth may be misguided, as these jobs will be inefficient if they do not lead to improvements in patient health and pull workers away from other, more productive, activities. We show that, in practice, such a normative assessment depends on the frictions in the labor market, as in Harberger (1971). The welfare gains in labor markets may outweigh the losses in product markets when incumbent labor markets are inefficient.

Our paper makes three main contributions. First, we add extensive new evidence to a very small literature that has been able to trace out the effects of health insurance expansions on healthcare sector employment (Finkelstein, 2007; Kondo and Shigeoka, 2013; Dillender, 2022). We do this in

[1] There are only a handful of exceptions. Finkelstein (2007) has documented a significant expansion in the U.S. hospital sector following the introduction of Medicare in 1965. Her estimates suggest that the increase in spending was more than six times larger than what the estimates from the RAND Health Insurance Experiment would have predicted. This was likely attributable to the high fixed costs of investments in new technologies or capacity, as well as spillover effects. Kondo and Shigeoka (2013) study the 1961 expansion of universal insurance in Japan, finding increase in utilization, but no evidence of increase in the number of physicians or nurses. Dillender (2022) finds that healthcare employers post more job vacancies and hire additional healthcare workers in response to Medicaid expansions in the U.S. Gottlieb et al. (2020) find evidence of changes in the income and labor supply of physicians in response to the relatively large insurance expansion in the U.S. following the Affordable Care Act.

an important and unique setting, the role-out of universal long term care insurance in Germany. Second, to the best of our knowledge we provide some of the first evidence of factor substitution between sectors of the economy following a health insurance expansion. Third, we show that the factor substitution is qualitatively and quantitatively important for the welfare implications of health insurance reform.

We proceed in several steps. In the first part of our analysis, we zoom in on the effect of insurance on aggregate employment in inpatient long-term care (SNF for "skilled nursing facilities"), which accounts for the majority of spending in LTC and is one the most labor-intensive parts of the healthcare system. The second part of our analysis goes beyond the partial equilibrium perspective and considers all workers, asking whether the new public funding of the long-term care sector affected the broader economy. Our baseline research design for both parts of this analysis is similar in spirit to the approach in Finkelstein (2007) and Kondo and Shigeoka (2013). We use historical records of means-tested assistance for long-term care services that predated universal coverage for 32% of the population needing care, to construct a measure of the geographic variation in exposure to the national insurance rollout.

Our empirical findings allow us to draw several important conclusions about the relationship between insurance and the supply-side of care. First, we document that the LTC insurance expansion leads to a dramatic increase in the number of firms and workers in this labor-intensive industry. We estimate that a 10 percentage point expansion in the share of insured elderly leads to 0.05 (7%) more inpatient LTC firms and four (13%) more workers per 1,000 elderly in Germany. Scaling this to the aggregate level of expansion that offered insurance to an additional 68% of the population needing long-term care, we find that insurance expansion leads to 0.35 (a 49% increase) more inpatient LTC firms with 30.6 (96%) more workers per 1,000 elderly in Germany. This amounts to an arc-elasticity of healthcare utilization to the price of care of 0.8—significantly larger than the elasticity estimates found in the RAND or the Oregon experiments (Newhouse et al., 1993; Finkelstein et al., 2012), but consistent with the evidence in Finkelstein (2007). The evidence on firm entry supports the idea that fixed costs of investment may be one reason for the differences in elasticity estimates between marginal and non-marginal insurance expansions.

Second, we gain novel insights into the anatomy of how a sector expands in response to the insurance-induced demand shock. We utilize our ability to observe workers' full job histories to examine how wages adjusted to accommodate the large influx of new workers. Perhaps surprisingly, we observe relatively limited movement of wages, which if anything, adjust downward. A textbook model of labor supply and demand would suggest that if firms wanted to hire more workers, they would increase wages unless labor supply is perfectly elastic. Empirically, however, our findings suggest a small reduction in the starting wage among new hires and experienced workers alike. The decline can largely be explained by a change in the skill mix toward less-educated and less-experienced workers. But even conditional on rich worker observables or worker fixed effects, we still find no evidence for an increase in wages.

Third, the granularity of our data allows us to directly examine the origins of the new workers. We find that marginal hires in our context were disproportionately drawn from unemployment or out of the labor force, with little evidence of relocation across sectors. Our general equilibrium analysis allows us to better understand the patterns of worker substitution across different types of economic activity. We estimate the effect that insurance expansion had on the overall (un)employment, earnings, and labor force participation in local labor markets. Even our most conservative estimates using the lower bounds of the 95% confidence intervals imply that LTC insurance served as a stimulus to local economies. We find that a 10 percentage point expansion in the share of insured elderly lead to 0.2 percentage point reduction in the unemployment rate off the base of 7.7% unemployment rate (the effect primarily driven by long-term unemployed), a 0.4% increase in the labor force, and a 0.5% increase in the total wage bill.

To summarize, our findings suggest that the LTC expansion boosted career opportunities for lower skilled workers at pre-reform wages, who would otherwise have collected unemployment benefits or stayed out-of-the labor market. We also find substantial positive spillover effects to other sectors of the economy, suggesting that the employment increases extend beyond those observed in LTC. Lastly, we find that insurance expansion reduced elderly mortality by 1%.

In the last section of the paper, we turn to the welfare implications of the reform in partial and general equilibrium. We start by combining the aforementioned estimates in a Harberger

(1971) style calculation that considers consumer surplus, worker surplus, and public spending. The partial equilibrium calculation abstracts away from the spillover effects in the labor market and their fiscal implications and instead benchmarks the gains in consumer welfare (without accounting for mortality gains) to the incremental costs of the LTC reform to the public. As expected in the textbook case of moral hazard in health insurance, we find estimate a marginal value of public funds (MVPF) of less than 1. In contrast, we find a net welfare gain when taking the full effects in the labor market into account. We find that the increase in spending is offset by savings on paid unemployment benefits and substantial increases in income taxes and social insurance contributions stemming from increased employment. Taking these positive externalities into account, we find a MVPF of well above 1 across a range of assumptions.

Finally, we develop and estimate a structural model of the labor market, which allows us to revisit the welfare implications of the non-marginal long-term care reform and the mechanisms that contributed to the observed employment effects. Building on Acemoglu and Shimer (1999) and Wright et al. (2021), we consider a model of directed search. The model can account for unemployment and non-labor force participation as equilibrium outcomes, and can reconcile the large employment gains absent meaningful increases in wages. We model heterogeneous workers and sectors. We allow for three sources of wedges in the labor market: unemployment benefits, sector-specific collective bargaining, and income taxes and social insurance contributions. Our estimates suggest that unemployment benefits and sector-specific collective bargaining distort employment outcomes between sectors and that the tax and social insurance contributions distort aggregate employment downward. As a result, product subsidies that expand employment generate a net welfare again when we account for multiple sources of fiscal externalities. Without the fiscal externalities, the expansion appears welfare-reducing.

These findings lead to our main conceptual insights. While the welfare effects of moral hazard are usually thought of as being driven by welfare losses from the inefficient consumption of care, this framework is incomplete if there are frictions in related (input) markets that leave socially efficient trades on the table (Lipsey and Lancaster, 1956; Harberger, 1971; Frick and Chernew, 2009). In our setting, moral hazard leads to the creation of jobs that displace workers from unemployment and pay significantly above reservation wages. More broadly, and in the spirit of the second-best, our findings emphasize that the surplus from the marginal dollar of public funds channeled through an insurance program needs to take into account not only the efficiency loss on the demand side, but also possible efficiency gains on the supply side when price rigidity, regulations, or market power distort healthcare production.

Our analysis relates to several strands in the literature. First we shed new light on the aggregate effects of insurance expansion in the context of long-term care, contributing to the rich literature that has analyzed insurance expansions, mostly in acute inpatient or outpatient healthcare contexts—Finkelstein et al. (2018) provide a relatively recent overview. A distinct feature of our analysis, besides the different setting, is that we can analyze the relocation of factor inputs between sectors that are important for the normative assessments. Our evidence on the allocation of health care workers ties together the discussion on the role of healthcare jobs in the broader economy (Baicker and Chandra, 2012b) and the role of frictions in health labor markets that may come from wage regulation (Sojourner et al., 2015; Propper and Van Reenen, 2010; Friedrich and Hackmann, 2017), monopsony power (Staiger et al., 2010; Prager and Schmitt, 2021), or price regulation and market power in output markets (Hackmann, 2019).

Second, our welfare estimates connect to the growing literature that uses the MVPF framework to compare public policies (Hendren and Sprung-Keyser, 2020; Finkelstein and Hendren, 2020). Consistent with existing work on health insurance expansions to adults (e.g. Massachusetts health reform (Finkelstein et al., 2019b), Oregon health insurance experiment (Finkelstein et al., 2019a), the introduction of Medicare (Finkelstein and McKnight, 2008), and Medigap (Cabral and Mahoney, 2019)), our partial equilibrium results suggest an MVPF of less than 1. Our general equilibrium MVPF estimate exceeds 1 even without accounting for potential gains from risk protection (Kowalski, 2015; Abaluck and Gruber, 2011; Handel, 2013), and households' finances (Brevoort et al., 2020).

Third, and methodologically, we extend the standard approaches for measuring welfare from public programs to a setting with general equilibrium effects. We combine recent advances in causal inference Arkhangelsky et al. (2021) with a novel structural model of the labor market to analyze the general equilibrium labor market effects of large reforms, connecting our findings a growing literature on the effects of place-based policies (Neumark and Simpson, 2015) and industrial policies (Juhász et al., 2023) more generally. While these policies have traditionally been motivated on the grounds of learning, technological, and national security considerations, we show that such policies may also generate value by creating "good" jobs for lower-skilled workers, lifting individuals into productive employment, see the discussion in Rodrik (2022). We provide some of the first evidence on these questions in a (growing) service sector, where the bulk of such jobs will have to be generated in the future. Our findings suggest that demand side subsidies for services can significantly boost local employment, which may of course be very different in a manufacturing context with tradeable goods.

Finally, we connect literatures on the provision of long-term care and salient labor market policies in Germany. Previous work on long-term care has studied the entry and competition between for-profit and not-for-profit nursing homes Grant et al. (2019) and the price setting negotiations between payers and nursing homes Herr et al. (2016) in the post-insurance period. We add to this by studying the effects of the introduction of universal LTC insurance on the supply of inpatient care. Our empirical setting considers the interplay of insurance expansion with labor market frictions including high unemployment benefits (Schmieder et al., 2012; Price, 2018) and collective bargaining that may have contributed to high unemployment in the 1990s (Antonczyk et al., 2010; Dustmann et al., 2014). Estimates from our structural model suggest that income taxes and social insurance contributions that generate a more than 60% wedge between the cost of employment and the take-home pay, played an even larger role in driving low pre-reform employment in our setting. Overall, out findings suggest that there was a lot of slack in the labor market, consistent with e.g. the relatively low female labor force participation in the mid 1990s and a more than 80% female share in SNF employment.

The rest of the paper proceeds as follows: In Section 2, we discuss the economic environment and data. Section 3.1 outlines our empirical strategy. In Section 3.2, we discuss empirical results. Section 4 outlines a simple model of labor demand and supply in long-term care and derives implications of our findings for assessing the normative impact of moral hazard. Section 5 offers a brief conclusion.

2 Setting and Data

2.1 German Long Term Care

Germany rolled out universal payroll-tax-financed long-term care insurance in 1995.[2] Prior to 1995, the German welfare system offered means-tested financial support for inpatient and outpatient LTC services—Hilfe zur Pflege[3] (Pabst, 2002). For patients receiving Hilfe zur Pflege (HzP), LTC providers were directly reimbursed from state and municipal budgets. Providers were predominantly public and not-for-profit, typically owned by Catholic (Caritas) or Protestant (Diakonie) Churches or non-statutory welfare agencies, jointly accounting for about 84% of inpatient beds in 1992 (Table 4 in Rothgang, 1997). The fact that public and not-for-profit firms dominated the SNF market is important, as the vast majority of public and not-for-profit providers have historically set wages through collective bargaining agreements. These agreements typically result in wage compression and wages that significantly exceed market wages, particularly so for lower-skilled workers.[4] In Section 4, we will come back to the role of wage-setting frictions.

In an effort to reduce the financial burden on local budgets and to meet the growing demand for LTC services in a rapidly aging population, Germany signed into law a sweeping LTC reform in 1994. The implementation took place over the course of 1995 and 1996. The centerpiece of the reform was the creation of a new social insurance for LTC services. The program was funded on a pay-as-you-go basis through mandated 1.7% payroll contributions.

The new benefits covered inpatient and outpatient LTC, were not means-tested, and increased with the individual's level of disability, which was determined by independent assessors. For inpatient care, the benefits were intended to cover the costs of healthcare services and the investment component of SNF care, requiring patients to pay for the room-and-board component out of pocket. In practice, the new insurance provided a fixed subsidy, and patients paid the difference between

[2] Our summary of the reform is naturally very brief. See Rothgang (1997); Nadash et al. (2018) for more details.
[3] Help for Care.
[4] Estimates from Bispinck et al. (2013) suggest that employees in nursing-related occupations earn 20% less if their wages are not set through collective bargaining agreements.

the subsidy and the market price, which was negotiated between the LTC provider and the insurer. The implicit patient cost-sharing was around 43% in the early years of the program and increased to around 54% by 2010. [5]

The sweeping expansion of benefits to the entire population has diminished the role of HzP as a source of revenue for providers and more than tripled the total amount of public spending on LTC. (See Figure 1A). Coverage rollout has led to a dramatic growth of the LTC sector in Germany, according to contemporary market observers and government reports alike (Bundesministerium für Arbeit und Soziales, 1997; Rothgang, 1997).[6]

Throughout, we focus on inpatient long-term care, often provided in skilled nursing facilities (SNF). SNFs account for the largest share of the LTC workforce and spending, and we can best identify these firms and their workers in our data.[7]

2.2 Data Sources and Sample Construction

2.2.1 Sampling Frame

Our primary source of data is the Integrated Employment Biographies (IEB) database provided by the German Institute for Employment Research, which is based on the process-generated data of the German Federal Employment Agency.[8] IEB is the universe of employment spells for the universe of workers subject to social security contributions in Germany from 1975 to 2019.[9] We aggregate

[5] In 1999, market prices for patients with the highest but also the most common care needs equaled 65 EUR per patient per day for healthcare services, and another 18 EUR per patient per day for room and board. LTC insurance offered patients with these needs financial support of 2,800 Deutsche marks per month, which corresponds to roughly 1,400 EUR per month, or 1,400 / 30 = 47 EUR per day. This implies an out-of-pocket pay of about 65 + 18 – 47 = 36 EUR per patient per day, which corresponds to 43% of the market price. Herr et al. (2016) report an average out-of-pocket price of 1,685 EUR per month between 2007 and 2009 for the highest level of care. During the same time window, the monthly insurer contributions paid to an SNF for beneficiaries of the highest-care level equaled 1,432 EUR. This implies a patient cost-sharing rate of about 1,685 / (1,685 + 1,432) = 54%. In 2010, Grant et al. (2019) report a total price of 109 EUR and a subsidy of 50 EUR per day among patients at the highest care level.

[6]The diminished importance of HzP as a revenue source has also led to a leveling in the playing field between private, public, and not-for-profit providers.

[7]See, e.g., Figure 3 in `shorturl.at/cmCDT`, last accessed in September 2021, for an overview of the share of LTC spending allocated toward inpatient care across OECD countries. Furthermore, most long-term care workers practice in residential care settings (Colombo et al., 2011).

[8]IEB database are processed and kept by the Institute for Employment Research according to Social Code III. The data fall under the confidentiality regulations of the German Social Code (Book I, Section 35, Paragraph 1). Access to the data is regulated by Section 75 of the the German Social Code, Book X.

[9]Specifically, the IEB data consist of all individuals in Germany, who fall into one of the following employment categories: employment subject to social security (in the data since 1975), marginal part-time employment (in the

the raw spell–level data to the individual-year level by retaining the spell that is observed on June 30 of each year.[10] We drop individual-year observations for employment in (former) East Germany, Berlin, or Bremen, for which no consistent time series are available. Appendix B.1 provides more detail on data processing.

We construct two analytic samples from the resulting database. The first extract ("SNF Sample") selects full labor market biographies for individuals who were employed in a skilled nursing facility (SNF)[11] at least once[12] between 1975 and 2008. We exclude observations from 2009 onward due to substantial changes in the industry classification system (Eberle et al., 2011). The second extract ("Labor Market Sample") is a 10% random sample of all labor market histories.

2.2.2 Characteristics of Workers

We observe the date of birth, sex, nationality, and educational attainment for individuals in our sample. For employment episodes, we further observe the anonymized employer identifier, employer's industry code, geographic location (county) of the employer, whether employment was full-time or part-time, and the employee's average daily wage. See Appendix B.2 for additional information on these variables.

In addition, we construct two measures of labor market experience for each individual from the (annualized) employment-spell data. First, for each year t, we compute the number of years the individual was employed in years $t-15$ to $t-1$. Analogously, we compute the number of years the individual worked in an SNF establishment in years $t-15$ to $t-1$.

Finally, we classify worker-year observations of SNF employment spells into SNF incumbents and new hires. A hire is defined to be new in year t if an individual is regular employment in an SNF in year t but not in year $t-1$.

data since 1999), benefit receipt according to the German Social Code III (since 1975) or II (since 2005), officially registered as job-seeking at the German Federal Employment Agency or (planned) participation in programs of active labor-market policies (in the data since 2000).

[10] We first clean the spell-level observations, following (Eberle and Schmucker, 2019).

[11] SNF is defined as an establishment with WZ73 industry codes for private and for-profit institutions or "homes" (710), private and not-for-profit homes (711), and homes in public ownership (712). The private not-for-profit institutions are primarily owned by social service organizations of Catholic and Protestant churches. We use time-consistent industry codes, following the procedure of Eberle et al. (2011).

[12] We only consider "regular" employment, following the IAB convention—see Appendix B.2 for details.

2.2.3 Mortality

We use two sources of mortality data. First, we compute county-level mortality rates for individuals aged 75 and older from the vital statistics of each West German state except Bremen and Rhineland-Palatinate (because of missing data). These data are available from 1991 to 2017 (Statistische Ämter des Bundes und der Länder, 2021b).[13] The second source is the Human Mortality Database, which allows us to compute age-by-sex mortality for years 1991–2008 for the former West Germany and 28 other countries.

2.2.4 Means-Tested LTC Benefits

We use historical statistical reports to compute the number of individuals covered by means-tested HzP in 1993. The counts of HzP recipients were available for 15 geographic regions covering the territory of the former West Germany. This includes state-level observations for all states except Bavaria. For Bavaria, we observed recipient counts for seven substate regions (*Regierungsbezirke*).[14]

To construct the reform exposure variable in Section 3.1, we further use counts of LTC claims in 1999, the first year for which reliable statistics on LTC claims by local geography are available. These were obtained from LTC insurance statistics published by the Federal Statistical Office of Germany (Statistisches Bundesamt, 1999).[15]

2.3 Summary Statistics

Table 1 provides descriptive statistics for the two analytic samples. The "SNF Sample" summarized in column (1) consists of 24.4 million observations for 1.6 million unique workers over the course of 1975 to 2008. Individuals in the sample are, on average, 38 years old. Some 77% are female, and 94% are German nationals. About 10% of the workers had completed the upper tier of high school

[13] Mortality data for years 1991–1994 have been obtained through written requests directed to the statistical offices of the respective German federal states.

[14] Counts of recipients of Hilfe zur Pflege at the state level were obtained from Statistisches Bundesamt (1993, p. 96). Counts for Bavaria at the regional level were obtained from page 297 of the volume *Regionalbericht 1993*, published by the Statistical Office of Bavaria (Statistical Office of Bavaria, 1993).

[15] Counts of LTC insurance beneficiaries in Bavaria in 1999 were obtained from the Statistical Office of Bavaria's GENESIS website at www.statistik.bayern.de.

(Abitur)[16]. Some 61% of observations are for employment in the healthcare sector, while 10% are unemployment episodes. The employment spells span nearly a million unique establishments of any kind and 18,675 SNF establishments. SNF spells, summarized in column (2), account for 9.8 million observations, or 40%, for the workers in our sample. During SNF employment episodes, workers are, on average, slightly older—41 years of age—and slightly more female, at 81%.

SNF employment episodes tend to happen later in a worker's career and are more likely to be part-time (27% of all employment spells, vs. 33% for SNF spells). During SNF episodes, workers have about five months more of labor market experience and 2.4 years more of SNF-specific experience. Workers earn 6% higher wages during their SNF spells (78 EUR/day vs. 83 EUR/day, in 2020 Euros). About 59% of SNF employment episodes are in not-for-profit (mainly church-owned) SNFs, 27% in for-profit, and 14% in publicly owned institutions.

Column (3) summarizes our "Labor Market Sample," which has 48 million observations for 3.8 million individuals over the 1980–2004 period. Subject to the sample refinements discussed earlier, this sample is broadly representative of the German workforce aged 25 and older. Individuals are on average 41 years old, 41% are female, and 92% are German nationals. These workers are about 10 times less likely to be employed in the healthcare sector (6%), and three percentage points less likely to be unemployed at any point in time (6.7%) than the workers in the SNF Sample. The average worker in the Labor Market Sample is also less likely to be working part-time (13%, vs. 27% part-time) and earns 36% higher wages.

In sum, we observe that an individual who, at some point in his or her career, works in an SNF (column 1) is 87% more likely to be a woman, 43% more likely to experience an unemployment spell, more than twice as likely to work part-time, and earns substantially lower wages relative to an average worker in Germany who is aged 25 or older (column 3).

[16]Our data is representative of the national Abitur rates for the cohorts we consider. For example, among 762,026 individuals graduating from high school in West Germany in 1970, 87,882 (= 11.5%) graduated with Abitur. These individuals were of prime working age by the time universal LTC insurance was introduced (Statistisches Bundesamt, 1995, Page 53).

3 The Impact of Insurance Expansion

3.1 Research Design

Our main empirical strategy relies on the geographic variation in the pre-reform coverage rates through the means-tested HzP program. The introduction of universal LTC insurance meant that all geographic areas had coverage for all people with medically approved LTC needs following the 1995–1996 rollout.[17] However, regions with lower pre-reform HzP coverage were in practice more affected by the expansion.

To capture this geographic variation in exposure, we use data on the number of claimants of HzP in 1993 and an estimate of the total underlying demand for care in the same year. We define exposure measure E_r as follows:

$$E_r = 100\% - \frac{HzP_{r,1993}}{g_{r,1993,1999} * LTCClaims_{r,1999}}, \quad (1)$$

where r denotes one of 15 regions for which we observe the count of HzP claimants in 1993, denoted with $HzP_{r,1993}$. $LTCClaims_{r,1999}$ is the region-specific count of all beneficiaries of LTC insurance in 1999. This specification assumes that after the full rollout of LTC insurance, the number of individuals claiming LTC insurance is a good approximation for the true underlying demand. To account for the potential of differential trends in aging across areas between 1993 and 1999, we deflate the 1999 count of LTC demand by the change in the number of older individuals in each region r between 1993 and 1999. The deflation factor $g_{r,1993,1999} = \frac{OlderPop_{r,1993}}{OlderPop_{r,1999}}$ is the region-specific ratio of age 65+ population in 1993 to that in 1999. Intuitively, E_r measures the share of individuals needing long-term care who did not have insurance coverage for this care prior to the reform.

Using this source of variation, we estimate an event study specification that measures whether areas that were more exposed to the national insurance reform experienced differential changes in the outcomes of interest. The identifying assumption needed for the causal interpretation of our

[17] LTC needs are determined by independent assessors (primarily doctors and nurses) who have no financial incentive to approve or deny applications. According to Nadash et al. (2018), benefit determinations, including denials, have generally been accepted as reliable and fair, and, if appealed, are rarely overturned.

estimates is that, in the absence of the insurance rollout, outcomes would have grown in parallel across geographic areas with different levels of exposure to LTC insurance expansion. For an outcome $Y_{c(r)t}$ in county c within region r in year t, we estimate:

$$Y_{c(r)t} = \alpha_c \times \mathbf{1}(\text{county}_c) + \delta_t \times \mathbf{1}(\text{year}_t) + \sum_{t=1975}^{t=2008} \lambda_t \times (E_r) \times \mathbf{1}(\text{year}_t) + \epsilon_{c(r)t} \tag{2}$$

To simplify the exposition, we also report estimates from a difference-in-differences specification that pools coefficients of transition years 1994 to 1996, and post-reform years 1997 to 2008:

$$\begin{aligned} Y_{c(r)t} = {} & \alpha_c \times \mathbf{1}(\text{county}_c) + \gamma_t \times \mathbf{1}(\text{year}_t) + \sum_{t=1975}^{t=1992} \delta_t \times (E_r) \times \mathbf{1}(\text{year}_t) \\ & + \delta_{94-96} \times (E_r) \times \mathbf{1}(\text{year}_{94-96}) \\ & + \delta_{97-08} \times (E_r) \times \mathbf{1}(\text{year}_{97-08}) + \epsilon_{c(r)t} \end{aligned} \tag{3}$$

We consider four sets of outcomes $Y_{c(r)t}$: 1) the number of SNF firms and workers, 2) workers' income, 3) the demographic characteristics of newly hired workers and their labor market experience, and 4) mortality. We aggregate outcomes to the county-year level by either summing (in the case of counts) or taking an average (in the case of characteristics of workers). For the specifications with income as an outcome, we first residualize log-wages, taking out the variation due to labor market experience (for new hires) or individual fixed effects (for incumbents). To account for the differential size of counties and for the potential for differential aging trends across geographies, we use population counts of individuals aged 65 and above to scale the count-based outcome measures into per elderly capita terms. We use population counts as weights in wage regressions.

General Equilibrium To characterize the potential spillover effects of the LTC insurance expansion on other sectors of the economy, we investigate employment outcomes at the population level. A practical challenge is that LTC is a relatively small sector of the economy. LTC's effects on local labor markets may be hard to detect if they are dominated by place-specific macroeconomic fluctuations. To improve our ability to account for place-specific trends in local rates of unemployment, size of the labor force, and aggregate wages, we adapt equation (2) following Arkhangelsky et al. (2021). We convert continuous exposure E_r to a dichotomous indicator. Counties are flagged as treated if their exposure was above the median level of exposure in the country; counties with below median exposure are considered control. With this binary measure of exposure, we use the synthetic difference-in-differences specification for our general equilibrium analysis.

3.2 Results

3.2.1 Partial Equilibrium: Industry-Specific Response to Demand Shock

Figure 1 displays the raw time series of the number of SNF workers between 1975 and 2008, both in absolute terms (panel B) and per 1,000 individuals aged 65 and older (panel C). Two descriptive facts are evident from these figures. First, employment in long-term care generally saw persistent growth over the three decades that we study. The number of SNF workers more than quadrupled from 1975 to 2008 (for comparison, population growth in West Germany was 7.5% over the same time period, according to the Human Mortality Database). Second, this increase was not mainly driven by the growth in the older population—which was itself pronounced, as we see in Panel D—but by a substantial increase in the number of SNF workers per elderly capita. The number of SNF workers per 1,000 individuals aged 65 and older more than tripled, going from 11 to 35 workers per 1,000 elderly.

In Panels A and B of Figure 2, we plot the county-year level data for SNF establishments and workers separately for the set of counties that were in geographic areas with above (blue line) and below (red dashed line) median exposure (E_r as derived in 1). We plot the average outcome within each group of counties. The time series are normalized to the mean of SNF establishments (in Panel A) or workers (in Panel 2) per capita across all counties in 1993. In the post–insurance rollout years, shaded in grey, both the number of establishments and the number of workers per 1,000 elderly were growing faster in the counties that were more exposed to insurance expansion.

In Panels C and D of Figure 2, we report the results of estimating the event study in Equation 2. The estimates suggest that prior to 1995, the rate of growth in the number of establishments and the number of workers per 1,000 elderly did not differ across geographic areas with different levels of means-tested coverage in 1993. After the rollout of universal insurance, however, we find that growth was more pronounced in areas that were more exposed to LTC insurance expansion. The acceleration flattened out around eight years after the new insurance was signed into law.

The pooled difference-in-difference coefficients in Table 2 measure the implied impact of the reform in an average post-reform year. Our estimates in columns (1) and (2) imply that, on average, 10 percentage points (or 15% relative to the mean) more exposure to the reform leads to 0.05 (6.4%) more SNFs and four (14%) more SNF workers at a point in time. The magnitude of the increase of workers was roughly equally split between part-time and full-time workers (columns C and D), implying a larger relative effect for part-time workers, of whom there were far fewer prior to the policy change (nine part-time workers per 1,000 elderly in 1993, versus 23 full-time workers).

A 10 percentage point change in exposure is close to the difference in mean exposure between counties with above median exposure and below median exposure (0.09), which we refer to as "in-sample variation" in the third panel of Table 2. Multiplying these "in-sample" per capita effects by the count of individuals aged 65 and older in West Germany (excluding Berlin and Bremen), we get that the insurance rollout added 443 SNFs and 39,058 SNF workers for each 9 percent of uninsured elderly. We also compute a more out-of-sample estimate of the aggregate impact of LTC insurance. Assuming that the effect scales approximately linearly with the share of the ex-ante uninsured implies that expanding universal coverage to 68.6% of the population was responsible for 0.34 (or 45% relative to the mean of 0.78 in 1993) more SNFs per 1,000 elderly and a nearly doubling of the SNF workforce.

To put the employment effects into further perspective, we divide the extrapolated increase in employment by the implicit change in the out-of-pocket prices for an average consumer:

$$\epsilon_{arc} = \frac{\Delta Q/(Q1+Q2)}{\Delta P/(P1+P2)} = \frac{30.5/(32+62.5)}{68.6\% \cdot 57\%/(68.6\% \cdot 100\% + 68.6\% \cdot 43\%)} = 0.81 \ .$$

The numerator considers changes in employment per 1,000 elderly (+30.5 workers) relative to pre-reform employment (32 workers) and post-reform employment (32+30.5)—see column (2) in Table 2. The denominator considers the change in prices. Pre-reform, 68.6% of potential patients paid the full price out-of-pocket, the remaining 31.4% were fully insured through means-tested HzP. So the average out-of-pocket price was $0.686P_{market}$. Post-reform, the cost-sharing of the newly insured, drops to 43%. The new average out-of-pocket price then becomes $0.686 * 0.43 P_{market}$. The effective change in the average price is then 68.6% * (43% – 100%). Put together, this suggests an arc elasticity of 0.81, which significantly exceeds the elasticity found in the RAND or the Oregon experiments (Newhouse et al., 1993; Finkelstein et al., 2012). Our data on firm entry provide evidence that fixed costs of investment may be one reason for the differences in the estimates (Finkelstein, 2007).

In the Appendix, we report versions of our baseline specifications with county-specific time trends, alternative clustering of standard errors (Figure A.5 and Table A1), with other ways of constructing the exposure measure (Figures A.6 and A.7, Table A2), and with controls for geographic trends in aging (Figure A.8 and Table A3). Our results remain largely invariant to these alternative specifications.

3.2.2 Partial Equilibrium: Anatomy of Expansion

In this section we characterize the nature of the LTC sector expansion. We consider changes in income and composition of newly hired SNF workers.

Price effects We start by examining whether the large expansion of the SNF workforce was accompanied by a growth in wages. We expect that firms have to increase their starting wages in order to attract more new hires. Table 3 displays the results from estimating specifications 2 and 3 for logged daily wages of new full-time hires (columns 1 and 2) and of incumbent full-time workers (columns 3 and 4). We find no evidence of systematic changes in wages on average, for either new hires or incumbents. If anything, our findings suggest a small reduction in wages following the expansion. The point estimates become smaller in magnitude as we control for experience (column 2) or worker fixed effects (column 4), suggesting that part of the potential decline can be attributed to a shift towards lower-skilled workers.[18] The lack of an increase in wages in a rapidly expanding sector points to the existence of wage frictions. The empirical pattern we see is consistent with a labor market equilibrium where the going wage is substantially above the market rate, allowing

[18]We residualize individual-level log wages to experience or worker fixed effects before constructing county-year level averages.

firms to easily expand their hiring without changing their posted wages. We return to the discussion of potential sources for SNF market wage frictions in Section 4.

Compositional effects We next consider whether the reform changed the average demographics or qualifications of newly hired SNF workers. Table 4 documents how the expansion of the LTC market changed the characteristics of new workers hired by SNF firms. We find no changes in age, nationality, or sex of the new hires. We do find that an average new hire, post-reform, appears to be less skilled. The new hires are 1 percentage point less likely (11% relative to the mean of 9%) to have the most advanced high school degree for each 9 percentage points of "in-sample" variation in exposure. They also have less general labor market experience—four months less general labor market experience relative to the average experience of 4.7 years. The point estimates for the SNF-specific labor market experience and for having previously worked in the healthcare sector are noisy, but they point in the direction of less experience. The post-reform new hires are substantially more likely to have been unemployed in the year prior to the SNF hire. Insurance expansion thus had a significant positive effect on hiring out of unemployment, increasing the share of new full-time employees who were unemployed before starting an inpatient LTC job from a base of 17% in 1993 by 1 percentage point for each 9 percentage points of additional exposure to the reform. Overall, we conclude that the expansion of the LTC sector resulted in SNF firms moving down in the skill distribution and offering jobs to workers who likely had a harder time finding employment previously.

3.2.3 General Equilibrium

The analysis in the previous section examined only the long-term care industry that was directly targeted by insurance expansion. We now ask if the flow of funding into the long-term care sector affected the local labor markets above and beyond the expansion in SNF jobs. We are primarily interested in understanding whether public funds invested into long-term care simply resulted in the reallocation of workers from other sectors into long-term care, which as Baicker and Chandra (2012a) argue would likely be inefficient, or whether it generated new jobs.

SNF employment: The first column of Table 5 displays the response of SNF employment as a share of all labor force participants. Consistent with our earlier evidence, we find that LTC insurance expansion led to a significant increase in the share of SNF workers: A 9 percentage point increase in exposure is associated with an increase in the count of SNF employees of 46,415, which is close to the implied effect of 39,058 displayed in column (2) of Table 2 and discussed in Section 3.2.1. We note three critical distinctions between the methods in this section and those in Sections 3.2.1 and 3.2.2, which contribute to the difference in point estimates. First, the results presented in this section rely on the synthetic difference-in-difference approach developed by Arkhangelsky et al. (2021), which re-weights individual exposure units to control for economic shocks and trends that might undermine the event study design from 2. Second, the denominator of the outcomes presented in Table 2 is the count of elderly, whereas in columns (1) through (3) of Table 5 we use the size of the labor force. For both specifications, when computing implied aggregate impacts, we fix numerators in 1993, even though the population of elderly grew faster than the labor force (Figures 1C and 1D). Third, the GE specification estimates reform impacts across years 1994 to 2004, as we drop years 2005 and onwards because of large reforms in unemployment insurance and welfare payments (Hartz-IV).

Full labor market: Columns (2) and (3) of Table 5 show effects on unemployment. We find that the magnitude of the implied response exceeds the implied gain in SNF employment, suggesting significant spillovers in equilibrium. The upper bound of the confidence interval in column (2) corresponds to a 0.2 percentage point reduction in the rate of unemployment, off the base of 7.7% in 1993. This aligns with findings from Table 4, which showed that newly hired SNF workers under the reform were more likely to be inexperienced in the labor market (column 5), previously uninvolved in healthcare (column 7), and predominantly recruited from unemployment. Additionally, columns (4) and (5) of Table 5 imply that the reform caused a 1.3% increase in the size of the labor force and a 2.4% increase in the count of workers re-entering the labor force, defined as having a previous absence from the labor force for at least one year, but having had labor force participation experience in our data.

While we find that individual daily wages decline (presumably reflecting the decline in the experience and qualifications of the labor force), we observe a significant growth in the aggregate wage bill, suggesting a daily increase of 0.5% or 240 million EUR (column 7). The positive effect on aggregate wages appears to be driven by the growth of the labor force. Overall, we find evidence consistent with the idea that in our context the LTC insurance expansion became an economic stimulus that increased the overall employment in the economy, primary bringing lower-skilled workers into jobs.

3.2.4 Mortality

We close this section with the analysis of mortality, asking whether the LTC insurance expansion and the associated increase in the SNF labor force lead to a change in health among the elderly. The net effect on mortality is unclear, ex ante. We may expect that better access to formal care will improve health and prolong survival. On the other hand, being cared for outside of the familiar home environment and the lower average skill of new SNF hires may lead to a decline in health.

For the analysis of mortality among individuals aged 75 and older, we first implement the same synthetic difference in differences approach as in our general equilibrium analysis, using variation *within* Germany. We then supplement this analysis with estimates based on cross-country variation and the synthetic control method (Abadie et al., 2010). We use the donor pool of the age-75-and-older population's annual mortality time series in 28 other countries to construct the counterfactual time series for West Germany. We follow Abadie et al. (2010) for the permutation-based inference procedures.

Figure 3 and Table 6 report the results. Panel A in Figure 3 and column (1) in Table 6 report the SDID results, while (Panel B in Figure 3 and column (2) in Table 6 show the results of the synthetic control estimates. The SDID point estimates and the visual evidence in Figure 3 are suggestive of a 1% decline in mortality, with an increasingly more pronounced negative effect on mortality over time. We conclude that the expansion of the SNF sector and increased hiring of observationally lower-skilled workers does not appear to have worsened mortality in the elderly population, and we see suggestive evidence that mortality may in fact has declined.

4 Welfare

Public funds invested into a health insurance expansion in our context served not only to alter the provision of healthcare, but were also effectively an economic stimulus that increased employment in the German economy. We now turn to evaluating the efficiency of this public spending.

We anchor our normative analysis in the marginal value of public funds (MVPF) framework (Hendren and Sprung-Keyser, 2020; Finkelstein and Hendren, 2020), which requires us to estimate the willingness to pay of all policy beneficiaries and compare that to the net cost of the program to government. The main challenge in our context is the non-marginal nature of the policy. This necessitates finding a way to estimate surplus from LTC insurance for marginal consumers and workers, as we cannot assume that this surplus was zero. We pursue two independent estimation strategies. Our first approach follows the spirit of the Harberger triangle (Harberger, 1971) and uses linear approximations to demand functions. Our second approach is more "structural." We develop a general equilibrium model of product and labor markets and allow for product market subsidies in the model. Our theoretical framework closely follows the directed search and matching literature, building on Acemoglu and Shimer (1999) and Wright et al. (2021). We show how to take this model to data and use it to compute the MPVF ingredients.

The general insight from both exercises is that the textbook narrative about the welfare losses from moral hazard in health insurance is incomplete. The full welfare effect of insurance needs to account for potential general equilibrium gains (or losses) in input markets as well as fiscal externalities.[19] Methodologically, our horse race between two estimation approaches highlights the challenge of estimating the MVPF of non-marginal policies (Finkelstein and Hendren, 2020).

4.1 Approximation Approach

MVPF divides the willingness to pay of policy beneficiaries by the net cost to government. We consider both the numerator and denominator separately for the case of partial equilibrium that

[19] We are sidestepping the discussion of health benefits, as our estimates of mortality reduction are statistically imprecise. We are also not including the risk protection value of insurance for the younger population. Instead, we treat LTC coverage as a product market subsidy, since the immediate recipients of LTC benefits in our context were already in need of long-term care. These sources of surplus could be central in other environments. Omitting these here biases us *against* finding that efficiency losses from moral hazard can be offset by surplus in input markets.

does not take into account labor markets, and for the case of general equilibrium that incorporates labor markets. Throughout, we assume a 9 percentage point level of insurance expansion, which corresponds to our in-sample variation in exposure (this is the difference in exposure between areas with above versus below median exposure).

Partial Equilibrium We start with a standard analysis of insurance expansion that only focuses on the product market for long-term care. The net cost to government from offering LTC insurance for SNF care has two components—mechanical costs that arise from inpatient LTC payments in the absence of any behavioral responses and fiscal externalities that arise due to patients and providers changing their behavior. The mechanical cost only arises for inframarginal patients who were not receiving HzP prior to insurance expansion. For these patients, the funding switched from being local to federal, but didn't necessarily change in magnitude, so additional government spending on these patients is zero and these patients' willingness to pay for the program is also zero.[20] Indeed, this is the idea underlying our research design. For patients who were consuming SNF care prior to expansions, but were not subsidized, the mechanical cost to the government was circa 1,400 EUR per month or 16,800 EUR per year (see footnote 5). As we do not directly observe patient counts prior to insurance expansion, we use the ratio of workers to patients to approximate the count of inframarginal patients. There were 1.56 million recipients of (any) long-term care benefits in 1999 (across the geographic regions we have used in estimation) and 0.39 million regular workers in SNFs, for a 4:1 ratio of (any LTC) patients to SNF workers. There were 0.33 million regular workers in 1993, which implies 1.32 million individuals were using long term care in 1993. Out of these, 0.49 million (or 37%) were claiming HzP, for 0.83 who were not. In 1999, about 30% of patients were in inpatient care. Applying the same rates of inpatient care use to 1993, we get 0.25 million inframarginal SNF patients. Each of these patients received a subsidy of 16,800 EUR per year that they valued as cash. Total government spending on these patients and the total surplus for them was thus $0.25 \times 16,800$, or 4.2 billion EUR. To scale these down to 9 percentage point exposure, we assume that the government paid only for 9 percent of all eligible inframarginal patients, which

[20] In practice the willingness to pay may be negative if LTC insurance leads to congestion in facilities. We do not have any empirical evidence for this and do not consider this mechanism.

gives us the spending and surplus of 0.38 billion EUR.

As we have shown, this insurance expansion did not just lead to a transfer of funds to inframarginal patients. Our event study points to a substantial expansion of the SNF industry, which in turn implies an important role of patients' behavioral response. The fiscal externalities arising from this behavioral response constitute the payment of 16,800 EUR per year for marginal patients. We estimate that a 9 percentage point of exposure lead to 39,058 more SNF workers. Again using the 4:1 patient to SNF worker ratio, this implies 156,232 more of *any* LTC patients and (times 30%) 46,869 of marginal *inpatient* patients (which is 1.8 times more than the number of inframarginal patients). In turn, 0.046 million extra patients implies 0.79 billion EUR extra in long-term care spending by the government. The Harberger triangle (Harberger, 1971) style approximation suggests that patients value this extra spending at about 50%, for a patient surplus of 0.39 billion EUR.

Putting these calculations together, we get a partial equilibrium MVPF of 0.66. The sum of benefits for the marginal and inframarginal patients is 0.39 billion EUR and 0.38 billion EUR, for a total of 0.77 billion EUR in the numerator of MVPF. The sum of government expenditures on the program is 0.38 billion EUR for the inframarginal patients and 0.79 billion EUR for the marginal patients, for a total MVPF denominator of 1.16 billion EUR. We note that the partial equilibrium MVPF in this approach is bounded above and below between 0.5 and 1, depending solely on the relative share of marginal and inframarginal beneficiaries. The MVPF below 1 here is equivalent to the textbook loss in surplus due to moral hazard in health insurance.[21]

General Equilibrium we now turn to the main novel component of our analysis and consider the surplus and fiscal externalities on the labor market. Throughout this discussion we use the most conservative version of our general equilibrium labor market estimates—the lower bound of our 95% confidence intervals. The labor market effects have several components. For workers who were already working in SNFs prior to expansion, there is no change in either surplus or fiscal externality as we estimate no changes in wages. For workers who wouldn't have worked in a SNF,

[21] Insurance if frequently posited as a tradeoff between risk-protection and moral hazard. We do not consider the risk protection benefits in our computation as there was no risk protection benefit for those individuals who were already in need of long-term care by the time of expansion.

but would have worked in a different sector at similar wages, there is also no extra saving or cost for the government and on the margin no willingness to pay by workers.[22]

The fiscal externalities are driven by the reduction in unemployment and changes in the wage bill (which in turn can be from workers getting higher-paid jobs or from higher labor force participation). The government saves on unemployment insurance (UI) payments on compliers who would have remained on UI. The magnitude of savings is equal to the average UI benefit times the change in unemployment. The change in unemployment attributable to a 9 percentage point change in exposure to insurance expansion is given directly by our general equilibrium estimates (lower bound of the 95% CI) and implies a 0.2 percentage point lower unemployment rate, which in turn corresponds to 42,195 fewer unemployed workers. We estimate the average UI benefit in our data to be 710 EUR per month or 8,520 EUR per year. Multiplying that by the reduction in the count in unemployed we get government savings of 0.36 billion EUR.

For all workers who were in lower-paid jobs, on UI, or out of the labor force, the government also gains income tax revenue. Our general equilibrium estimates suggest that while average wages in the economy went down (presumably reflecting entry of lower-skilled workers), the total wage bill went up by 0.5%. The total yearly wage bill was 665.1 billion in 1993, so the increase is 3.3 billion. The average rate of income and social insurance contributions in Germany in 1999 was 39.4% for an unmarried worker, [23] with another 20.8% of the wage collected by the government in social insurance contributions from the employer. This means the government collected 60.2% or 1.99 billion EUR in extra funds from the wage increase. Workers who would have been unemployed in the absence of LTC insurance expansion forgo their UI payments and the value of leisure, but gain wages. Workers who would have been out of the labor force gain wage but forgo leisure and household production. Mui and Schoefer (2024) estimate the median reservation "raise" (which aims to capture a notion of reservation wages) to be circa 90% of observed post-tax and contributions wages in the German context. Applying this scaling to our estimate of the increase in the total wage bill, we get a post-tax and contributions wage increase of 2.0 billion EUR, which the workers'

[22]Workers could have experienced gains from having a more robust labor market, potential gains in amenities, or other factors, none of which we are able to capture in this computation.

[23]Steuer- und Abgabenlast von Durchschnittsverdienern, Bundesministerium der Finanzen (BMF), Datensammlung zur Steuerpolitik

value at 10% or 0.2 billion EUR.

As a final adjustment to our partial equilibrium computation, we add the willingness to pay and government expenditures on non-SNF long-term care patients, as our labor market results capture the full labor market, including non-SNF types of long term care. We get government spending on all inframarginal patients to be 0.07 million patients (0.83 patients times 9% exposure) times 16,800 EUR per year per patient, for a total of 1.25 billion EUR. To this we add spending on 0.16 million marginal patients, which adds up to 2.6 billion EUR. Patient willingness to pay for these subsidies is one for one for inframarginal workers and 50% of the subsidy for marginal workers.

Putting these together, we get a general equilibrium MVPF of 1.7, meaning that the program generated more than one dollar of value for every dollar spent. In the numerator we have the benefits for all marginal and inframarginal patients, which amount to 1.3 billion EUR and 1.25 billion EUR, respectively for a total patient benefit of 2.55. The workers value the wage gains at 0.2 billion EUR, for a total of 2.75 in the numerator of MVPF. In the denominator, we get 1.25 billion EUR and 2.6 billion EUR in public spending on the marginal and inframarginal patients, for a total of 3.85. This is offset by 0.36 billion EUR in government savings on unemployment insurance, and 1.99 billion EUR in extra funds collected from taxation (and social insurance contributions) on the wage increase. On net, the government spending and MVPF's denominator is 1.5 billion EUR. Combining the estimates of the denominator and the numerator, we get an MVPF of 1.7.

To summarize, the MVPF analysis of the universal LTC insurance expansion that focused only on partial equilibrium, i.e. only moral hazard, would have concluded the the marginal value of public funds was below 1. In other words, in partial equilibrium the net cost to government is larger than the benefit to patients. This is the familiar textbook case of deadweight loss from moral hazard. Adding the willingness to pay of workers who were affected by changes in consumer demand, as well as the corresponding fiscal externalities in taxes and UI savings, we conclude the opposite—that a marginal dollar invested into long-term care insurance generates a substantial fiscal payoff. This is driven by the fact that moral hazard acts as an economic stimulus to local labor markets in our context.

4.2 Model-based Approach

We next specify and estimate a structural model of the labor market that allows us to reconcile the descriptive facts as equilibrium outcomes and to revisit the welfare analysis of the LTC reform. Building on Acemoglu and Shimer (1999) and Wright et al. (2021), we consider a model of directed search. In this model, markets do not "just" clear in prices allowing us to reconcile large changes in employment absent significant changes in wages. Our empirical model adds worker and firm heterogeneity, collective bargaining, unemployment benefits, and income taxes to the empirical model to fit the institutional context.

4.2.1 Theory

Environment: The production of the economy is populated with a continuum of potential firms and workers. Workers differ in their skill level ϕ. We assume that each firm has a production technology that requires one worker. Let $j \in J$ index sectors of the economy– all firms in j have homogeneous production technologies. Workers and firms meet via search. Firms first decide whether to enter a sector and which skill segment to enter in. Conditional on entry, each firm posts a vacancy with a wage w_j^{ϕ} (which will be common among all firms in j in equilibrium). If j is subject to binding wage-setting frictions, e.g. due to collective bargaining, firms set w_j^{ϕ} to equal the wage floor. In the next stage, workers observe all wage offers for their skill type and direct their search, and apply, to one *job* offer or decide against search and stay out of the labor market. We denote the ratio of the number of applicants to the number of vacancies in each sector j and skill segment ϕ with $q_j^{\phi} > 0$ and refer to this as the queue length. Each applicant is hired with a probability $\mu(q_j^{\phi})$. If hired, the worker earns wage w_j^{ϕ} and produces ϕ output units. Otherwise the worker remains unemployed and obtains unemployment benefits or benefits form home production and leisure, which we allow to vary by skill level, b^{ϕ}. The probability of being hired decreases in the queue length. Conversely, the probability of filling a vacancy, denoted with $\eta(q_j^{\phi}) = \mu(q_j^{\phi}) \times q_j^{\phi}$, increases in q_j^{ϕ}. Intuitively, firms have higher chances of filling vacancies in labor markets that have more applicants for any fixed number of open positions.

Payoffs: There are three types of agents in the economy—firms, workers, and consumers of the final good. We describe each of their payoffs in turn. A firm's payoff is its profit. For a firm in labor market j that has entered skill segment ϕ, the profit in this skill segment is given by:

$$\pi_j^\phi \quad = \quad \eta(q_j^\phi) \times (P_j \times \phi - w_j^\phi) - c_j(\phi). \tag{4}$$

$c_j(\phi)$ denotes the cost of vacancy posting, capturing recruiting and retention costs. They are incurred with certainty—irrespective of whether the firm manages to fill the vacancy. We allow these costs to vary across labor markets and worker skill (it may be costlier to hire higher-skilled workers). With probability $\eta(q_j^\phi)$, the firm fills its vacancy, produces output, collects revenue, and pays wages. This is captured by the first term of the profit function. Matched workers earn wage w_j^ϕ and produce ϕ units of output each of which generate revenue P_j to the firm.

Worker i's maximizes their expected utility by directing their search toward sector j or staying out of of the labor force. The expected utility of worker i with skill ϕ is given by:

$$u_{ij} = \begin{cases} \mu(q_j^\phi) \times w_j^\phi + (1 - \mu(q_j^\phi)) \times b^\phi + \epsilon_{ij} & \text{if } i \text{ searches in j} \\ \kappa^\phi + \epsilon_{i0} & \text{if } i \text{ doesn't search} \end{cases}, \tag{5}$$

where w_j^ϕ is the wage the worker gets if matched to a vacancy, b^ϕ is the payoff if the worker searches but is not matched, and κ^ϕ is the flow utility from not searching. Workers who do not search are assumed to obtain utility from home production and leisure as well as the benefit of foregoing the hassle cost of applying for jobs along with potential stigma effects of being unemployed. We allow all flow utilities to vary by skill level. ϵ_{ij} denotes idiosyncratic preference shock that worker i may have for labor market j, where $j = 0$ denotes the choice to stay out of the labor force. For example, prior experience in industry j, or living closer to market j, or having a small child at home may lead the worker to obtain a higher utility from choice j, all else equal.

Finally, we consider a representative consumer who has preferences over output produced in the sectors of the economy and a numeraire good. The consumer solves

$$\max_{Q} v(Q) \tag{6}$$

$$\text{s.t. } y \leq \sum_{j} P_j \times Q_j \tag{7}$$

where $v(Q)$ is the monetized utility from consuming the vector of output quantities Q and $\sum_j P_j \times Q_j$ denotes consumer expenditures on all goods $j \in J$.[24]

Equilibrium: Building on proposition 1 in Acemoglu and Shimer (1999), we define the search equilibrium as a tuple of wages, queue lengths, output prices, and output quantities that maximizes worker's expected utility, U_{ij}, subject to the following constraints. First, firms maximize expected profits, taking output prices as given, subject to institutional wage-setting constraints if any (equation (10)). Under free entry, firms expected profits are equated to zero (equation (9)). Second, output markets clear in each sector (equation (11)).

$$\max_{w^{\phi}, q^{\phi}} U_{ij} \tag{8}$$

$$s.t. \quad \eta(q_j^{\phi}) \times ((P_j - mc_j) \times \phi - w_j^{\phi}) - c_j(\phi) = 0 \tag{9}$$

$$w_j^{\phi} = \underline{w^{\phi}} \text{ if } j \text{ is constrained by wage floor} \tag{10}$$

$$Q_j^D(P_j) = Q_j^S(P_j) \tag{11}$$

We note that under the directed search, firms post efficient wages in equilibrium that depend on the elasticity of the matching function, Moen (1997); Acemoglu and Shimer (1999). In our setting, wages and vacancy posting are distorted by collective bargaining agreement, public UI benefits, and income taxes, see Appendix Section for details.

[24] Utility from and spending on the numeraire good cancel out.

4.3 Taking the Model to the Data

The goal of the model is to reconcile the post-reform employment and wage outcomes in long term care and estimated partial and general equilibrium reform effects to provide credible welfare estimates. Since all regions reached universal coverage in the post-reform period, we abstract from cross-sectional differences across regions and instead consider a single national labor and product market for our quantitative model. We hence index a market by $t \in 0, 1$ distinguishing between the pre- and the post-reform period. For tractability, our quantitative model does not distinguish between full- and part-time jobs. Instead we aggregate observed wage and employment profiles to full-time equivalent positions and only model full-time positions in the quantitative model.

4.3.1 Parametric Restrictions for Estimation

We divide long term care firms into two sectors, one comprising for-profit nursing homes, and one comprising public and not-for-profit nursing homes to capture differences in wage setting (e.g. collective bargaining) and non-wage marginal costs that can capture differences in firm objectives (Lakdawalla and Philipson, 1998). We lump all other sectors into one outside sector arriving at $J = 3$ productive sectors. Non-wage marginal costs, mc, vary by sector, and we assume that only not-for-profit and public nursing homes are bound to collective bargaining. Their wages are determined exogenously according to:[25]

$$\underline{w_t^{\phi}} = \beta_0 + \beta_1 \times \phi \times (P_t - mc) + \beta_2 \times \Big(\phi \times (P_t - mc)\Big)^2 \quad . \tag{12}$$

To reconcile the wage profiles in long term care, we model worker heterogeneity in the number of years of health care experience e_{hc}, which ranges from 0 to 18 in our setting, defining 19 different worker types. We model worker skills as linear function of experience, that may be different for employment in the outside sector. We flexibly allow for differential skills when workers have no experience in health care, who as we show below, are less likely to work in long term care.

$$\phi_j(e_{hc}) = \zeta_j^0 + \zeta_j^1 \times e_{hc} + \zeta_j^2 \times (e_{hc} > 0). \tag{13}$$

[25] For workers with no health care experience we assume $\underline{w^{\phi}} = \beta_0$.

Search and matching frictions help to reconcile the large changes in employment absent significant changes in wages. Following Buchholz (2022), we assume the following matching function:

$$\eta(q_{jt}^{\phi}) = \Big(1 - \exp(-\frac{q_{jt}^{\phi}}{\lambda_j^{\phi}})\Big), \tag{14}$$

allowing the parameter governing the matching efficiency λ to vary flexible by skill level and between for-profit and non-for-profit/public firms. Vacancy posting is costly, and we also allow the vacancy costs c_j^{ϕ} to vary flexibly by skill level and between for-profit and non-for-profit/public firms.

Turning to the worker's flow payoffs, we assume

$$
\begin{aligned}
u_{jt}^{c,\phi} &= (1-\tau) \times w_{jt}^{\phi} + \xi_j && (15)\\
u_{jt}^{u,\phi} &= b + \xi_u && (16)\\
u_{ot}^{u,\phi} &= \kappa_0 + \kappa_1 * (e_{hc} > 0) && (17)\\
\epsilon_{ijt} &= \gamma \times \Big(\vartheta_{ig} + (1-\rho) \times \tilde{\epsilon}_{ijt}\Big)\ . && (18)
\end{aligned}
$$

Going linearly, τ denotes the income tax rate and ξ_j captures compensating differentials for working in sector j. We normalize the compensating differential in the outside sector but allow different compensating differentials in long term care for workers with at least one year of experience. b denotes unemployment benefits and ξ_u captures monetized non-pecuniary utility from unemployment. Similarly, u_o captures monetized non-pecuniary utility from being out-of-the labor force which we allow to vary based on whether workers have any health experience. Lastly, and to allow for more elastic substitution between long term care sector, we model the worker's job search as a nested logit choice problem. We group the two long term care sectors into one nest g, keeping the outside sector and being out-of-the labor force as separate nests. ϑ_{ig} denotes a taste shock that worker i may have for nest g, whereas $\tilde{\epsilon}_{ij}$ is an identically and independently distributed extreme value shock for sector j. The nesting parameter $0 \leq \rho < 1$ governs the correlation of worker utility across long term care sectors, and γ denotes a scaling parameter.

Finally, we assume CES preferences for the representative consumer and that long term care firms (not-for-profit and for-profit firms) produce homogeneous SNF outputs. We thus have:

$$
\begin{aligned}
v(Q_t) &= \Big(\alpha_o \times J^o \times (\frac{Q_{o,t}}{J^o})^{\frac{\sigma-1}{\sigma}} + \alpha_{SNF} \times Q_{SNF,t}^{\frac{\sigma-1}{\sigma}}\Big)^{\frac{\sigma}{\sigma-1}} && (19)\\
s.t.\;\; \tilde{Q}_{SNF,t} &= Q_{SNF,t} + HZP_{SNF} && (20)\\
y_t + T_t &\leq \sum_{j\in\{o,SNF\}} \Big(P_{jt} - s_{jt}\Big) \times Q_{jt} && (21)
\end{aligned}
$$

We assume that the outside sector comprises J^o homogeneous subsectors. α denotes scaling parameters and σ denotes the elasticity of substitution. Q_{SNF} denotes the demand for long term care services paid out-of-pocket. HZP_{SNF} denotes the demand by patients insured via 'Hilfe-zur-Pflege', which we treat as exogenous. Together they comprise total demand $\tilde{Q}_{SNF}$, which equals the total output in equilibrium. s denotes the product subsidy that the government provides to the SNF sector. Finally, income y is given by the sum of workers' wage earnings, unemployment benefits, firm profits (zero in equilibrium), vacancy costs (earned by recruiters), and other marginal costs. T denotes a lump sum transfer from the government to the consumer, which denotes the difference between aggregate firm revenues to aggregate income. T comprises income taxes collected by the government minus government spending on product subsidies, unemployment benefits, and services for patients insured via 'Hilfe-zur-Pflege'.

4.3.2 Estimation

Our estimation strategy proceeds in two steps. In the first step, we estimate the parameters governing worker preferences, production, and the matching technology via generalized method of moments (GMM). In the second step, we impose the market clearing conditions in the product market to recover the preference parameters of the representative consumer.

Our approach to step 1 takes advantage of the closed form expressions for equilibrium wages, see Appendix for details, meaning that we only need to solve for the equilibrium queue lengths. We only observe output prices and quantities in long-term care for the post-reform period, hence we cannot condition on prices in estimation. Instead, we treat output prices as parameters in the first step and impose the market clearing conditions in the second step. Our goal is to find parameters and non-wage marginal costs, $\theta_1 = \{mc, \beta, c, \zeta, \lambda, \xi, \kappa, \gamma, \rho\}$, equilibrium queue lengths, q_{jt}, output prices, P_{jt}, and output quantities, Q_{jt} that minimize the distance between the observed and predicted moments. To do so, we consider three sets of moments. First, we construct the employment shares and mean wages by sector and years of health care experience in the post-reform period (year 1999). We also use supplemental data to calculate long-term care revenues and prices in the post-reform period. Second, use the estimated partial equilibrium reform effects on long-term care employment, wages, and experience, and ownership composition but also the estimated general equilibrium reform effects on unemployment and labor force participation. Third, we impose that equilibrium matching probabilities (job finding and vacancy filling probabilities) are bounded by 0 and 1.

In the second step, we infer the preference parameters of the representative consumer, $\theta_2 = \{\alpha, \sigma, HzP\}$, based on the observed share of individual covered by 'Hilfe-zur-Pflege', the observed long term care price subsidy, and by imposing the market clearing conditions in the product market, conditional estimated equilibrium prices.

4.4 Results

4.4.1 Parameter Estimates

The details of all parameter estimates are reported in Appendix Section C.3. Here, we highlight two findings that are of particular relevance for the welfare calculations. First, we estimate a demand elasticity of 1.51. This estimate exceeds landmark estimates from the RAND and Oregon experiment that center around 0.2. We note three important differences between ours and their settings that may contribute to the difference. First, we consider a large reform with general equilibrium effects that culminated in large demand and employment expansion (Finkelstein, 2007). Second, and related, we estimate substantial increases in income that accounts for substantial increase in demand. Third, the long term care demand decision interacts with the labor supply decision of informal caregivers.

Second, we estimate a high vacancy filling rate for low-skilled workers allowing long term care firms to expand employment without significantly raising wages and consequently output prices, see Figure C.1A. The increase in employment increases total earnings which in turn stimulates demand and employment in other sectors of the economy.

4.4.2 Model Fit

We present the model fit of monthly wages and employment shares by sector and years of health care experience in Figure 5. The solid lines denote the estimated full-time equivalent average wages and sector employment shares based on IAB data in 1999. The horizontal axis denotes the number of completed years of health care experience. In Figure 5A we present the log average wage among full-time employees. Our quantitative model closely tracks the observed long term care wage profiles, reconciling the higher and more compressed wage profile among not-for-profit providers.

In Figure 5B we present full-time equivalent employment shares by sector and health care experience. To do so, we assume that individuals either consider full-time or part-time employment and assign the latter a weight of only 50%. We infer the employment type among employed workers based on their concurrent work hours, and assign the employment type for unemployed individuals and individuals out-of-the labor force based on their most recent employment spell. Our quantitative model closely tracks the observed employment profiles, reconciling the higher share of more experienced workers in not-for-profit long term care providers. More details on model fit along with the estimated parameters are provided in the Appendix.

4.4.3 Welfare

Finally, we revisit the reform effects through the lenses of the quantitative model and their welfare implications. We estimate that increasing long term care insurance coverage from 32% to 100% creates an additional 170,000 long term care jobs to serve an additional 320,000 patients. While the increase is accompanied by a small increase in wages, we also find that more than half of the employment gains in the LTC sector stem from increased vacancy posting, see Appendix Figure C.2C for details. About 50,000 individuals are removed from unemployment and labor force participation increases by 280,000 individuals. Adding the decline in the number of the employed, overall employment increases by 370,000 individuals implying substantive employment gains in other sectors of the economy. Mechanically, and through the lenses of the model, the reform boosted incomes among new SNF hires who spend their incomes on all goods in the economy. This generates positive spillover effects to other sectors.

To understand the welfare implications, we start with a partial equilibrium analysis that abstracts away from aggregate income effects. We evaluated the estimated Marshallian demand curve at pre- and post-reform out-of-pocket prices holding pre-reform income, $y_0 - T_0$, fixed. Next, we construct the standard Harberger triangle considering a post-subsidy of s=1,200 per month: $DWL = \frac{1}{2} \times s \times (Q_{SNF,1}(P_1 - s_1, y_0 - T_0) - Q_{SNF,0}(P_0, y_0 - T_0))$. We estimate a deadweight loss of 314 million Euro per month, which corresponds to about 450 Euro per SNF patient and month.

We next consider the general equilibrium welfare implications. To avoid double counting of increases in income, we again evaluate consumer welfare at pre-reform income, and account for income gains in worker welfare through increases in wage earnings. Increased tax revenues are counted as a surplus to the public budget. We estimate a pooled consumer and worker welfare gain of 253 million Euros per month. Benchmarked to aggregate subsidy spending of 583 million, this would again suggest a deadweight loss of 330 million Euros. However, when considering reduced spending on unemployment benefits worth 36 million per month and increased tax revenues, worth 727 million per month, we estimate a net welfare gain of 427 million Euros per month, or 610 Euros per SNF patient and month.

4.5 Discussion

Our estimates suggest that welfare gains from internalizing fiscal externalities and wage distortions arising from collective bargaining may offset the traditional deadweight loss from moral hazard and that a product-market subsidy can be welfare enhancing on net in the second best sense. These offsetting effects are particularly large in our empirical setting as the employment gains are entirely driven by formerly unemployed workers. Interpreted through the lense of a labor market model with frictions, this suggests that queues for SNF jobs were relatively long, consistent with collective bargaining wage floors and a high unemployment rate at the time, and that idiosyncratic preference shocks ϵ_{ij} were sufficiently large such that workers were not willing to switch across labor markets following an increase in SNF vacancy postings.

We would expect the fiscal externalities and the gains in the labor market surplus to be sufficiently smaller in economic environments with shorter queues in the labor market that produces the subsidized good (Baicker and Chandra, 2012a). If workers define the shorter market side, employment expansion will largely involve the relocation workers across labor markets, muting the potential gains in the labor market. The wage wedge may even turn negative in the expanding labor market, resulting in a potentially negative net effect on labor market surplus. The fiscal externalities would then also be significantly smaller since a share of new SNF workers would already come from employment in the outside sector rather than unemployment, particularly so when demand for the outside good is high (Stevens et al., 2015).

5 Conclusion

Arrow (1963) hypothesized that demand-side moral hazard induced by health insurance can lead to supply-side expansions in health-care markets. Capturing this general equilibrium conjecture empirically has been challenging. In this paper, we combine detailed administrative labor market data with a rarely observed rollout of a universal insurance program—the introduction of national long-term care (LTC) insurance in Germany in 1995—to shed new light on how expansions of public health insurance programs can affect the allocation of workers across sectors.

We started by documenting a dramatic expansion of the LTC labor market. A 10 percentage point expansion in the share of insured elderly leads to 0.05 (7%) more inpatient LTC firms and four (13%) more workers per 1,000 elderly in Germany. This amounts to an arc-elasticity of healthcare utilization to the price of care of 0.8—significantly larger than the elasticity estimates found in the RAND or the Oregon experiments (Newhouse et al., 1993; Finkelstein et al., 2012), but consistent with the evidence in Finkelstein (2007). Wages did not increase on average, while the quality of newly hired workers declined. Old age mortality declined. We further estimate that insurance expansion reduced *overall* (un)employment, increased earnings, and labor force participation in local labor markets. To the best of our knowledge this provides some of the first evidence of factor substitution between sectors of the economy following a health insurance expansion.

As expected in the textbook case of moral hazard in health insurance, we found that the marginal value of public funds (MVPF) of a health insurance expansion is less than 1 in partial equilibrium. In contrast, taking the full effects on the labor market into account suggests that in the German labor markets of the mid 1990s, the increase in government LTC spending was offset by savings on paid unemployment benefits, and increases in income taxes and social insurance contributions stemming from increased employment. These fiscal externalities increase MVPF to be well above 1 under a range of assumptions. We unpack the microfoundations of these findings in a structural directed search model of the labor market, building on Acemoglu and Shimer (1999) and Wright et al. (2021). The model can account for unemployment and non-labor force participation as equilibrium outcomes and can reconcile the large employment gains absent meaningful increases in wages. The analysis of the underlying economic forces allows us to speak to the external validity of the estimates from the historical episode of insurance expansion in Germany. While the welfare effects of moral hazard are usually thought of as being driven by welfare losses from the inefficient consumption of care, this framework is incomplete if there are frictions in related (input) markets that leave socially efficient trades on the table. In our setting, moral hazard led to the creation of jobs that displaced workers from unemployment and pay significantly above reservation wages. More broadly, and in the spirit of the second-best, we emphasize that the surplus from the marginal dollar of public funds channeled through an insurance program needs to take into account not only the efficiency loss on the demand side, but also possible efficiency gains on the supply side when price rigidity, regulations, or market power distort healthcare production.

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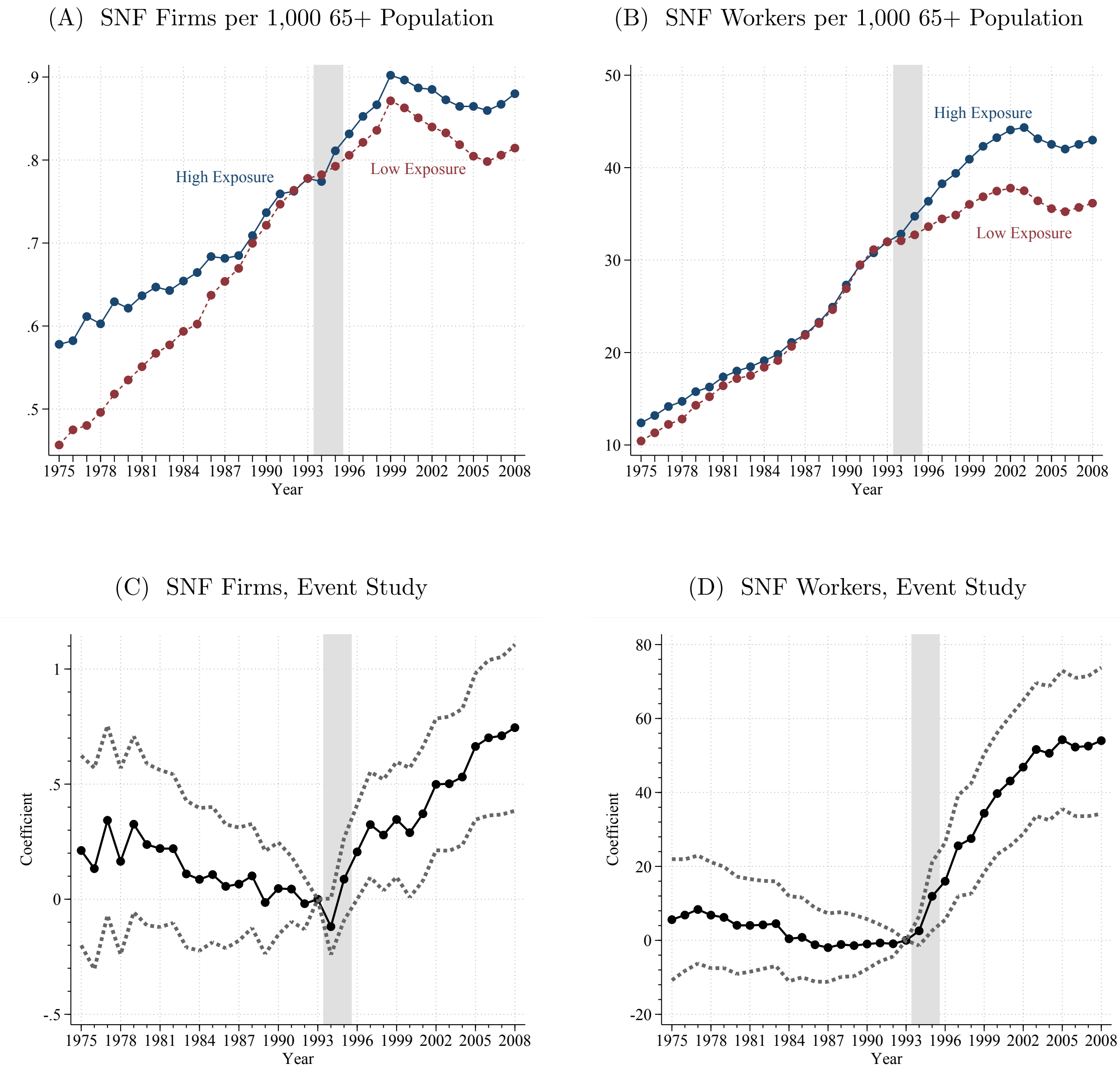
Figure 1: LTC Spending, SNF Workers, and Aging Over Time[a]

Notes: Panel A displays the evolution of the *total* public spending on long-term care benefits in Germany from 1990 to 2008, and separately by means-tested benefits (Hilfe zur Pflege) and universal long-term care insurance. Universal LTC insurance started covering outpatient services in 1995 and inpatient services in 1996. These transition years are shaded in grey. Panel B displays the counts of regular (see Appendix B.2 for definition) employees in inpatient long-term care (SNF) over time. Panel C shows the counts of regular SNF employees per 1,000 individuals age 65 and over. Panel D shows the number of individuals age 65 and over over time. Data underlying panels B and C have been restricted to West Germany excluding Bremen and Berlin, panel D is all of West Germany. Data source for panel B is Pflegestatistik 1999, available at www.statistischebibliothek.de; for panels B and C the analytic files constructed from the universe of Integrated Employment Biography data (Appendix B.1); for panel D - Human Mortality Database.

[a] LTC=Long-Term Care; SNF=Skilled Nursing Facility (inpatient LTC).

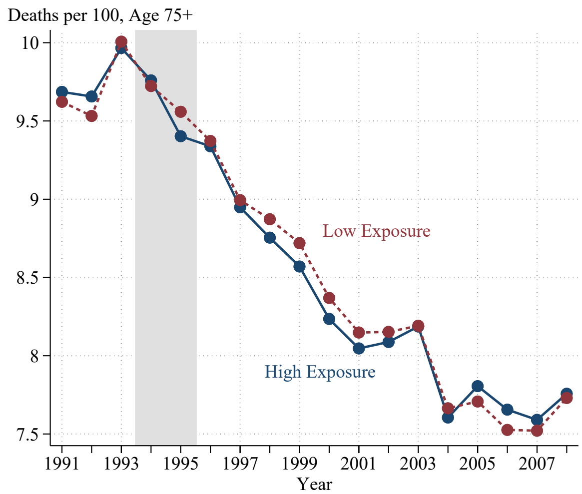
Figure 2: Introduction of Universal LTC Insurance and Supply of SNF Care



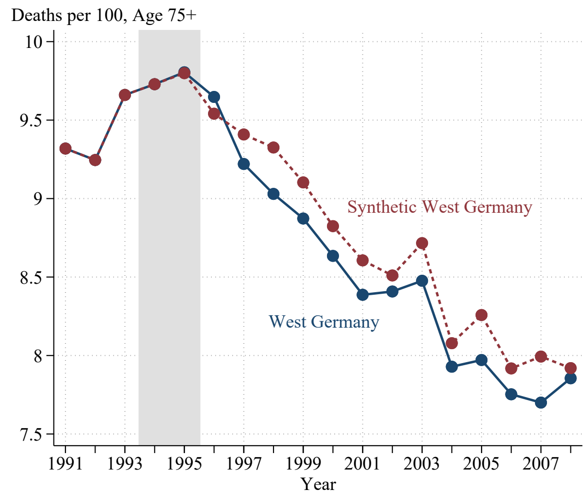
Notes: The top panels plot the average—across counties—number of SNF firms (panel A) and of SNF workers (panel B) per 1,000 individuals age 65+ and over, in 1975-2008. The county-level average is computed separately for the group of West German counties with (region-level) exposure variable E_r above and below the median across counties. All counties at the median are assigned to the below median group. Both time-series are normalized to the aggregate mean across all counties in 1993. Panels C and D display λ_t coefficients and 95% confidence intervals from estimating the specification in Equation 2 with the number of SNF firms (panel C) or workers (panel D) as an outcome. Coefficients λ_t were normalized to zero in the pre-reform year $t = 1993$. λ_t multiply the exposure variable E_r that takes values from 0 to 1 and measures the share of potential long-term care patients who did not have public assistance for LTC prior to the rollout of universal LTC insurance (mean of E_r=0.686). The geographic variation in E_r is visualized in Figure A.1. The mean of outcome variables in 1993 is reported in Table 2.

Figure 3: Old-Age Mortality

(A) Within-Germany Variation in Exposure

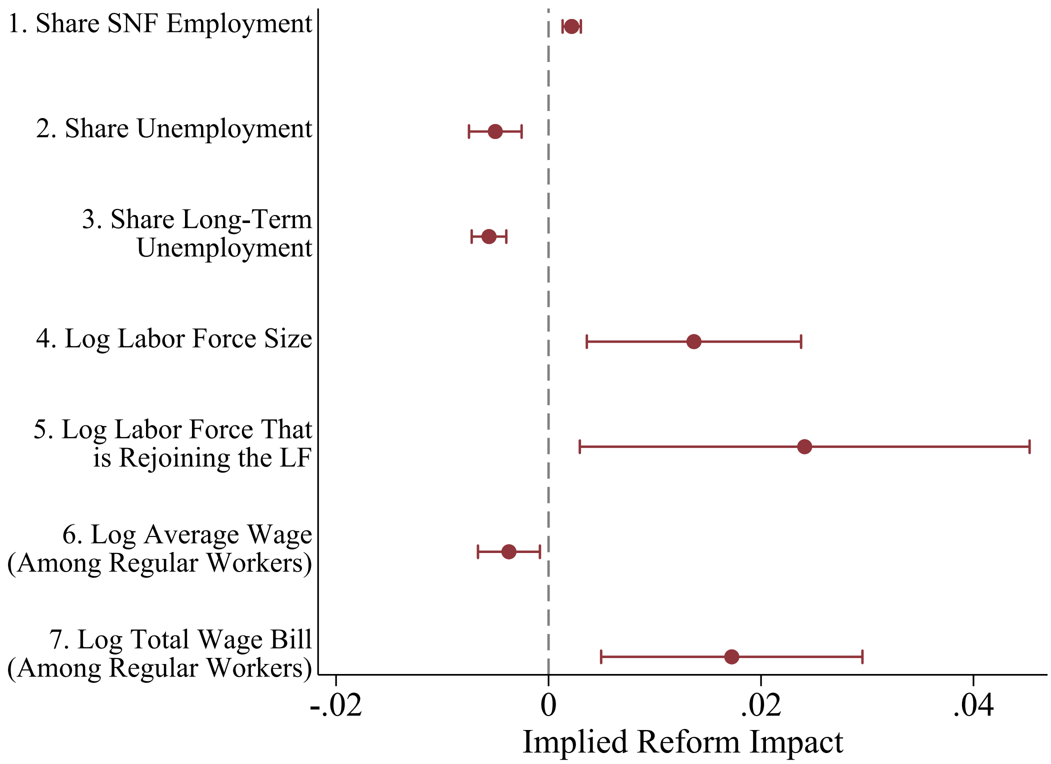


(B) Synthetic Control



Notes: Panel A displays the raw time series of average mortality rates in the age 75+ population, bifurcated into counties above and below median exposure to the LTC insurance expansion E_r. Panel B displays the time series of average mortality rates in the age 75+ population in the entirety of West Germany (including Bremen and Berlin) combined with a counterfactual time series of mortality. The counterfactual time series is constructed using the synthetic control method following Abadie et al. (2010). The treatment year in the synthetic control model is defined to be 1995. Corresponding event study estimates are reported in Table 6. Data source for panel A are statistical agencies of the West German federal states, excluding Bremen and Berlin. The data source for panel B is the Human Mortality Database.

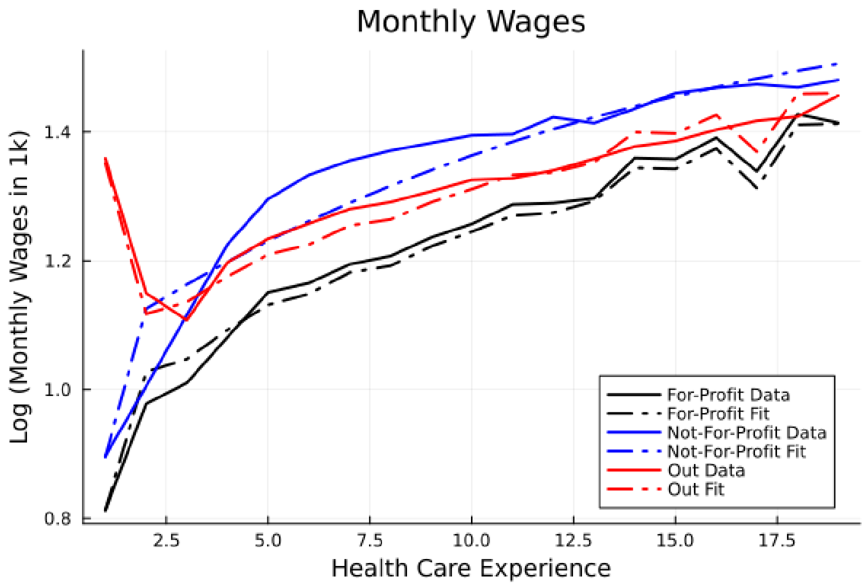
Figure 4: Introduction of Universal LTC Insurance and Effects in General Equilibrium



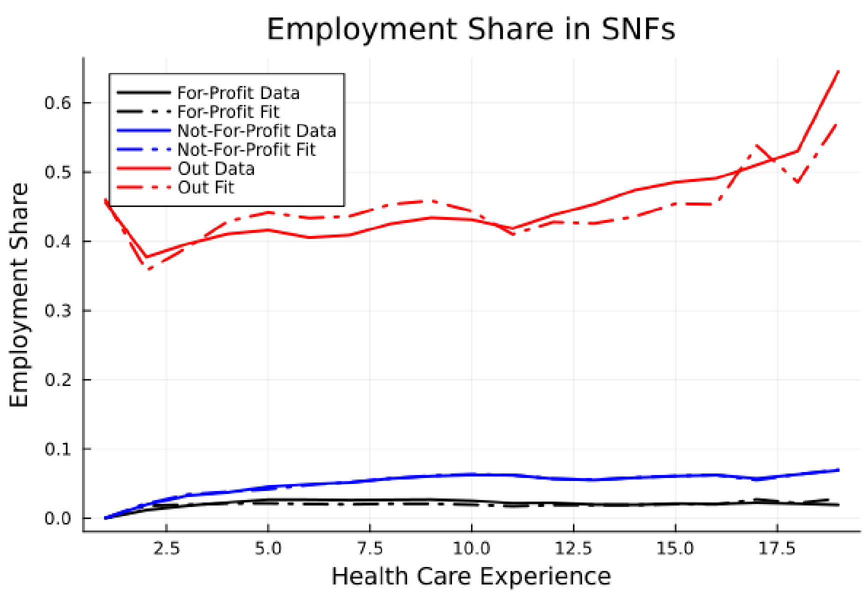
Notes: This panel displays treatment effects from seven separate synthetic difference-in-difference (SDID) specifications estimated at the county-year level, using the Labor Market Sample (LMS), for which summary statistics are displayed in Table 1. We use a binary measure of exposure to the reform, which defines regions with an above-median exposure variable E_r as treated units and counties at or below median exposure as control units. The geographic variation of E_r is visualized in Figure A.1. For more information on the SDID method refer to Arkhangelsky et al. (2021).

Figure 5: Employment and Wages by Sector and Experience

(A) Wages



(B) Employment



Notes: This figure presents employment and log wages estimates by sector and health care experience for the post-reform period (1999). The three sectors include for for-profit nursing homes, abbreviated by for-profit, not-for-profit nursing homes, abbreviated by 'not-for-profit', and all other sectors combined, abbreviated by 'Out'. The solid lines denote estimated full-time equivalent average wages and sector employment shares based on the LMS sample in 1999. Th dashed lines denote corresponding estimates from the quantitative model.

Table 1: Summary Statistics

	SNF Sample[a]		Labor Market Sample
	All Spells	SNF Spells	All Spells
	1975-08	1975-08	1980-04
	(1)	(2)	(3)
No. of Individual-Year Observations	24,369,708	9,834,229	48,102,814
Individuals			
No. of Unique Individuals	1,589,014	1,589,014	3,818,780
Demographics			
Mean Age	37.7	41.0	41.1
% Female	77.3	80.6	41.3
% German	94.1	93.8	92.0
% High School Education (Abitur)	10.0	9.3	10.5
% in Healthcare Sector	61.0	100.0	6.3
% Unemployed	9.6	0.0	6.7
Mean 15-Year Labor Market Experience (yrs)	8.4	8.8	10.2
Mean 15-Year SNF Experience (yrs)	3.6	6.0	0.0
% Part-Time[b]	27.3	32.7	13.0
Mean Daily Wage (EUR)[c]			
All Observations	77.5	82.9	105.4
SNF Observations	82.9	82.9	80.1
Establishments			
No. of Unique Establishments			
Any	953,497	18,675	1,532,794
SNF	18,675	18,675	13,089
Of SNF Employment Spells, % in			
% For-Profit SNF		26.9	29.8
% Church-Owned SNF		58.9	56.2
% Publicly-Owned SNF		14.2	13.9

[a] SNF=Skilled Nursing Facility (inpatient long-term care)
[b] Conditional on being employed.
[c] In constant 2020 Euros.

Notes: The table reports a selection of summary statistics for the two main analytic samples "SNF Sample" and "Labor Market Sample." Both are extracts from the universe of the German Integrated Employment Biographies data for years 1975-2008. "SNF Sample" is the annualized (taking the spell observed on June 30th of a given year) set of full labor market biographies for individuals who had at least one regular employment spell in a SNF over the course of 1975 to 2008. "Labor Market Sample" is a 10% draw from the annualized universe of labor market biographies, restricted to individuals over 25 who did not have a history of SNF employment five years before each index year. See Section 2 and Data Appendix B.1 for details.

Table 2: Event Study Results: Aggregate Response

	Outcome (per 1,000 Age 65+ Population)			
	Firms	Workers	Full-time	Part-time
	(1)	(2)	(3)	(4)
Pooled Coefficients				
δ_{97-08}	0.50	44.37	21.89	22.48
	(0.13)	(8.41)	(4.95)	(4.92)
Event Study Coefficients				
1-Year Effect, λ_{1997}	0.32	25.58	13.36	12.23
	(0.12)	(6.93)	(4.34)	(3.29)
3-Year Effect, λ_{1999}	0.35	34.37	19.59	14.78
	(0.13)	(8.14)	(4.91)	(4.18)
5-Year Effect, λ_{2001}	0.37	43.10	24.98	18.12
	(0.15)	(8.92)	(5.44)	(4.82)
10-Year Effect, λ_{2006}	0.70	52.28	21.70	30.58
	(0.17)	(9.50)	(5.64)	(6.20)
Implied Impact				
Using In-sample Variation[a]	0.05	4.03	1.99	2.04
Aggregate Impact, West Germany[b]	443.20	39,058	19,268	19,815
Using Out-of-sample Variation[c]	0.34	30.45	15.02	15.43
Aggregate Impact, West Germany[b]	3,308	295,192	145,627	149,565
Level of Outcome in 1993				
Mean	0.78	31.98	23.11	8.87
S.D.	0.33	13.58	10.11	4.52
Years	1975 - 2008	1975 - 2008	1975 - 2008	1975 - 2008
No. of Observations	10,635	10,948	10,948	10,819

[a] Multiplies δ_{97-08} by the 9 percentage point difference in mean exposure between counties with above and below the median level of exposure
[b] Scales estimates by 9,693 thousand people age 65+ in West Germany (excluding Berlin and Bremen) in 1993.
[c] Multiplies δ_{97-08} by the mean of the exposure variable across counties, $\text{E}_r = 0.686$.

Notes: The top panel displays the pooled coefficient δ_{97-08}, obtained from estimating the difference in differences specification in Equation 3 at the county-year level, using E_r, derived in Equation 1, as the measure of a county's exposure to the reform. Outcome variables include the number of SNF firms and the number of regular SNF workers, in total (column 2) and separately by part-time and full-time status (columns 3 and 4) per 1,000 individuals age 65 and older. See Appendix B.2 for the definition of a SNF and a "regular" worker in SNF. The second panel displays λ_t coefficients of the event study in Equation 2. Coefficients were normalized to zero in year $t = 1993$. The results are visualized in Figure 2. All specifications include county and year fixed effects. Standard errors clustered at the county-level are reported in parentheses.

Table 3: Event Study Results: SNF Wages

Outcome	Log Daily Full-Time SNF Wage			
	New Hires[a]		Incumbents[b]	
	(1)	(2)	(3)	(4)
Pooled Coefficients				
δ_{97-08}	-0.08	-0.02	-0.02	-0.01
	(0.08)	(0.01)	(0.05)	(0.04)
Event Study Results				
1-Year Effect, λ_{1997}	-0.05	-0.04	-0.00	0.01
	(0.10)	(0.01)	(0.03)	(0.03)
3-Year Effect, λ_{1999}	-0.06	-0.01	-0.02	0.01
	(0.11)	(0.01)	(0.05)	(0.04)
5-Year Effect, λ_{2001}	-0.09	-0.03	-0.03	-0.01
	(0.10)	(0.01)	(0.05)	(0.04)
8-Year Effect, λ_{2004}	-0.18	-0.02	-0.03	-0.03
	(0.16)	(0.02)	(0.06)	(0.05)
Controls[c]				
15-Year LM & SNF Experience		✓		
Individual Fixed Effects				✓
Wage Level in 1993 (EUR)				
Mean	80.14	80.14	93.23	93.23
S.D.	8.18	8.18	7.05	7.05
Years	1990 - 2004	1990 - 2004	1975 - 2008	1975 - 2008
No. of Observations	4,830	4,830	10,948	10,948

[a] "New Hires" are individuals who were not employed in a SNF in the year before each index year.
[b] SNF "Incumbents" are SNF employees who are not new hires.
[c] Control variables in column (2) are county-year-level means of residuals from individual-year-level regressions of log wage on 15-Year Rolling Labor Market and SNF Experience. Control variables in column (4) are county-year-level mean of residuals from a regression of log wage on worker fixed effects.

Notes: The top panel displays the pooled coefficient δ_{97-08}, obtained from estimating the difference in differences specification in Equation 3 at the county-year level, using E_r, derived in Equation 1, as the measure of a county's exposure to the reform. The outcome variable in all columns is log of daily wage in constant 2020 Euros. The second panel displays λ_t coefficients of the event study in Equation 2. Coefficients were normalized to zero in year $t = 1993$. All specifications include county and year fixed effects. Standard errors clustered at the county-level are reported in parentheses.

Table 4: Event Study Results: Characteristics of New SNF Hires

	Outcome (Among New SNF Hires[a])								
	Age	Share German	Share Female	Share Abitur	15-Year LM Exp[b]	15-Year SNF Exp[b]	In Health-care in t-1	Unemployed in t-1[c]	UE Duration During 3 Pre-Hire Years
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Pooled Coefficients									
δ_{97-08}	-1.06	0.05	0.04	-0.13	-3.54	-0.40	-0.07	0.12	0.54
	(1.56)	(0.04)	(0.05)	(0.04)	(0.71)	(0.38)	(0.07)	(0.05)	(0.11)
Event Study Results									
1-Year Effect, λ_{1997}	-0.97	0.03	0.12	-0.01	-2.48	-0.91	-0.09	0.26	0.73
	(1.92)	(0.04)	(0.06)	(0.05)	(1.00)	(0.47)	(0.11)	(0.07)	(0.16)
3-Year Effect, λ_{1999}	-1.13	0.06	0.04	-0.05	-2.42	-0.62	-0.01	0.09	0.58
	(1.65)	(0.04)	(0.06)	(0.05)	(0.87)	(0.47)	(0.08)	(0.07)	(0.14)
5-Year Effect, λ_{2001}	-2.60	0.05	0.05	-0.06	-4.00	-0.87	-0.03	0.05	0.43
	(1.80)	(0.04)	(0.06)	(0.04)	(0.90)	(0.43)	(0.08)	(0.06)	(0.14)
8-Year Effect, λ_{2004}	0.80	0.05	0.03	-0.14	-2.95	-0.20	-0.02	0.11	0.57
	(2.29)	(0.04)	(0.07)	(0.05)	(0.94)	(0.53)	(0.11)	(0.07)	(0.15)
Implied Impact									
Using In-sample Variation[d]	-0.10	0.00	0.00	-0.01	-0.32	-0.04	-0.01	0.01	0.04
Level of Outcome in 1993									
Mean	35.14	0.91	0.83	0.09	4.71	1.02	0.19	0.17	0.36
S.D.	1.60	0.08	0.06	0.05	0.82	0.38	0.07	0.07	0.16
Years	1976 - 2008	1976 - 2008	1976 - 2008	1976 - 2008	1990 - 2008	1990 - 2008	1976 - 2008	1976 - 2004	1978 - 2004
No. of Observations	10,620	10,620	10,620	10,620	6,118	6,118	10,620	9,332	8,690

[a] "New Hires" are individuals who were not employed in a SNF in the year before each index year.
[b] Outcomes in columns (5) and (6) are county-level means of the sum of years, measured throughout a rolling retrospective 15-year window, of labor market experience of new SNF hires, with index years restricted to 1990 through 2008.
[c] Restricted to years 1976 through 2004 due to the introduction of ALG-II unemployment benefits in 2005.
[d] Multiplies δ_{97-08} by the 9 percentage point difference in mean exposure between counties with above and below the median level of exposure

Notes: The top panel displays the pooled coefficient δ_{97-08}, obtained from estimating the difference in differences specification in Equation 3 at the county-year level, using E_r, derived in Equation 1, as the measure of a county's exposure to the reform. The outcome variables are demographic or labor market experience of new hires, as specified in column titles. The second panel displays λ_t coefficients of the event study in Equation 2. Coefficients were normalized to zero in year $t = 1993$. All specifications include county and year fixed effects. Standard errors clustered at the county-level are reported in parentheses.

Table 5: Synthetic Differences-in-Differences Results: GE Response

	Outcome						
	Share			Log			
	SNF Workers	Unemployed	Long-Term UE[a]	LF Participants	LF Re-Entrants	Regular Wages[b]	Total Wage Bill[b]
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Synthetic DiD Estimates							
ATT	0.0022	-0.0050	-0.0056	0.0137	0.0241	-0.0037	0.0172
	(0.0004)	(0.0013)	(0.0008)	(0.0051)	(0.0108)	(0.0015)	(0.0063)
Level of Outcome in 1993							
Mean	0.017	0.077	0.027	10.773	7.837	4.505	15.198
S.D.	0.008	0.021	0.012	0.719	0.695	0.055	0.758
Years	1985 – 2004	1985 – 2004	1985 – 2004	1985 – 2004	1985 – 2004	1985 – 2004	1985 – 2004
No. of Observations	6,440	6,440	6,440	6,440	6,440	6,440	6,440

[a] We define individuals who are observed as unemployed in at least two subsequent years as long-term unemployed.
[b] Daily wages in 2020 EUR.

Notes: This table displays results of synthetic difference-in-differences (SDID) specifications at the county-year level, using the analytic county-year-level Labor Market Sample (LMS), for which summary statistics are displayed in Table 1. We use a binary measure of exposure to the reform, which defines regions with an above-median exposure variable E_r as treated units and counties at or below median exposure as control units. The geographic variation of E_r is visualized in Figure A.1. For more information on the SDID method see Arkhangelsky et al. (2021).

Table 6: Event Study Results: Old-Age Mortality

	Outcome: Deaths per 100 in 75+ population	
	Variation in E_r (1)	Synthetic Control (2)
Pooled Coefficients		
δ_{97-08}	-0.11	-0.14
	(0.06)	[p-value=0.39]
Level of Outcome in 1993		
Mean[a]	10.01	9.66
S.D.	0.88	-
Years	1991 - 2008	1991 - 2008
No. of Observations	5,238	522.00

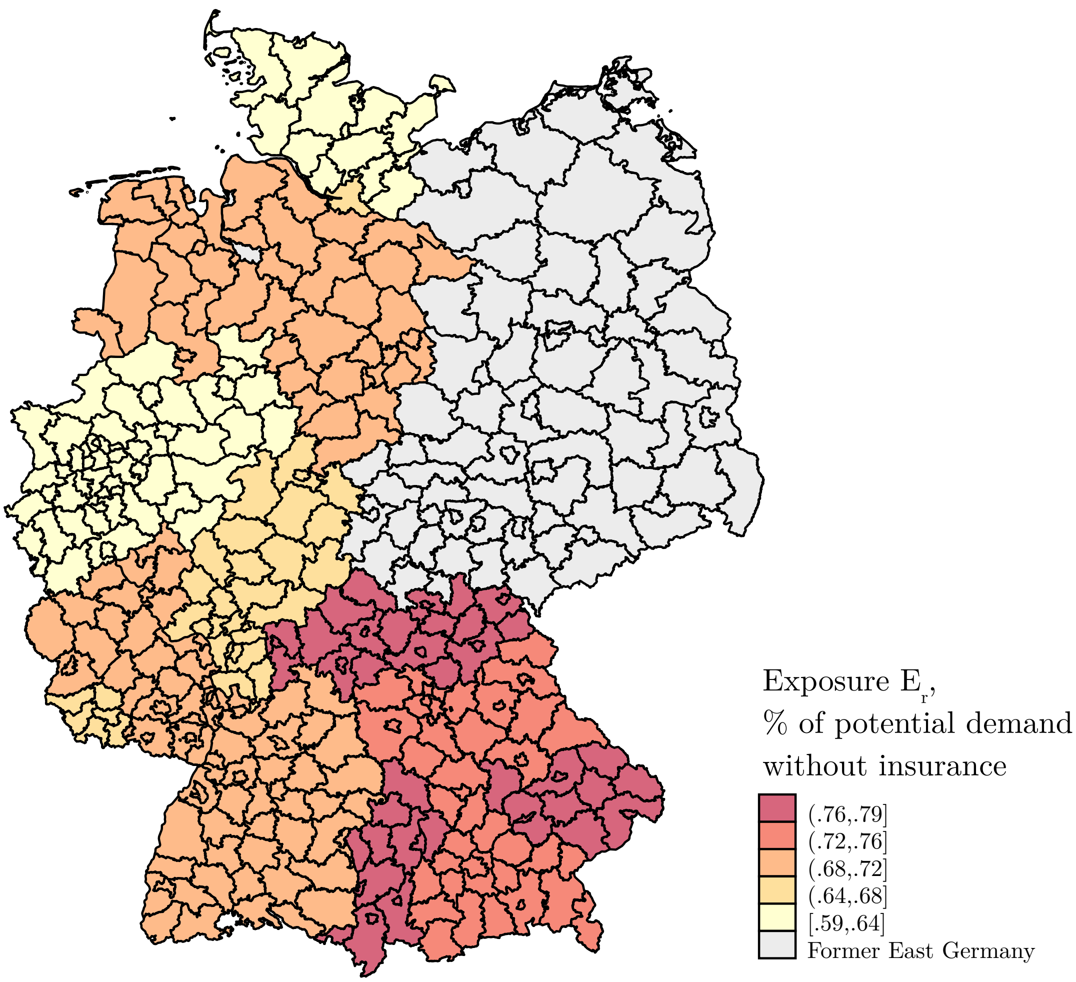
[a] The mean level of the outcome in (2) is for West Germany only, as obtained from the Human Mortality Database, and includes all counties

Notes: Column (1) displays the average treatment on the treated estimate form the synthetic difference in difference analogue (Arkhangelsky et al., 2021) of equation 2 and for older age mortality (population age 75+) as an outcome. Counties are considered treated if their measure of exposure to LTC insurance expansion E_r, derived in 1, was above median. Column (2) displays coefficients from the synthetic control procedure (Abadie et al., 2010). The pooled coefficient is defined as the average difference in the mortality rate, for the population age 75 and above, between West Germany and synthetic West Germany from $t = 1997$ to $t = 2008$. Bootstrap standard errors are reported in parentheses in (1), p-values, from permutation-based inference following Abadie et al. (2010), are reported in square brackets in (2). Data source in (1) are the statistical agencies of West German federal states, excluding Bremen and Berlin. Data source in (2) is the Human Mortality Database.

ONLINE APPENDIX

A Figures and tables

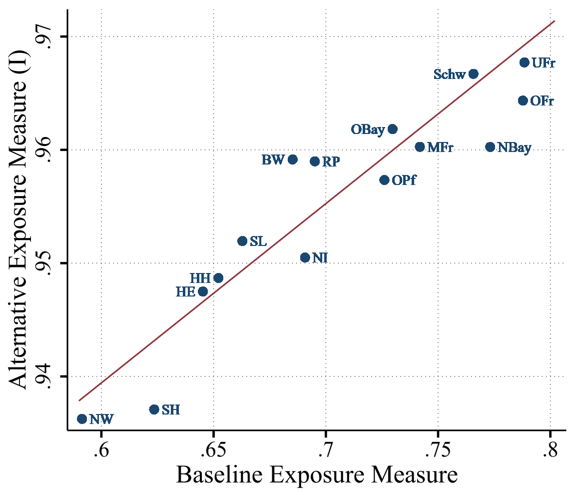
Figure A.1: Geographic Variation in Exposure



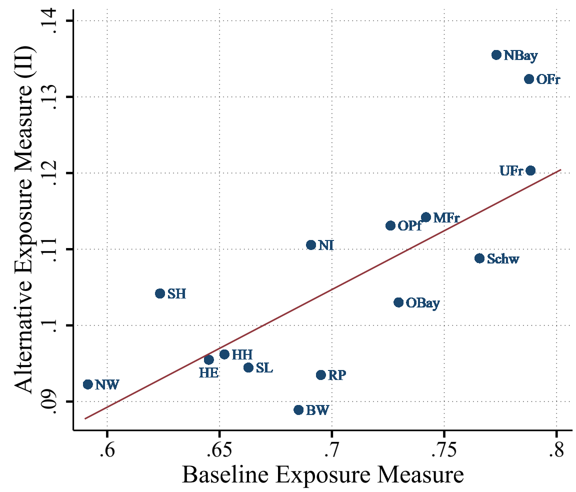
Notes: The share of individuals in need of long-term care, who did not have means-tested support for long-term care services in 1993, prior to 1995-1996 rollout of universal LTC insurance. The measure, denoted with E_r throughout the text is derived in Equation (1). We maps shows E_r for 322 West German counties in 15 exposure regions, excluding Berlin and Bremen.

Figure A.2: Relationship between Baseline and Alternative Measures of Exposure to the Reform

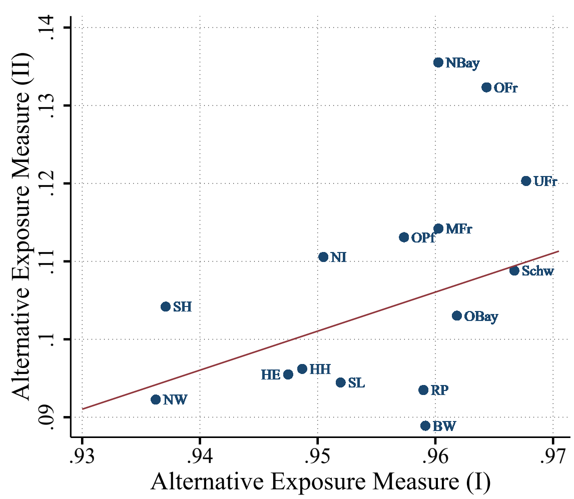
(A) Baseline and Alternative Measure (I)



(B) Baseline and Alternative Measure (II)



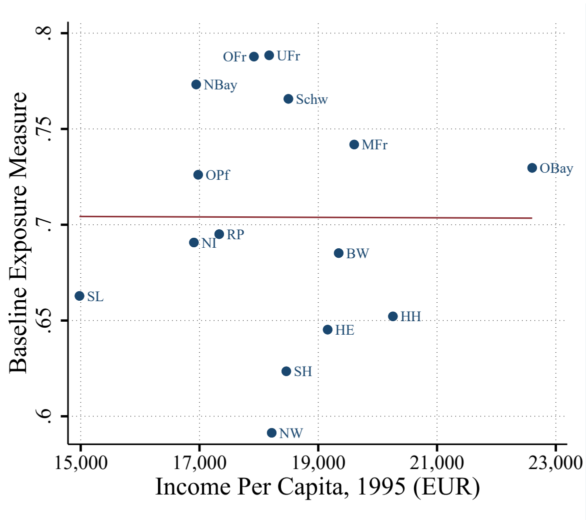
(C) Alternative Measures (I) and (II)



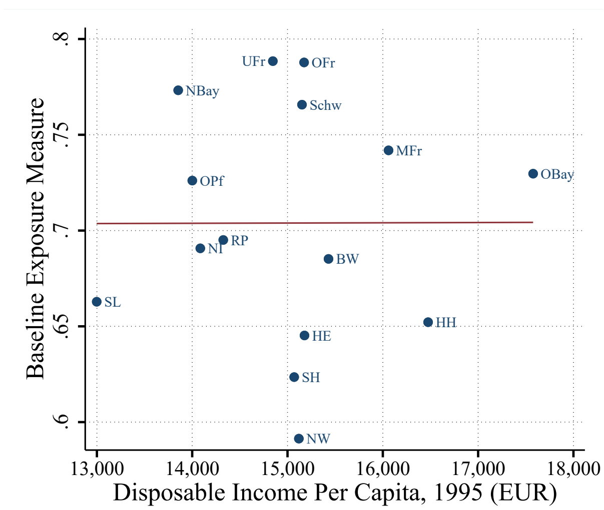
Notes: Displayed are scatter plots of measures of exposure to the LTC insurance reform. The "Baseline Exposure Measure", denoted with E_r throughout the text, is derived in Equation (1) and measures the share of individuals in need of long-term care, who did not have means-tested support for long-term care services in 1993, prior to the 1995-1996 rollout of universal LTC insurance (mean of $E_r = 0.686$). The "Alternative Exposure Measure I" is defined as $E_r = 100\% - \frac{HzP_{r,1993}}{65andOlderPopulation_{r,1993}}$ (mean of $E_r = 0.953$) and "Alternative Exposure Measure II" as $E_r = \frac{g_{r,1993,1999} * LTCClaims_{r,1999} - HzP_{r,1993}}{65andOlderPopulation_{r,1993}}$ (mean of $E_r = 0.103$). The slope coefficient of the regression line displayed in panel A.2A is 0.158 (standard error 0.004), the slope of the line in A.2B is 0.154 (s.e. 0.009), and the slope in A.2C is 0.501 (s.e. 0.065). All three measures vary across 15 different West German geographical regions. Figure A.1 displays the variation of the "Baseline Exposure Measure" across geographies.

Figure A.3: Geographic Variation in Baseline Exposure and Income

(A) Exposure to the Reform and Gross Income

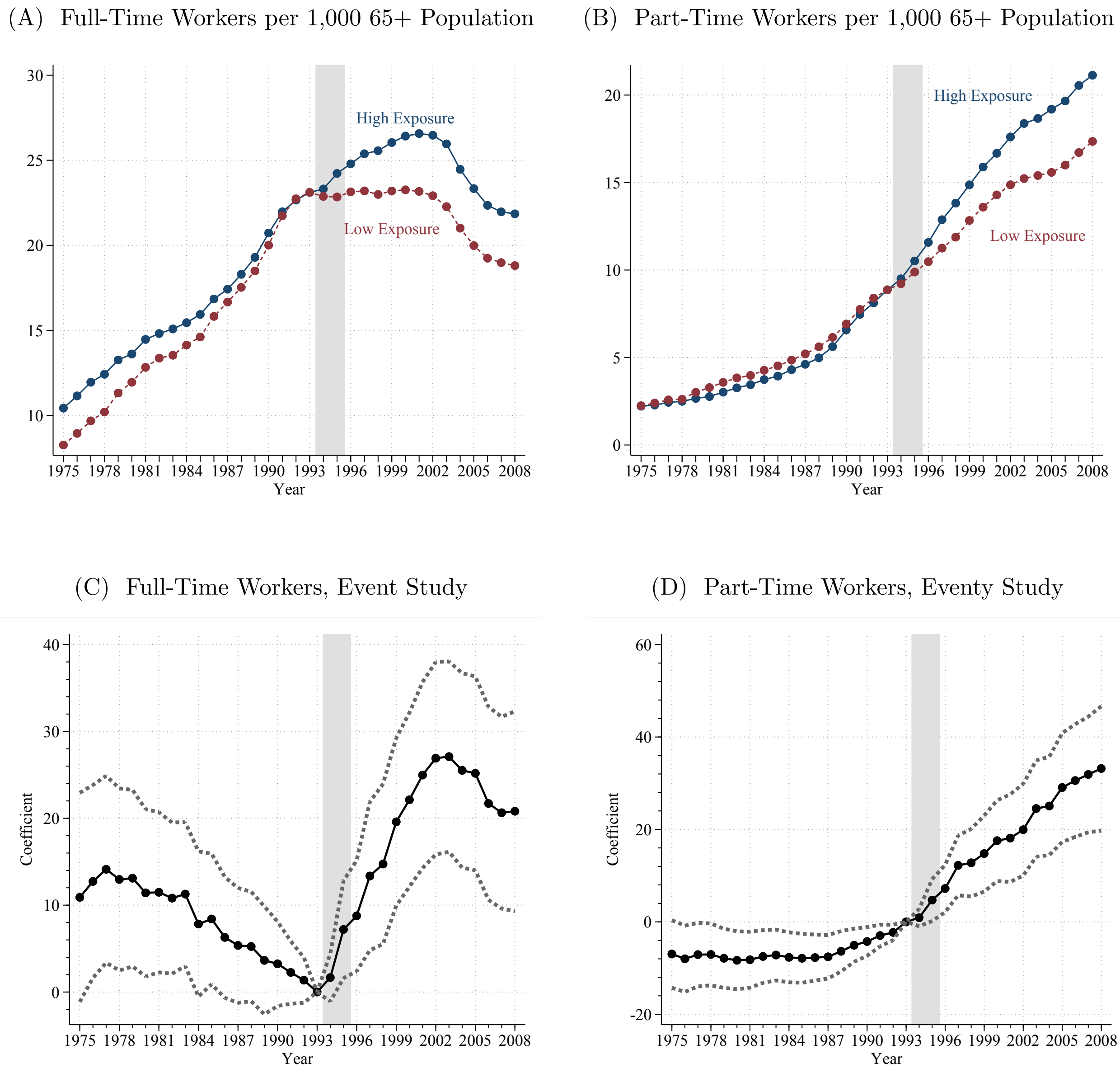


(B) Exposure to the Reform and Disposable Income



Notes: Displayed are scatter plots of the baseline measure of exposure to the LTC insurance reform and 1995 per capita income in EUR at the exposure-region-level. The baseline exposure measure, denoted with E_r throughout the text, is derived in Equation (1) and measures the share of individuals in need of long-term care, who did not have means-tested support for long-term care services in 1993, prior to the 1995-1996 rollout of universal LTC insurance (mean of $E_r = 0.686$). This measure varies across 15 different West German geographical regions, visualized in Figure A.1. The correlation of the baseline exposure measure with income per capita, visualized in A.3A, is statistically insignificant at $p = 0.991$, and the correlation with disposable income, displayed in in A.3B, is statistically insignificant at $p = 0.993$. Income data have been obtained from (Statistische Ämter des Bundes und der Länder, 2021a).

Figure A.4: Universal LTC Insurance and Supply of SNF Care, by Type of Employment

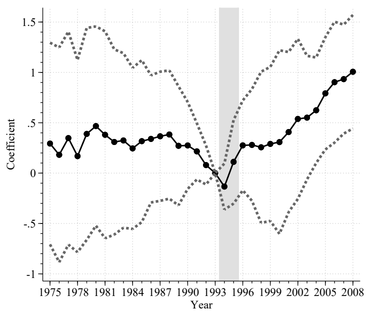


Notes: The top panels plot the average—across counties—number of SNF full-time (panel A) and part-time (panel B) workers per 1,000 individuals age 65+ and over, in 1975-2008. The county-level average is computed separately for the group of West German counties with (region-level) exposure variable E_r above and below the median across counties. All counties at the median are assigned to the below median group. Both time-series are normalized to the aggregate mean across all counties in 1993. Panels C and D display λ_t coefficients and 95% confidence intervals from estimating the specification in Equation 2 with the number of full-time (panel C) or part-time (panel D) workers as an outcome. Coefficients λ_t were normalized to zero in the pre-reform year t = 1993. λ_t multiply the exposure variable E_r that takes values from 0 to 1 and measures the share of potential long-term care patients who did not have public assistance for LTC prior to the rollout of universal LTC insurance (mean of E_r=0.686). The geographic variation in E_r is visualized in Figure A.1. The mean of outcome variables in 1993 is reported in Table 2.

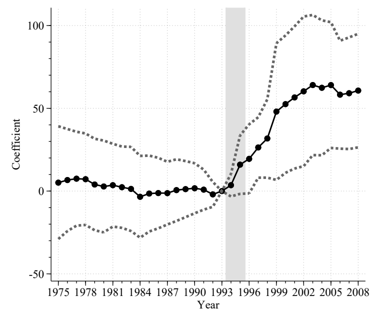
Figure A.5: Introduction of Universal LTC Insurance and Supply of SNF Care: Alternative Specifications

I. Baseline Specification at Region r Level, at which Exposure E_r varies

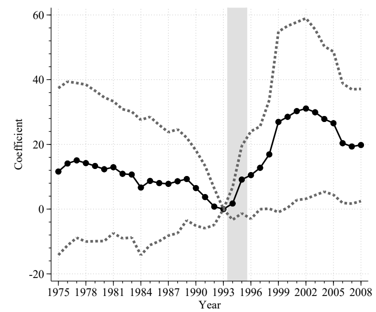
(A) SNF Firms



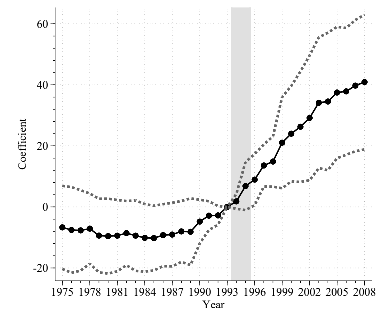
(B) SNF Workers



(C) SNF Full-Time Workers

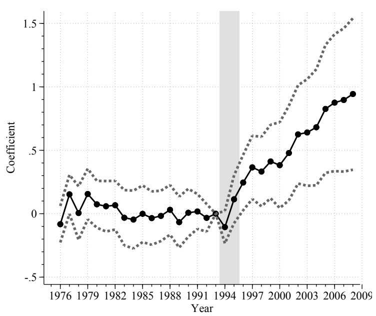


(D) SNF Part-Time Workers

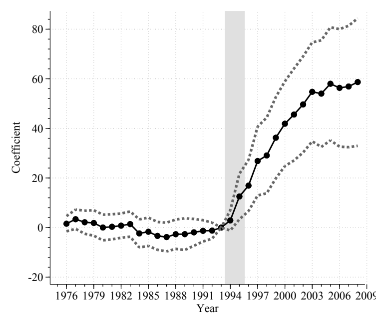


II. County-Specific Time Trend

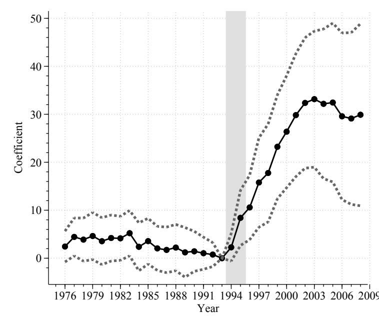
(E) SNF Firms



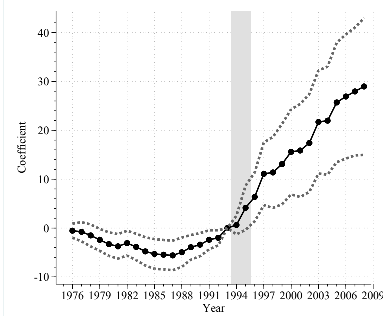
(F) SNF Workers



(G) SNF Full-Time Workers



(H) SNF Part-Time Workers

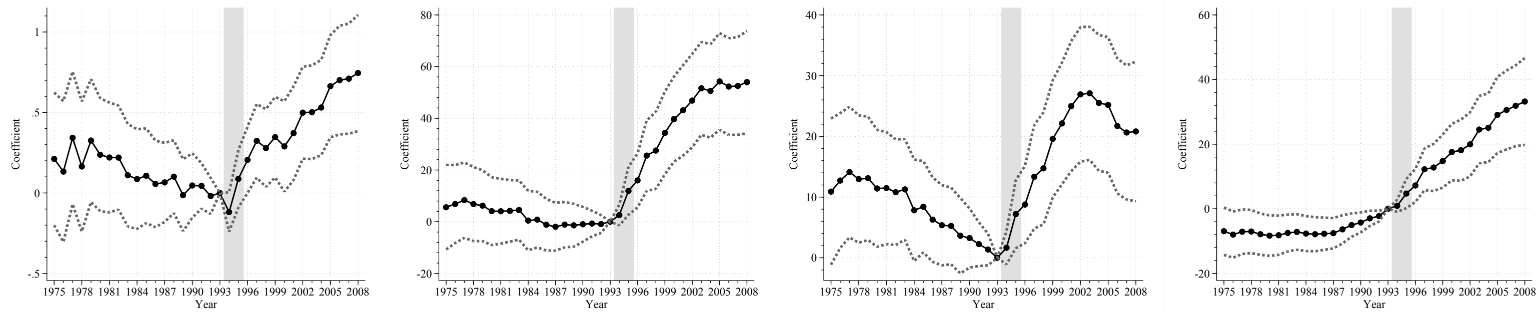


Notes: All panels display λ_t coefficients and 95% confidence intervals from estimating variations—as specified above the panels—of the specification in Equation 2 with the number of SNF firms, all workers, full-time workers, and part-time workers as outcomes, as specified in the panel title. Coefficients λ_t were normalized to zero in the pre-reform year $t = 1993$. λ_t multiply the exposure variable E_r that takes values from 0 to 1 and measures the share of potential long-term care patients who did not have public assistance for LTC prior to the rollout of universal LTC insurance (mean of E_r=0.686). The geographic variation in E_r is visualized in Figure A.1. The mean of outcome variables in 1993 is reported in Table A1.

Figure A.6: Introduction of Universal LTC Insurance and Supply of SNF Care: Alternative Specifications

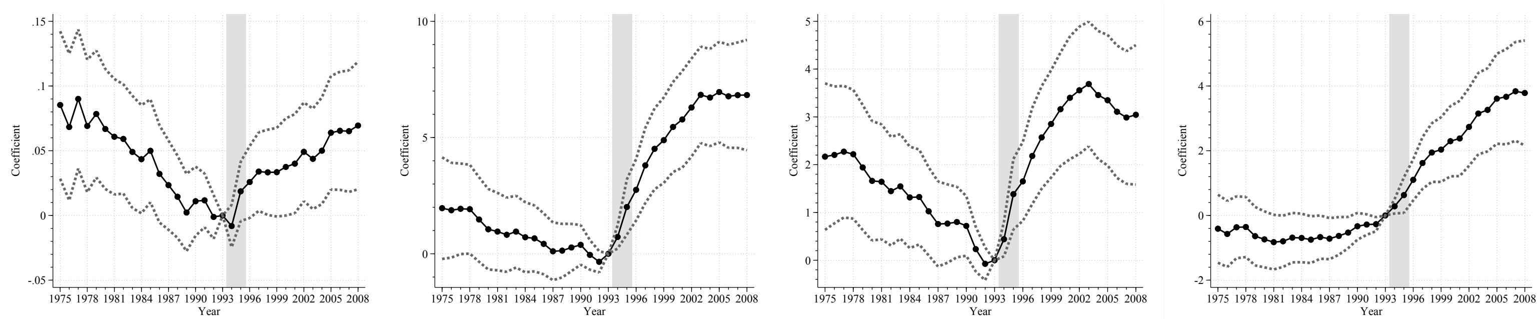
III. S.E. Clustered at Region r Level, at which Exposure E_r varies

(A) SNF Firms (B) SNF Workers (C) SNF Full-Time Workers (D) SNF Part-Time Workers



IV. Binary Exposure Measure

(E) SNF Firms (F) SNF Workers (G) SNF Full-Time Workers (H) SNF Part-Time Workers

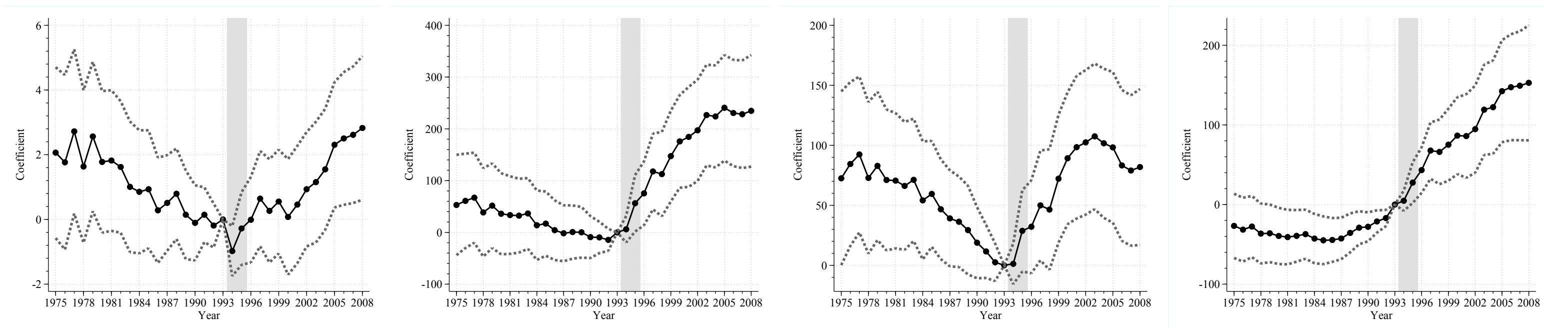


Notes: All panels display λ_t coefficients and 95% confidence intervals from estimating the specification in Equation 2, with the number of SNF firms, all workers, full-time workers, and part-time workers as outcomes, as specified in the panel title. Coefficients λ_t were normalized to zero in the pre-reform year $t = 1993$. The geographic variation in E_r is visualized in Figure A.1. The bottom panel uses an alternative measures of exposure to the reform, which takes on the value of one for counties above the median of the exposure measure derived in Equation 1, and zero otherwise (mean of 0.410). The mean of outcome variables in 1993 is reported in Tables A1 and A2.

Figure A.7: Introduction of Universal LTC Insurance and Supply of SNF Care: Alternative Specifications

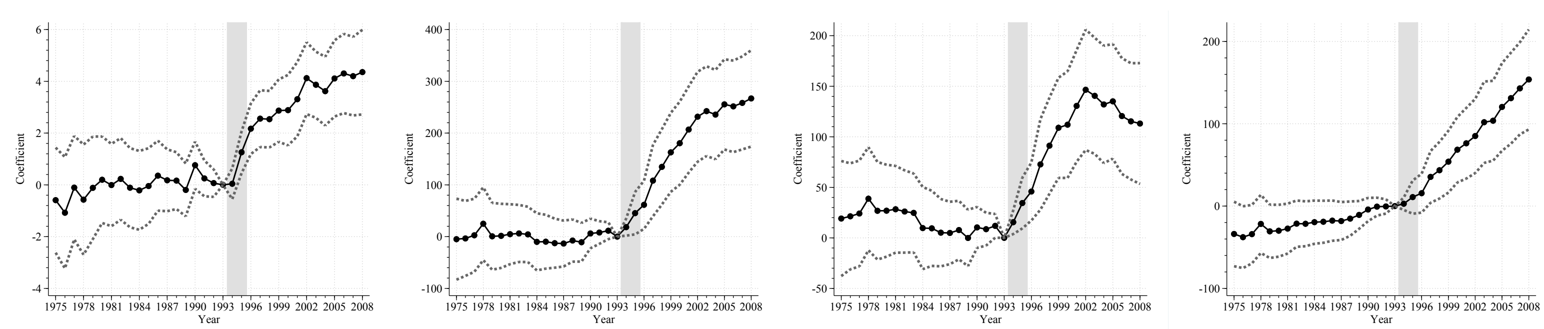
V. Alternative Exposure Measure (I): $E_r = 100\% - \frac{HzP_{r,1993}}{65andOlderPopulation_{r,1993}}$.

(A) SNF Firms (B) SNF Workers (C) SNF Full-Time Workers (D) SNF Part-Time Workers



VI. Alternative Exposure Measure (II): $E_r = \frac{g_{r,1993,1999} * LTCClaims_{r,1999} - HzP_{r,1993}}{65andOlderPopulation_{r,1993}}$

(E) SNF Firms (F) SNF Workers (G) SNF Full-Time Workers (H) SNF Part-Time Workers

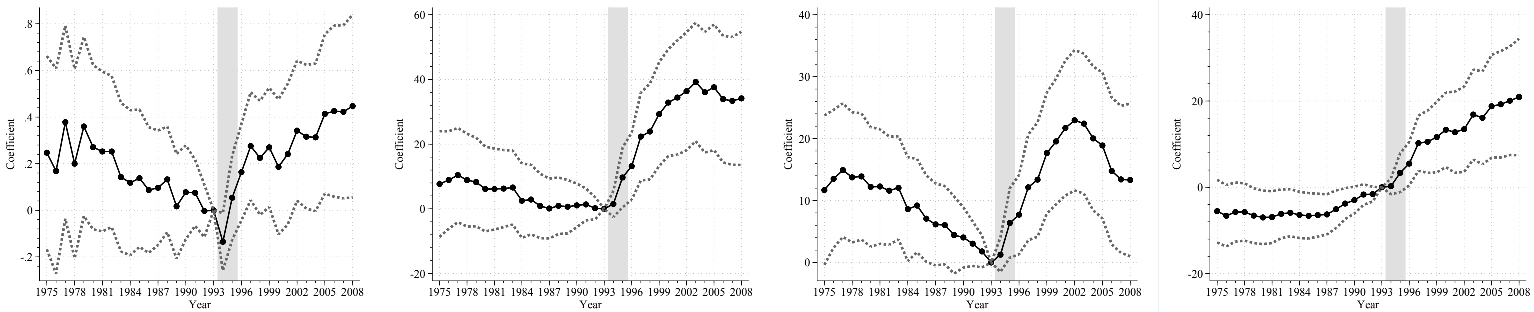


Notes: All panels display λ_t coefficients and 95% confidence intervals from estimating the specification in Equation 2 with alternative measures of exposure to the reform, with the number of SNF firms, all workers, full-time workers, and part-time workers as outcomes, as specified in the panel title. Coefficients λ_t were normalized to zero in the pre-reform year $t = 1993$. The alternative exposure measure (I) is defined as $E_r = 100\% - \frac{HzP_{r,1993}}{65andOlderPopulation_{r,1993}}$ (mean of $E_r = 0.953$). The alternative exposure measure (II) is defined as $E_r = \frac{g_{r,1993,1999} * LTCClaims_{r,1999} - HzP_{r,1993}}{65andOlderPopulation_{r,1993}}$ (mean of $E_r = 0.103$). The mean of outcome variables in 1993 is reported in Table A2.

Figure A.8: Introduction of Universal LTC Insurance and Supply of SNF Care: Alternative Specifications

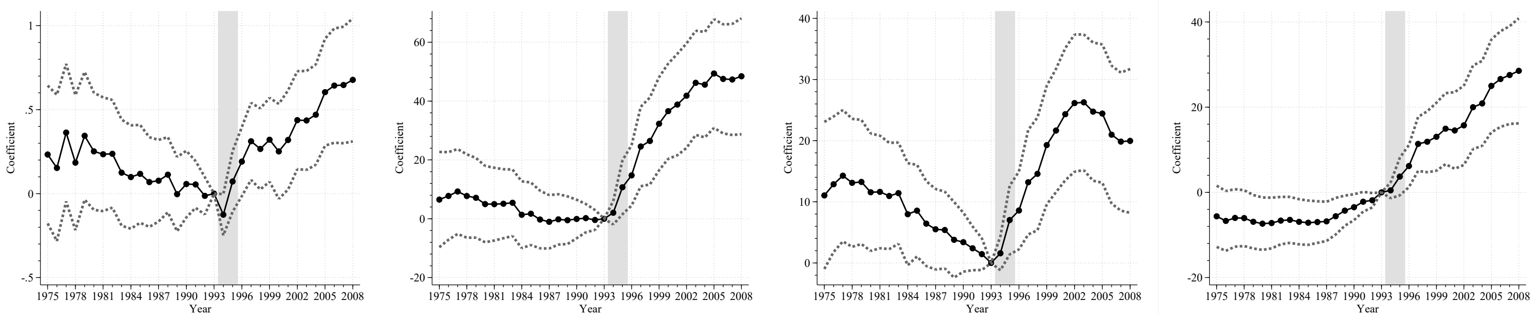
VII. Controlling for the County-Year-Level Count of Elderly

(A) SNF Firms (B) SNF Workers (C) SNF Full-Time Workers (D) SNF Part-Time Workers



VIII. Controlling for the County-Year-Level Share of Elderly

(E) SNF Firms (F) SNF Workers (G) SNF Full-Time Workers (H) SNF Part-Time Workers



Notes: All panels display λ_t coefficients and 95% confidence intervals from estimating variations—as specified above the panels—of the specification in Equation 2 with the number of SNF firms, all workers, full-time workers, and part-time workers as outcomes, as specified in the panel title. Coefficients λ_t were normalized to zero in the pre-reform year $t = 1993$. λ_t multiply the exposure variable E_r that takes values from 0 to 1 and measures the share of potential long-term care patients who did not have public assistance for LTC prior to the rollout of universal LTC insurance (mean of E_r=0.686). The geographic variation in E_r is visualized in Figure A.1. The mean of outcome variables in 1993 is reported in Table A3.

Table A1: Event Study Results: Aggregate Response, Alternative Specifications

	Outcome (per 1,000 Age 65+ Population)											
	At Exposure Region Level				County-Specific Time Trend				S.E. Clustered at Region r level			
	Firms	Workers	Full-time	Part-time	Firms	Workers	Full-time	Part-time	Firms	Workers	Full-time	Part-time
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Pooled Coefficients												
δ_{97-08}	0.57	53.68	24.20	29.48	0.42	39.98	22.71	17.12	0.50	44.37	21.89	22.48
	(0.26)	(15.08)	(9.08)	(7.55)	(0.16)	(8.51)	(5.84)	(4.11)	(0.17)	(12.39)	(6.19)	(7.23)
Event Study Coefficients												
1-Year Effect, λ_{1997}	0.28	26.36	12.76	13.59	0.37	26.83	15.78	11.10	0.32	25.58	13.36	12.23
	(0.26)	(8.51)	(5.96)	(3.22)	(0.13)	(7.05)	(4.73)	(3.26)	(0.15)	(7.82)	(5.46)	(2.80)
3-Year Effect, λ_{1999}	0.29	48.02	26.96	21.06	0.41	36.23	23.22	13.09	0.35	34.37	19.59	14.78
	(0.36)	(19.25)	(13.01)	(6.97)	(0.15)	(8.34)	(5.50)	(4.18)	(0.18)	(10.37)	(6.71)	(4.62)
5-Year Effect, λ_{2001}	0.41	56.58	30.29	26.29	0.48	45.59	29.82	15.87	0.37	43.10	24.98	18.12
	(0.37)	(20.03)	(12.82)	(8.44)	(0.19)	(9.42)	(6.51)	(4.84)	(0.23)	(12.22)	(6.95)	(6.37)
10-Year Effect, λ_{2006}	0.90	58.23	20.36	37.87	0.88	56.32	29.58	26.92	0.70	52.28	21.70	30.58
	(0.28)	(15.20)	(8.61)	(9.68)	(0.27)	(12.04)	(8.83)	(6.46)	(0.24)	(15.15)	(6.37)	(10.32)
Implied Impact												
Using In-sample Variation[a]	0.06	5.54	2.50	3.04	0.04	3.63	2.06	1.56	0.05	4.03	1.99	2.04
Aggregate Impact, West Germany[b]	574.49	53,701	24,208	29,493	373.15	35,193	19,995	15,090	443.20	39,058	19,268	19,815
Using Out-of-sample Variation[c]	0.40	37.78	17.03	20.75	0.29	27.44	15.59	11.75	0.34	30.45	15.02	15.43
Aggregate Impact, West Germany[b]	3,918	366,270	165,114	201,156	2,785	265,985	151,119	113,902	3,308	295,192	145,627	149,565
Level of Outcome in 1993												
Mean	0.73	31.44	22.84	8.60	0.78	31.98	23.11	8.87	0.78	31.98	23.11	8.87
S.D.	0.17	5.54	4.01	2.00	0.33	13.58	10.11	4.52	0.33	13.58	10.11	4.52
Years	1975 - 2008	1975 - 2008	1975 - 2008	1975 - 2008	1976 - 2008	1976 - 2008	1976 - 2008	1976 - 2008	1975 - 2008	1975 - 2008	1975 - 2008	1975 - 2008
No. of Observations	510.00	510.00	510.00	510.00	10,635	10,948	10,948	10,819	10,635	10,948	10,948	10,819

[a] Multiplies δ_{97-08} by the 9 percentage point difference in mean exposure between counties with above and below the median level of exposure.
[b] Scales estimates by 9,693 thousand people age 65+ in West Germany (excluding Berlin and Bremen) in 1993.
[c] Multiplies δ_{97-08} by the mean of the exposure variable across counties, $\mathrm{E}_r = 0.686$.

Notes: The top panel displays the pooled coefficient δ_{97-08}, obtained from estimating the difference in differences specification in Equation 3 at the county-year level, using E_r, derived in Equation 1, as the measure of a county's exposure to the reform. Outcome variables include the number of SNF firms and the number of regular SNF workers, in total, part-time and full-time, per 1,000 individuals age 65 and older. See Appendix B.2 for the definition of a SNF and a "regular" worker in SNF. The second panel displays λ_t coefficients of the event study in Equation 2. Coefficients were normalized to zero in year $t = 1993$. All specifications include county and year fixed effects. Columns (1)-(4) also include county-specific time trend. Standard errors clustered at the county-level (columns 1-4) and at the region r level (columns 5-8) are included in parentheses.

Table A2: Event Study Results: Aggregate Response, Alternative Specifications

	Outcome (per 1,000 Age 65+ Population)											
	Binary Exposure Measure[a]				Alternative Exposure Measure (I)[b]				Alternative Exposure Measure(II)[c]			
	Firms	Workers	Full-time	Part-time	Firms	Workers	Full-time	Part-time	Firms	Workers	Full-time	Part-time
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Pooled Coefficients												
δ_{97-08}	0.05	5.97	3.11	2.86	1.32	193.29	84.17	109.12	3.57	211.26	118.20	93.06
	(0.02)	(0.97)	(0.59)	(0.59)	(0.84)	(45.57)	(27.39)	(26.91)	(0.58)	(40.23)	(25.87)	(22.20)
Event Study Coefficients												
1-Year Effect, λ_{1997}	0.03	3.80	2.18	1.62	0.64	117.72	49.93	67.79	2.56	108.15	72.69	35.46
	(0.02)	(0.82)	(0.51)	(0.41)	(0.75)	(37.19)	(23.26)	(17.98)	(0.56)	(35.02)	(22.75)	(15.96)
3-Year Effect, λ_{1999}	0.03	4.89	2.85	2.04	0.55	147.29	72.16	75.13	2.87	162.85	108.93	53.92
	(0.02)	(0.93)	(0.57)	(0.51)	(0.82)	(44.54)	(27.06)	(22.99)	(0.61)	(38.75)	(25.19)	(19.08)
5-Year Effect, λ_{2001}	0.04	5.78	3.40	2.38	0.46	184.39	98.43	85.97	3.31	206.84	130.57	76.27
	(0.02)	(1.06)	(0.65)	(0.59)	(0.92)	(49.05)	(30.21)	(26.68)	(0.73)	(42.31)	(28.06)	(21.81)
10-Year Effect, λ_{2006}	0.07	6.77	3.11	3.67	2.50	230.58	83.23	147.36	4.30	251.61	120.53	131.09
	(0.02)	(1.13)	(0.70)	(0.75)	(1.04)	(52.16)	(31.97)	(33.80)	(0.78)	(44.93)	(29.10)	(28.10)
Implied Impact												
Using In-sample Variation[a]	0.05	5.97	3.11	2.86	0.02	2.87	1.25	1.63	0.08	4.49	2.51	1.97
Aggregate Impact, West Germany[b]	472.69	57,896	30,173	27,723	194.19	27,846	12,126	15,802	733.61	43,568	24,377	19,101
Level of Outcome in 1993												
Mean	0.78	31.98	23.11	8.87	0.78	31.98	23.11	8.87	0.78	31.98	23.11	8.87
S.D.	0.33	13.58	10.11	4.52	0.33	13.58	10.11	4.52	0.33	13.58	10.11	4.52
Years	1975 - 2008	1975 - 2008	1975 - 2008	1975 - 2008	1975 - 2008	1975 - 2008	1975 - 2008	1975 - 2008	1975 - 2008	1975 - 2008	1975 - 2008	1975 - 2008
No. of Observations	10,635	10,948	10,948	10,819	10,635	10,948	10,948	10,819	10,635	10,948	10,948	10,819

[a] The binary exposure measure takes on the value of one for counties above the median of the exposure measure E_r derived in Equation 1, and zero otherwise.
[b] The alternative exposure measure (I) is defined as $E_r = 100\% - \frac{HzP_{r,1993}}{65andOlderPopulation_{r,1993}}$.
[c] The alternative exposure measure (II) is defined as $E_r = \frac{g_{r,1993,1999} * LTCClaims_{r,1999} - HzP_{r,1993}}{65andOlderPopulation_{r,1993}}$.
[d] The "In-sample impact" of the reform on the per capita outcome of interest uses variation in exposure across regions. We multiply δ_{97-08} with the difference in mean exposure (1 for the "Binary Exposure Measure", 0.015 for the "Alternative Exposure Measure (I)", and 0.021 for the "Alternative Exposure Measure (II)") between counties with above median exposure and those with below median exposure.
[e] Scales estimates by 9,693 thousand people age 65+ in West Germany (excluding Berlin and Bremen) in 1993.

Notes: The top panel displays the pooled coefficient δ_{97-08}, obtained from estimating the difference in differences specification in Equation 3 at the county-year level, using either a binary version of E_r, derived in Equation 1, as the measure of a county's exposure to the reform (columns 1-4), or a simplified version of E_r computed using age 65+ population as the measure of potential demand for LTC rather than the number of LTC insurance claimants (columns 5-8), or an alternative exposure measure exploiting variation in the difference between the count of LTC insurance beneficiaries and beneficiaries from the means tested HzP program (columns 9-12). Outcome variables include the number of SNF firms and the number of regular SNF workers, in total, part-time and full-time, per 1,000 individuals age 65 and older. See Appendix B.2 for the definition of a SNF and a "regular" worker in SNF. The second panel displays λ_t coefficients of the event study in Equation 2. Coefficients were normalized to zero in year $t = 1993$. All specifications include county and year fixed effects. Standard errors clustered at the county-level are reported in parentheses.

Table A3: Event Study Results: Aggregate Response, Alternative Specifications

	Outcome (per 1,000 Age 65+ Population)							
	Controlling for Count of Elderly				Controlling for Share of Elderly			
	Firms	Workers	Full-time	Part-time	Firms	Workers	Full-time	Part-time
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pooled Coefficients								
δ_{97-08}	0.32	32.43	17.53	14.96	0.45	40.36	21.26	19.14
	(0.14)	(8.43)	(5.06)	(4.78)	(0.13)	(8.28)	(5.01)	(4.57)
Event Study Coefficients								
1-Year Effect, λ_{1997}	0.28	22.34	12.13	10.22	0.31	24.57	13.20	11.37
	(0.12)	(6.89)	(4.34)	(3.25)	(0.12)	(6.87)	(4.34)	(3.22)
3-Year Effect, λ_{1999}	0.27	29.26	17.66	11.62	0.32	32.30	19.27	13.05
	(0.13)	(8.16)	(4.96)	(4.16)	(0.13)	(8.05)	(4.93)	(4.06)
5-Year Effect, λ_{2001}	0.24	34.41	21.70	12.76	0.32	38.82	24.32	14.53
	(0.15)	(8.97)	(5.54)	(4.78)	(0.15)	(8.77)	(5.49)	(4.57)
10-Year Effect, λ_{2006}	0.43	33.90	14.78	19.23	0.64	47.54	20.98	26.60
	(0.19)	(9.94)	(6.02)	(6.26)	(0.17)	(9.41)	(5.73)	(5.71)
Implied Impact								
Using In-sample Variation[a]	0.03	2.95	1.59	1.36	0.04	3.67	1.93	1.74
Aggregate Impact, West Germany[b]	281.10	28,551	15,436	13,188	399.35	35,529	18,713	16,867
Using Out-of-sample Variation[c]	0.22	22.26	12.03	10.27	0.31	27.70	14.59	13.13
Aggregate Impact, West Germany[b]	2,098	215,784	116,661	99,541	2,981	268,519	141,426	127,311
Level of Outcome in 1993								
Mean	0.78	31.98	23.11	8.87	0.78	31.98	23.11	8.87
S.D.	0.33	13.58	10.11	4.52	0.33	13.58	10.11	4.52
Years	1975 - 2008	1975 - 2008	1975 - 2008	1975 - 2008	1975 - 2008	1975 - 2008	1975 - 2008	1975 - 2008
No. of Observations	10,635	10,948	10,948	10,819	10,635	10,948	10,948	10,819

[a] Multiplies δ_{97-08} by the 9 percentage point difference in mean exposure between counties with above and below the median level of exposure.
[b] Scales estimates by 9,693 thousand people age 65+ in West Germany (excluding Berlin and Bremen) in 1993.
[c] Multiplies δ_{97-08} by the mean of the exposure variable across counties, $\mathrm{E}_r = 0.686$.

Notes: The top panel displays the pooled coefficient δ_{97-08}, obtained from estimating the difference in differences specification in Equation 3 at the county-year level, using E_r, derived in Equation 1, as the measure of a county's exposure to the reform. Outcome variables include the number of SNF firms and the number of regular SNF workers, in total, part-time and full-time, per 1,000 individuals age 65 and older. See Appendix B.2 for the definition of a SNF and a "regular" worker in SNF. The second panel displays λ_t coefficients of the event study in Equation 2. Coefficients were normalized to zero in year $t = 1993$. Columns 1-4 display results of specifications controlling for the county-year-level count of individuals age 65 and above, columns 5-8 control for the county-year-level population share of residents age 65 and above. All specifications include county and year fixed effects. Standard errors clustered at the county-level are included in parentheses.

Table A4: Event Study Results: Count of New SNF Hires By Origin

	Outcome (per 1,000 Age 65+ Population)					
	Count New SNF Hires[a]	Among New SNF Hires[a], Count of				
		Employed & in HC in t-1	Employed & not in HC in t-1	Unemployed in t-1	Temporarily Not in Labor Force in t-1	Not Yet in Data in t-1
	(1)	(2)	(3)	(4)	(5)	(6)
Pooled Coefficients						
δ_{97-08}	8.69	0.67	1.16	2.04	3.83	1.00
	(1.92)	(0.75)	(0.58)	(0.43)	(0.53)	(0.42)
Event Study Results						
1-Year Effect, λ_{1997}	8.74	3.19	0.23	2.48	2.43	0.40
	(4.28)	(3.23)	(0.89)	(0.60)	(0.54)	(0.49)
3-Year Effect, λ_{1999}	6.75	0.01	1.35	1.76	2.95	0.68
	(2.16)	(0.80)	(0.65)	(0.58)	(0.67)	(0.49)
5-Year Effect, λ_{2001}	9.11	-0.27	2.32	2.06	3.45	1.55
	(2.33)	(1.03)	(0.72)	(0.53)	(0.71)	(0.47)
10-Year Effect, λ_{2006}	8.98	1.31	0.69	2.30	3.49	1.20
	(2.25)	(1.03)	(0.71)	(0.51)	(0.62)	(0.54)
Implied Impact						
Using In-sample Variation[a]	0.79	0.06	0.11	0.19	0.35	0.09
Aggregate Impact, West Germany[b]	7,651	586	1,020	1,798	3,370	877
Using Out-of-sample Variation[c]	5.97	0.46	0.80	1.40	2.63	0.68
Aggregate Impact, West Germany[b]	57,826	4,430	7,707	13,590	25,474	6,625
Level of Outcome in 1993						
Mean	6.44	1.00	1.33	1.10	1.98	1.03
S.D.	2.80	0.72	0.81	0.62	0.90	0.61
No. of Observations	10,626	10,626	10,626	10,626	10,626	10,626

[a] "New Hires" are individuals who were not employed in a SNF in the year before each index year.
[b] Multiplies δ_{97-08} by the 9 percentage point difference in mean exposure between counties with above and below the median level of exposure.
[c] Scales estimates by 9,693 thousand people age 65+ in West Germany (excluding Berlin and Bremen) in 1993.
[d] Multiplies δ_{97-08} by the mean of the exposure variable across counties, $E_r = 0.686$.

Notes: The top panel displays the pooled coefficient δ_{97-08}, obtained from estimating the difference in differences specification in Equation 3 at the county-year level, using E_r, derived in Equation 1, as the measure of a county's exposure to the reform. The outcome variables are demographic or labor market experience of new hires, as specified in column titles. The second panel displays λ_t coefficients of the event study in Equation 2. Coefficients were normalized to zero in year $t = 1993$. All specifications include county and year fixed effects. Standard errors clustered at the county-level are reported in parentheses.

Table A5: Event Study Results: Count of New SNF Hires By Characteristics

	Outcome (per 1,000 Age 65+ Population)					
	Count of New SNF Hires[a]	Among New SNF Hires[a], Count of				
		Abitur Holders	Germans	Females	Part-time Employees	Apprentices in t-1
	(1)	(2)	(3)	(4)	(5)	(6)
Pooled Coefficients						
δ_{97-08}	8.69	0.28	8.33	7.54	2.72	-0.24
	(1.92)	(0.28)	(1.74)	(1.56)	(0.84)	(0.17)
Event Study Results						
1-Year Effect, λ_{1997}	8.74	0.48	8.36	8.22	3.44	0.32
	(4.28)	(0.42)	(4.11)	(3.51)	(1.63)	(0.19)
3-Year Effect, λ_{1999}	6.75	0.28	6.60	6.11	1.21	-0.77
	(2.16)	(0.39)	(2.00)	(1.78)	(0.96)	(0.24)
5-Year Effect, λ_{2001}	9.11	0.28	8.67	8.15	1.29	-0.09
	(2.33)	(0.41)	(2.17)	(1.81)	(1.08)	(0.21)
10-Year Effect, λ_{2006}	7.89	0.22	7.43	6.79	3.40	-0.38
	(2.31)	(0.34)	(2.11)	(1.92)	(1.16)	(0.21)
Implied Impact						
Using In-sample Variation[a]	0.79	0.03	0.76	0.69	0.25	-0.02
Aggregate Impact, West Germany[b]	7,651	243	7,330	6,642	2,393	-209
Using Out-of-sample Variation[c]	5.97	0.19	5.71	5.18	1.87	-0.16
Aggregate Impact, West Germany[b]	57,826	1,838	55,395	50,198	18,090	-1,581
Level of Outcome in 1993						
Mean	6.44	0.57	5.85	5.29	1.80	0.26
S.D.	2.80	0.47	2.60	2.21	0.98	0.18
# Observations	10,626	10,626	10,626	10,626	10,626	10,626

[a] "New Hires" are individuals who were not employed in a SNF in the year before each index year.
[b] Multiplies δ_{97-08} by the 9 percentage point difference in mean exposure between counties with above and below the median level of exposure.
[c] Scales estimates by 9,693 thousand people age 65+ in West Germany (excluding Berlin and Bremen) in 1993.
[d] Multiplies δ_{97-08} by the mean of the exposure variable across counties, $E_r = 0.686$.

Notes: The top panel displays the pooled coefficient δ_{97-08}, obtained from estimating the difference in differences specification in Equation 3 at the county-year level, using E_r, derived in Equation 1, as the measure of a county's exposure to the reform. The outcome variables are demographic or labor market experience of new hires, as specified in column titles. The second panel displays λ_t coefficients of the event study in Equation 2. Coefficients were normalized to zero in year $t = 1993$. All specifications include county and year fixed effects. Standard errors clustered at the county-level are reported in parentheses.

B Data Appendix

B.1 Cleaning and aggregation

The primary data source for the results in this paper, unless otherwise indicated, is the Integrated Employment Biographies (IEB) database. This part of the appendix describes how the IEB data are cleaned, aggregated, and outcomes coded.[26]

The IEB is the universe of employment spells for the universe of workers subject to social security contributions in Germany from 1975 to 2019, consisting of all individuals in Germany who fall into one of the following five employment categories: 1) employment subject to social security (in the data since 1975), 2) marginal part-time employment (in the data since 1999), 3) benefit receipt according to the German Social Code, Book III (since 1975) or II (since 2005), 4) officially registered as job-seeking at the German Federal Employment Agency, or 5) (planned) participation in programs of active labor market policies (in the data since 2000). Start and end dates of spells are reported to day-level precision.

We subset the raw IEB data by keeping employment spells (originating in the IEB's "Employee History (BeH)" source data set) and unemployment spells only (from the IEB's "Benefit Recipient History [LeH]" or "Unemployment Benefit II Recipient History [LHG]" source data sets). Moreover, we drop spells with a daily wage or benefit rate equal to zero, marginal part-time employment spells (variable "employment status [erwerbstatus]" equal to 109 or 209), and spells corresponding to employment notifications due to a lump-sum payment (variable "reason of cancellation/notification/termination [grund]" equal to 154). We also drop employment spells corresponding to workplaces in East Germany, Berlin, or Bremen.

Next, we aggregate the accordingly subset IEB data to the individual-year level by selecting spells covering June 30th of a given year, dropping spells not covering June 30th, and splitting spells covering multiple instances of June 30th across more than one year, for which we use a script prepared by the IAB (Eberle and Schmucker, 2019). In the case of persisting duplicate individual-year observations, we keep the spell with the highest reported daily wage/benefit rate.

We fill gaps in individual-year-level data due to temporary absence from the labor market in the geographies that provide our data (e.g., because of temporary self-employment, maternity leave, or relocation to East Germany, Berlin, Bremen, a different country), so that our analytic data set becomes an unbalanced individual-year panel of labor market histories without gaps.

[26] A comprehensive introduction to (and codebook for) a processed, representative 2% extract of the IEB data, the Sample of Integrated Labour Market Biographies (SIAB), is available at (Antoni et al., 2019).

B.2 Variable coding

We define a Skilled Nursing Facility (SNF) as an establishment with WZ73 industry codes 710, 711, and 712 for private and for-profit institutions or "homes" (710); private, not-for-profit homes (711); and homes in public ownership (712). As WZ73 had been discontinued and replaced with alternative, more granular industry classifications after 2002, we impute time-consistent WZ73 codes, following the procedure of Eberle et al. (2011).

The majority of analyses focus on "regular" SNF employees, which we define, following the IAB convention, if the variable "employment status" [erwerbstatus] takes on values 101 ("Employees subject to social security with no special features") or 140 ("Seamen") and 143 ("Maritime pilots"). Examples for nonregular employees are apprentices, workers in part-time pre-retirement employment, and working students.

We define an SNF hire as new in year t if an individual is observably employed in an SNF in year t but had not been employed in an SNF in year $t-1$. As our identification strategy exploits spatial variation in exposure to the reform, we rely on county-level workplace data, which we impute during non-employment spells with the most recent observable county of work.

The IEB reports information on income via the variable "Daily wage, daily benefit rate [tentgelt]," which, depending on the source data set, may have different interpretations. During employment observations from the BeH, the variable contains data on "the employee's gross daily wages [...] calculated from the fixed-period wages reported by the employer and the duration of the (unsplit) original notification period in calendar days" in EUR (Antoni et al., 2019). Daily wages are top-coded at the level of the upper earnings limit of the statutory pension insurance, with possible exceptions due to annual bonus payments or employment interruptions. We replace daily gross wages exceeding the upper earnings limit with the limit that applied during the respective year. For unemployment spells from the LeH, the "Daily wage, daily benefit rate" variable contains information on daily benefits, which, prior to 1998, apply to working days, and, during subsequent years, to calendar days.

Next, we construct several worker characteristics. For each individual in years 1990–2008, we construct a 15-year rolling labor market experience measure by counting the number of years the respective individual was in any kind of employment throughout the preceding 15 years. We construct an equivalent measure corresponding to the 15-year rolling SNF experience.

Moreover, we construct a dummy that is equal to 1 for individuals who passed the Abitur, the German A-levels equivalent, usually obtained after 12 or 13 years of schooling and indicated by values of the raw schooling [schule] variable equal to 8 (upper secondary school leaving certificate from a specialized upper secondary school (Fachoberschule), general upper secondary school leaving certificate, A-level equivalent, qualification for university) or 9 (general upper secondary school leaving certificate, A-level equivalent, qualification for university). Individuals who have the Abitur dummy equal to zero accordingly have obtained less than 12 years of schooling, have failed the A-levels examination or have the raw schooling variable missing. We code a second dummy that is "1" for individuals who have obtained a bachelor's degree or equivalent, corresponding to values of the raw tertiary-education [ausbildung] variable of 11 (degree from a university of applied sciences) or 12 (university degree).

C Model Details

C.1 Equilibrium Wages and Queues

In equilibrium, firms choose the set of wages and queue lengths for each skill level that maximize worker flow utilities subject to any wage floors and subject to product market clearing. That means that in all sectors that are not subject to wage constraints, firms post efficient wages (second-best efficient, as the firms are still constrained by search frictions) that depend on the elasticity of the matching function (Moen, 1997; Acemoglu and Shimer, 1999), as we detail below. Wages in sectors constrained by wage floors are determined exogenously. Higher wages are, all else equal, accompanied by longer queues in equilibrium. This implies that sectors with a binding wage floors will be more competitive for workers when regulated wages exceed the competitive wage. Competing firms that post unconstrained competitive wages for the same type of jobs will find it more difficult to match with workers such that a cost advantage from lower wages is partially offset by higher recruiting and retention costs.

C.1.1 Equilibrium Wages

Abstracting away from clearing output markets, we here solve the simplified optimization problem:

$$\max_{w^{\phi},q^{\phi}} U_{ij} \tag{22}$$

$$s.t. \quad \eta(q_j^{\phi}) \times ((p_j - mc_j) \times \phi - w_j^{\phi}) - c = 0 \tag{23}$$

$$w_j^{\phi} = \Delta w + \beta \times (p_j \times \phi) \quad if \text{ j is constrained by collective bargaining .} \tag{24}$$

To simplify the notation, we suppress worker and sector indices i and j. Starting with sectors that are not constrained by collective bargaining, we solve equation (23) for wages and plug this into flow utilities. Out characterization of flow payoffs considers taxes τ and compensating differentials, as outlined in Section

4.3.1, to illustrate the relationship with equilibrium wages. $\tilde{b} = b + \xi_u$ abbreviates the flow payoff from unemployment including UI benefits, b, and non-monetary benefits ξ_u. We then have:

$$U = \mu(q) \times \Big((1-\tau) \times [(p-mc) \times \phi - \frac{c}{\eta(q)}] + \xi\Big) + (1-\mu(q)) \times \tilde{b} + \epsilon \ .$$

Using $\eta(q) = \mu(q) \times q$, we have

$$u = \mu(q) \times \Big((1-\tau) \times (p-mc) \times \phi + \xi\Big) - \frac{c}{q} \times (1-\tau) + (1-\mu(q)) \times \tilde{b} + \epsilon \ . \tag{25}$$

We note that

$$\partial\mu(q)/\partial q = \partial\frac{\eta(q)}{q}/\partial q = \frac{\eta(q)}{q} \times (\epsilon - 1) = \frac{\mu(q)}{q^2} \times (\epsilon - 1) \tag{26}$$

where $\epsilon = \frac{\eta'(q) \times q}{\eta(q)}$ is the elasticity of the matching function. Using this and maximizing equation (25) with respect to q, we get:

$$\frac{\partial u}{\partial q} = \frac{\mu(q)}{q} \times (\epsilon - 1) \times \Big((1-\tau) \times (p-mc) \times \phi + \xi - \tilde{b}\Big) + \frac{c}{q^2} \times (1-\tau) = 0 \ .$$

Multiplying by q and using $\frac{c}{q} = \mu(q) \times ((p-mc) \times \phi - w)$ (from equation (23)) we can (after dividing by $\mu(q)$) simplify to

$$(\epsilon - 1) \times \Big((1-\tau) \times (p-mc) \times \phi + \xi - \tilde{b})\Big) + (1-\tau) \times (p-mc) \times \phi - w \times (1-\tau) = 0$$

.

Further simplifying we have:

$$\epsilon \times (1-\tau) \times (p-mc) \times \phi + (1-\epsilon) \times (\tilde{b} - \xi) = w \times (1-\tau)$$

.

Rearranging, we find that that equilibrium wages for firms not affected by collective bargaining are given by

$$w = \epsilon \times (p-mc) \times \phi + \frac{1-\epsilon}{1-\tau} \times (\tilde{b} - \xi) \ .$$

Together, equilibrium wages are given by

$$w_j^{\phi,*} = \begin{cases} \Delta w + \beta_1 \times (p - mc) \times \phi + \beta_2 * (\phi * (p - mc))^2 & if \text{ j is constrained by collective bargaining} \\ \epsilon \times (p - mc) \times \phi + \frac{1-\epsilon}{1-\tau} \times (\tilde{b} - \xi) & else \end{cases} \tag{27}$$

and equilibrium queues are determined by the free entry condition (equation (23)) evaluated at equilibrium output prices and wages. Considering the case without collective bargaining, we see that equilibrium wages are a weighted average the marginal product of labor, $(p - mc) \times \phi$, and the net flow-payment from unemployment, $\tilde{b}$, net of compensating differentials from working, ξ, and adjusted for income taxes, $(1 - \tau)$. The weight is given by the elasticity of matching function, ϵ. Intuitively, when the elasticity converges to 1, workers hold effectively all the bargaining power and extract the entire marginal product of labor. Conversely, when the elasticity converges to 0, firms hold effectively all the bargaining power and pay workers their flow payoff from unemployment. Holding the elasticity fixed, we see that higher UI benefits and higher taxes push wages upward. Positive compensating differentials push wages downward.

C.2 Details on Estimation and Model Fit

Full time wages and employment: Our model intends to match full-time employment and wages by sector and experience. We calculate cumulative years of experience in health care ranging from 0 to 18 or more. For each experience level and sector, we then calculate the mean full-time wage. Columns 3-5 in Table C6 present the monthly wages in 1,000 Euros in 1999. The remaining columns show the corresponding model estimates. The first column presents experience and the second denotes the total working age population in millions.

To construct full-time employees, we assume that individuals either consider full-time or part-time employment and assign the latter a weight of only 50%. We infer the employment type among employed workers based on their concurrent work hours, and assign the employment type for unemployed individuals and individuals out-of-the labor force based on their most recent employment spell. For each experience level, we then calculate the share employed in each sector and the share that is out-of-the labor force. Columns 3-7 in Table C7 present the corresponding shares in 1999. These shares do not sum to 1, the residual share denotes the share of individuals that are unemployed. The remaining columns show the estimated counterparts. The first two columns are again presenting experience and the total working age population in millions.

Table C6: Monthly Wages by Experience and Sector in 1999

Experience	**Population**	**DataFP**	**DataNFP**	**DataOUT**	**ModelFP**	**ModelNFP**	**ModelOUT**
`Float64`	`Float64`	`Float64`	`Float64`	`Float64`	`Float64`	`Float64`	`Float64`
1.0	33.9732	2.25361	2.45144	3.89172	2.25423	2.44806	3.86279
2.0	0.827591	2.65825	2.73131	3.15744	2.79396	3.08103	3.05651
3.0	0.496441	2.7461	3.05129	3.02718	2.84948	3.19993	3.11366
4.0	0.406766	2.94852	3.40537	3.31163	2.98205	3.31445	3.23959
5.0	0.32972	3.16118	3.65417	3.43557	3.10014	3.42461	3.35241
6.0	0.288818	3.20698	3.79328	3.51761	3.15306	3.53039	3.40461
7.0	0.258696	3.30167	3.87803	3.59729	3.25979	3.6318	3.50643
8.0	0.238495	3.34413	3.93916	3.6367	3.29417	3.72883	3.53999
9.0	0.215078	3.44232	3.98586	3.69741	3.39469	3.8215	3.63557
10.0	0.190268	3.51524	4.03362	3.7643	3.47335	3.90979	3.71033
11.0	0.16072	3.62308	4.04025	3.77316	3.56063	3.99371	3.79316
12.0	0.138635	3.63074	4.14929	3.82024	3.57684	4.07326	3.80783
13.0	0.124218	3.65828	4.11126	3.88885	3.64198	4.14843	3.86908
14.0	0.109798	3.89414	4.20415	3.96438	3.83513	4.21923	4.05341
15.0	0.0966077	3.88782	4.30743	3.9986	3.82879	4.28566	4.04581
16.0	0.0845363	4.01875	4.34325	4.06895	3.95243	4.34772	4.16336
17.0	0.076431	3.81494	4.36702	4.12585	3.71677	4.40541	3.93265
18.0	0.0706675	4.16897	4.34618	4.15317	4.10041	4.45872	4.30255
19.0	0.431144	4.11267	4.39571	4.29062	4.10735	4.50766	4.30702

Notes: Columns 1-3 show monthly earnings by experience level and labor market in the pre-reform years. Columns 4-6 show the estimated counterparts.

Table C7: Employment Share by Experience and Sector in 1999

Experience	Population	DataFP	DataNFP	DataOUT	DataOOL	ModelFP	ModelNFP	ModelOUT	ModelOOL
Float64	Float64	Float64	Float64	Float64	Float64	Float64	Float64	Float64	Float64
1.0	33.9732	0.000354544	0.000587816	0.455811	0.496833	0.0	0.000588226	0.4599	0.500002
2.0	0.827591	0.0116362	0.0193332	0.377167	0.503998	0.0179803	0.0212495	0.357496	0.555474
3.0	0.496441	0.017706	0.0325719	0.396029	0.478281	0.0191267	0.0341728	0.390624	0.525612
4.0	0.406766	0.0226912	0.0371466	0.410506	0.471518	0.0210278	0.0379705	0.428873	0.483381
5.0	0.32972	0.0269623	0.0451899	0.415914	0.466785	0.0212235	0.0416092	0.441344	0.453968
6.0	0.288818	0.0268681	0.0491659	0.405394	0.47776	0.0201419	0.0476146	0.433446	0.443798
7.0	0.258696	0.0262664	0.0516243	0.408916	0.475329	0.0197391	0.052203	0.436035	0.421564
8.0	0.238495	0.0267091	0.0573177	0.425291	0.458235	0.0205872	0.0574176	0.453335	0.40486
9.0	0.215078	0.02706	0.0606293	0.433936	0.449642	0.0204967	0.0612611	0.458529	0.383724
10.0	0.190268	0.0252276	0.0624384	0.431182	0.452357	0.0192601	0.0633715	0.443405	0.376443
11.0	0.16072	0.0217148	0.0620646	0.418524	0.470438	0.017102	0.0621383	0.409958	0.379192
12.0	0.138635	0.0220723	0.0569479	0.437947	0.455223	0.0186329	0.0571151	0.427816	0.369486
13.0	0.124218	0.0194417	0.055266	0.453519	0.446379	0.0185988	0.0555311	0.425933	0.361281
14.0	0.109798	0.0190349	0.0584252	0.473959	0.424388	0.0187908	0.0587441	0.435539	0.3288
15.0	0.0966077	0.0208058	0.0607094	0.485261	0.408114	0.020028	0.0609491	0.454353	0.318614
16.0	0.0845363	0.0203463	0.0621626	0.490795	0.400293	0.0198014	0.0623211	0.453411	0.302275
17.0	0.076431	0.0221769	0.0573066	0.510133	0.386128	0.0272971	0.0552064	0.537943	0.297237
18.0	0.0706675	0.0207309	0.0630417	0.53023	0.361069	0.0219814	0.0631373	0.485212	0.267461
19.0	0.431144	0.0190192	0.0688053	0.645364	0.244627	0.0282727	0.0697201	0.573711	0.223881

Notes: Columns 1-3 show employment shares by experience level and labor market in the pre-reform years. Columns 4-6 show the estimated counterparts.

Table C8: Other Moments

Moment	Data	Model
String	Any	Float64
Monthly SNF Price Post in 1k Euro	2.03	2.12
Monthly SNF Revenues Post in bn Euro	1.14	1.51
% Change in SNF Wage	-0.05	0.01
SNF Employment Post/Pre	2.0	1.98
% Change in SNF Experience	-0.51	-0.17
% SNF Employment Gains from UI	1.14	0.32
% SNF Employment Gains from OOL	1.55	1.72
%NFP Empl Gain - %FP Empl. Gain	0.0	-0.04

Notes: This table presents the model fit on various other targeted moments. The second column denotes the data estimate and the third column presents the model estimate.

Other Moments: We target several other key moments, outlined in Table C8. We first target the monthly SNF price in 1,000 Euros in 1999 as well as monthly SNF revenues.[27] Second, we target several reform estimates discussed above, including the estimated change in SNF wages and experience, the expansion on SNF employment, compositional changes between for-profit and not-for-profit/public nursing homes, and the estimated change in unemployment and labor force participation.

We also ensure that the job filling and vacancy filling rates are bounded between 0 and 1, see Figure C.1.

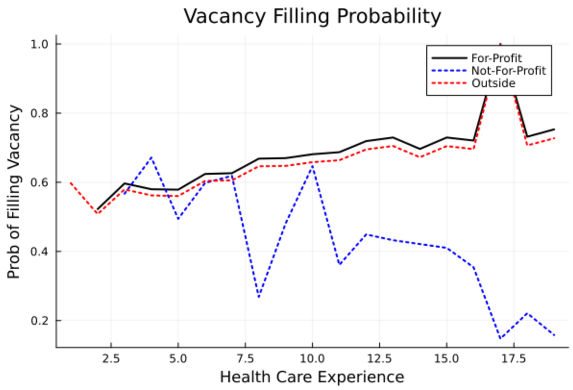
C.3 Details on Parameter Estimates

Calibrated parameters: Finally, and as stated in the main text, we calibrate several parameters, displayed in Table C9. First, calibrate the share insured via 'Hilfe-zur-Pflege' in the post-reform to 32%. Set, we set the price subsidy to the average inpatient benefits, weighted by the care level distribution of LTC beneficiaries. We calculate a price subsidy of about 1,200 Euros per month. Third, we calculate use the average tax rate and social security contributions of singles without children in 1999. We use the tax rate of 18.6% and social security contribution of 20.6% paid by employee and also by the employer.[28] This implies a wedge between total costs to the employer and the net takehome pay for workers of in 1999 of $\tau = \frac{18.6\%+2\times 20.6\%}{1+20.6\%} = 50\%$. Finally, we set the unemployment benefits to 700 Euros per month.

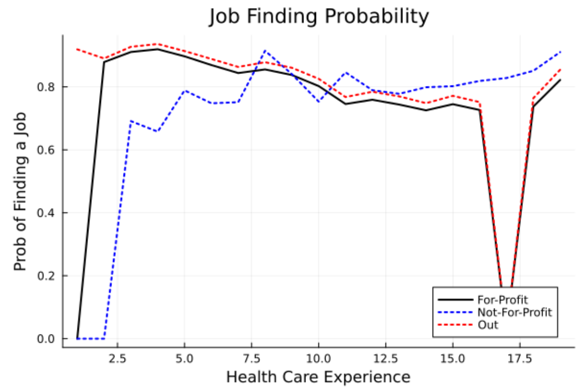
[27]We use prices by care level and weight the prices by the care level composition in nursing homes. Cross-multiplying prices with the quantities gives us an estimate of revenues. Both prices and quantities are retrieved from http://carecommunity.de/pflegeberufe/politik/studien_enquetepflege_Pflegestatistik99.pdf.

[28]See https://www.bpb.de/kurz-knapp/zahlen-und-fakten/soziale-situation-in-deutschland/61896/steuer-und-abgabenlast-von-durchschnittsverdienern/.

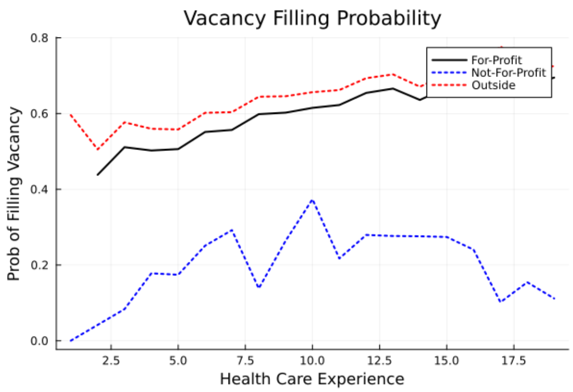
Figure C.1: Job Finding and Vacancy Filling Probability



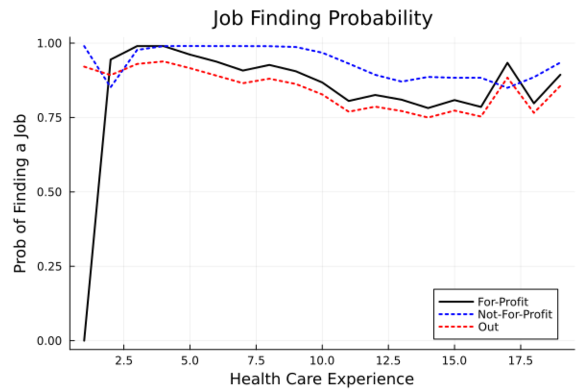
(A) Pre-Reform Vacancy Filling Rate in SNFs



(B) Pre-Reform Job Finding Probability in SNFs



(C) Post-Reform Vacancy Filling Rate in SNFs



(D) Post-Reform Job Finding Probability in SNFs

Parameter Estimates: Next we turn to the estimated parameters. We present the estimated λ parameters governing the matching technology and the vacancy posting costs c in Table C10. We allow them to vary by experience and estimate separate parameters for not-for-profit long term care providers.

The remaining parameter are summarized in Table C11. The first three parameters govern the demand of the representative agent. The next eight parameters govern the worker's utility function. Finally, we present the firm's non wage marginal costs and the estimated equilibrium output prices.

C.4 Welfare Estimates

Next, we turn to the welfare implications. The first rows from Table C12 summarize reform-induced changes on a variety of outcomes that are relevant for the welfare calculations. Notably, we find an increasing in SNF employment of 160k workers, we see an increase the labor force by 276k workers and a drop in the number of unemployed by 52k people.

Table C9: Calibrated Parameters

Moment	Data
String	Float64
Share Hilfe-zur Pflege Post	0.32
LTC Price Subsidy in 1,000 Euro per month: s	1.20536
% Tax and Social Security Contributions: τ	0.498344
Unemployment benefits in 1,000 Euro per month: b	0.7

Notes: This table presents calibrated parameters.

Table C10: Matching Technology and Hiring Costs Parameters

Experience	LambdaFP	LambdaNFP	LambdaOut	cFP	cNFP	cOut	Skills
Int64	Float64	Float64	Float64	Float64	Float64	Float64	Float64
1	0.71436	1.00998	0.71436	0.528215	4.29983e-6	0.528215	1.51508
2	0.804388	1.17393	0.804388	0.138796	5.49178e-5	0.138796	1.60708
3	0.72145	0.980142	0.72145	0.224484	0.0331167	0.224484	1.69908
4	0.727112	0.917222	0.727112	0.243512	0.0849195	0.243512	1.79108
5	0.746324	0.919042	0.746324	0.275656	0.0978496	0.275656	1.88308
6	0.733715	0.87727	0.733715	0.369273	0.163191	0.369273	1.97508
7	0.753862	0.854109	0.753862	0.41262	0.217237	0.41262	2.06708
8	0.707942	0.938924	0.707942	0.529454	0.116204	0.529454	2.15908
9	0.721516	0.872713	0.721516	0.579649	0.249082	0.579649	2.25108
10	0.742639	0.825245	0.742639	0.652985	0.392285	0.652985	2.34308
11	0.79322	0.95258	0.79322	0.717493	0.252216	0.717493	2.43508
12	0.745975	0.954326	0.745975	0.860263	0.356519	0.860263	2.52708
13	0.750097	0.981239	0.750097	0.950437	0.386052	0.950437	2.61908
14	0.805218	0.964168	0.805218	0.898066	0.419184	0.898066	2.71108
15	0.748825	0.968436	0.748825	1.06743	0.451574	1.06743	2.80308
16	0.777728	0.989439	0.777728	1.0918	0.428132	1.0918	2.89508
17	0.584508	1.11598	0.584508	1.53693	0.195187	1.53693	2.98708
18	0.754112	1.03965	0.754112	1.25273	0.317981	1.25273	3.07908
19	0.654993	1.00898	0.654993	1.4109	0.246238	1.4109	3.17108

Notes: This table presents estimated matching technology parameters, λ and hiring costs parameters, c, by sector and experience.

Table C11: Parameter Estimates

Parameter	Estimate
String	Float64
Demand: alphaSNF	2.24051
Demand: alphaOUT	4.5415
Demand: Sigma	1.51196
Workers: Flow Payoff Unemployment (b+xi)	1.22804
Workers: nesting paramter gamma	0.369808
Workers: standard deviation shocks rho	0.303925
Workers: xiFP	-0.644772
Workers: xiNFP	-0.657869
Workers: beta1	0.921462
Workers: kappa	10.5596
Workers: kappa1	-1.01261
Firms: MCFP	0.181188
Firms: MCNFP	2.95463e-39
Firms: MCOUT	0.0628833
SNF Price Pre	1.87074
SNF Price Post	2.11677
OUT Price Pre	2.01676
OUT Price Post	2.02312

Building on these insights we turn to the welfare implications. We start with a welfare calculation in partial equilibrium. This calculation ignores observed changes in income and hence overall spending, as well as price changes in the outside good sector. We calculate a welfare loss of 0.31bn per month.

We now provide a more comprehensive assessment taking the welfare effects in labor market into account. We start by considering the change in consumer surplus, ignoring changes income, which we incorporate in the worker's surplus via earnings. We find no gain in consumer surplus, as the out-of-pocket price drop for LTC services is offset by an increase in the price for the outside sector good.

Turning to the worker surplus, we find an increase in wage earnings of 1.45bn but this translates into a gain in worker surplus of only 0.25bn because many workers give up enjoying being out-of-the labor force and non-pecuniary benefits from unemployment. This estimate encompasses a few benefits.

Combined we calculate a private welfare gain of 0.25bn, which falls short of total subsidy spending of 0.59bn by 0.34bn. However total public spending falls when taking the fiscal externalities into account. UI payments are reduced by 0.04bn and tax revenues increase by 0.73bn. Together this implies a total welfare gain of 0.43bn per month.

Table C12: Reform Effects and Counterfactuals

Outcome	**Pre**	**Post**	**Difference**
String	Float64	Float64	Float64
Monthly SNF Price in 1k	1.87074	2.11677	0.246029
Monthly Price of Outside Good	2.01676	2.02312	0.00636169
Patient Demand SNF in 1m	0.389841	0.714213	0.324372
Demand for Outside Good	41.8993	42.3329	0.433601
SNF Subsidy	0.0	1.20536	1.20536
SNF Employment in 1m	0.163361	0.32401	0.160649
Monthly SNF Wage in 1k	3.55694	3.58033	0.0233878
Wage Earnings	67.0754	68.5336	1.45826
Unemployment in 1m	1.72232	1.6706	-0.0517149
Labor Force in 1m	19.3125	19.5886	0.276183
Welfare Effects in PE	0.0	-0.314161	-0.314161
Monthly Consumer Surplus in bn (no inc effect)	84.8028	84.7992	-0.00361256
Monthly Worker Surplus in bn	127.011	127.264	0.253097
Monthly Subsidy Spending in bn	0.0	0.585374	0.585374
Monthly UI Spending in bn	1.20562	1.16942	-0.0362004
Monthly Tax Revenues in bn	33.4266	34.1534	0.726715
Monthly Total Welfare in bn	244.034	244.461	0.427

C.5 Mechanisms, Counterfactuals

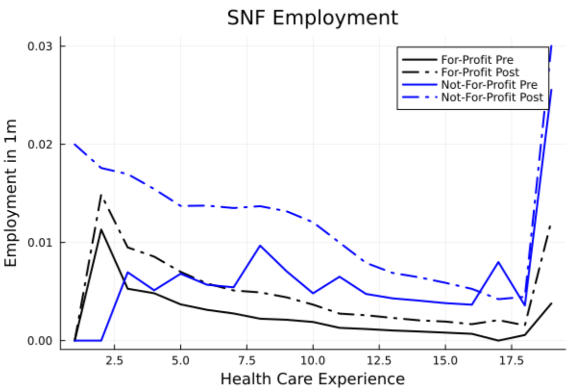
Next we provide more details on the reform's effect on the experience composition and the role of search frictions, unemployment benefits, and collective bargaining.

Employment Effects by Experience: We start by plotting out the reform-induced employment expansion by experience in Figure C.2A. We find that the increase in employment was concentrated among lower experienced workers, suggesting that there was considerable slack in the labor market among people who were previously out-of-the labor force and thus held little health care experience.

Wage Distortions: To better understand the wage differences between not-for-profit SNFs and for-profit SNFs and the role of distortions, we use the model to provide a wage decomposition in Figure C.2B. The solid lines represent the estimate wage profiles for SNFs already shown in Figure C6. We then start with the NFP wages and consider the effects of collective bargaining (holding output prices and vacancy posting fixed). The wage profile becomes steeper suggesting that collective bargaining results in significant wage compression. Interestingly, we find that the wage profile shifts upward suggesting that collective bargaining imposed a wage ceiling rather than a wage floor. We next replace marginal costs and the compensating differential with those from for-profit SNFs, which shifts the wage profile downward. This suggests that not-for-profits can afford higher wages due to a marginal cost advantage as the compensating differentials are quite similar, see Table C11. The remaining difference in wages between for profit and not-for-profits are explained by different wage posting decisions (that we held fixed in this exercise). Finally, we consider the distortions arising from unemployment benefits. To this end we take simulate the wages in for-profit SNFs under no unemployment benefits ($b = 0$). The wage curve shifts downward as illustrated by the black dashed line.

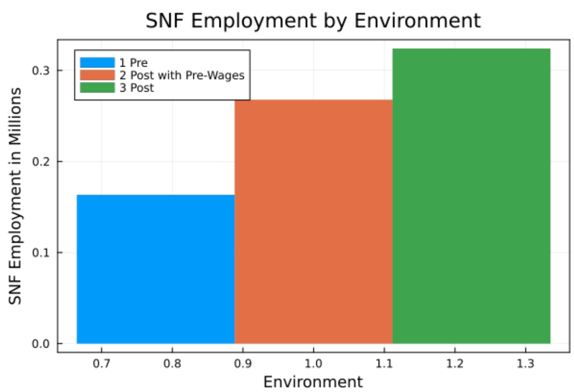
Vacancy Posting: Figures C.2C-C.2E illustrate that labor markets do not 'just' clear in wages and instead depend on job posting decisions by firms. Figure C.2C illustrates pre-reform and post-reform SNF employment but also counterfactual SNF employment had wages not adjusted. We find that more than half of the increase in employment can be attributed to changes in vacancy postings. Unemployment would have decreased even further, had wages remained the same, Figure C.2D. In contrast, a larger fraction of the increases in labor force participation can be attributed to changes in wages, see Figure C.2E, suggesting that changes in vacancy posting played less of a role for the employment gains in other sectors.

Figure C.2: Mechanisms and Counterfactuals

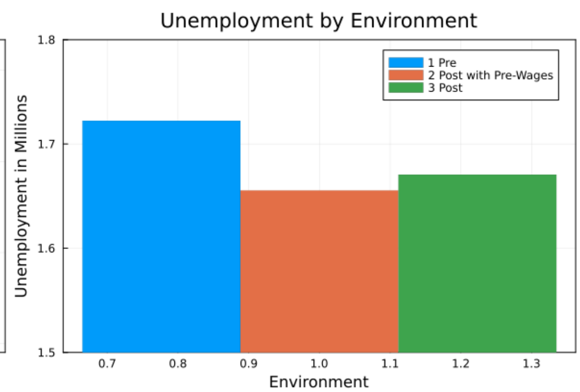


(A) Reform Effects on Employment

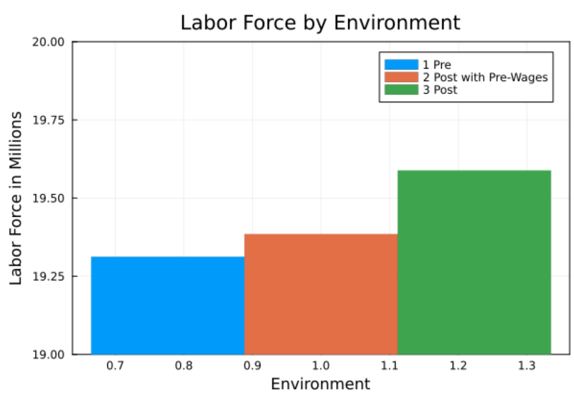
(B) Wages and Distortions SNFs



(C) SNF Employment



(D) Unemployment



(E) Labor Force