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03|2025 Health Insurance as Economic Stimulus? Evidence from Long-Term Care Jobs

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Mit der Reihe „IAB-Discussion Paper“ will das Forschungsinstitut der Bundesagentur für Arbeit den Dialog mit der externen Wissenschaft intensivieren. Durch die rasche Verbreitung von Forschungsergebnissen über das Internet soll noch vor Drucklegung Kritik angeregt und Qualität gesichert werden.

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Abstract

We leverage decades of administrative data and quasi-experimental variation in the introduction of universal long-term care (LTC) insurance in Germany in 1995 to examine whether health insurance expansions can stimulate local economies. We find that the LTC insurance rollout led not only to sizeable growth of the target LTC sector, but also to an aggregate fall in unemployment and an increase in the labor force participation. Quantitatively, a 10 percentage point increase in the share of insured LTC patients led to 4 more nursing home workers per 1,000 individuals age 65 and older (12 percent increase). Wages did not rise in the LTC sector or other sectors of the economy. The quality of newly hired nursing home workers declined, but this had no negative effect on old-age life expectancy. Overall, the insurance expansion brought lower-skilled workers into new jobs rather than reallocating workers away from other productive sectors. Our marginal value of public funds (MVPF) analysis suggests that the reform paid for itself when taking the positive fiscal externalities in the labor market into account. To understand which market primitives underpin our findings and to inform the external validity of our results, we develop and estimate a general model of labor markets with product-market subsidies in the presence of wedges, such as income taxes. Our model simulations show that the aggregate welfare effects of insurance expansions are theoretically ambiguous and depend centrally on the magnitude of frictions in input markets.

Zusammenfassung

Wir nutzen administrative Daten und quasi-experimentelle Variationen bei der Einführung der allgemeinen Langzeitpflegeversicherung (LTC) in Deutschland im Jahr 1995, um zu untersuchen, ob die Ausweitung der Sozialversicherung sich positiv auf die lokale Wirtschaft auswirken kann. Wir stellen fest, dass die Einführung der Langzeitpflegeversicherung nicht nur zu einem beträchtlichen Wachstum des Zielsektors der Langzeitpflege führte, sondern auch zu einem Gesamtrückgang der Arbeitslosigkeit und einem Anstieg der Erwerbsbeteiligung. Quantitativ führte ein Anstieg des Anteils der versicherten Langzeitpflegepatienten um 10 Prozentpunkte zu 4 mehr Pflegeheimmitarbeitern pro 1.000 Personen im Alter von 65 Jahren und älter (12 Prozent Anstieg). Die Löhne stiegen weder im Pflegesektor noch in anderen Wirtschaftszweigen. Die Qualität der neu eingestellten Pflegeheimkräfte nahm ab, was sich jedoch nicht negativ auf die Lebenserwartung im Alter auswirkte. Insgesamt führte die Versicherungsausweitung dazu, dass weniger qualifizierte Arbeitskräfte neue Arbeitsplätze bekamen, anstatt Arbeitskräfte aus anderen produktiven Sektoren zu verlagern. Unsere Analyse des Grenzertrags öffentlicher Mittel (MVPF) legt nahe, dass sich die Reform unter Berücksichtigung der positiven externen fiskalischen

Effekte auf dem Arbeitsmarkt bezahlt gemacht hat. Um zu verstehen, welche Marktkomponenten unseren Erkenntnissen zugrunde liegen, und um die externe Validität unserer Ergebnisse zu ermitteln, entwickeln und schätzen wir ein allgemeines Modell von Arbeitsmärkten mit Produktmarktsubventionen bei Vorhandensein von ökonomischen Zusatzlasten, wie z. B. Einkommenssteuern. Unsere Modellsimulationen zeigen, dass die aggregierten Wohlfahrtseffekte von Versicherungsausweitungen theoretisch mehrdeutig sind und zentral vom Ausmaß der Friktionen in den Inputmärkten abhängen.

JEL

D58, H0, H51, I0, I13, I31, I38, J08, J14, J23, J64

Keywords

General Equilibrium, Fiscal Externalities, Health Insurance Expansion, Moral Hazard, Marginal Value of Public Funds (MVPF)

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1 Introduction

Arrow (1963) and Feldstein (1971, 1977) have argued that the proliferation of health insurance significantly contributes to the growth of the healthcare sector. The textbook view of insurance is that it mutes the price signal inducing inefficiently high demand for healthcare—a phenomenon commonly referred to as moral hazard. Optimal insurance, in turn, trades off the welfare losses from moral hazard vis-a-vis the welfare benefits of risk protection. In this paper, we investigate whether, in practice, publicly funded health insurance programs are also a form of an industrial policy that channels consumers, workers, and capital into a subsidized industry.

In the United States alone, more than $2 trillion in government expenditures flow to healthcare through insurance programs each year, underscoring the importance of understanding this spending's broader economic effects. Yet the aggregate impacts of health insurance, as envisioned by Arrow and Feldstein, have been difficult to capture empirically.[1] Two main challenges arise when trying to measure the broad economic consequences of health insurance expansions. First, many changes in health insurance programs are incremental and are likely to produce only small and diffuse effects on the healthcare sector (Finkelstein, 2007). Second, data limitations often hamper our ability to precisely capture how healthcare workers, firms, and capital reallocate in response to insurance expansions.

In this paper, we overcome some of these challenges by exploiting a major social insurance reform—the introduction of universal long-term care (LTC) insurance in Germany in 1995—and leveraging uniquely comprehensive administrative labor market data. Governments commonly justify health insurance policy in part by its effects on healthcare employment (Ku/Brantley, 2021). However, Baicker/Chandra (2012) and Cutler (2018)

[1] There are a handful of exceptions. Finkelstein (2007) has documented a significant expansion of 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/Shigeoka (2013) study the 1961 expansion of universal insurance in Japan, finding increase in utilization, but no evidence of an 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. Geddes/Schnell (2023) demonstrate that the impact of insurance expansions on retail clinic entry in the U.S. hinges on price regulations in output markets. Their analysis reveals that Medicaid expansion under the Affordable Care Act discourages entry (and the expansion of care) when regulated reimbursement rates fall below the market-clearing price (consistent with evidence from Grabowski/Gruber (2007) in the case of U.S. LTC). Conversely, and in alignment with our findings, they show that when insurance subsidizes prices set by private firms, insurance expansions stimulate increased retail clinic entry. Gottlieb et al. (forthcoming) 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.

caution that viewing healthcare jobs as drivers of economic growth may be misguided if such jobs do not improve patient health or if they simply crowd out employment in more productive sectors. Thus, an essential question—for both fiscal accounting and welfare analysis—is whether insurance expansions create new jobs on net or merely reallocate existing workers from productive employment elsewhere in the economy (Dustmann et al., 2021). To inform this debate, we examine both the partial equilibrium effects of LTC insurance on the LTC market itself, as well as the general equilibrium effects on employment in the economy as a whole. We find that the German LTC insurance program created jobs and improved welfare. Yet we also show that this stimulus effect is attributable to many frictions that characterized the German labor market in the mid-1990s and may not generalize to other contexts.

Our paper makes three main contributions. First, we add extensive new evidence to a small but growing literature that has been able to trace out the effects of health insurance expansions on healthcare sector employment (Finkelstein, 2007; Kondo/Shigeoka, 2013; Dillender, 2022). We do so in an important and unique setting, the rollout of universal long-term care insurance in a large economy. Second, to the best of our knowledge, we provide some of the first evidence of factor substitution between sectors of the economy in response to a health insurance expansion. Third, we show that the nature of factor substitution and market frictions is qualitatively and quantitatively important for the welfare implications of public spending on health insurance.

Our positive analysis proceeds in two steps. We start by measuring the effect of LTC insurance on its primary target: the long-term care sector itself. We focus specifically on employment in nursing homes as our key outcome measure. Nursing home care is one of the most labor-intensive parts of the healthcare system and accounts for the majority of spending in long-term care. We then take a broader perspective, examining whether the new public funds flowing to the long-term care sector affected the overall economy. Our causal research design is similar in spirit to the approach in Finkelstein (2007) and Kondo/Shigeoka (2013). We take advantage of the geographic variation in partial public assistance for long-term care services that existed prior to the implementation of the universal insurance program.

The results of our positive analysis provide several key insights about the relationship between insurance and the supply side of care.

First, we observe a dramatic increase in the number of nursing homes and workers in this labor-intensive industry following LTC insurance expansion. We estimate that a 10 percentage point increase in the share of insured LTC patients led to 0.06 (6 percent) more inpatient LTC firms and four (12 percent) more workers per 1,000 age 65 and older individuals in Germany. Scaling this to the aggregate level of expansion, which offered insurance to an additional 69 percent of the population needing long-term care, we estimate that the LTC insurance rollout led to 0.42 (a 40 percent increase) more inpatient LTC firms and 30.5 (91 percent) more workers per 1,000 age 65 and older population. These responses are substantially larger than those found in the analyses of the RAND and the Oregon health insurance experiments (Newhouse/Insurance Experiment Group, 1993; Finkelstein et al., 2012), but are consistent with the evidence on the effects of the introduction of Medicare in Finkelstein (2007).

Second, we gain novel insights into the anatomy of how a sector expands in response to an 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, adjusted downward. A textbook model of labor supply and demand suggests that if firms want to hire more workers, they increase wages unless labor supply is perfectly elastic. Empirically, however, we find 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. The granularity of our data also allows us to directly trace the origins of the new workers. We find that marginal hires in our context were disproportionately drawn from unemployment or from outside the labor force, with little evidence of relocation across sectors.

Third, we document that an insurance program can act as an economic stimulus. Our estimates imply that the German LTC insurance rollout reduced overall unemployment and expanded the labor force, which was accompanied by a proportional increase in the total wage bill. The increase in the total wage bill was larger than the incremental reform spending. Further, the overall employment gains exceed the estimated employment gains in nursing homes alone. All these facts are consistent with a fiscal multiplier on LTC reform spending of more than 1 (Chodorow-Reich, 2019).

To summarize, our causal findings suggest that the LTC insurance program improved career opportunities for lower-skilled workers at pre-reform wages. These workers would have relied on unemployment benefits or stayed out of the labor market otherwise. This entry of lower-skilled workers was not detrimental to the quality of patient care (Stevens et al., 2015); on the contrary, we find that the insurance expansion reduced elderly mortality by 1 percent. Finally, we estimate substantial positive employment spillover effects to other sectors of the economy, suggesting that the employment increases extended beyond those in LTC alone.

In the last part of the paper, we turn to welfare. Existing studies of social insurance programs tend to focus on the risk protection value of such programs and the trade-off between risk protection and moral hazard. Yet public insurance programs also simply transfer substantial public funds into a specific sector of the economy and can thus be usefully conceptualized as an industrial policy. To develop this way of thinking about public insurance programs further, we focus our normative analyses on quantity expansions in the product and labor markets, treating LTC insurance as a product-market subsidy and abstracting from its risk protection value and its effects on mortality.

We use two complementary approaches to measure consumer welfare, worker welfare, and public spending, each with its distinct strengths and weaknesses. Inspired by Harberger (1971) and Hendren/Sprung-Keyser (2020), the first approach combines our causal estimates with linear approximations to the patient demand function to estimate the marginal value of public funds (MVPF). We start with a partial equilibrium calculation that ignores the spillover effects onto the labor market and the broader economy. Consistent with the textbook idea of welfare loss from moral hazard in health insurance, we estimate an MVPF of less than 1. Including LTC workers overturns this textbook result, giving us an MVPF of above 1. In other words, in our context the welfare gains in the LTC labor market outweigh the welfare loss from moral hazard in the product market. Even more strikingly, we conclude that LTC insurance pays for itself and has an MVPF of infinity when we take into account the fiscal externalities on the broader economy. The increase in public spending on LTC is more than offset by savings on unemployment benefits and substantial increases in income taxes and social insurance contributions stemming from increased overall employment in local economies. This contrasts sharply with the prior evidence showing that public spending targeted at older individuals tends to have lower MVPFs (Hendren/Sprung-Keyser, 2020). Our findings suggest that when spending on older adults generates jobs for younger workers, the MVPF can be exceptionally high.

Our second approach to welfare relies on a structural model of the labor market. The model serves two purposes. First, it allows us to do a horse race between two very different ways of approximating consumer welfare, relying on different sets of assumptions. Second, the model gives us a way to assess the external validity of our findings to other economic environments through counterfactual simulations. Building on Acemoglu/Shimer (1999) and Wright et al. (2021), we consider a model of directed search. The model allows for unemployment and labor force non-participation as equilibrium outcomes, and reconciles the large reform-induced employment gains absent meaningful increases in wages. We model heterogeneous workers and sectors. We include three sources of labor market wedges: unemployment benefits, sector-specific collective bargaining, and income taxes and social insurance contributions. The welfare estimates implied by the model are qualitatively consistent with the insights from the “model-free” MVPF calculations. From the counterfactual exercises we learn that the overall welfare effects are centrally driven by tax wedges. We find that the LTC insurance expansion is less effective in stimulating the economy and is welfare-reducing on net under lower levels of income taxes and social insurance contributions. In these counterfactual environments, labor force participation is considerably higher to begin with and, as a result, employment expansion in one sector will largely involve the relocation of workers across labor markets, a situation more akin to the healthcare job fallacy idea in Baicker/Chandra (2012).

These findings lead to our main conceptual insights. While the welfare analyses of health insurance programs typically highlight moral hazard, or the inefficiently high utilization of healthcare, this framework is incomplete when frictions or tax wedges in related (input) markets leave socially efficient trades on the table (Lipsey/Lancaster, 1956; Harberger, 1971; Frick/Chernew, 2009). In our setting, moral hazard led to the creation of jobs that displaced unemployed workers, increased labor force participation, and paid significantly above reservation wages. These jobs generated significant positive fiscal externalities by saving on unemployment benefits and, more importantly, through tax and social insurance contributions that exceed 60 percent of total pay in Germany. Accounting for these benefits significantly raises the net welfare effects of insurance, in some specifications to the point where the reform pays for itself.

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, complementing the rich literature that has analyzed insurance expansions in acute inpatient or outpatient care—Finkelstein/Mahoney/Notowidigdo (2018) provide a recent overview. A distinguishing feature of our study is that we can analyze the relocation of factor inputs between sectors, allowing for a more comprehensive normative assessment. Our evidence on the allocation of healthcare workers ties together the discussion on the role of healthcare jobs in the broader economy (Baicker/Chandra, 2012) and the role of frictions in health labor markets that may stem from wage regulation (Sojourner et al., 2015; Propper/Van Reenen, 2010; Friedrich/Hackmann, 2021), monopsony power (Staiger/Spetz/Phibbs, 2010; Prager/Schmitt, 2021), or price regulation and market power in output markets (Hackmann, 2019; Geddes/Schnell, 2023; Gandhi/Song/Upadrashta, 2023).

Second, our welfare estimates connect to the growing literature that uses the MVPF framework to compare and evaluate public policies (Hendren/Sprung-Keyser, 2020; Finkelstein/Hendren, 2020). Consistent with prior work on health insurance expansions to adults, such as the Massachusetts health reform (Finkelstein/Hendren/Shepard, 2019), the Oregon health insurance experiment (Finkelstein/Hendren/Luttmer, 2019), the introduction of Medicare (Finkelstein/McKnight, 2008), and Medigap (Cabral/Mahoney, 2019), our partial equilibrium results suggest an MVPF of less than 1. However, out general equilibrium MVPF estimate exceeds 1, even without accounting for potential gains from risk protection (Kowalski, 2015; Abaluck/Gruber, 2011; Handel, 2013), household finances (Brevoort/Grodzicki/Hackmann, 2020), or mortality reductions.

Third, and methodologically, we extend the standard approaches for measuring welfare from public programs to a setting with general equilibrium effects. By combining recent advances in causal inference (Arkhangelsky, Dmitry and Athey, Susan and Hirshberg, David A. and Imbens, Guido W. and Wager, Stefan, 2021) with a novel structural model of the labor market, we are able to analyze the general equilibrium labor market effects of a large public program. This connects our findings to a growing literature on the effects of place-based policies (Neumark/Simpson, 2015) and industrial policies (Juhász/Lane/Rodrik, 2024) more generally. While such policies have traditionally been motivated by learning, technological advancement, or national security considerations, we show that they may also generate value by creating "good" jobs for lower-skilled workers, lifting individuals into productive employment with potentially lifelong positive consequences (Schwandt/von Wachter, 2020; Rodrik, 2022). Our findings contribute to a growing empirical literature examining industrial policy (Lane, 2020), providing some of the first evidence from the (growing) service sector that already employs four out of five American workers in the private sector (Barnes/Bauer/Edelberg, 2022). We show that demand-side subsidies for healthcare services can significantly boost local employment.

Finally, we connect literatures on the provision of long-term care and salient labor market policies in Germany (Geyer et al., 2023). Prior work on long-term care has focused on entry and competition between for-profit and not-for-profit nursing homes (Grant/Kesternich/Van Biesebroeck, 2019) and price-setting negotiations between payers and nursing homes (Herr/Saric, 2016) in the post-insurance period. We add to this literature by studying the effects of universal LTC insurance on the supply of inpatient care. Our empirical setting highlights the interplay between insurance expansion and labor market frictions, including high unemployment benefits (Schmieder/Von Wachter/Bender, 2012; Price, 2019) and collective bargaining agreements that may have contributed to elevated unemployment in the 1990s (Antonczyk/Fitzenberger/Sommerfeld, 2010; Dustmann et al., 2014). Structural model estimates suggest that income taxes and social insurance contributions, which generate a more than 60 percent wedge between employer costs and worker take-home pay, played an even greater role in driving low pre-reform employment. Overall, our findings suggest that there was a lot of slack in the labor market, consistent with, e.g., the relatively low female labor force participation of the mid-1990s and a more than 80 percent female share in the nursing home workforce.

The rest of the paper is organized as follows: In Section 2, we discuss the economic environment and data. Section 3 outlines our empirical strategy, while Section 4 presents the empirical results. In Section 5, we introduce a model of labor demand and supply in long-term care and explore the factors that determine the external validity of our results. Section 6 offers a brief conclusion.

2 Institutional Setting and Data

2.1 Long-Term Care Insurance in Germany

Universal long-term care (LTC) insurance is the newest branch of the extensive German social insurance system; it was created in 1995.[2] It is funded through payroll contributions,[3] and provides fixed-amount benefits that vary depending on the level of medical need, determined by assessors, and the type of care, chosen by the patient. Assessors use objective criteria to classify dependency into three levels of care need, based on the frequency and duration of assistance required to perform daily activities such as hygiene, nutrition, mobility, and domestic care due to illness or disability. Patients can choose between a cash benefit (typically used to help pay for informal care) or financial support for formal care, which may include outpatient care at home or inpatient care in full-time nursing homes. Patients then pay the difference between the insurance subsidy and the market price of care. The highest benefit level is provided for nursing home care. At the start of the insurance program, this benefit amounted to approximately 1,200 EUR per month, covering about 60 percent of the cost of inpatient care.[4] Nursing home care is the most expensive type of LTC, accounting for the largest share of the workforce and spending in the sector.[5] A large share of nursing homes are not-for-profit, owned or affiliated with the Catholic or Protestant Churches, or in public ownership. Workers in such not-for-profit establishments are commonly subject to cross-industry collective bargaining agreements.

Prior to the introduction of universal insurance in 1995, the German welfare system provided means-tested financial support for LTC services, known as *Hilfe zur Pflege*.[6] *Hilfe zur Pflege* support was funded primarily through municipal budgets (Rothgang, 1997) and was allocated on a case-by-case basis following a review of the patient's medical and financial circumstances. Eligible recipients received full coverage of formal LTC services. In an effort to help municipal budgets meet the growing demand for LTC services driven by a

[2] Rothgang (1997); Nadash/Doty/von Schwanenflügel (2018) as well as a series of detailed government reports (Bundesministerium für Arbeit und Sozialordnung, 1997) provide overviews of the reform.
[3] As of 2024, the contribution rate is 4% for employees without children, and 3.4% for those with children and those born before 1940, statutorily split equally between the employee and the employer.
[4] In 1999 (the first year of full reporting by the new insurance program) the average monthly benefit paid was 1,193 EUR for nursing home care, 783 EUR for outpatient care, and 344 EUR in cash benefits (Bundesministerium für Arbeit und Soziales, 2011). In 1999, the average market price for patients in nursing home care was approximately 2,000 EUR per month (computed as a weighted average across patients of different severity), including both healthcare services and room and board (Statistisches Bundesamt, 1999a).
[5] In 2009, approximately 70% of workers in the LTC sector were employed in inpatient settings (Bundesministerium für Arbeit und Soziales, 2011).
[6] Literally: Help for Care. See Pabst (2002) for a detailed description of the program.

rapidly aging population, the Bundestag passed a sweeping LTC reform in 1994.[7] The centerpiece of the reform was the creation of a new social insurance program for LTC services, which was implemented over the course of 1995 and 1996. The new program more than tripled public spending on LTC nationwide (Figure A2).[8] According to contemporary accounts, the implementation of the insurance program was considered (and indeed intended) to be a deliberate catalyst for the growth of the LTC sector of the economy (Bundesministerium für Arbeit und Sozialordnung, 1997; Rothgang, 1997).

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 (IAB). The IEB is derived from administrative records maintained by the German Federal Employment Agency.[9] The data capture the universe of employment spells for workers subject to social insurance contributions in Germany.[10] The dataset begins in 1975. For our analysis, we restrict the sample to the years up to 2008 and to observations in (former) West Germany.[11] We aggregate the raw spell-level data to the individual-year level by retaining the spell active on June 30th of each year.[12] Appendix A1.1 provides details of the data processing steps.

We construct two analytic samples from the resulting person-year dataset. The first extract—which we refer to as the "Nursing Home Sample (NHS)"—selects full labor market biographies for individuals who were employed in a nursing home at least once between

[7] Figure A1 shows that the share of the population aged 65 and older grew from ca. 15% to more than 20% in the two decades after 1995.

[8] Total LTC expenditures rose from 6.5 billion EUR in 1991 to 19.3 billion EUR in 1999 (Statistisches Bundesamt (2013) Table D5 and Bundesministerium für Arbeit und Soziales (2011) Appendix 3). In comparison, the German GDP grew from 1.6 trillion in 1991 to 2.1 trillion in 1999, so LTC expenditures increased from 0.4% to 0.9% of GDP. For reference, Medicare and Medicaid programs in the U.S. spent $32.8 billion (0.5% of GDP) on nursing homes and home health care in 1990 (Levit et al., 1991).

[9] The IEB database is maintained by the Institute for Employment Research in accordance with the German Social Code Book III. The data are subject to the confidentiality regulations outlined in Book I, Section 35, Paragraph 1 of the Social Code, with access regulated under Section 75 of Book X.

[10] Hence, the IEB excludes self-employed individuals and civil servants but includes the following categories: employment subject to social insurance (in the data since 1975), marginal part-time employment (since 1999), recipients of unemployment benefits under the German Social Code III (since 1975) or II (since 2005), registered job-seekers at the German Federal Employment Agency, or participants in active labor-market programs (since 2000).

[11] We exclude observations from 2009 onward due to substantial changes in the industry classification system (Eberle et al., 2011). Furthermore, we exclude observations for employment in (former) East Germany, Berlin, or Bremen, as consistent time series are unavailable for these regions.

[12] Before aggregating to the annual level, we clean spell-level data following the procedures outlined in Eberle/Schmucker (2019).

1975 and 2008.[13] We use this sample to provide a deep-dive into the reform's effects on employment in LTC, which we refer to as the partial equilibrium analysis. We focus on workers in nursing homes, who account for the lion's share of LTC employment, and can be best identified in our data.[14]

Our second data extract comprises full labor market biographies for a 10 percent random sample of workers observed in 1975 to 2008. We refer to the subset of these data that is restricted to years 1985 to 2004 as the "Labor Market Sample (LMS)". Starting the analysis in 1985 ensures a minimum ten-year look-back period for identifying workers who re-enter the labor market. Moreover, it mitigates potential concerns that geographic variation in overall employment in 1970s may correlate with geographic variation in the eligibility for welfare programs among older adults in the 1990s. Limiting the sample to pre-2005 data further avoids years with substantial changes in the unemployment benefit system introduced by the 2005 Hartz IV reforms (Price, 2019). These reforms led to significant gaps in unemployment benefit histories, compromising the reliability of longitudinal unemployment analyses for years following 2004 (Antoni et al., 2019).

2.2.2. Characteristics of Workers

We observe the year of birth, sex, nationality, and educational attainment for individuals in both samples. For employment spells, 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 A1.2 for additional information on these variables.

We construct several measures of labor market experience for all individuals in our samples.

[13] We define nursing homes as establishments categorized under 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). We use time-consistent industry codes following the procedure of Eberle et al. (2011) and consider only "regular" employment, as defined by the IAB convention—see Appendix A1.2 for details. Not-for-profit institutions, typically affiliated with or owned by Catholic and Protestant churches, hold a significant market share in the German LTC sector. While for simplicity of exposition we refer to all "homes" that fall under these WZ73 industry codes as nursing homes, in practice the industry classification is coarse and includes several different types of care and assisted living institutions that may have different formal certifications. Some establishments may function more like retirement homes with minimal assistance for daily living, while others may provide intensive skilled nursing care (yet others may serve populations outside the elderly, such as adults and children with disabilities). All such facilities could be affected by all types of LTC insurance benefits and hence we include them in our analysis. However, not all establishments that we classify as nursing homes qualify for inpatient LTC insurance benefits, which require licensing under the German SGB XI. The latter certification typically requires specific skilled nursing services to be offered on site. LTC insurance statistics report 6,564 such licensed facilities (Bundesministerium für Gesundheit (2001), Anlage 8), while our sample includes 11,401 facilities—approx. 74% more. We account for this discrepancy in the welfare analysis presented in Section 5.

[14] IEB industry codes have limited precision in the years we analyze, making it challenging to identify formal outpatient care providers.

For workers in the nursing home sample we construct a measure of the *general* labor market experience by counting the number of years an individual was employed over a fixed 15-year look-back window. Analogously, we construct a measure of *nursing home* experience by counting the number of years the individual worked in a nursing home establishment over the prior 15 years. The 15-year look-back window restricts the number of years that we can include in regressions that use experience as an outcome variable, to years 1990 to 2008, but helps avoid a censoring bias in the early years of our sample period. For each nursing home employment spell, we additionally classify each worker-year observation into a nursing home incumbent or a new hire. A worker is considered to be a new hire in year t if the person was regularly employed in a nursing home in year t but not in year $t-1$.

For workers in the labor market sample, we classify each worker-year observation as being either employed or unemployed (see precise definitions in Section A1.2). If a worker is unemployed in year t, we also create an indicator for long-term unemployment status, which requires being unemployed in two consecutive years. We consider a worker to be rejoining the labor force in year t if the worker was not observed in the data in year $t-1$, but was observed in at least one year prior to $t-1$, and was age 55 or younger (and hence not close to early retirement) in year t.

2.2.3. Mortality

We use two sources of mortality data. First, we obtain county-level mortality rates for individuals age 75 and older from the vital statistics of West German states, covering the years 1991 to 2008.[15] The second source is the Human Mortality Database, which allows us to compute age group-specific mortality for years 1991–2008 for West Germany and 27 other countries.

2.2.4. Means-Tested and Universal LTC Beneficiary Counts

We use historical statistical reports to compute the number of individuals who received means-tested *Hilfe zur Pflege* in 1993. The most granular geographic resolution at which we were able to obtain *Hilfe zur Pflege* recipient counts consists of 15 geographic regions covering the former West Germany. These regions include state-level observations for all states (*Länder*) and seven sub-state regions (Regierungsbezirke) within Bavaria. We sourced

[15] Data from 1994 onwards are publicly available as online resources (Statistische Ämter des Bundes und der Länder, 2021a). Mortality data for years 1991–1994 were obtained through written requests from the statistical offices of the respective German federal states.

state-level recipient counts from Statistisches Bundesamt (1993: p. 96) and obtained counts for Bavaria's Regierungsbezirke from Statistical Office of Bavaria (1993: p. 297).

We obtained LTC claim counts from federal LTC insurance program reports (Statistisches Bundesamt, 1999b: p. 7). We use counts from 1999, which is the first year with reliable state-level LTC insurance statistics. We extracted corresponding data for Bavaria's seven Regierungsbezirke from Statistical Office of Bavaria (1999).

2.3 Summary Statistics

Table 1 provides descriptive statistics for the two analytic samples. The nursing home sample summarized in column (1) consists of 25.3 million observations for 1.6 million unique workers across years 1975 to 2008. Individuals in the sample are, on average, 36 years old. 78 percent are female, and 94.5 percent are German nationals. About 7 percent of the workers have completed the upper tier of high school (*Abitur*). 58 percent of observations are for employment in the healthcare sector, while 8.7 percent are unemployment episodes. The employment spells span nearly a million unique establishments of any kind, of which 22,629 are nursing home establishments.[16]

Nursing home spells, summarized in column (2), account for 10.2 million individual-year observations. Nursing home spells are more likely to occur at a slightly older age (40 vs. 36 years old) and be part-time (25 percent of all employment spells vs. 29 percent for nursing home spells). The share of women is 82%. Workers earn 2.5 percent higher wages during their nursing home spells (78.60 EUR/day vs. 76.70 EUR/day, in 2020 Euros). About 59 percent of nursing home employment episodes are in not-for-profit (mainly church-owned) nursing homes, 27 percent in for-profit, and 14 percent in publicly-owned institutions.

The labor market sample, summarized in column (3) of Table 1, has 44 million observations for 3.8 million individuals in years 1985 to 2004. This sample is representative of the German socially insured workforce. Workers are on average 38 years old and 93 percent are German nationals. 41.5 percent of workers are women. 7.7 percent of workers are unemployed, 13 percent work part-time. The average daily wage is 96.4 EUR.

In sum, we see that individuals who work in nursing homes at some point in their careers are predominantly women, are more likely to work part-time, and earn about 20 percent lower wages than the average worker in Germany.

[16] Recall that we are only able to count establishments and not firms in our data. Also see footnote 13 for the exact definition of which establishments are included in our count of nursing homes.

3 Research Design

3.1 Source of Variation

Our empirical strategy takes advantage of the geographic variation in the prevalence of the means-tested *Hilfe zur Pflege* program prior to the rollout of universal LTC insurance. After the introduction of LTC insurance in 1995, all individuals with medically documented LTC needs became eligible for the new insurance benefits.[17] The new program, however, had little financial impact on individuals already receiving *Hilfe zur Pflege*, as their care needs were effectively already covered by an existing public program. Consequently, regions with a higher pre-reform share of *Hilfe zur Pflege* coverage were likely less affected by the insurance expansion.[18] The variation in pre-existing coverage reflects differences in local *Hilfe zur Pflege* eligibility determinations as well as the historical financial circumstances of older individuals in 1995.[19]

To capture this geographic variation in exposure to the new insurance program, we compute the share of individuals with LTC needs who were already "covered" through the *Hilfe zur Pflege* program prior to 1995 for 15 geographic regions of Germany r (defined in Section 2.2.4). The denominator of this share is the number of claims for LTC insurance in 1999, adjusted back to 1993 to account for region-specific demographic growth. This measures the latent demand for LTC prior to the expansion under the assumption that *after* the expansion all individuals with medical needs revealed their demand by claiming benefits. We define the numerator to be the count of *Hilfe zur Pflege* recipients in 1993, just before the new insurance program was signed into law. Our exposure measure E_r is then:

$$E_r = 100\% - \frac{\textit{Hilfe zur Pflege}_{r,1993}}{g_{r,1993,1999} \times \textit{LTC Insurance Claims}_{r,1999}}, \tag{1}$$

[17] Medical necessity for LTC is determined by independent medical assessors who have no financial incentive to approve or deny applications. According to Nadash/Doty/von Schwanenflügel (2018), benefit determinations, including denials, have generally been accepted as reliable and fair, and, if appealed, are rarely overturned.

[18] There are two possible countervailing channels that may complicate this interpretation. Patients qualifying for *Hilfe zur Pflege* can select cash benefits over formal care benefits in the post-reform period. This is primarily relevant for patients with relatively minor care needs, who prefer informal over formal home care, and arguably less relevant for patients considering nursing home care. This potential substitution effect *away* from formal care could have been more pronounced in regions with a higher pre-reform share of *Hilfe zur Pflege* coverage, thus attenuating the reform's impact in these regions (and thus amplifying our estimates of the causal effect). On the other hand, areas with a higher share of *Hilfe zur Pflege* payments that were now displaced by federal funds would have experienced a higher windfall to local budgets, which could have independently affected local economies, thus amplifying the reform's impact in these regions (and thus attenuating our estimates of the causal effect).

[19] Notably, our measure of variation *does not* simply reflect differences in contemporaneous incomes across areas. Figure A3 shows that exposure is uncorrelated with average area-level income in 1993.

The deflation factor $g_{r,1993,1999}$ captures region-specific aging trends, computed as the ratio of the population aged 65 and older in 1993 to that in 1999. $g_{r,1993,1999}$ thus deflates the 1999 count of LTC insurance recipients by the change in the number of older individuals in each region r between 1993 and 1999. Intuitively, E_r measures the share of individuals with LTC needs who did not have insurance coverage for these needs prior to the reform.[20] The geographic variation in E_r is visualized in Figure A4, which plots the region-level variation in E_r and the mapping of counties to regions. On average, across counties,[21] 68.7 percent of individuals with LTC medical needs gained insurance coverage. This exposure rate exhibited notable regional disparities, ranging from less than 60 percent in North Rhine-Westphalia to nearly 80 percent in parts of Bavaria.

Using this source of variation, we estimate an event study specification to examine whether areas with greater exposure to insurance expansion experienced differential changes in the outcomes of interest. For an outcome $Y_{c(r)t}$ in county c within region r in year t, we estimate:

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

where α_c are county fixed effects that capture time-invariant differences in outcomes across counties, and δ_t are year fixed effects that non-parametrically capture a common time trend across counties. The coefficients of interest, λ_t, multiply the interaction between year fixed effects and the (time-invariant) measure of exposure E_r. These coefficients measure whether areas with greater exposure to the LTC insurance expansion experienced differential growth in outcomes. This flexible specification does not impose a trend break in any specific year, allowing the data to reveal whether any changes in trends emerged after the expansion. The identifying assumption for a causal interpretation of λ_t is that, absent the insurance expansion, outcomes would have evolved in parallel across geographic areas with different levels of exposure.

To simplify the discussion of effect magnitudes, we also report results from a difference-in-differences specification that pools the coefficients of the transition years

[20] We cannot distinguish between individuals ineligible for *Hilfe zur Pflege* and those not taking it up. While incomplete take-up is common and likely present in our context, this distinction is not essential for our analysis, as we are interested in the effective change in the share of subsidized versus unsubsidized LTC patients irrespective of the reason for not having a subsidy.

[21] We assign each county the level of E_r for region r in which the county is located. Using counties as the unit of analysis allows for more flexible specifications of time- and place-invariant factors and provides a comparable spatial unit of analysis across the different exposure regions. It also better aligns with natural labor markets. We report region-level specifications in the Appendix; the results are similar.

(1994 to 1996) and the post-reform years (1997 to 2008):

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

3.1.1. Partial Equilibrium

In our partial equilibrium analysis of the nursing home market, we consider three sets of outcomes $Y_{c(r)t}$: the number of nursing home workers and establishments, the wage of new hires and incumbent workers, and the demographic characteristics and labor market experience of new hires. We construct all outcomes from individual-level data and aggregate to the county-year level by summing counts (for the first set) or by taking averages (for worker characteristics). To account for varying county sizes and potential differences in aging trends, we scale all count-based outcomes into per capita terms using the count of the population age 65 and older. We also use these population counts as weights in wage regressions. Throughout, we cluster standard errors at the county level.

In the Appendix, we report the results of several alternative specifications for our main outcomes of interest. We show specifications that re-estimate Equation (2) at the region r rather than county level (top row of Figure A6 and columns (1)-(4) of Table A1), or that keep the county-level specification, but cluster standard errors at the region r level (bottom row of Figure A6 and columns (5)-(8) of Table A1). We also present the results of specifications that include county-specific time trends (top row of Figure A7 and columns (9)-(12) of Table A1), control for the share of the population age 65 and older in the county (bottom row of Figure A7 and columns (5)-(8) of Table A2), or control for the county-year counts of people aged 65 and older (top row of Figure A8 and columns (1)-(4) of Table A2). Further, we show two specifications that use alternative ways of defining exposure (bottom row of Figure A8, Figure A9, and Table A3). Figure A5 shows that alternative definitions of exposure are highly correlated with our baseline measure. Across all specifications, our main takeaways remain qualitatively the same.

3.2 General Equilibrium

We next move beyond nursing homes and consider the overall effects of the LTC insurance expansion on the local economy.[22] We consider several county-level employment outcomes, including local rates of unemployment (including long-term unemployment), labor force size, the number of workers re-entering the labor force, average wages, and the total wage bill. A practical challenge is that overall local labor market trends are heavily influenced by place-specific macroeconomic fluctuations, making it hard to separate trend changes related to treatment from the overall volatility. To address this, for our general equilibrium analysis we adopt the synthetic difference-in-differences method, which weakens the reliance on the parallel trends assumption (Arkhangelsky, Dmitry and Athey, Susan and Hirshberg, David A. and Imbens, Guido W. and Wager, Stefan, 2021). This data-driven procedure optimally reweights treatment and control units, ensuring that treatment units are compared to controls that had more similar trends prior to treatment (in our case, this would mean comparing units with more similar macro-economic fluctuations). To apply this method, we convert the continuous exposure E_r to a dichotomous indicator. Counties are classified as treated if their exposure is above the median, while those at or below the median are used as control units. This binary measure corresponds to a 9.1 percentage point difference in exposure between treated and control counties.

3.3 Mortality

A natural and key question is whether any of the changes precipitated by the rollout of universal LTC insurance ultimately resulted in improved care for the older population—one of the stated goals of the LTC reform (Rothgang, 1997). While we lack direct measures of care quality, we consider mortality at older ages as one way to capture the net effect of the LTC reform on (potential) patients. We examine deaths among the population aged 75 and older at the county level. We estimate Equation (2) as our baseline specification, but also report results from the synthetic difference-in-differences specification in Figure A10a. In addition, we estimate a synthetic control specification that leverages variation in mortality among the elderly (aged 75 and older) between Germany and other high-income countries, rather than variation in exposure across geographic regions within Germany (Figure A10b). In this specification we consider West Germany to be “treated” after 1995, and construct a counterfactual mortality time trend (a “synthetic” West Germany) by reweighing mortality trends in other countries following Abadie/Diamond/Hainmueller (2010).

[22] This analysis also captures the effects on the formal outpatient LTC sector and LTC cash benefits, which we cannot investigate separately.

4 Results

4.1 Partial Equilibrium

4.1.1. Industry Expansion

Figure 1 plots the time series of the number of nursing home workers (Panel 1a) and the number of nursing home establishments (Panel 1b) per 1,000 individuals aged 65 and older between 1975 and 2008. We show the unweighted average of each outcome separately for counties in regions with above-median exposure (blue solid line) and below-median exposure (red dashed line). Both time series are normalized to the overall unweighted mean across all counties in 1993 (Figure A11 shows the raw time series without this normalization). The grey shaded area marks the years of the insurance rollout.

Three facts emerge. First, inpatient LTC employment per capita saw persistent growth over the three decades that we study, with the number of nursing home workers per 1,000 individuals age 65 and older more than tripling from 12 to 40 workers.[23] Second, the growth in the nursing home workforce was accompanied by growth in the number of nursing home facilities per capita until the late 1990s, increasing to more than one facility per 1,000 older adults in 1990. However, growth in establishments slowed relative to population growth after this period. Third, we observe that in the post-expansion years, both the numbers of nursing home establishments and of workers per 1,000 elderly were growing visibly faster (or declining slower) in counties that were more exposed to the insurance expansion.

In Panels 1c and 1d of Figure 1, we present the results of estimating the event study in Equation (2), with point estimates also reported in Table 2. The estimates suggest that prior to 1995, the rate of growth in the number of workers and in the number of establishments per 1,000 older adults did not differ across geographic areas with different levels of means-tested coverage in 1993. After the rollout of universal insurance, however, growth was more pronounced in areas that were more exposed to insurance expansion.[24] The acceleration flattened out around eight years after the new insurance was signed into law.

Table 2 presents pooled difference-in-differences estimates from Equation (3). The results in columns (1) and (4) indicate that, on average, a 10 percentage point increase in exposure to

[23] This corresponds to an annual growth rate of 3.6%, in contrast to a 0.2% annual growth rate for the overall West German population and 1.2% for the 65+ population during this period (Human Mortality Database).

[24] Figure A11 suggests that places with higher exposure (and hence a lower prevalence of subsidized care prior to insurance expansion) had lower levels of workers and establishments per capita prior to the reform. These areas caught up with less exposed areas in the number of workers per capita after the insurance expansion.

the reform (equivalent to a 15 percent increase relative to the mean) led to an additional four nursing home workers per 1,000 individuals age 65 and older (a 12 percent increase) and 0.06 more nursing homes per 1,000 elderly (a 6 percent increase). The increase in the number of nursing home workers is approximately evenly distributed between part-time and full-time workers (columns 2 and 3), suggesting a significantly larger relative effect for part-time workers. Before the reform, the number of part-time workers was less than half that of full-time workers (nine part-time workers per 1,000 elderly in 1993 versus 24 full-time workers). Figure A12 illustrates the time series and event studies for both worker types.

A 10 percentage point change in exposure is close to the 9.1 percentage point difference in mean exposure between counties with above- and below-median exposure. We refer to this difference 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, we estimate that offering LTC insurance to an additional 9.1 percentage points of uninsured elderly adds 38,979 nursing home workers and 542 nursing home establishments. We also calculate an out-of-sample estimate of the aggregate impact of LTC insurance. This extrapolation assumes linear scaling with exposure, which is inherently more speculative. The out-of-sample prediction suggests that expanding universal coverage by 68.7 percentage points (i.e. moving from 31.3 percent of the potential patient population being insured to full coverage; or from 0 percent to 68.7 percent) would result in 0.42 more nursing home establishments per 1,000 older adults (a 40 percent increase relative to the mean of 1.04 in 1993) and nearly a doubling of the nursing home workforce, adding close to 300,000 nursing home jobs.

To contextualize these employment effects, we construct a coarse arc elasticity by dividing the extrapolated increase in employment by the implicit change in the out-of-pocket price for an average consumer:

$$\epsilon_{arc} = \frac{\Delta Q/(Q1 + Q2)}{\Delta P/(P1 + P2)} = -0.74 \,. \tag{4}$$

The numerator considers changes in employment per 1,000 older adults (ΔQ=30.5 workers) relative to the average employment between the pre-reform period ($Q1$=33.1 workers as seen in column (1) of Table 2), and the post-reform period ($Q2 = Q1 + \Delta Q$=63.6 workers). The denominator considers the change in prices for inpatient care. Pre-reform, on average 68.7 percent of potential patients paid the full price of care out-of-pocket, while the remaining 31.3 percent were fully insured through means-tested *Hilfe zur Pflege*. Hence, the average out-of-pocket price pre-reform was $P1 = 0.687 P_{market}$. Post-reform, cost-sharing of the newly insured drops to 40 percent (cf. footnote 4). The new average out-of-pocket price then becomes $P2 = 0.687 \times 0.40 P_{market}$, or $0.28 P_{market}$.[25] Put together, this suggests an arc elasticity of -0.74, which significantly exceeds the elasticity estimates in the RAND or the Oregon experiments (Newhouse/Insurance Experiment Group, 1993; Finkelstein et al., 2012). Our data on firm entry suggest that fixed costs of investment may be one explanation for these differences (Finkelstein, 2007).

4.1.2. Anatomy of Expansion

In this section, we characterize the nature of the nursing home industry expansion. We consider the change in wages and the composition of newly hired workers. Figure 2 summarizes all point estimates.

Price effects

We start by examining whether the large expansion of the nursing home workforce was accompanied by growth in wages. We expect that firms increased their wages in order to attract more new hires or to improve the retention of incumbent workers. Table 3 displays the results from estimating Specifications (2) and (3) for (log) daily wages of new full-time hires (columns 1 and 2) and of incumbent full-time workers (columns 3 and 4).[26] We find no evidence of systematic increases in wages on average, for either the new hires or the incumbents. For the new hires, the point estimates are close to zero when we control for experience (column 2), suggesting that the wage decline in column 1 is driven by a shift towards lower-skilled workers. For incumbents, we find no evidence for a change in wages. This can be most clearly seen in the event study coefficients for the first and second year post expansion (λ_{1997} and λ_{1998}), as these coefficients mostly capture the effects for workers who were hired prior to the reform.

The lack of an increase in wages in a rapidly expanding sector is consistent with either a perfectly elastic labor supply curve among lower-skilled workers, or with the existence of labor market frictions and the prevalence of excess labor supply prior to the insurance expansion. For example, nursing home labor markets may not (just) clear in prices in the presence of search and matching frictions that interact with tax wedges, unemployment insurance benefits, and collective bargaining agreements, all of which characterized the

[25] If we assume (1) that the entirety of the employment expansion is due to new patients without *Hilfe zur Pflege*, (2) that the proportion of inpatient patients among all patients under *Hilfe zur Pflege* is the same as under full insurance in 1999, and (3) that the staffing ratio of patients to workers is fixed, then we obtain an even higher elasticity. In this case, the relative increase in patients is larger (considering a smaller base of non-*Hilfe zur Pflege* patients). At the same time, the observed increase in demand combines a substitution and an income effect, which we consider in the structural model outlined in Section 5.2. Isolating the substitution effect, the model estimates suggest a demand elasticity of -1.19.

[26] Event studies are in Figure A13. To allow for individual-specific controls in county-level regressions, we first residualize individual-level log wages with respect to worker fixed effects and then compute county-year level averages of these residuals.

German economy in the mid-1990s. In that environment, a demand shock can simply induce increased vacancy posting, which can increase job finding rates and employment even when holding wages fixed. We return to this discussion in Section 5.

Compositional effects

We next consider whether the expansion of the nursing home market was accompanied by a change in the average demographics or qualifications of the new hires. This analysis can also be viewed as assessing the characteristics of the compliers. Table 4 (and Panel B of Figure 2) documents how the insurance expansion impacted the characteristics of new workers hired by nursing homes. We find no changes in the nationality or sex of new hires. However, we find that an average new hire, post-reform, appears to be less skilled. New hires are 0.9 percentage point less likely (11 percent relative to the mean of 9 percent) to hold the most advanced high school degree (*Abitur*) for each 9.1 percentage points of exposure. They also have four months less general labor market experience relative to the average experience of 4.6 years, some of it due to a slightly younger age of the new hires. The point estimates for the nursing home-specific labor market experience are noisy, but also point in the direction of less experience. We find no change in apprenticeship experience or the frequency of part-time employment among new nursing home hires. Table 5 considers the origins of new workers hired by nursing homes in response to the reform.[27] We estimate a significant positive effect on hiring out of unemployment and from among the pool of workers who are temporarily not in the labor force. We find that the share of new employees who were unemployed before starting an inpatient LTC job increases by 1.1 percentage point (from a base of 17 percent in 1993) for each 9.1 percentage points of additional exposure to the reform. For workers temporary out of the labor force, the increase is 1.6 percentage points off a 30 percent base, for each 9.1 percentage points of additional exposure to the reform.

Overall, we conclude that the expansion of the LTC sector resulted in nursing homes moving down in the skill distribution and providing job opportunities to individuals who likely would have faced greater difficulty finding employment otherwise.

4.2 General Equilibrium

Our preceding analysis focused solely on the nursing home market directly targeted by the insurance expansion; yet a comprehensive understanding of the program's welfare implications requires a broader perspective. As Baicker/Chandra (2012) point out, public funds invested in long-term care (or healthcare more generally) might merely reallocate

[27] Table A4 reports analogous estimates using the count of workers rather than shares as the outcome.

workers from other productive sectors, potentially leading to inefficiencies. This section examines the net effects of the LTC insurance expansion on the local economy.

Table 6, columns (1) and (2), present synthetic difference-in-differences (SDID) estimates of the reform effect on county-level unemployment; the corresponding graphical evidence is displayed in Figures 4a and 4c.[28] The reported average treatment on the treated effect (ATT) corresponds to the effect of a 9.1 percentage point change in the share of insured patients. On the eve of the LTC expansion, (former West) Germany faced a relatively high unemployment rate, averaging 7.4 percent in our sample, with substantial variation across counties (standard deviation of 2 percentage points). Our ATT point estimate suggests a significant decline of 0.5 percentage points—or a quarter of the cross-county standard deviation—for each 9.1 percentage point increase in exposure. This effect appears to operate primarily through a reduction in long-term unemployment, which we define as unemployment lasting at least two consecutive years. The overall impact on unemployment exceeds our estimated employment increase within the nursing home industry. This encompasses hiring across various parts of the long-term care sector, as well as potential spillover effects on the broader economy.

Column (3) of Table 6 and Figures 4b and 4d show that in addition to the reduction in the rate of unemployment, LTC insurance also induced an expansion in the labor force.[29] An important component of this expansion was workers re-entering the labor force (column 4 and Figure A15). We classify individuals aged 55 and younger as re-entering the labor force in year t if they were formally employed or unemployed at some point prior to year $t-1$, but were not formally (un)employed in year $t-1$. We find that a 9.1 percentage point expansion in LTC insurance resulted in a 1.6 percent increase in the size of the labor force and a 1.9 percent rise in labor force re-entries.[30] Remarkably, column (5) of Table 6 again indicates no change in average daily wages in the economy, supporting the hypothesis that job creation was driven by additional vacancy postings, which were filled by workers with less experience and lower qualifications. Mechanically, with wages constant but the workforce expanding, we observe a substantial increase in the aggregate wage bill. We

[28] As proof of concept, we report the SDID estimates for nursing home employment in Figure A14. For this outcome, our SDID estimates are similar to the DID estimates obtained using a standard two-way fixed effects regression. For a labor force size of 22.3 million across our exposure regions, the estimated 0.2 percentage point increase translates into roughly 44,000 additional nursing home jobs, per 9.1% in additional exposure. This is close to the estimated in-sample increase of 38,979 nursing home jobs reported in Table 2.

[29] Figures A11c and A11d show the raw time series of unemployment and of labor force participation without the normalization to the common mean in 1993.

[30] This overall expansion of the labor force captures multiple mechanisms that we cannot estimate separately in the reduced-form specification, as we lack data on individuals' reasons for labor force absence. Potential factors include worker (re-)entry due to newly available LTC vacancies, the expansion of vacancies in the overall economy due to fiscal multiplier effects, and the potential transition of family members from informal LTC at home into the formal labor market. The multifaceted impact of public fund influx into LTC underscores the importance of analyzing net labor market effects.

estimate a 2.2 percent increase of the daily wage bill, amounting to an additional 42 million EUR in daily wages paid across the economy (column 6, Figure A15).

In summary, our evidence suggests that the LTC insurance expansion functioned as an economic stimulus, boosting overall employment primarily by integrating lower-skilled workers into the labor market. When assessing the external validity of these results, it is important to consider the context of the German labor market in the early 1990s, characterized by relatively high unemployment and low female labor force participation. These conditions are commonly attributed to generous unemployment benefits, substantial income tax wedges, and collective bargaining agreements (Dustmann et al., 2014). As we discuss in Section 5.2, these factors may have significantly shaped the impact of introducing a public insurance program in mid-1990s Germany. More broadly, we will demonstrate that the net effect of insurance expansions on the economy is theoretically ambiguous and heavily dependent on specific labor market fundamentals.

4.3 Mortality

We conclude this section by presenting our estimates of the LTC insurance expansion's impact on older age mortality. The net effect on mortality is ambiguous *ex ante*: Enhanced access to formal care and additional consumption enabled by insurance payments may improve health and extend life expectancy. Conversely, receiving care outside the familiar home environment and the lower average skill level of newly hired nursing home staff may negatively affect health (as hypothesized in Stevens et al., 2015).

Figure 5 and column (1) of Table 7 present event study results using our baseline specification from Equation (2). Table 7 reports pooled point estimates for separate regressions combining two sets of post-reform years. While the event study pattern exhibits some noise, the pooled point estimates for the early post-reform years suggest a 0.09 percentage point (0.9 percent) decline in mortality for a 9.1 percentage point increase in exposure. This negative impact fades out over time, possibly due to compositional changes among the (now) longer-living elderly. The synthetic difference-in-differences estimator yields similar results (column 2). We detect no significant changes in mortality in the cross-country comparison (column 3).[31] We conclude that the expansion of the LTC sector and the increased hiring of observationally lower-skilled workers does not appear to have worsened mortality among the elderly population in the long-run; mortality declined in the short-run.

[31] We implement the permutation-based inference method of Abadie/Diamond/Hainmueller (2010) for column 3.

The baseline point estimate implies an aggregate reduction of 9 deaths per 10,000 individuals age 75 and older per year. In 1995, West Germany had a population of 4.2 million age 75 and older. Life expectancy at age 75 in 1993 (i.e. prior to the reform) was 8.7 years for men and 10.9 for women (Federal Statistical Office, 2024). Positing a mean life expectancy of 10 years, our estimates imply 37,607 years of life gained (YLG) in West Germany.[32] Applying a median estimate for the value of a statistical life year (VSLY) in Europe of approximately 115,000 EUR (Deutsches Krebsforschungszentrum, 2018)[33] yields a total mortality gain worth 4.4 billion EUR per year for West Germany. A back-of-the-envelope cost-effectiveness calculation suggests a gain of 5.5 billion EUR in life-years saved for Germany overall (by linearly scaling to population counts right before the reunification), for 9.6 billion EUR in extra annual public expenditures on LTC coverage.[34] At this point we could conclude that the insurance expansion did not result in sufficient health improvements (as measured by mortality gains) to justify the additional public expenditure. However, this conclusion changes sharply once the associated gains in the labor markets are accounted for, as we demonstrate next.

5 Welfare

Public funds allocated to a health insurance expansion in our context were effectively an economic stimulus that increased employment across the German economy. In this section, we evaluate the efficiency of this public spending program.

We anchor our normative analysis in the marginal value of public funds (MVPF) framework (Hendren/Sprung-Keyser, 2020; Finkelstein/Hendren, 2020), which compares the willingness to pay of all policy beneficiaries to the net cost to the government. In our context, the insurance expansion was not marginal, necessitating an approach to estimate surplus for marginal consumers and workers. Our first approach follows the spirit of the Harberger triangle (Harberger, 1971), using linear approximations to demand functions to approximate surplus. Our second approach is model-based. We develop a general equilibrium model of product and labor markets with product-market subsidies. Our

[32] A YLG estimate assumes that an averted death returns the individual to the age-specific population life expectancy. This is a standard measure that is best interpreted as the upper bound on the life-years gained. The lower bound would assume that an averted death only results in the gain of one year of life, for 3,761 life-years (or 10% of YLG) in our case (Claxton et al., 2015).

[33] Median VSLY of 168,367 EUR reported in 2019 EUR deflated to 1997 EUR using HICP - Overall price index for the Euro area.

[34] See Figure A2 which plots the time series of *Hilfe zur Pflege* and LTC insurance spending for Germany overall. *Hilfe zur Pflege* spending was 9.1 billion EUR on the eve of the reform in 1994. After the reform in 1997, *Hilfe zur Pflege* spending dropped to 3.5 billion EUR; LTC insurance spending in that first year of full rollout was 15.1 billion EUR, for a total increase of 9.6 billion EUR.

theoretical framework draws on the directed search and matching literature, building on Acemoglu/Shimer (1999) and Wright et al. (2021). We demonstrate how to take this model to data to compute the MPVF ingredients.

The central insight from both exercises is that the textbook narrative of welfare losses from moral hazard in health insurance is incomplete. The full welfare effect of public spending on insurance programs needs to account for potential general equilibrium gains (or losses) in input markets as well as fiscal externalities.[35]

Methodologically, our horse race between the two estimation approaches illustrates the challenge of estimating the MVPF of non-marginal policies (Finkelstein/Hendren, 2020). Moreover, the model-based approach highlights that the MVPF derived from causal estimates is not a context-invariant policy parameter. Instead, the estimated policy elasticities, and by extension the MVPF, depend heavily on the specific economic circumstances under which the policy was implemented.[36] We use our model to simulate counterfactual economic environments that speak to the external validity of our quasi-experimental results. We find that in contexts with lower tax rates and higher labor force participation, the same LTC policy would have been less effective in stimulating economic activity and might have even been net welfare-reducing.

5.1 Approximation Approach

For any policy, the MVPF is calculated as the ratio of beneficiaries' willingness to pay to the net cost of the policy to the government. In our analysis, we separately consider the numerator and denominator for two groups: patients, the direct beneficiaries of the LTC insurance expansion, and workers, the indirect beneficiaries. Throughout, we focus on the full effect of the insurance expansion, leveraging the out-of-sample variation in exposure derived in Section 4.1.1. This approach involves linearly extrapolating our causal estimates to the mean exposure level of 69 percent. Key quantities are summarized in Table 8, with Table A5 detailing the data objects and derivations underlying the welfare calculations.

[35] To simplify the exposition, we are sidestepping the discussion of health benefits in this section due to the noisiness of our long-run mortality estimates. Moreover, we are 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 LTC. These sources of social surplus could be central in other environments. Omitting these sources of benefits here biases us *against* finding that efficiency losses from moral hazard can be offset by surplus in input markets.

[36] This point relates to the discussion of counterfactual policy evaluation in Chetty (2009), remark 2 in Kleven (2021) that discusses the sufficient statistics approach to policy evaluation, as well as the discussion of MVPF's assumptions about existing tax and transfer programs in Hendren/Sprung-Keyser (2022).

Partial equilibrium, patients only

We start with the textbook version of the partial equilibrium analysis that only considers patients as policy beneficiaries. In column (1) of Table 8 we focus on the recipients of insurance benefits for inpatient nursing home care.[37] We start with the count of such patients as reported in 1999 (post-expansion) LTC statistics. We use our causal estimates from Section 4.1.1 to categorize this set of patients into those who are infra-marginal and those who are marginal to the expansion. The underlying assumption is a constant staffing ratio (i.e. the ratio of patients to workers, which is frequently regulated in inpatient LTC). Under this assumption, the increase in patient counts is proportional to the increase in the number of workers, as estimated in Section 4.1.1. Applying the estimate of the growth in workers to the post-expansion patient count then allows us to infer the counterfactual number of patients, who we then consider to be infra-marginal. Infra-marginal patients are those who are either receiving *Hilfe zur Pflege* (and hence are already subsidized), or those who are willing to pay the full price of care in the absence of any coverage. For these patients, the willingness to pay for LTC insurance is equivalent to its cash value.[38] The difference between the observed and the counterfactual count of patients represents marginal patients—those who purchase care only when insurance is available, but not otherwise. As the insurance expansion we consider was substantial, we cannot assume that the marginal patients were indifferent. Instead, following the Harberger triangle (Harberger, 1971) logic, we approximate their willingness to pay, assuming that marginal consumers value a dollar of subsidy at 50 cents. Combining these calculations, our estimates imply that 47 percent of inpatient patients were marginal, yielding a patient-only MVPF of 0.6.[39]

Partial equilibrium, patients and workers

We now extended this calculation to include labor markets; see column (2) of Table 8. For infra-marginal workers, who would have worked in skilled inpatient care[40] even in the absence of the insurance expansion, there is no change in either the surplus or the fiscal externality, as we estimate no change in wages. For marginal workers who switch into the nursing home sector from other industries at comparable wages, there is similarly no extra

[37] Recall that the new insurance program also provided cash and outpatient benefits. Here we only consider patients who received benefits for skilled inpatient care.

[38] For patients who are receiving *Hilfe zur Pflege* there is no extra subsidy, so their willingness to pay for insurance is zero.

[39] Including patients that receive cash and outpatient insurance benefits, as in the general equilibrium calculation, raises the patient-only MVPF to 0.7.

[40] As with patients, we restrict our analysis here to workers in skilled inpatient facilities. As we discuss in footnote 13, workers in our Nursing Home Sample (NHS) include both those working in skilled inpatient facilities, as well as those in other types of inpatient elderly care, such as retirement homes. Hence, we scale down the count of workers in the NHS sample by a factor of 1.7, which reflects the difference in the count of establishments between our sample and the count of skilled inpatient establishments in official LTC statistics (Bundesministerium für Arbeit und Sozialordnung, 1997).

saving or cost for the government and on the margin (under simplifying assumptions revisited in Section 5.2) no additional willingness to pay by workers.[41] This is the point highlighted by Baicker/Chandra (2012)—reallocating workers to subsidized sectors from other sectors of the economy generally does not generate welfare gains on labor markets. Our results in Section 4, however, suggest that some marginal workers entered the nursing home sector out of unemployment or from out of the labor force. For these workers, wages represented a source of surplus, while the government collected additional taxes and reduced its unemployment insurance expenditures. To quantify these benefits, we make several assumptions. First, we assume that for every extra Euro in wages, the German government collected 60 cents in taxes and social insurance contributions.[42] Second, following Mui/Schoefer (2024), we assume that, on average, workers' reservation wages were 90 percent of the after-tax (and after-social insurance contribution) income.[43] This implies that a Euro in gross wages generates 4 cents (10 percent of the post-tax 40 cents) in worker surplus for successful employment matches among workers who were formerly unemployment or out of the labor force. Adding this worker surplus, government tax revenue, and unemployment insurance savings to our MVPF estimates above, we obtain a combined MVPF of the insurance expansion in the skilled inpatient nursing home market of 1.06. In other words, when we account for workers who found new jobs as a result of subsidizing patients' demand for care, we get positive returns on a dollar of public spending.

General Equilibrium

We now turn to the general equilibrium analysis, asking: What was the overall economic return on each dollar of public funds spent subsidizing long-term care through the universal long-term care insurance program? For this computation, we use the most conservative version of our general equilibrium labor market estimates—the lower bound of the 95 percent confidence intervals. The general equilibrium effects are driven primarily by fiscal externalities in the labor market. The government gains additional income tax revenue and saves on unemployment benefits as workers transition into higher-wage jobs, enter the labor market, and exit unemployment. Our estimates indicate that the government saves 4.7 billion EUR in unemployment insurance payments and collects an additional 26 billion EUR in income taxes and contributions to social insurance programs (see column (3) of

[41] Workers could have experienced gains from having a more robust labor market, higher job finding rates from increased vacancy posting, potential gains in amenities, or other factors, none of which we are able to capture in this computation. We revisit the role of vacancy posting and non-wage compensating differentials in Section 5.2.

[42] In 1999, a single worker with no children paid 18.6% in income tax and 41.6% in social insurance contributions, the latter statutorily split equally between the employer and the employee (Bundeszentrale für Politische Bildung, 2023).

[43] Mui/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 post-contributions wages in the German context.

Table 8). These fiscal gains far exceed the 8.4 billion EUR in additional spending on long-term care subsidies, for 5.9 billion EUR in patient surplus. In summary, the policy achieves an infinite MVPF in general equilibrium—it not only pays for itself but also generates surplus for the government.

Summary

To summarize, the MVPF analysis of the universal LTC insurance expansion when focused only on partial equilibrium without accounting for labor market effects concludes that the MVPF is below 1. This reflects the familiar textbook case of deadweight loss from moral hazard and is a common finding for many healthcare programs, especially aimed at older adults. Our point estimate is very similar to other MVPF estimates from health insurance expansions to adult populations, as discussed in Hendren/Sprung-Keyser (2020) and summarized in Figure A16. In contrast, when we add 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 that a marginal dollar invested into LTC insurance generates a substantial fiscal payoff. This puts health insurance expansions to adult populations more on par with programs for children which frequently achieve infinite MVPF. However, the mechanism here is different, as it operates through the indirect benefits of the economic stimulus to local labor markets rather than the direct benefits to program recipients.

We emphasize that our estimates are specific to the German labor market context of the 1990s. The large employment gains and significant positive fiscal externalities we document are tied to high contemporary baseline unemployment rates and low labor force participation. These conditions, in turn, were at least partially the result of substantial labor market wedges—high unemployment benefits and tax rates (Dustmann et al., 2014). As such, our MVPF estimate here is not a structural parameter of health insurance expansions, but is a reflection of the economic circumstances and existing tax and transfer programs under which the reform was implemented. In the next section, we offer a formal model that allows us to speak to the external validity of our estimates by quantifying the role of these incumbent economic conditions.

5.2 Model-based Approach

We specify and estimate a structural model of the labor market. Building on Acemoglu/Shimer (1999) and Wright et al. (2021), we consider a directed search model, in which finding a job is a costly process and markets do not clear solely in prices. We incorporate worker and firm heterogeneity, unemployment benefits, income taxes, and collective bargaining to reflect the institutional context. We pin down the parameters of the model using our causal estimates from Section 4 as target moments. We then use the model to revisit the welfare calculation.

5.2.1. Theory

Environment:

The economy is populated by 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 the 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; the wage 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 decide whether to search and apply to *one* job offer, or whether to 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, pays taxes at rate τ, and produces ϕ output units. Otherwise, the applicant remains unemployed and obtains unemployment benefits as well as benefits from home production. 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 sector j that has entered skill segment ϕ, the profit is given by:

$$\pi_j^\phi \quad = \quad \eta(q_j^\phi) \times (P_j \times \phi - w_j^\phi) - c_j(\phi). \tag{5}$$

$c_j(\phi)$ denotes the cost of vacancy posting, capturing recruiting and retention costs. These costs are incurred with certainty—irrespective of whether the firm manages to fill the vacancy. We allow these costs to vary across sectors and worker skill, reflecting that 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. The firm pays wage w_j^ϕ to matched workers, who produce ϕ units of output that the firm can sell at price P_j per unit.

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

$$U_{ij} = \begin{cases} \mu(q_j^\phi) \times u^e((1-\tau) \times w_j^\phi) + (1-\mu(q_j^\phi)) \times u^u + \epsilon_{ij} & \text{if } i \text{ searches in j} \\ u^{ool} + \epsilon_{i0} & \text{if } i \text{ doesn't search} \end{cases}, \tag{6}$$

where u^e denotes the payoff from employment when matched to a vacancy. This payoff depends on the after-tax wage $(1-\tau) \times w_j^\phi$. u^u is the payoff from unemployment, which occurs if the worker searches but is not matched and increases in unemployment benefits. u^{ool} is the flow utility from staying out of the labor force and 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 not being formally employed. ϵ_{ij} denotes idiosyncratic preference shock that worker i may have for sector j. Prior experience in sector j, or living closer to firms in sector j, or having a small child at home and needing more flexibility and proximity to work 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 all sectors of the economy. The consumer solves

$$\max_Q v(Q) \tag{7}$$

$$\text{s.t. } y \leq \sum_j P_j \times Q_j \tag{8}$$

where $v(Q)$ is the utility from consuming the vector of output quantities Q and $\sum_j P_j \times Q_j$ denotes consumer expenditures on all goods $j \in J$. y denotes income derived from earnings and transfers, as detailed below.

Equilibrium:

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

Third, output markets clear in each sector (Equation 12).

$$\max_{w^\phi, q^\phi} U_{ij} \tag{9}$$

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

$$\eta(q_j^\phi) \times (P_j \times \phi - w_j^\phi) - c_j(\phi) = 0 \tag{11}$$

$$Q_j^D(P_j) = Q_j^S(P_j) \tag{12}$$

In equilibrium with directed search, firms post efficient wages that depend on the elasticity of the matching function (Moen, 1997; Acemoglu/Shimer, 1999). In our setting, wages and vacancy postings are affected by unemployment insurance benefits, income tax wedges, and collective bargaining agreements. A2.1 provides additional model details.

5.2.2. Taking Theory to Data

Parametric assumptions

We make several parametric assumptions to take this theoretical model to our data. First, we assume a single national labor and product market, abstracting from the geographic variation. We index "markets" by $t \in 0, 1$, distinguishing between the observed post-reform period and the counterfactual without insurance expansion. Second, for tractability, we convert all types of employment to full-time equivalents. Third, we assume that worker heterogeneity is a function of the number of years of health care experience e_{hc}, which ranges from 0 to 18 in our setting, defining 19 different types of workers. We allow for the importance of healthcare experience to be different across sectors, and we also allow for a discontinuity in skill at zero experience, as empirically workers with no healthcare experience are much less likely to work in nursing homes. We impose the following relationship between years of healthcare experience and skills:

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

Next, we assume that the economy has three sectors: for-profit nursing homes, public and not-for-profit nursing homes, and all other sectors of the economy. We distinguish between for-profit and not-for-profit nursing homes as the latter may face different wage constraints due to collective bargaining, and may differ in non-wage marginal costs capturing differences in firm objectives (Lakdawalla/Philipson, 1998). The wages in not-for-profit and public nursing homes are then determined exogenously according to a second-order polynomial in the marginal revenue product net of non-wage marginal costs; see Sections

A2.2 and A2.3 for details.

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

$$\eta(q_{jt}^{\phi}) = \Big(1 - \exp(-\frac{q_{jt}^{\phi}}{\lambda_{j}^{\phi}})\Big). \tag{14}$$

We allow the parameter governing the matching efficiency λ to vary flexibly by skill level and sector. Vacancy posting is costly, and we allow the vacancy costs c_{j}^{ϕ} to vary by skill level and between for-profit and non-for-profit/public nursing homes.

Turning to the worker's flow payoffs, we assume:

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

In the flow utility from employment, ξ_j captures compensating differentials of working in sector j. Parameter ν allows compensating differentials to vary by health experience to capture differential attachment to working in nursing homes for workers with some health care experience. We normalize the compensating differential in the outside sector to zero. In the flow utility from unemployment, b denotes unemployment benefits and ξ_u captures monetized non-pecuniary utility from unemployment. Similarly, u^{ool} 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, we impose an assumption on the distribution of idiosyncratic worker preferences that leads to a nested logit choice problem for the worker. We group the two nursing home 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 $\tilde{\epsilon}_{ijt}$ 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 different types of nursing homes, and γ denotes a scaling parameter.

Finally, we assume that the representative consumer has CES preferences, and that nursing homes produce homogeneous outputs. We then write the consumer problem as:

$$v(Q_t) = \left(\alpha_o \times J^o \times (\frac{Q_{o,t}}{J^o})^{\frac{\sigma-1}{\sigma}} + \alpha_{NH} \times Q_{NH,t}^{\frac{\sigma-1}{\sigma}}\right)^{\frac{\sigma}{\sigma-1}} \quad (19)$$

$$s.t.\ \tilde{Q}_{NH,t} = Q_{NH,t} + HzP_{NH} \quad (20)$$

$$y_t + T_t \geq P_{ot} \times Q_{ot} + (P_{NH,t} - s_{NH,t}) \times Q_{NH,t} \ . \quad (21)$$

We assume that the outside sector comprises J^o homogeneous subsectors. The α denote scaling parameters and σ denotes the elasticity of substitution. Q_{NH} denotes the demand for nursing home care services paid out of pocket. HZP_{NH} denotes the demand by patients insured via *Hilfe zur Pflege*, which we treat as exogenous. Income y is given by the sum of the wage earnings of workers, 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 is income taxes net of government spending on nursing home care. The main policy parameter of interest for our analyses of insurance expansion is s_{NH}, which captures the product subsidy that the government provides to the nursing home sectors.

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. We use two primary sets of moments for estimation: first, the observed employment shares and mean wages by sector and years of health care experience in 1999; and second, the causal estimates from Section 4.1.1. Figure 6 illustrates the key empirical moments and model fit. Section A2.2 describes the details of the estimation approach.

The details of all parameter estimates are reported in Section A2.3. We estimate an elasticity of demand to out-of-pocket prices for nursing home care of -1.19, slightly larger than our estimate of the arc-elasticity in Equation (4). The model also allows for (and estimates) substantial income effects from the insurance expansion. The importance of income effects in our context is similar to the role of income effects found in Finkelstein/Hendren/Luttmer (2019) for Medicaid coverage in the U.S.

5.2.3. Welfare and Counterfactuals

Table 9 summarizes our welfare analysis. Columns (1) through (3) keep the tax and transfer environment fixed. We report the equilibrium labor market allocation in Panel A and surplus in Panel B. Moving from column (1) to column (2) shows how the allocation and surplus change when we introduce LTC insurance into the economy.[44] As in the causal evidence of Section 4.1.1, the model simulation of LTC subsidies results in an increase in nursing home employment and overall labor force participation.

We decompose the change in welfare into three components:

$$\Delta W = \Delta \text{Consumer Welfare} + \Delta \text{Worker Welfare} + \Delta \text{Government Surplus}\,. \tag{22}$$

We measure the change in consumer welfare through the equivalent variation, considering changes in out-of-pocket prices but holding pre-reform income $y_0 + T_0$ fixed. Consumers benefit from lower out-of-pocket prices for nursing home care but are harmed by the price increase for the outside sector good (not considered in Section 5.1).[45] Worker welfare is also measured through the equivalent variation, capturing changes in vacancy postings, after-tax wages, and hence earnings.[46] Finally, the government surplus is defined as tax revenues minus LTC subsidy spending and UI spending.

We find that on net, consumer welfare with LTC insurance goes *down* in the model. This decline in consumer welfare as well as the extra government outlays on LTC subsidies are, however, offset by welfare gains in the labor markets as well as by a substantial increase in tax revenues collected by the government. As in the model-free calculation, we get that in the general equilibrium environment overall social welfare goes up when LTC insurance is rolled out and that the overall government surplus (tax revenues minus spending on LTC insurance and unemployment benefits) increases, i.e. the insurance expansion pays for itself. Quantitatively, we find a net welfare gain of 0.78 billion EUR per month, or 2,294 EUR per full-time-equivalent nursing home worker and month.

[44] We operationalize this by treating column (2) as data—it is the observed environment with insurance in place in 1999 as simulated by the model. Column (1) then reports the results of a counterfactual simulation that removes long-term care subsidies.

[45] We first calculate consumer utility at pre- and post-reform out-of-pocket prices, holding income fixed at pre-reform levels. We refer to the before and after expansion prices and utility as P_0, u_0 and $P_1 - s, u_1$, respectively. The equivalent variation is then given by $e(P_0, u_1) - e(P_0, u_0)$, where $e()$ denotes the expenditure function.

[46] The equivalent variation equals the compensating variation given the worker's linear indirect utility function and is given by $EV = \gamma \times \left\{ \sum_i log[\sum_g (\sum_{j \in g} exp(\frac{\tilde{U}^1_{ij}}{\gamma \times (1-\rho)}))^{1-\rho}] - \sum_i log[\sum_g (\sum_{j \in g} exp(\frac{\tilde{U}^0_{ij}}{\gamma \times (1-\rho)}))^{1-\rho}] \right\}$, where $\tilde{U}^t_{ij} = U^t_{ij} - \epsilon_{ij}$.

To what extent are these welfare gains from a health insurance expansion likely to generalize to other contexts? We use our model to help us think about this key policy question. Specifically, we explore the sensitivity of our net welfare numbers to the generosity of unemployment insurance (UI) benefits, the income tax rate, and the productivity of the outside sector. We focus our discussion on relatively large changes in these primitives and present analogous results on more marginal changes in Appendix A2.4.

In our first counterfactual, we revisit the with- versus without-expansion outcomes after setting UI benefits to zero.[47] We find a lower unemployment rate but also a lower labor force participation rate suggesting that more individuals refrain from searching for jobs altogether. Columns (4)-(6) of Table 9 document these facts. We find that the insurance expansion in this context has similar effects on social welfare suggesting that the generosity of UI benefits plays a secondary role in driving the welfare results.[48]

We next consider a 50 percent drop in the income tax rate. We estimate a larger labor force participation in the no-insurance counterfactual and find that under these circumstances the insurance expansion is less successful in increasing labor force participation further; see columns (7)-(9). In the context with lower tax rates and higher labor-force participation, expanding insurance leads to a significant share of new nursing home employees to be hired away from productive jobs in the outside sector. In this environment with much lower taxes, we no longer find that the insurance expansion pays for itself and estimate an overall welfare loss of 10 million EUR per month.

Finally, we simulate the interaction between productivity growth in the outside sector and the insurance expansion. As wages increase in the outside sector, this also drives up wages in nursing home care. Without productivity growth in the nursing home care sector, wage increases will lead to higher output prices, illustrating Baumol's cost disease (Baumol/Bowen, 1965). We consider a 50 percent increase in productivity and again estimate substantially higher labor force participation, see columns (10)-(12).[49] In contrast to the tax counterfactual, we now estimate substantially higher nursing home wages and, as a result, higher nursing home output prices. We find smaller increases in nursing home employment and larger increases in prices, implying that the insurance expansion is less effective in expanding nursing home jobs. We again estimate smaller gains in labor force participation. Overall we estimate smaller welfare gains from the insurance expansion both

[47] To ensure weakly positive job finding and vacancy filling rates, we gradually increase the matching parameter λ in 1% increments for the respective skill-sector type until the job finding rates for each skill and sector are bounded between 0 and 100%.

[48] Here we note, however, that our model can only account for a small share of the reform-induced decline in unemployment in our baseline model, thereby possibly understating the role of UI benefits; see Section A2.2, Table A8.

[49] The calibrated productivity increase reflects the cumulative growth in productivity from the mid-1990s to the present. This serves to assess how differences in productivity between these environments might influence the welfare effects of the LTC reform.

in absolute terms and even more strikingly in relative terms—social welfare in column (10) exceeds baseline welfare in column (1) by 77 percent.

In summary, we find that our welfare estimates are sensitive to the economic environment in important and policy-relevant ways. Lower income taxes or higher productivity in the outside sector render policy efforts to stimulate the economy less effective. We also find smaller positive fiscal externalities and gains in the labor market surplus in economic environments with higher labor force participation to begin with. When workers define the shorter market side, policy-induced employment expansions will largely involve the reallocation of workers across sectors of the economy, muting potential welfare gains in the labor market (Baicker/Chandra, 2012).

6 Conclusion

Arrow (1963) and Feldstein (1971, 1977) hypothesized that demand-side moral hazard induced by health insurance can trigger supply-side expansions in healthcare markets. Capturing this phenomenon empirically has proven challenging. In this paper, we combine unusually comprehensive administrative labor market data with a rarely observed large-scale, universal insurance rollout—Germany’s 1995 introduction of national long-term care (LTC) insurance—to examine how a public insurance expansion can reallocate workers across sectors.

We find that the LTC insurance rollout led to a dramatic expansion in LTC employment. While many more workers were hired into LTC jobs, average wages did not increase, consistent with considerable slack in the labor market. Notably, this surge in LTC hiring drew in workers who likely faced obstacles to employment, such as those with less experience, lower skill level, or extended gaps in work histories due to long-term unemployment or non-participation in the labor force. By providing “good” jobs for for lower-skilled workers, the reform aligns with an aim of industrial policy recently highlighted by Rodrik (2022).

We further find that the effect of insurance expansion on the labor market was not limited to LTC workers. Instead, we estimate a reduction in *overall* local unemployment, and increased labor force participation. 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.

Our normative analysis considers the external validity of the German experience and leads to two main policy-relevant takeaways. First, public spending on programs for older adults can have high economic returns if they generate jobs for the younger generation. Second, while moral hazard traditionally implies a welfare loss from inefficiently high consumption of care, such conclusions are incomplete if frictions in related input markets impede socially efficient transactions. In our setting, moral hazard effects went hand in hand with significant job creation, displacing workers from unemployment toward better-paying opportunities exceeding reservation wages. More broadly, in a second-best world, the net surplus from each additional dollar of public funds channeled through a health insurance program depends not only on demand-side efficiency losses, but also on potential supply-side gains when labor market frictions, price rigidities, regulations, or market power influence healthcare production. Understanding these trade-offs is essential for designing health insurance policies that balance welfare gains against potential distortions.

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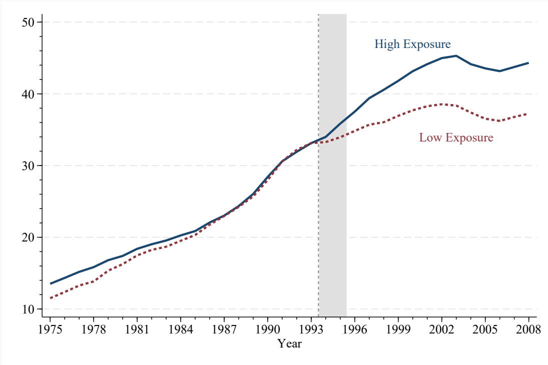
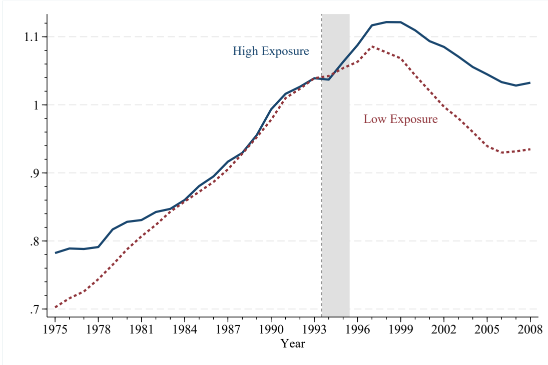
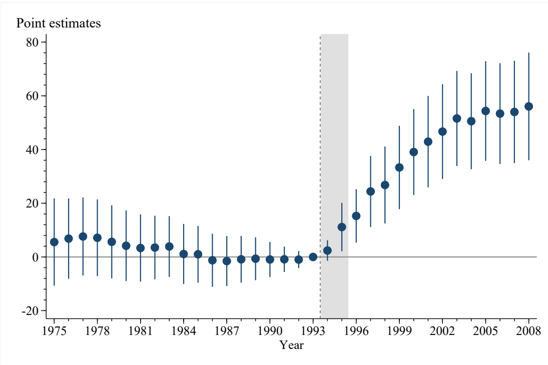
Figure 1.: Introduction of Universal LTC Insurance and the Nursing Home Market



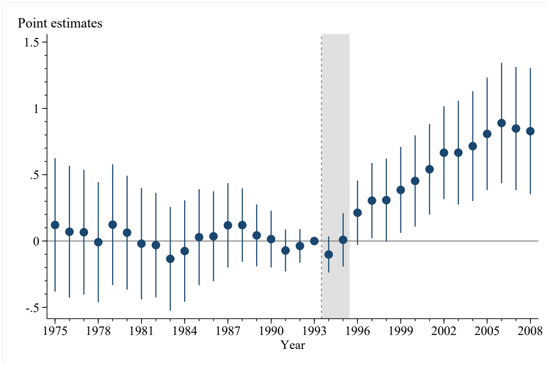
(a) NH Workers per 1,000 65+ Population



(b) NH Establishments per 1,000 65+ Population



(c) NH Workers, Event Study

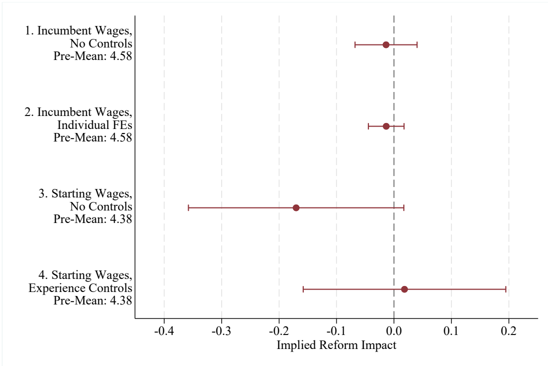


(d) NH Establishments, Event Study

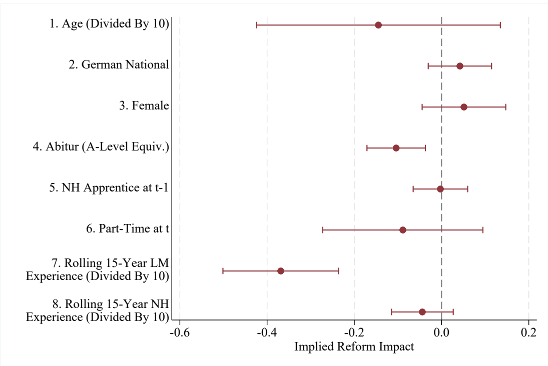
Notes: Panels in the top row plot the number of regular nursing home workers (A) and nursing home establishments (B) per 1,000 individuals age 65 and over, on average across counties for each year 1975 to 2008. The average in each year is computed separately for the group of West German counties with (region-level) exposure variable E_r above ("high exposure") and below ("low exposure") the level of exposure of the median county. E_r takes values from 0 to 1 and measures the share of potential long-term care patients who did not have public assistance for long-term care prior to the rollout of universal LTC insurance (mean and median of E_r=0.69) All counties with exposure level at the median are assigned to the below median group. For visual clarity, both time-series are normalized to the aggregate mean of the y-axis variable across all counties in 1993 (see Figure A11 for raw time-series without the normalization). Appendix A1.2 provides the definition of nursing homes and "regular" workers. E_r is derived in Equation 1 and its geographic variation is visualized in Figure A4. Panels in the bottom row display λ_t coefficients and 95% confidence intervals from estimating the specification in Equation 2 with the number of regular nursing home workers (C) and nursing home establishments (D) per 1,000 individuals age 65 and above in a county as an outcome. λ_t are coefficients that multiply exposure variable E_r; λ_t is normalized to zero in the pre-reform year $t = 1993$. More regression details are reported in columns (1) and (4) of Table 2. Regressions are estimated on the nursing home sample; see column (2) of Table 1 for summary statistics.
Source: Own calculations.

Figure 2.: Changes in Nursing Home Wages and Worker Sorting

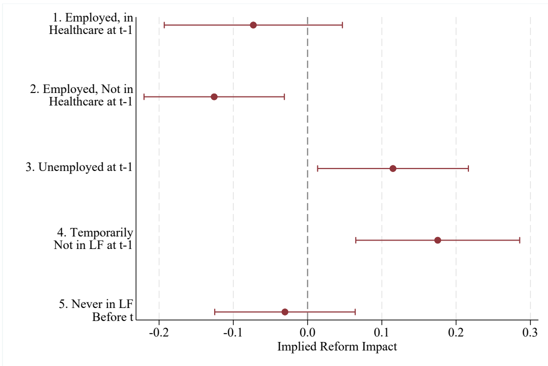
(a) Incumbent and Starting Daily Wage (EUR)



(b) Characteristics, New Hires

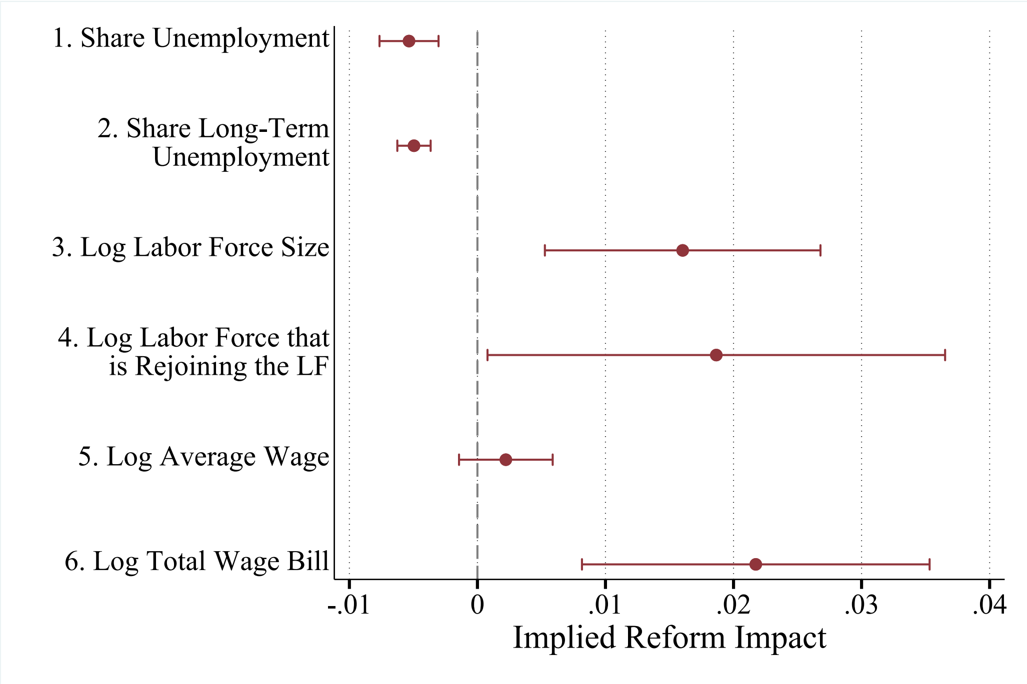


(c) Origins, New Hires



Notes: This panel displays aggregate treatment effects δ_{97-08} and 95% confidence intervals from estimating the difference-in-differences specification in Equation 3. The coefficient measures the effect of universal long-term care insurance expansion per unit of exposure to expansion, E_r. E_r takes values from 0 to 1 and measures the share of potential long-term care patients who did not have public assistance for long-term care prior to the rollout of universal LTC insurance (mean and median of E_r=0.69). E_r is derived in Equation 1 and its geographic variation is visualized in Figure A4. The top panel (A) displays the treatment effects on log regular full-time daily wages of nursing home incumbents and new hires. A new hire in year t is defined as an individual not in nursing home employment in year $t-1$. Regression details, including coefficients of the event study version, are reported in Table 3. In the bottom row, the outcomes in panel (B) are the characteristics and in panel (C) the immediate employment history of new regular nursing home hires. Tables 4 and 5 report regression details for panels (B) and (C), respectively.
Source: Own calculations.

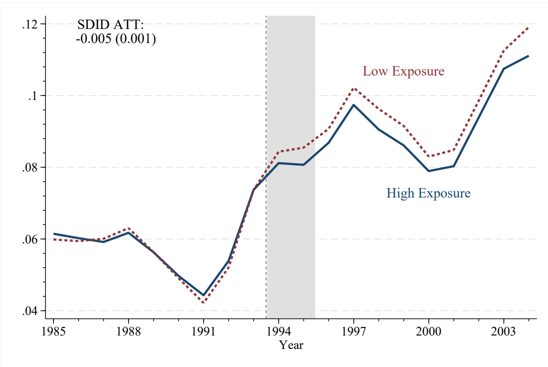
Figure 3.: Changes in Overall Employment



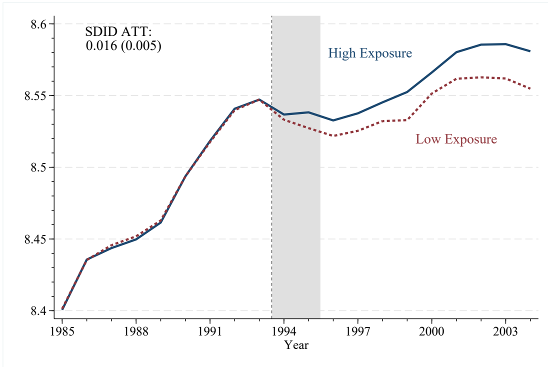
Notes: This panel displays aggregate treatment effects and 95% confidence intervals from estimating the synthetic difference-in-differences (SDID) specification version of Equation 3, following Arkhangelsky, Dmitry and Athey, Susan and Hirshberg, David A. and Imbens, Guido W. and Wager, Stefan (2021) methodology. The underlying data is the sample of all German labor market biographies—Labor Market Sample (LMS) summarized in column (3) of Table 1. The treatment effect coefficient measure the effect of more exposure to universal long-term care insurance expansion on outcomes specified on the y-axis. We use a binary measure of exposure to the reform, which defines regions with an above-median exposure variable E_r as treated units (i.e. more exposed) and counties at or below median exposure as control units. E_r is derived in Equation 1 and its geographic variation is visualized in Figure A4. “Long-term unemployment” is defined as unemployment observed on in at least two consecutive years. Table 6 reports regression details for all outcomes.
Source: Own calculations.

Figure 4.: Introduction of Universal LTC Insurance and Overall Employment

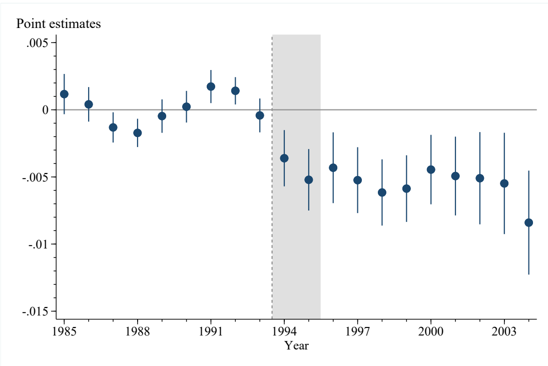
(a) Share Unemployed



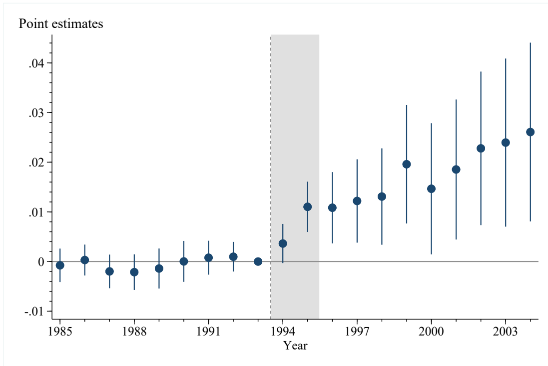
(b) Log Labor Force Size



(c) Share Unemployed, Event Study



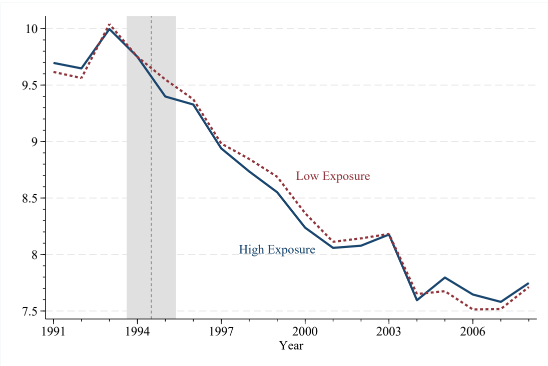
(d) Log Labor Force Size, Event Study



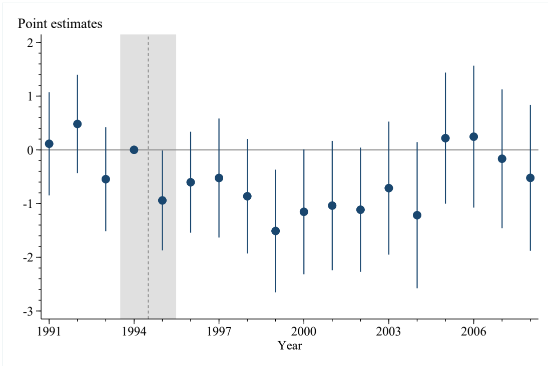
Notes: Panels in the top row display treatment and matched control time series from synthetic difference-in-difference (SDID) specifications, following Arkhangelsky, Dmitry and Athey, Susan and Hirshberg, David A. and Imbens, Guido W. and Wager, Stefan (2021) methodology, for the rate of unemployment in a county (A) and the (log) size of the labor force in a county (B). The underlying data is the sample of all German labor market biographies—Labor Market Sample (LMS) summarized in column (3) of Table 1. The share unemployed uses the size of the labor force in the denominator, which is defined as the count of all employed and unemployed individuals. The treatment group are West German counties with (region-level) exposure variable E_r above ("high exposure") and below ("low exposure") the level of exposure of the median county. E_r takes values from 0 to 1 and measures the share of potential long-term care patients who did not have public assistance for long-term care prior to the rollout of universal LTC insurance (mean and median of E_r=0.69) All counties with exposure level at the median are assigned to the below median group. For visual clarity, both time-series are normalized to the aggregate mean of the y-axis variable across all counties in 1993 (see Figure A11 for the time-series without the normalization). The bottom panel shows event study charts for the same outcomes, using $b = 100$ bootstrap draws. Coefficients are normalized to zero in the pre-reform year $t = 1993$. More regression details are reported in Table 6.
Source: Own calculations.

Figure 5.: Introduction of Universal LTC Insurance and Old-Age Mortality

(a) Deaths per 100 Age 75+



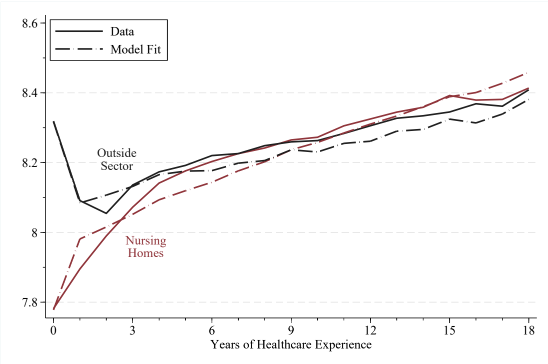
(b) Deaths per 100 Age 75+, Event Study



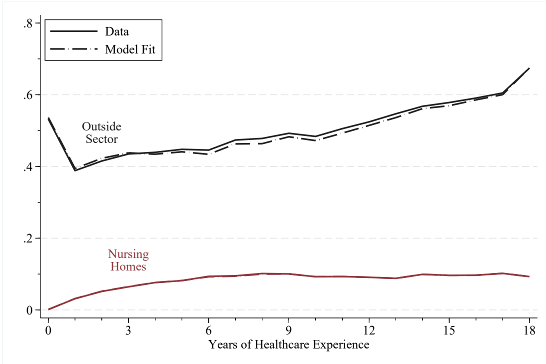
Notes: Panel a plots the raw time series of mortality per 100 age 75 and over population, on average across counties for each year 1991 to 2008. The average in each year is computed separately for the group of West German counties with (region-level) exposure variable E_r above ("high exposure") and below ("low exposure") the level of exposure of the median county. E_r takes values from 0 to 1 and measures the share of potential long-term care patients who did not have public assistance for long-term care prior to the rollout of universal LTC insurance (mean and median of E_r=0.69) All counties with exposure level at the median are assigned to the below median group. For visual clarity, both time-series are normalized to the aggregate mean of the y-axis variable across all counties in 1993. E_r is derived in Equation 1 and its geographic variation is visualized in Figure A4. Panel b display λ_t coefficients and 95% confidence intervals from estimating the specification in Equation 2 with the same mortality measure as the outcome. More regression details and alternative specifications are reported in Table 7.
Source: Own calculations.

Figure 6.: Cost of Employment and Employment Rates by Sector and Experience

(a) Log Monthly Employment Cost (EUR)



(b) Employment Type to Population Ratio



Notes: Panel 6a plots average log monthly cost of employment (full-time gross wages and employer social insurance contributions, in EUR) for all full-time workers age 20–64 in the Labor Market Sample in 1999 (i.e. after the full insurance expansion). For each worker, we calculate years of prior employment in the healthcare sector before 1999. Wage averages are then computed within one-year bins of healthcare experience, separately for nursing homes employees (red lines) and workers in other sectors (black lines). Solid lines report observed data; dashed lines show model predictions (Section 5.2). Panel 6b, constructed analogously, displays the full-time equivalent employment shares in nursing homes and other sectors in 1999, using all workers age 20–64. Full-time equivalents are calculated by considering two part-time jobs as one full-time position. Employment categories omitted from the exhibit are formal unemployment and being out of the labor force. Refer to Section A1.2 for definitions of the healthcare sector and nursing homes.
Source: Own calculations.

Table 1.: Summary Statistics

	Nursing Home Sample		Labor Market Sample
	All Spells	Nursing Home Spells	All Spells
	1975-2008	1975-2008	1985-2004
	(1)	(2)	(3)
No. of Individual-Year Observations	25,273,408	10,184,624	44,096,416
Individuals			
No. of Unique Individuals	1,639,576	1,639,576	3,787,607
Mean Age	36.2	40.2	38.0
% Female	78.2	81.8	41.5
% German	94.5	95.0	92.9
% High School Education (Abitur)	7.32	7.01	8.00
% in Healthcare Sector	58.2	100.0	9.65
% Unemployed	8.65	0	7.75
Mean 15-Year Labor Market Experience (yrs)	8.24	8.69	9.18
Mean 15-Year Nursing Home Experience (yrs)	3.50	5.80	0.14
% Part-Time[a]	25.0	29.2	13.3
Mean Daily Wage (EUR)[b]			
All Observations	76.7	78.6	96.4
Nursing Home Observations	78.6	78.6	83.0
Establishments			
No. of Unique Establishments			
Any	991,814	22,629	1,748,171
Nursing Homes	22,629	22,629	13,880
Of Nursing Home Employment Spells, Share in			
For-Profit Nursing Home	0.27	0.27	0.27
Church-Owned Nursing Home	0.59	0.59	0.59
Publicly-Owned Nursing Home	0.14	0.14	0.14

[a] Conditional on being employed.
[b] In constant 2020 Euros.

Notes: The table reports summary statistics for two main analytic samples "Nursing Home Sample (NHS)" and "Labor Market Sample (LMS)." NHS is an extract from the annualized universe of the German Integrated Employment Biographies for years 1975-2008. The extract contains full labor market biographies of individuals who were employed in a nursing home in at least one year in 1975-2008. Employment spells are annualized by taking the spell observed on June 30th of a given year. Nursing homes are defined as establishments 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). LMS is a 10% draw of the annualized universe of labor market biographies for years 1985 to 2004. In both samples, individual-year observations are excluded if the place of employment is in the (former) East Germany, Berlin, or Bremen.
Source: Own calculations.

Table 2.: Event Study Results: Aggregate Response

	Outcome (per 1,000 Age 65+ Population)			
	Workers	Full-Time	Part-Time	Firms
	(1)	(2)	(3)	(4)
Pooled Coefficients				
δ_{97-08}	44.4	21.9	22.5	0.62
	(8.35)	(4.87)	(4.90)	(0.17)
Event Study Coefficients				
1-Year Effect, λ_{1997}	24.4	12.3	12.1	0.30
	(6.74)	(4.21)	(3.25)	(0.14)
3-Year Effect, λ_{1999}	33.3	18.8	14.6	0.39
	(7.91)	(4.79)	(4.07)	(0.17)
5-Year Effect, λ_{2001}	42.9	24.8	18.1	0.54
	(8.69)	(5.27)	(4.74)	(0.17)
10-Year Effect, λ_{2006}	53.4	22.6	30.7	0.89
	(9.57)	(5.55)	(6.24)	(0.23)
Implied Impact				
Using In-sample Variation[a]	4.02	1.98	2.03	0.06
Aggregate Impact, West Germany[b]	38,979	19,253	19,726	542.1
Level of Outcome in 1993				
Mean	33.1	23.9	9.19	1.04
S.D.	13.8	10.3	4.57	0.47
Years	1975 - 2008	1975 - 2008	1975 - 2008	1975 - 2008
No. of Observations	10,948	10,948	10,948	10,948

[a] Multiplies δ_{97-08} by 9.1 percentage point difference in mean exposure between counties with above and below the median level of exposure
[b] Scales estimates by 9,699 thousand people age 65+ in West Germany (excluding Berlin and Bremen) in 1993.

Notes: This table reports the results of estimating the event study specification in Equation (2) and the pooled difference-in-differences specification in Equation (3). The coefficients measure the impact of long-term care insurance expansion—per unit of exposure (E_r)—on the outcome variables as specified in column titles. Exposure measure E_r is derived in Equation (1). E_r takes values from 0 to 1 and measures the share of potential long-term care patients who did not have public assistance for long-term care prior to the rollout of universal LTC insurance (mean and median of E_r=0.69). Outcome variables are: the number of regular nursing home workers, in total (column 1), and separately by part-time and full-time status (columns 3 and 4), as well as the number of nursing home establishments (column 4) per 1,000 individuals age 65 and older in a county. Event study results in columns (1) and (4) are visualized in Figure 1; the estimates in columns (2) and (3) are visualized in Figure A12. All specifications include county and year fixed effects. Standard errors clustered at the county-level are reported in parentheses.
Source: Own calculations.

Table 3.: Event Study Results: Nursing Home Wages

	Log Daily Full-Time Nursing Home Wage			
	New Hires[a]		Incumbents[b]	
	(1)	(2)	(3)	(4)
Pooled Coefficients				
δ_{97-08}	-0.17	0.02	-0.08	-0.08
	(0.10)	(0.09)	(0.05)	(0.02)
Event Study Results				
1-Year Effect, λ_{1997}	-0.09	0.04	-0.01	-0.01
	(0.08)	(0.07)	(0.03)	(0.02)
3-Year Effect, λ_{1999}	0.003	0.06	-0.04	-0.02
	(0.09)	(0.08)	(0.04)	(0.02)
5-Year Effect, λ_{2001}	-0.03	0.19	-0.06	-0.05
	(0.10)	(0.09)	(0.04)	(0.02)
8-Year Effect, λ_{2004}	-0.15	0.04	-0.09	-0.09
	(0.14)	(0.13)	(0.06)	(0.02)
Controls[c]				
15-Year LM & NH Experience		✓		
Individual Fixed Effects				✓
Wage Level in 1993 (EUR)				
Mean	4.38	4.38	4.56	0.13
S.D.	0.10	0.10	0.07	0.02
Years	1990 - 2008	1990 - 2008	1976 - 2008	1976 - 2008
No. of Observations	6,118	6,118	10,626	10,626

[a] “New hires” are workers who were not employed in a nursing home in the preceding year
[b] “Incumbents” are nursing home 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 the worker’s starting log wage on the worker’s 15-year rolling labor market and 15-year rolling nursing home experience. Control variables in column (4) are county-year-level means of residuals from a regression of log wage on worker fixed effects.

Notes: This table reports the results of estimating the event study specification in Equation (2) and the pooled difference-in-differences specification in Equation (3). The coefficients measure the impact of long-term care insurance expansion—per unit of exposure (E_r)—on the log daily wage of regular new (columns 1 and 2) and incumbent (columns 3 and 4) nursing home workers. Exposure measure E_r is derived in Equation (1). E_r takes values from 0 to 1 and measures the share of potential long-term care patients who did not have public assistance for long-term care prior to the rollout of universal LTC insurance (mean and median of E_r=0.69). All event studies are visualized in Figure A13. All specifications include county and year fixed effects. Standard errors clustered at the county-level are reported in parentheses.
Source: Own calculations.

Table 4.: Event Study Results: Characteristics of New Nursing Home Hires

	Outcome (Among New Nursing Home Hires[a])							
	Age	Share German	Share Female	Share Abitur	Apprentice in $t-1$	Share Part-Time	15-Year LM Exp[b]	15-Year NH Exp[b]
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pooled Coefficients								
δ_{97-08}	-1.45	0.04	0.05	-0.10	-0.003	-0.09	-3.69	-0.44
	(1.43)	(0.04)	(0.05)	(0.03)	(0.03)	(0.09)	(0.68)	(0.36)
Event Study Results								
1-Year Effect, λ_{1997}	-0.90	0.03	0.12	-0.02	-0.01	0.03	-2.77	-0.88
	(1.77)	(0.04)	(0.06)	(0.04)	(0.04)	(0.10)	(0.94)	(0.45)
3-Year Effect, λ_{1999}	-0.97	0.06	0.06	-0.06	0.10	-0.24	-2.43	-0.60
	(1.54)	(0.04)	(0.06)	(0.04)	(0.04)	(0.09)	(0.82)	(0.44)
5-Year Effect, λ_{2001}	-2.31	0.04	0.06	-0.05	0.003	-0.27	-3.95	-0.85
	(1.68)	(0.04)	(0.05)	(0.04)	(0.03)	(0.11)	(0.86)	(0.41)
8-Year Effect, λ_{2004}	-0.44	0.06	0.02	-0.12	-0.04	-0.21	-3.19	-0.31
	(2.08)	(0.04)	(0.07)	(0.04)	(0.04)	(0.12)	(0.85)	(0.46)
Level of Outcome in 1993								
Mean	35.0	0.91	0.83	0.09	0.05	0.28	4.62	1.01
S.D.	1.55	0.08	0.06	0.05	0.04	0.09	0.81	0.38
Years	1976 - 2008	1976 - 2008	1976 - 2008	1976 - 2008	1976 - 2008	1976 - 2008	1990 - 2008	1990 - 2008
No. of Observations	10,621	10,621	10,621	10,621	10,621	10,621	6,118	6,118

[a] "New hires" are workers who were not employed in a nursing home in the preceding year
[b] LM = Labor Market. The sample in columns (7) and (8) is restricted to year 1990 and later to allow for a 15 year look-back window.

Notes: This table reports the results of estimating the event study specification in Equation (2) and the pooled difference-in-differences specification in Equation (3). The coefficients measure the impact of long-term care insurance expansion—per unit of exposure (E_r)—on the outcome variables as specified in column titles. Outcome variables are measured as averages among nursing home new hire workers in a county-year. Exposure measure E_r is derived in Equation (1). E_r takes values from 0 to 1 and measures the share of potential long-term care patients who did not have public assistance for long-term care prior to the rollout of universal LTC insurance (mean and median of E_r=0.69). All specifications include county and year fixed effects. Standard errors clustered at the county-level are reported in parentheses.
Source: Own calculations.

Table 5.: Event Study Results: Origins of New Nursing Home Hires

	Outcome (Among New Nursing Home Hires[a])				
	Employed & in HC in $t-1$	Employed & not in HC in $t-1$	Unemployed in $t-1$[b]	Temporarily not in LF in $t-1$	Never in LF before t
	(1)	(2)	(3)	(4)	(5)
Pooled Coefficients					
δ_{97-08}	-0.07	-0.13	0.12	0.18	-0.03
	(0.06)	(0.05)	(0.05)	(0.06)	(0.05)
Event Study Results					
1-Year Effect, λ_{1997}	-0.12	-0.17	0.27	0.09	-0.07
	(0.11)	(0.07)	(0.07)	(0.09)	(0.05)
3-Year Effect, λ_{1999}	-0.02	-0.08	0.09	0.10	-0.08
	(0.08)	(0.06)	(0.07)	(0.07)	(0.06)
5-Year Effect, λ_{2001}	-0.05	-0.04	0.04	0.05	-0.01
	(0.07)	(0.06)	(0.06)	(0.07)	(0.05)
8-Year Effect, λ_{2004}	-0.02	-0.20	0.09	0.15	-0.02
	(0.10)	(0.06)	(0.07)	(0.08)	(0.06)
Level of Outcome in 1993					
Mean	0.19	0.19	0.17	0.30	0.16
S.D.	0.07	0.06	0.07	0.06	0.06
Years	1977 - 2008	1977 - 2008	1977 - 2004	1977 - 2008	1977 - 2008
No. of Observations	10,304	10,304	9,016	10,304	10,304

[a] “New hires” are workers who were not employed in a nursing home in the preceding year. HC = healthcare. LF = labor force.
[b] Restricted to years through 2004 due to the introduction of ALG-II unemployment benefits in 2005.

Notes: This table reports the results of estimating the event study specification in Equation (2) and the pooled difference-in-differences specification in Equation (3). The coefficients measure the impact of long-term care insurance expansion—per unit of exposure (E_r)—on the share of new hires coming from different employment backgrounds as specified in column titles. Outcome variables are measured as averages among nursing home new hire workers in a county-year. Exposure measure E_r is derived in Equation (1). E_r takes values from 0 to 1 and measures the share of potential long-term care patients who did not have public assistance for long-term care prior to the rollout of universal LTC insurance (mean and median of E_r=0.69). All specifications include county and year fixed effects. Standard errors clustered at the county-level are reported in parentheses. The results of analogous specifications that use *counts* of new hires by origin group rather than *shares* as outcome variables are reported in Table A4.
Source: Own calculations.

Table 6.: Synthetic Differences-in-Differences Results: Overall Employment in the Economy

	Outcome					
	Share		Log			
	Unemployed	Long-Term UE[a]	LF Participants	LF Re-Entrants	Regular Wages[b]	Total Wage Bill[b]
	(1)	(2)	(3)	(4)	(5)	(6)
Synthetic DiD Estimates						
ATT	-0.005	-0.005	0.02	0.02	0.002	0.02
	(0.001)	(0.0007)	(0.005)	(0.009)	(0.002)	(0.007)
Level of Outcome in 1993						
Mean	0.07	0.03	8.55	5.56	4.57	13.0
S.D.	0.02	0.01	0.71	0.69	0.08	0.78
Years	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

[a] Unemployment is considered long-term if it lasts at least two subsequent years
[b] Daily wage in 2020 EUR

Notes: This table reports the results of estimating the synthetic difference-in-differences (SDID) version of Equation (3). The specifications are estimated using the Labor Market Sample aggregated to the county-year level. The average treatment effect (ATT) coefficients measure the impact of higher exposure to long-term care insurance expansion on the share of new hires coming from different employment backgrounds as specified in column titles. We use a binary measure of exposure to the expansion, which defines counties with an above-median exposure variable E_r as treated units and counties at or below median exposure as control units. E_r is derived in Equation (1). E_r takes values from 0 to 1 and measures the share of potential long-term care patients who did not have public assistance for long-term care prior to the rollout of universal LTC insurance (mean and median of E_r=0.69). Outcome variables in columns (1) and (2) are the share of unemployed and long-term unemployed individuals, respectively, in the population. Outcome variables in columns (3) and (4) are logarithm counts of workers in the labor force (i.e. workers who are employed or unemployed in a given year), and the count of workers who are in the labor force in year t, but were not in the labor force in year $t-1$. Outcomes in columns (5) and (6) are the log of average daily wages and the log of the total daily wage bill in the economy. The corresponding event study specifications are visualized in Figures A13 and A15.
Source: Own calculations.

Table 7.: Event Study Results: Old-Age Mortality

	Deaths per 100 Age 75+ Population		
	Variation in E_r		Cross-Country
	DiD	Synthetic DiD	Synthetic Control
	(1)	(2)	(3)
Pooled Coefficients			
δ_{95-02}	-0.97	-0.12	-0.14
	(0.46)	(0.05)	[p-value=0.42]
δ_{95-08}	-0.71	-0.06	-0.17
	(0.50)	(0.06)	[p-value=0.45]
Level of Outcome in 1994			
Mean[a]	9.75	9.75	9.73
S.D.	0.76	0.76	-
Years	1991 - 2008	1991 - 2008	1991 - 2008
No. of Observations	5,760	5,760	504

[a] Mortality rate for all of West Germany, as obtained from the **(alias?)**. Does not exclude Bremen or Berlin.

Notes: Column (1) reports the results of estimating the pooled difference-in-differences specification in Equation (3). We estimate versions that pool periods 1995-2002 and 1995-2008 separately. The coefficients measure the impact of long-term care insurance expansion—per unit of exposure (E_r)—on the number of deaths in a county per 100 age 75 and older population. (1). E_r takes values from 0 to 1 and measures the share of potential long-term care patients who did not have public assistance for long-term care prior to the rollout of universal LTC insurance (mean and median of E_r=0.69). All specifications include county and year fixed effects. Standard errors clustered at the county-level are reported in parentheses. Column (2) reports the results of an alternative specification that uses the synthetic difference-in-differences estimator (Arkhangelsky, Dmitry and Athey, Susan and Hirshberg, David A. and Imbens, Guido W. and Wager, Stefan, 2021). In this specification the measure of exposure to insurance expansion is binary; counties are considered treated if their exposure to LTC insurance expansion E_r was above median. Bootstrap standard errors are reported in parentheses. Column (3) displays the results of a synthetic control specification (Abadie/Diamond/Hainmueller, 2010). This specification constructs a counterfactual time series for West Germany using a donor pool consisting of annual mortality time series for the 75-and-older population in 27 other countries. P-values, from permutation-based inference following Abadie/Diamond/Hainmueller (2010), are reported in square brackets.
Source: Own calculations.

Table 8.: Marginal Value of Public Funds

		Nursing Homes		General Equilibrium
		Patients Only	Patients & Workers	
		(1)	(2)	(3)
Patients				
a	Patient Surplus Inframarginal (EUR Billion / Year)	1.17	1.17	1.17
b	Patient Surplus Marginal (EUR Billion / Year)	1.52	1.52	4.71
c	Total [a + b]	2.70	2.70	5.88
d	Gov Spending Inframarginal (EUR Billion / Year)	1.17	1.17	1.17
e	Gov Spending Marginal (EUR Billion / Year)	3.05	3.05	7.24
f	Total [d + e]	4.22	4.22	8.41
Workers				
g	Worker Surplus	-	0.15	2.57
h	Gov Collecting Extra Tax	-	-1.53	-25.55
i	Gov UI Savings	-	-	-4.74
j	MVPF (Numerator) [c + g]	2.70	2.85	8.45
k	MVPF (Denominator) [f + h + i]	4.22	2.69	-21.88
l	MVPF [j / k]	0.64	1.06	-0.39

Notes: This table summarizes the main components of the marginal value of public funds (MVPF) calculation that is described in Section 5. Note that in this calculation the definition of the nursing homes is more narrow than in the rest of paper. To make the count of nursing home compatible with the count of patients in inpatient skilled facilities only (patients in column 1 do not include patients who received outpatient and cash insurance benefits), we adjust down the number of workers in the Nursing Home Sample by a factor of 0.58. This is the ratio between the number of skilled nursing homes licensed according to SGB XI (Bundesministerium für Gesundheit (2001), Anlage 8) reported in official statistics and the number of establishments in our Nursing Home Sample. See footnote 13 for the discussion of the differences between facility types. The detailed inputs of the MVPF calculation are reported in Table A5.
Source: Own calculations.

Table 9.: Counterfactuals and Welfare

	Baseline			100% Reduction in UEB			50% Reduction in Income Tax			50% Increase in Productivity		
	Insurance			Insurance			Insurance			Insurance		
	No	Yes	Diff	No	Yes	Diff	No	Yes	Diff	No	Yes	Diff
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel A: Employment and Earnings												
Nursing Home Employment (million FTE)	0.18	0.34	0.16	0.19	0.34	0.16	0.23	0.47	0.24	0.25	0.36	0.11
Total Labor Costs to Employers (billion EUR/month)	70.6	73.6	2.99	68.8	71.9	3.04	111.5	114.4	2.81	178.7	182.1	3.36
Unemployment (million FTE)	1.69	1.66	-0.03	0.73	0.72	-0.006	1.85	1.80	-0.05	0.88	0.85	-0.04
Labor Force (million FTE)	19.4	19.9	0.50	18.6	19.1	0.53	30.3	30.5	0.28	30.8	31.0	0.20
Panel B: Welfare (billion EUR/month)												
Consumer Welfare	81.0	80.3	-0.69	81.7	81.0	-0.69	130.2	129.1	-1.10	203.0	201.3	-1.72
Worker Welfare	148.7	149.2	0.59	147.7	148.3	0.60	172.1	173.5	1.35	175.4	176.5	1.12
Government Surplus	33.4	34.3	0.88	33.9	34.8	0.88	25.9	25.7	-0.25	87.8	88.8	0.99
LTC Subsidy Spending	-0.42	-1.05	-0.63	-0.43	-1.06	-0.63	-0.42	-1.41	-0.99	-0.57	-1.28	-0.71
UI Spending	-1.31	-1.29	0.02	0	0	0	-1.44	-1.40	0.04	-0.68	-0.66	0.03
Tax Revenues	35.2	36.7	1.49	34.3	35.8	1.51	27.8	28.5	0.70	89.1	90.7	1.67
Total Welfare	263.1	263.9	0.78	263.3	264.1	0.78	328.2	328.2	-0.01	466.2	466.6	0.38

Notes: This table summarizes the model-simulated effects of a universal LTC insurance expansion on a number of outcomes in different economic environments. For each environment, we present outcomes (i) without universal LTC insurance, where LTC support is provided via *Hilfe zur Pflege* only and (ii) with universal LTC insurance coverage. Universal LTC insurance is modeled as a subsidy of s=1,200 EUR per month that can only be applied to the cost of nursing home care by individuals who would have otherwise had to pay the full price of care out-of-pocket. This way of modeling the subsidy maintains the availability of *Hilfe zur Pflege*. We also present the difference between (i) and (ii). We consider four environments. Columns (1)-(3) present results for our baseline economic environment, columns (4)-(6) revisit the results after reducing the level of unemployment insurance benefits (UEB) from 775 EUR per month to zero. Columns (7)-(9) revisit the results after reducing the income taxes and contributions by 50% (from about 50 p.p. to 25 p.p.). Columns (10)-(12) revisit the results after increasing the productivity in the outside sector for each skill segment, $\phi_{out}, (e_{hc})$ by 50%. For each environment, we report several descriptive measures of the resulting allocation (Panel A): nursing home employment, total gross wage payments by employers in all sectors of the economy, the count of workers in unemployment, and the number of individuals in the labor force (employed or unemployed). Panel B reports the corresponding normative measures. We report the level of consumer welfare, worker welfare, and net government spending, which captures fiscal externalities. Extra government outlay is the spending on LTC insurance. The government can also spend more or less on unemployment insurance benefits and can collect more or less revenue in taxes and social insurance contributions. Total welfare add consumer and worker welfare along with changes in government spending. We do not weight the change in government spending by a cost of public funds.
Source: Own calculations.

Appendix

Online Appendix to:

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

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A1 Data Appendix

A1.1. Processing of the Raw Data

The primary data source for this paper is the Integrated Employment Biographies (IEB) database, which contains the universe of employment and unemployment spells for workers subject to social security contributions in Germany. We use data spanning the years 1975 to 2008. The IEB covers individuals across five employment categories: 1) employment subject to social security (included since 1975), 2) marginal part-time employment (included since 1999), 3) unemployment benefit receipt under the German Social Code Books III (included since 1975) or II (included since 2005), 4) registered job-seekers (included since 2000), and 5) participants in active labor market programs (included since 2000). All spells are recorded with day-level precision.

For each employment spell, the database records the industry code of the establishment. To ensure consistency over time, we harmonize industry codes of the three-digit WZ73 classification, following the methodology of Eberle et al. (2011). For spells with missing WZ73 codes, we extrapolate values within establishments across time. When this extrapolation is not feasible, we impute missing WZ73 codes using values from later industry classifications (WZ93 and WZ03), relying on the most frequently observed WZ73 code during overlapping years.

We construct two analytic samples from the IEB. The “Nursing Home Sample (NHS)” comprises complete person-histories of individuals employed in nursing homes for at least one day during 1975–2008. We define a nursing home as an establishment with one of the three time-consistent 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). We also extract the “Labor Market Sample (LMS)”, a random 10% draw of complete person-histories from the complete IEB population during 1975 to 2008.

We subset the NHS and LMS to include only employment spells (originating in the IEB’s “BeH Employee History’’ source data set) and unemployment spells (from “LEH Benefit Recipient History’’ or “LHG Unemployment Benefit II Recipient History’’). We exclude spells with zero daily wage or benefit rate, marginal part-time workers (identified via values of the “employment status [erwstat]” variable equal to 109 or 209), and notifications of lump-sum payments (“reason of cancellation/notification/termination [grund]” with value 154). For included spells, we impute missing values of the workplace location variable [ao_kreis] during non-employment periods with the individual’s most recent non-missing value. If imputation is not possible, we drop the corresponding observations from the analytic samples.

We aggregate the NHS and LMS to the individual-year level by selecting the employment status of the spell that includes June 30th of each year. For unemployment spells that span multiple instances of June 30, we split the spells following the approach of Eberle/Schmucker (2019). If duplicates persist, we retain the spell with the highest reported daily benefit amount. After coding variables of interest, as described in Section A1.2, we subset the LMS (but not the NHS) to the years 1985 to 2004.

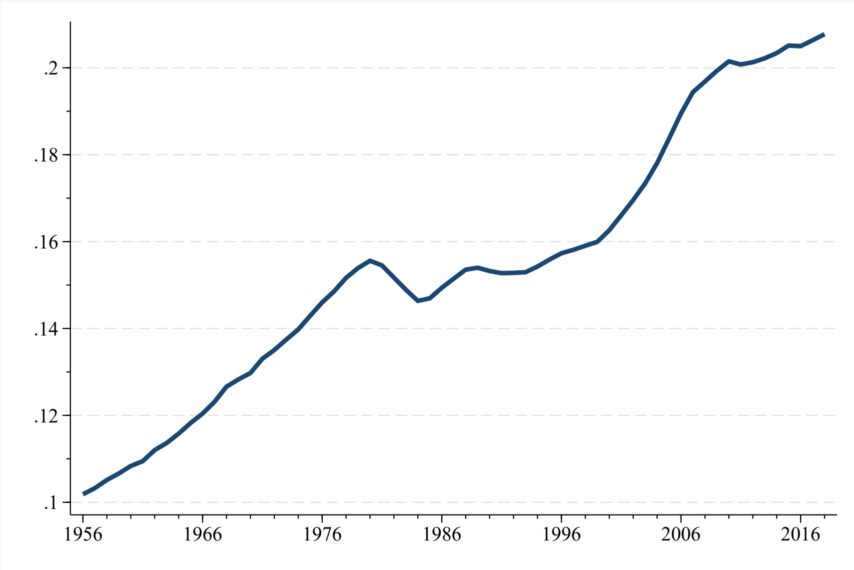
A1.2. Variable Definitions

1. **(Un)employment:** Individuals are classified as unemployed in year t if their employment status [erwstat] in that year is coded as 1 (long-term unemployment assistance post-2005 for adults able to work [VeP]), 11 (Unemployment benefits [ALG]), 12 (Unemployment assistance [ALHI]), or 13 (Maintenance allowance [UHG]). All other observations with a record in the NHS or LMS are classified as employed.
2. **Regular employment:** Following IAB conventions, regular employees are individuals whoseemployment status [erwstat] is coded as 101 (employees subject to social security with no special features), 140 (seamen), or 143 (maritime pilots). Non-regular employees include apprentices, workers in part-time pre-retirement employment, and working students.
3. **Nursing homes:** Defined as establishments classified under WZ73 industry codes 710 (private and for-profit), 711 (private, not-for-profit), and 712 (public ownership).
4. **Healthcare sector:** Employment spells are classified as part of the healthcare sector if they occur in establishments with one of the WZ73 industry codes 710, 711, 712, 780, 781, 782, 783, 784, 880, or if the spell corresponds to one of the KldB 1988 occupation codes [beruf] 841, 842, 844, 851, 852, 853, 854, 855, 856, 857, 861, 862.
5. **Labor market experience:** This variable measures the number of years with any employment during a rolling 15-year look-back window for the years 1990–2008.
6. **Nursing home experience:** Constructed analogously to labor market experience but specific to employment in nursing homes.
7. **Healthcare experience:** A 15-year rolling measure specific to employment in the healthcare sector, as defined above.
8. **New hires:** An individual is classified as a new hire in year t if they are employed in year t but not in year $t-1$.
9. **Wages:** For employment spells, wages are recorded in the variable “Daily wage, daily benefit rate” [tentgelt]. This represents “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” (Antoni et al., 2019). We top-code daily gross wages at the annual upper earnings limit set by statutory pension insurance regulations.

10. **Unemployment benefits:** For unemployment spells, [tentgelt] records daily benefit amounts. Prior to 1998, these values refer to working days, while from 1998 onward, they refer to calendar days.
11. **Schooling:** We construct an indicator variable for individuals who have passed the *Abitur*, coded as 1 if the schooling variable [schule] equals 8 or 9 (upper secondary school leaving certificate, equivalent to A-levels). A second dummy variable is coded as 1 for individuals with a bachelor's degree, corresponding to values of the tertiary education variable [ausbildung] equal to 11 (degree from a university of applied sciences) or 12 (university degree).

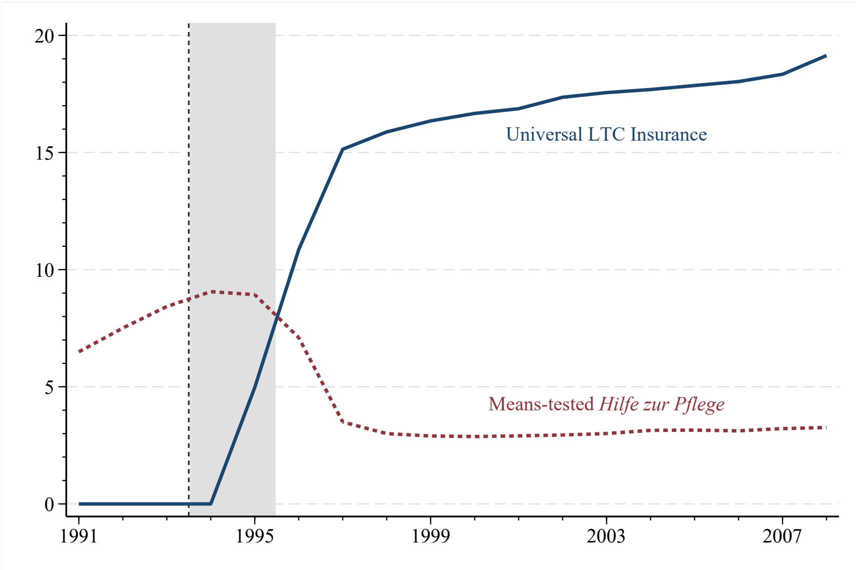
A1.3. Appendix Figures and Tables

Figure A1.: Population Share Age 65 and Over in West Germany



Notes: This figure plots the count of individuals age 65 and older as a share of the total population of West Germany by year. The time series includes Berlin and Bremen that are excluded in our primary analysis. The data source is the Human Mortality Database (2021).
Source: Own calculations.

Figure A2.: Public Program Spending on Long-Term Care (in Billion EUR)

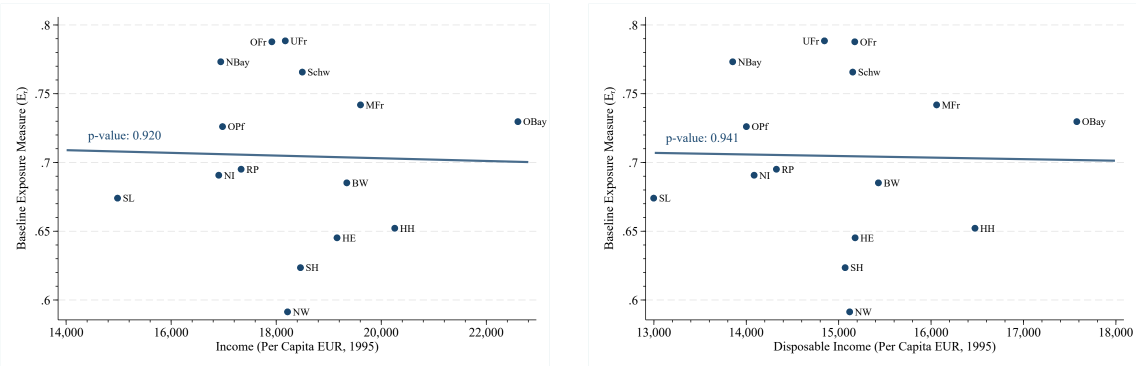


Notes: This figure plots aggregate public spending on means-tested long-term care benefits, *Hilfe zur Pflege*, and universal long-term care (LTC) insurance. The spending statistics cover all of Germany (East and West). Universal LTC insurance started covering outpatient services in 1995 and inpatient services in 1996. These transition years are shaded in gray. The data source for expenditures on *Hilfe zur Pflege* is Statistisches Bundesamt (2013), Table D5. The source for expenditures on universal LTC insurance is Bundesministerium für Arbeit und Soziales (2011), Appendix 3.
Source: Own calculations.

Figure A3.: Geographic Variation in Baseline Exposure and Local Income

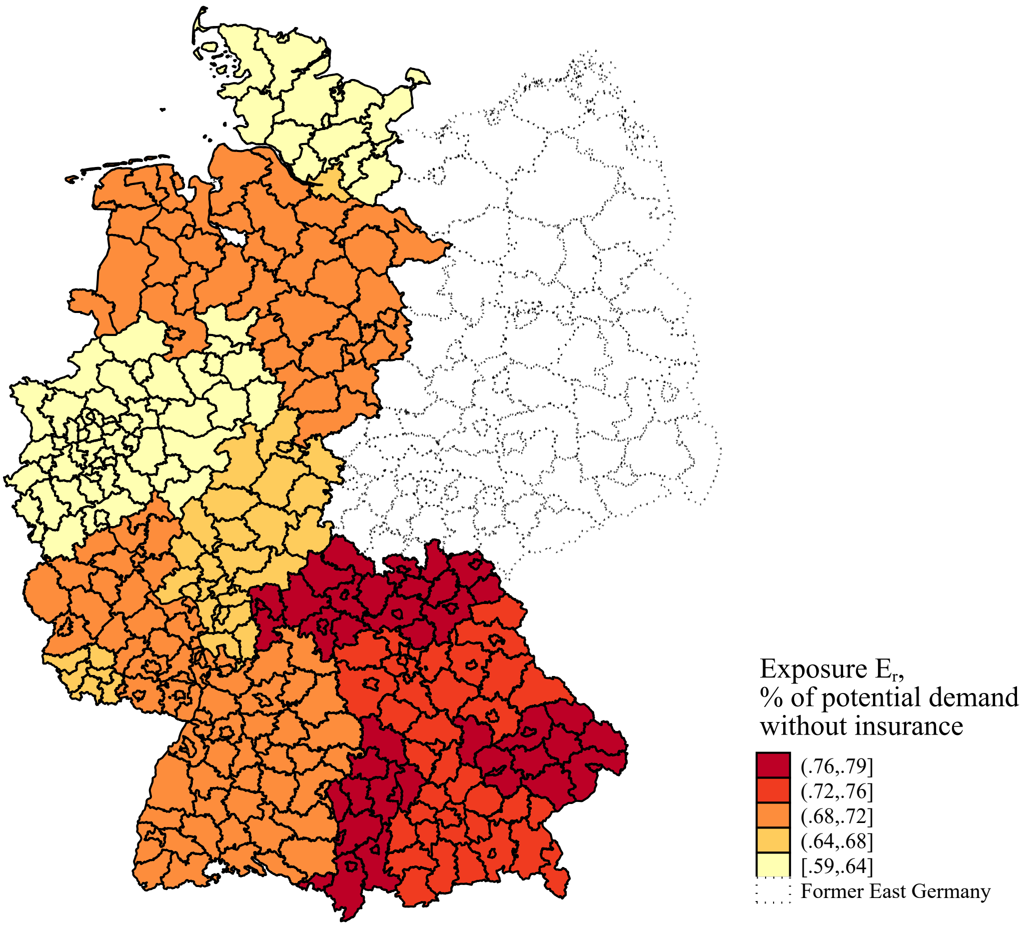
(a) Er **and Average Gross Income**

(b) Er **and Average Disposable Income**



Notes: This figure estimates the relationship between the baseline measure of exposure to LTC insurance rollout and measures of per capita in come in 1995, at the level of 15 exposure regions. 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 rollout of universal LTC insurance (mean of $E_r = 0.69$). This measure varies across 15 different West German geographical regions, visualized in Figure A4. The correlation of the baseline exposure measure with income per capita, visualized in A3a, is statistically insignificant at $p = 0.920$, and the correlation with disposable income, displayed in in A3b, is statistically insignificant at $p = 0.941$. Income data have been obtained from (Statistische Ämter des Bundes und der Länder, 2021b).
Source: Own calculations.

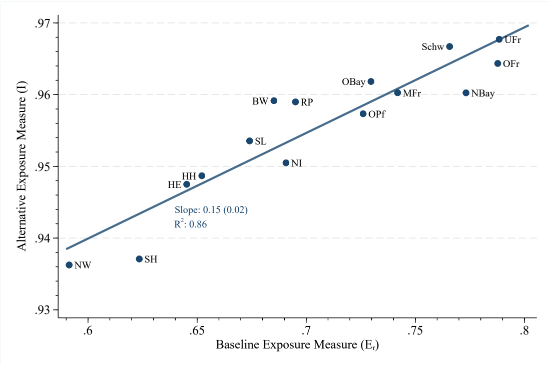
Figure A4.: Geographic Variation in Exposure E_r



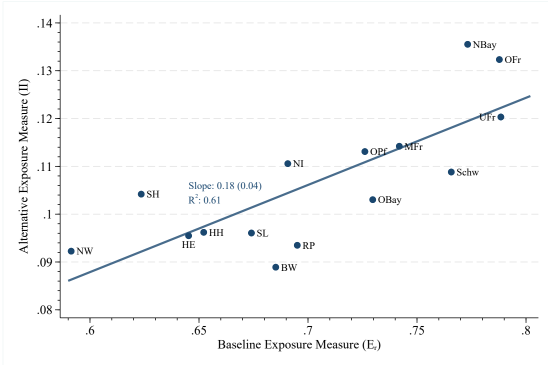
Notes: This figure plots the value of exposure to the rollout of universal long-term care insurance, E_r, for each county. Exposure varies at the level of 15 regions; counties in the same region are assigned to the same level of exposure. E_r is defined as the count of individuals who did not have means-tested support for long-term care services (*Hilfe zur Pflege*) in 1993 divided by the count of people who received universal long-term care (LTC) benefits in 1999, adjusted by county-specific 1993-1999 population growth. See Equation (1) for the exact derivation of E_r.
Source: Own calculations.

Figure A5.: Alternative Ways of Computing Exposure to Insurance Rollout

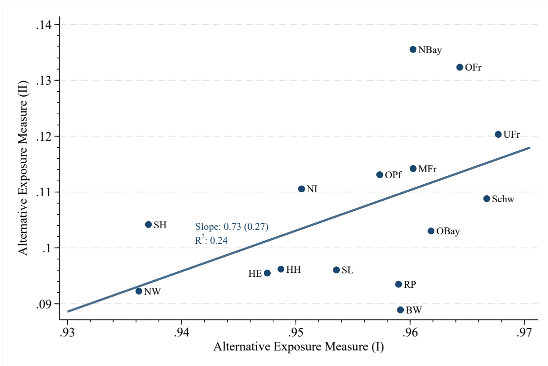
(a) Baseline and Alternative E_r (I)



(b) Baseline and Alternative E_r (II)



(c) Alternative E_r (I) and (II)



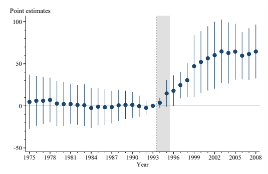
Notes: This panel displays bi-variate relationships between different ways of computing exposure to long-term care insurance rollout E_r. The baseline E_r is derived in Equation (1) and measures the share of individuals in need of long-term care (imputed from 1999 LTC insurance claims), who did not have means-tested support for long-term care services in 1993. The "Alternative Exposure Measure I" replaces denominator of exposure with the overall count of 65 and older population in 1993; i.e. it measures the share of 65 and older population that was receiving means-tested benefits. "Alternative Exposure Measure II" is computed as the share of individuals in 1993 who were not receiving means-tested benefits, but were in need of care (imputed from 1999 LTC insurance claims) among all individuals age 65 and older. In other words, $E_r = \frac{g_{r,1993,1999} * LTCClaims_{r,1999} - HzP_{r,1993}}{65andOlderPopulation_{r,1993}}$ (mean of $E_r = 0.103$). Solid lines plot the line of best fit. The slope coefficient and the R-squared are reported next to the line.

Source: Own calculations.

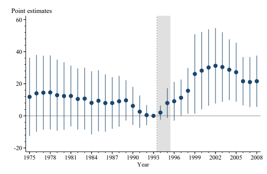
Figure A6.: Universal LTC Insurance and the Nursing Home Market: Alternative Specifications

I. Baseline Specification Estimate at Exposure Region r Level

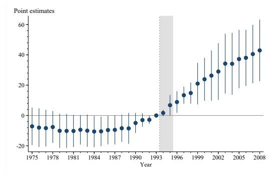
(a) Workers



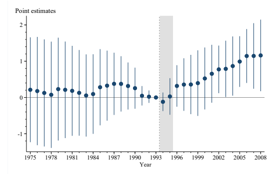
(b) NH Full-Time Workers



(c) NH part-Time Workers

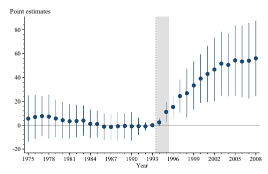


(d) NH Establishments

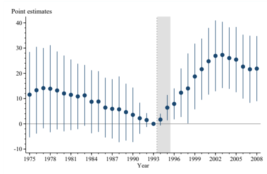


II. S.E. Clustered at Exposure Region r Level

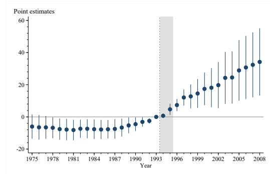
(e) NH Workers



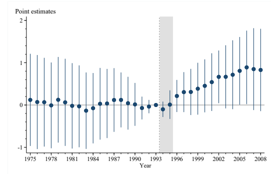
(f) NH Full-Time Workers



(g) NH Part-Time Workers



(h) NH Establishments

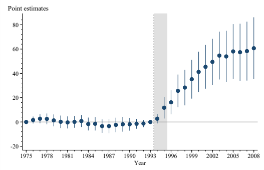


Notes: This panel presents robustness checks of the baseline specifications displayed in Figures 1, A12, and Table 2. All graphs show λ_t coefficients and 95% confidence intervals from estimating variations—as specified above the panels—of the specification in Equation 2 with the number of Nursing Home (NH) workers, full-time workers, part-time workers, and establishments per 1,000 individuals age 65 and above as outcomes. 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 and median of E_r=0.69). E_r is derived in Equation 1 and its geographic variation is visualized in Figure A4. See Appendix A1.2 for the definition of Nursing Homes and "regular" workers. Displayed results, including the mean of outcome variables in 1993, are also reported in columns (1)-(4) of Table A1.
Source: Own calculations.

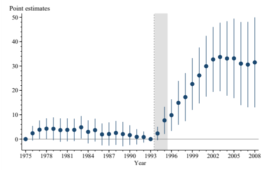
Figure A7.: Introduction of Universal LTC Insurance and Supply of Nursing Home Care: Alternative Specifications

III. County-Specific Time Trend

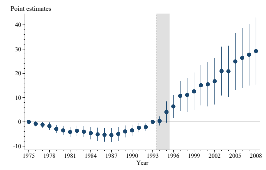
(a) NH Workers



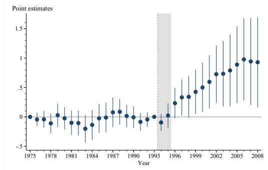
(b) NH Full-Time Workers



(c) NH Part-Time Workers

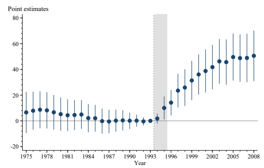


(d) NH Establishments

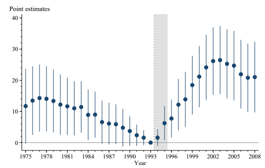


IV. Controlling for the County-Year-Level Share of Elderly

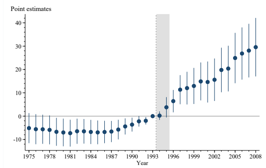
(e) Workers



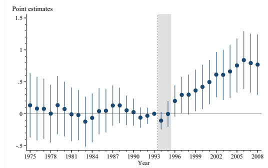
(f) NH Full-Time Workers



(g) NH Part-Time Workers



(h) NH Establishments

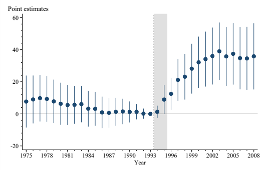


Notes: This panel presents robustness checks of the baseline specifications displayed in Figures 1, A12, and Table 2. All graphs show λ_t coefficients and 95% confidence intervals from estimating variations—as specified above the panels—of the specification in Equation 2 with the number of Nursing Home (NH) workers, full-time workers, part-time workers, and establishments per 1,000 individuals age 65 and above as outcomes. 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 and median of E_r=0.69). E_r is derived in Equation 1 and its geographic variation is visualized in Figure A4. See Appendix A1.2 for the definition of Nursing Homes and "regular" workers. Displayed results, including the mean of outcome variables in 1993, are also reported in columns (9)-(12) of Table A1 and columns (1)-(4) of Table A2. Main data source for results displayed is the Nursing Home Sample, see column (2) of Table 1 for summary statistics and Section 2 for further details.
Source: Own calculations.

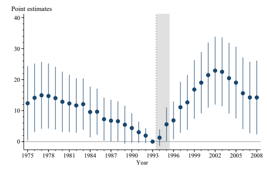
Figure A8.: Introduction of Universal LTC Insurance and Supply of Nursing Home Care: Alternative Specifications

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

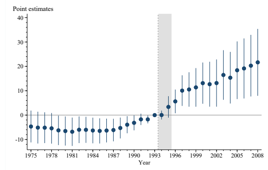
(a) NH Workers



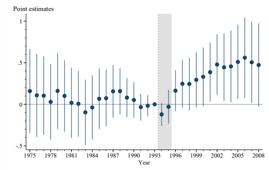
(b) NH Full-Time Workers



(c) NH Part-Time Workers

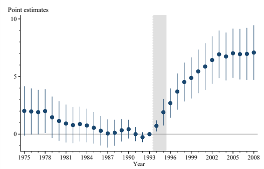


(d) NH Firms

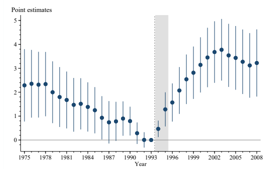


VI. Binary Exposure Measure

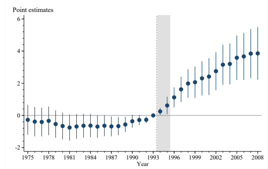
(e) NH Workers



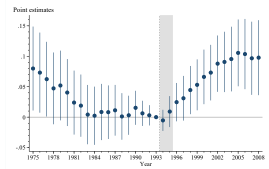
(f) NH Full-Time Workers



(g) NH Part-Time Workers



(h) NH Firms

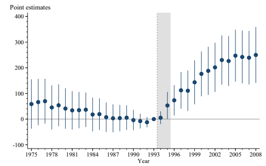


Notes: This panel presents robustness checks of the baseline specifications displayed in Figures 1, A12, and Table 2. All graphs show λ_t coefficients and 95% confidence intervals from estimating variations—as specified above the panels—of the specification in Equation 2 with the number of Nursing Home (NH) workers, full-time workers, part-time workers, and establishments per 1,000 individuals age 65 and above as outcomes. 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 and median of E_r=0.69). E_r is derived in Equation 1 and its geographic variation is visualized in Figure A4. See Appendix A1.2 for the definition of Nursing Homes and "regular" workers. Displayed results, including the mean of outcome variables in 1993, are also reported in columns (5)-(5) of Table A2 and columns (1)-(4) of Table A3. Main data source for results displayed is the Nursing Home Sample, see column (2) of Table 1 for summary statistics and Section 2 for further details.
Source: Own calculations.

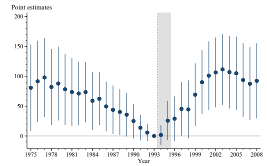
Figure A9.: Universal LTC Insurance and the Nursing Home Market: Alternative Specifications

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

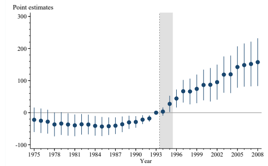
(a) NH Workers



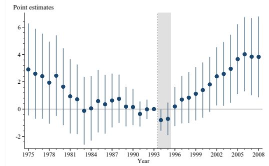
(b) NH Full-Time Workers



(c) NH Part-Time Workers

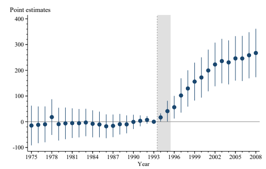


(d) NH Establishments

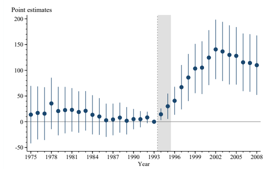


VIII. Alternative Exposure Measure (II): $E_r = \frac{g_{r,1993,1999} * LTCClaims_{r,1999} - HzP_{r,1993}}{65andOlderPopulation_{r,1993}}$

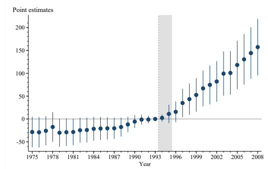
(e) NH Workers



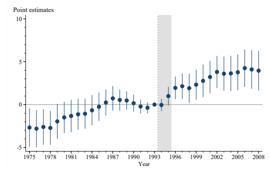
(f) NH Full-Time Workers



(g) NH Part-Time Workers



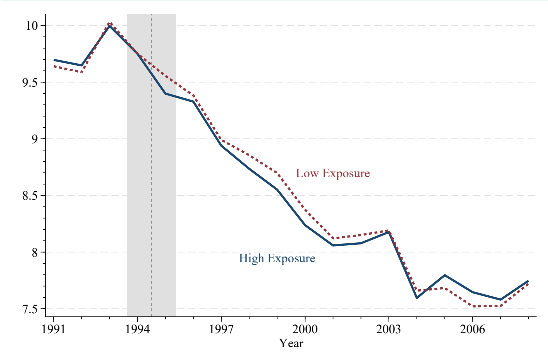
(h) NH Establishments



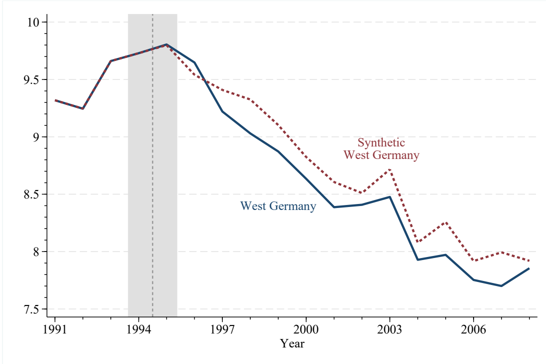
Notes: This panel presents robustness checks of the baseline specifications displayed in Figures 1, A12, and Table 2. All graphs show λ_t coefficients and 95% confidence intervals from estimating variations—as specified above the panels—of the specification in Equation 2 with the number of Nursing Home (NH) workers, full-time workers, part-time workers, and establishments per 1,000 individuals age 65 and above as outcomes. 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 and median of E_r=0.69). E_r is derived in Equation 1 and its geographic variation is visualized in Figure A4. 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 $E_r = 0.103$). See Appendix A1.2 for the definition of Nursing Homes and "regular" workers. Displayed results, including the mean of outcome variables in 1993, are also reported in columns (5)-(12) of Table A2.
Source: Own calculations.

Figure A10.: Old-Age Mortality

(a) Deaths per 100 Age 75+, Synthetic DiD



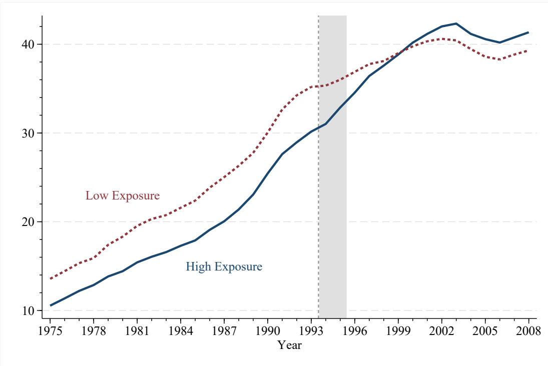
(b) Deaths per 100 Age 75+, Synthetic Control



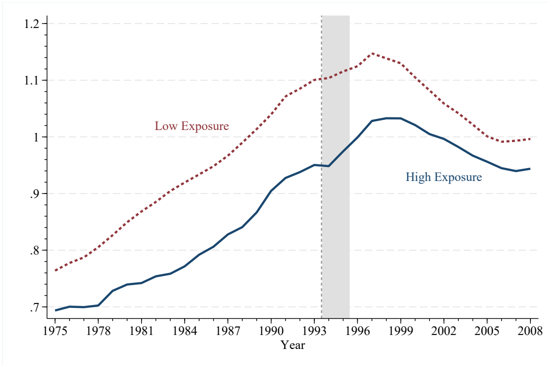
Notes: Panel A displays treatment and matched synthetic control time series for old-age mortality using a synthetic difference-in-difference (SDID) analogue of equation 2 estimated at the county-year level. We use a binary measure of exposure to the reform, which defines regions with an above-median exposure variable E_r as treated units and counties at or below median exposure as control units. E_r takes on 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 and median of E_r =0.69). The geographic variation of E_r is visualized in Figure A4. Panel B displays treatment and matched control time series for old-age mortality using the synthetic control (Abadie/Diamond/Hainmueller, 2010) method, estimated on a cross-*country* panel of mortality rates. We construct a counterfactual time series for West Germany using a donor pool consisting of annual mortality time series for the 75-and-older population in 27 other countries. Results of these specifications are summarized in columns 2 and 3 of Table 7. Data source for the top panel A are the statistical agencies of West German federal states, excluding Bremen and Berlin, and data source for the bottom panel B is the **(alias?)**.
Source: Own calculations.

Figure A11.: Levels of Selected County-Level Outcomes by Exposure E_r Level

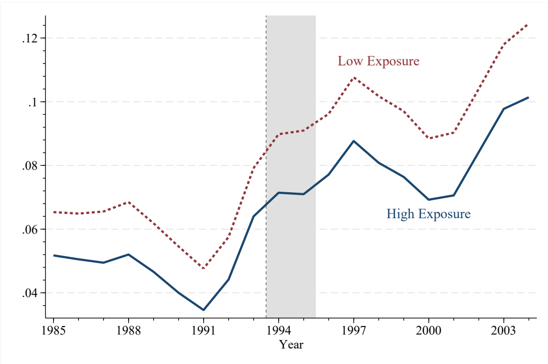
(a) NH Workers per 1,000 65+ Population



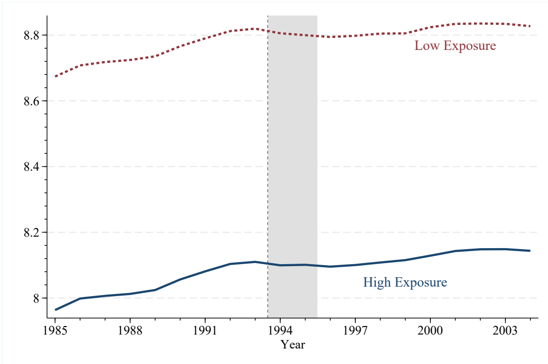
(b) NH Establishments per 1,000 65+ Population



(c) Share Unemployed



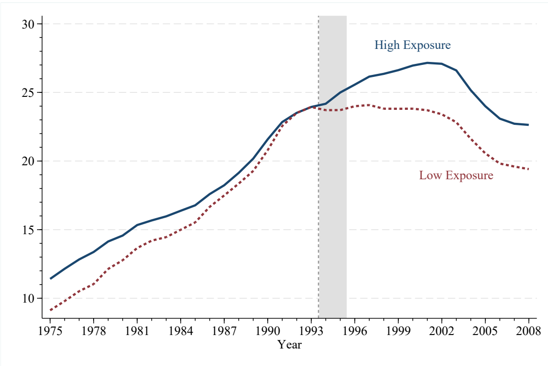
(d) Log Labor Force Size



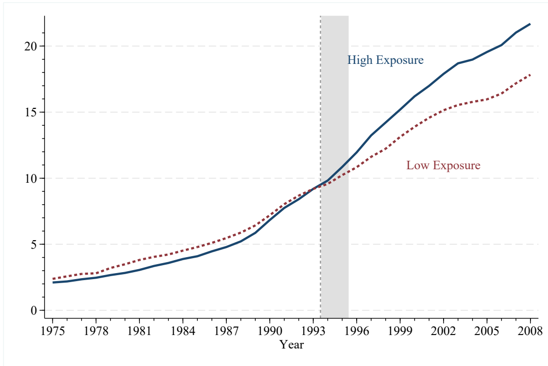
Notes: Panels in the top row plot the number of regular nursing home workers (A) and nursing home establishments (B) per 1,000 individuals age 65 and over, on average across counties for each year 1975 to 2008. Panels in the bottom row plot the share of unemployed individuals (C) and the log count of labor force participants (D), on average across counties for each year 1975 to 2008. The average in each year is computed separately for the group of West German counties with (region-level) exposure variable E_r above ("high exposure") and below ("low exposure") the level of exposure of the median county. E_r takes values from 0 to 1 and measures the share of potential long-term care patients who did not have public assistance for long-term care prior to the rollout of universal LTC insurance (mean and median of E_r=0.69) All counties with exposure level at the median are assigned to the below median group. The time-series are *not* normalized. See Appendix A1.2 for the definition of nursing homes, "regular" workers, unemployment, and the labor force. E_r is derived in Equation 1 and its geographic variation is visualized in Figure A4.
Source: Own calculations.

Figure A12.: Universal LTC Insurance and the Nursing Home Market, by Type of Employment

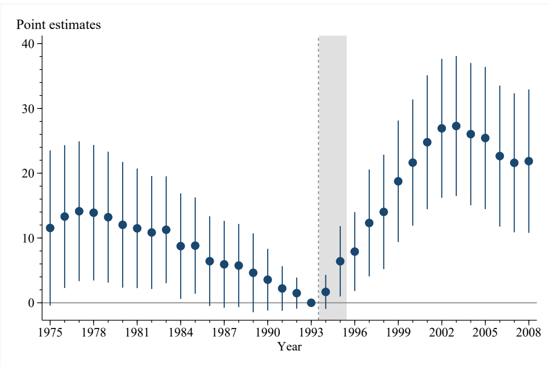
(a) Full-Time NH Workers per 1,000 65+ Popl



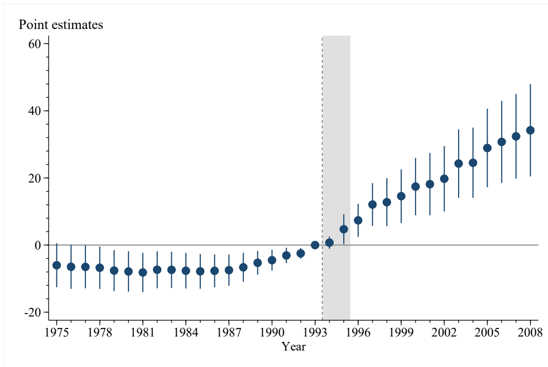
(b) Part-Time NH Workers per 1,000 65+ Popl



(c) Full-Time NH Workers, Event Study



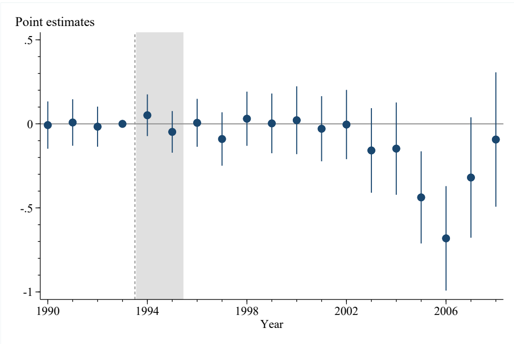
(d) Part-Time NH Workers, Event Study



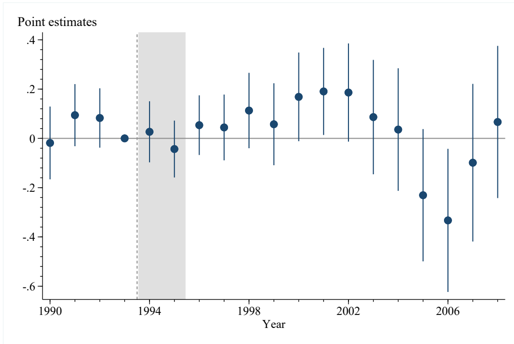
Notes: Panels in the top row plot the number of regular full-time nursing home workers (A) and part-time nursing home workers (B) per 1,000 individuals age 65 and over, on average across counties for each year 1975 to 2008. The average in each year is computed separately for the group of West German counties with (region-level) exposure variable E_r above ("high exposure") and below ("low exposure") the level of exposure of the median county. E_r takes values from 0 to 1 and measures the share of potential long-term care patients who did not have public assistance for long-term care prior to the rollout of universal LTC insurance (mean and median of E_r=0.69). All counties with exposure level at the median are assigned to the below median group. Both time-series are normalized to the aggregate mean of the y-axis variable across all counties in 1993. See Appendix A1.2 for the definition of nursing homes and "regular" workers. E_r is derived in Equation 1 and its geographic variation is visualized in Figure A4. Panels in the bottom row display λ_t coefficients and 95% confidence intervals from estimating the specification in Equation 2 with the number of regular full-time nursing home workers (C) and part-time nursing home workers (D) per 1,000 individuals age 65 and above in a county as an outcome. λ_t are coefficients that multiply exposure variable E_r; λ_t is normalized to zero in the pre-reform year $t = 1993$. More regression details are reported in columns (2) and (3) of Table 2. Regressions are estimated on the nursing home sample; see column (2) of Table 1 for summary statistics.
Source: Own calculations.

Figure A13.: Event Study Results: Nursing Home Wages

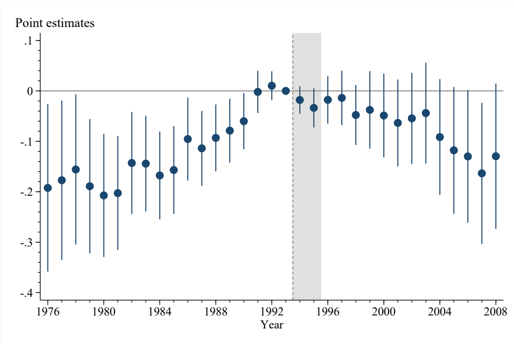
(a) New Hires



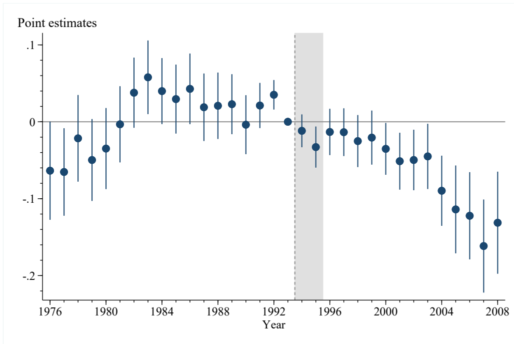
(b) New Hires, Experience Controls



(c) Incumbents



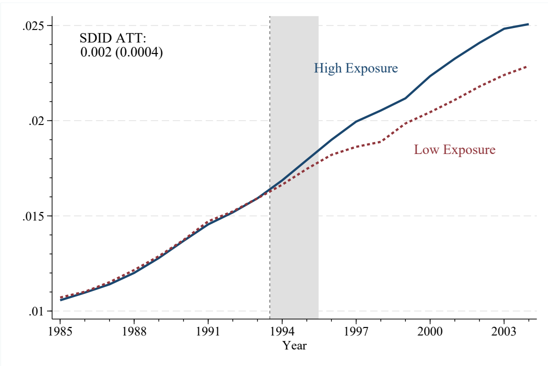
(d) Incumbents, Individual FE



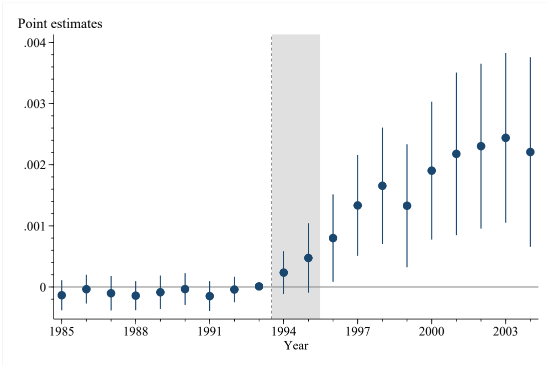
Notes: This panel display λ_t coefficients and 95% confidence intervals from estimating the specification in Equation 2 with the log full-time wage of regular new (Panels A and B) or incumbent (panels C and D) nursing home workers. Wages are in constant 2020 EUR. See Appendix 2 for the definition of nursing homes and regular workers. Panel A13b displays results from a specification that controls for years of prior employment (overall and in nursing homes). Panel A13d displays results from a specification that includes individual fixed effects. Coefficients λ_t are 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 roll-out of universal LTC insurance (mean and median of E_r=0.69). The geographic variation in E_r is visualized in Figure A4. All specifications include county and year fixed effects. The results are summarizes in Table 3.
Source: Own calculations.

Figure A14.: Introduction of Universal LTC Insurance and Supply of Nursing Home Care: SDID

(a) Share Nursing Home Workers



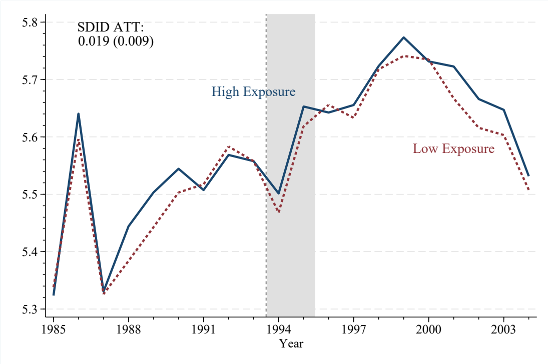
(b) Share Nursing Home Workers, Event Study



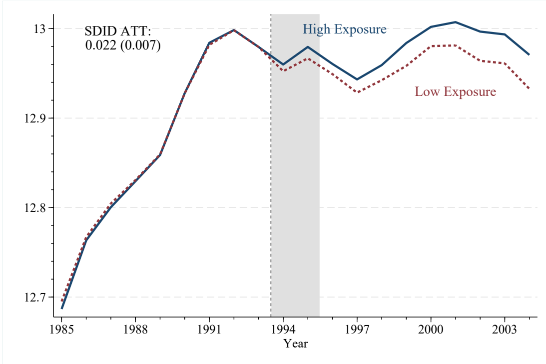
Notes: This exhibit replicates the analysis in Figure 1 using the synthetic difference-in-difference (SDID) specification (Arkhangelsky, Dmitry and Athey, Susan and Hirshberg, David A. and Imbens, Guido W. and Wager, Stefan, 2021). The outcome is the share of regular nursing home employees among all employed and unemployed individuals. 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. E_r 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 and median of E_r =0.69) as a measure of local exposure to the reform. E_r is derived in 1 and its geographic variation is visualized in Figure A4. Panel A displays treatment and matched control time series. Both time-series are normalized to the aggregate mean between control and synthetic treated units across all counties in 1993. Panel B shows the corresponding event study chart. We use $b = 100$ bootstrap draws to compute the 95% confidence intervals. Coefficients are normalized to zero in the pre-reform year $t = 1993$.
Source: Own calculations.

Figure A15.: Introduction of Universal LTC Insurance and Overall Employment

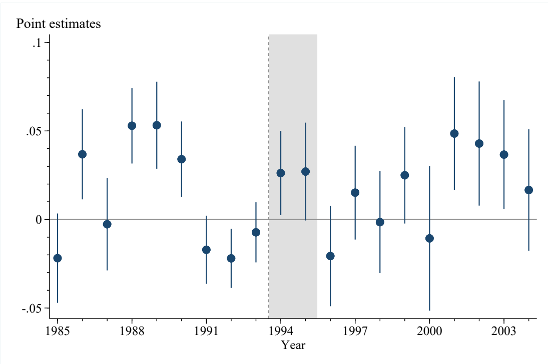
(a) Log Population Rejoining the Labor Force



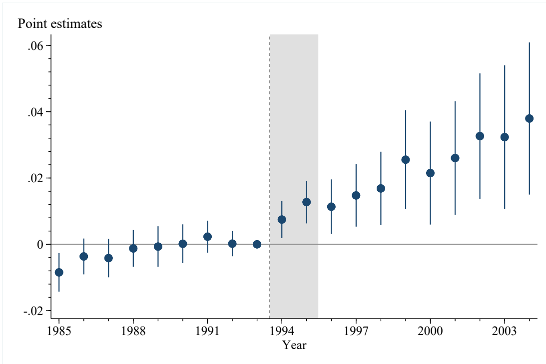
(b) Log Total Regular Wage Bill



(c) Log Population Rejoining the Labor Force, Event Study

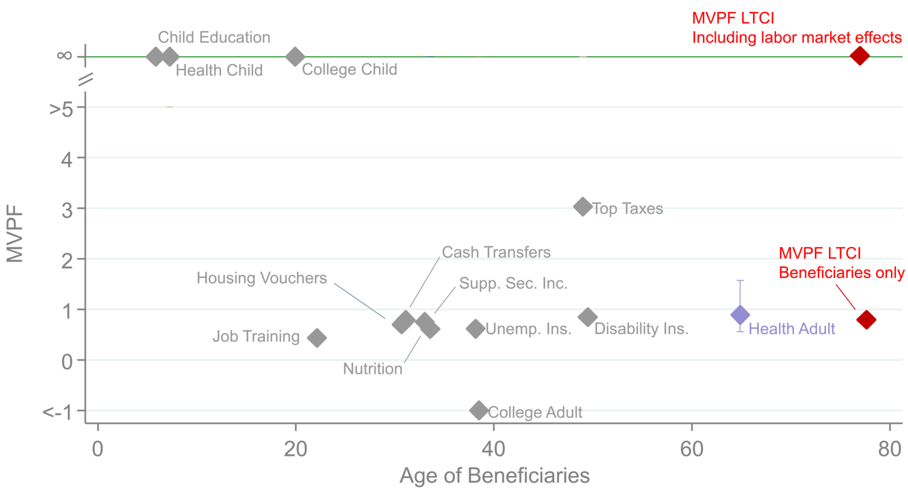


(d) Log Total Regular Wage Bill, Event Study



Notes: Panels in the top row display treatment and matched control time series from synthetic difference-in-difference (SDID) specifications estimated at the county-year level. The outcome used in Panel (A) is the log count of individuals rejoining the labor force during a given index year; Panel (B) uses the log of the total daily wage bill pertaining to regular employment. Both time-series are normalized to the aggregate mean between control and synthetic treated units across all counties in 1993. The bottom panel shows event study charts for the same outcomes. We use $b = 100$ bootstrap draws to compute the 95% confidence intervals. Coefficients are normalized to zero in the pre-reform year $t = 1993$ 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. E_r 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 and median of E_r =0.69) as a measure of local exposure to the reform. E_r is derived in 1 and its geographic variation is visualized in Figure A4.
Source: Own calculations.

Figure A16.: MVPF Estimates in Context



Notes: This exhibit overlays our MVPF estimates (in red) over a simplified version of Figure IV.B in Hendren/Sprung-Keyser (2020). The original figure reports average MVPFs and 95% confidence intervals for several categories of public policies, plotted as a function of the average age of each policy's beneficiaries.
Source: Own calculations.

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

	Outcome (per 1,000 Age 65+ Population)											
	At Exposure Region (r) Level				S.E. Clustered at Region (r) Level				County-Specific Time Trend			
	Workers	Full-Time	Part-Time	Firms	Workers	Full-Time	Part-Time	Firms	Workers	Full-Time	Part-Time	Firms
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Event Study Coefficients												
1-Year Effect, λ_{1997}	24.7	11.3	13.4	0.36	24.4	12.3	12.1	0.30	25.6	14.9	10.7	0.33
	(8.07)	(5.77)	(2.88)	(0.37)	(7.04)	(4.91)	(2.56)	(0.24)	(6.85)	(4.59)	(3.16)	(0.16)
3-Year Effect, λ_{1999}	47.2	26.1	21.0	0.40	33.3	18.8	14.6	0.39	35.2	22.6	12.6	0.43
	(18.9)	(12.6)	(6.96)	(0.46)	(10.3)	(6.64)	(4.56)	(0.31)	(8.14)	(5.43)	(3.97)	(0.19)
5-Year Effect, λ_{2001}	56.5	30.1	26.3	0.65	42.9	24.8	18.1	0.54	45.4	29.9	15.5	0.60
	(19.5)	(12.2)	(8.47)	(0.41)	(12.0)	(6.74)	(6.22)	(0.35)	(9.17)	(6.37)	(4.64)	(0.23)
10-Year Effect, λ_{2006}	59.6	21.6	38.0	1.14	53.4	22.6	30.7	0.89	57.4	31.0	26.4	0.98
	(14.4)	(7.67)	(9.43)	(0.38)	(15.3)	(6.46)	(10.0)	(0.44)	(12.0)	(8.71)	(6.29)	(0.36)
Level of Outcome in 1993												
Mean	32.5	23.6	8.92	0.99	33.1	23.9	9.19	1.04	33.1	23.9	9.19	1.04
S.D.	5.86	4.25	2.08	0.27	13.8	10.3	4.57	0.47	13.8	10.3	4.57	0.47
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	510	510	510	510	10,948	10,948	10,948	10,948	10,948	10,948	10,948	10,948

Notes: This table summarizes the results of alternative specifications to the baseline results reported in 1, A12, and Table 2. Displayed are λ_t coefficients, obtained from estimating different versions (as specified in column titles) of the difference-in-differences specification in Equation (2). Outcome variables include the number of regular nursing home workers, part-time and full-time nursing home employment, and the number of nursing home establishments, per 1,000 individuals age 65 and older. The results in columns (1)-(8) are visualized in Figure A6 and the results in columns (9)-(12) in the top row of Figure A7. All specifications include county and year fixed effects. Columns (9)-(12) also include county-specific time trends. Standard errors clustered at the county level (columns 1-4, 9-12) and at the region r level (columns 5-8) are included in parentheses.
Source: Own calculations.

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

	Outcome (per 1,000 Age 65+ Population)							
	Controlling for Count of Elderly				Controlling for Share of Elderly			
	Workers	Full-Time	Part-Time	Firms	Workers	Full-Time	Part-Time	Firms
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Event Study Coefficients								
1-Year Effect, λ_{1997}	21.1	11.1	10.1	0.25	23.5	12.2	11.3	0.30
	(6.69)	(4.20)	(3.20)	(0.15)	(6.67)	(4.20)	(3.18)	(0.14)
3-Year Effect, λ_{1999}	28.2	16.8	11.4	0.29	31.4	18.5	12.9	0.36
	(7.92)	(4.83)	(4.04)	(0.17)	(7.82)	(4.80)	(3.95)	(0.17)
5-Year Effect, λ_{2001}	34.1	21.5	12.7	0.39	38.8	24.1	14.6	0.50
	(8.73)	(5.37)	(4.70)	(0.18)	(8.53)	(5.32)	(4.49)	(0.18)
10-Year Effect, λ_{2006}	34.7	15.6	19.1	0.56	48.8	21.9	26.8	0.84
	(9.93)	(5.90)	(6.29)	(0.25)	(9.39)	(5.63)	(5.71)	(0.23)
Level of Outcome in 1993								
Mean	33.1	23.9	9.19	1.04	33.1	23.9	9.19	1.04
S.D.	13.8	10.3	4.57	0.47	13.8	10.3	4.57	0.47
Years	1975 - 2008	1975 - 2008	1975 - 2008	1975 - 2008	1975 - 2008	1975 - 2008	1975 - 2008	1975 - 2008
No. of Observations	10,948	10,948	10,948	10,948	10,948	10,948	10,948	10,948

Notes: This table summarizes the results of alternative specifications to the baseline results reported in 1, A12, and Table 2. Displayed are λ_t coefficients, obtained from estimating different versions (as specified in column titles) of the difference-in-differences specification in Equation (2). Outcome variables include the number of regular nursing home workers, part-time and full-time nursing home employment, and the number of nursing home establishments, per 1,000 individuals age 65 and older. Columns (1)-(4) display results of specifications additionally controlling for the county-year-level count of individuals age 65 and above, and columns (5)-(8) control for the county-year-level population share of residents age 65 and above. The results in columns (1)-(4) are visualized in the bottom row of Figure A7 and the results in columns (5)-(8) in the top row of Figure A8. All specifications include county and year fixed effects. Standard errors clustered at the county level are reported in parentheses.
Source: Own calculations.

Table A3.: 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]			
	Workers	Full-Time	Part-Time	Firms	Workers	Full-Time	Part-Time	Firms	Workers	Full-Time	Part-Time	Firms
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Event Study Coefficients												
1-Year Effect, λ_{1997}	3.69	2.07	1.62	0.03	112	45.3	66.8	0.70	102	67.2	35.0	2.14
	(0.80)	(0.50)	(0.40)	(0.02)	(36.5)	(22.8)	(18.0)	(0.89)	(34.1)	(22.0)	(15.8)	(0.76)
3-Year Effect, λ_{1999}	4.88	2.81	2.06	0.05	143	69.2	74.2	1.12	156	103	52.6	2.32
	(0.91)	(0.56)	(0.50)	(0.02)	(43.7)	(26.7)	(22.8)	(1.00)	(37.6)	(24.5)	(18.7)	(0.89)
5-Year Effect, λ_{2001}	5.87	3.45	2.41	0.07	188	101	87.1	1.81	199	125	74.7	3.22
	(1.04)	(0.63)	(0.58)	(0.02)	(47.9)	(29.3)	(26.6)	(1.03)	(41.3)	(27.3)	(21.7)	(0.97)
10-Year Effect, λ_{2006}	6.94	3.27	3.67	0.10	242	93.7	148	4.02	246	115	131	4.25
	(1.12)	(0.69)	(0.75)	(0.03)	(52.4)	(31.3)	(34.4)	(1.39)	(44.8)	(28.6)	(28.2)	(1.11)
Level of Outcome in 1993												
Mean	33.1	23.9	9.19	1.04	33.1	23.9	9.19	1.04	33.1	23.9	9.19	1.04
S.D.	13.8	10.3	4.57	0.47	13.8	10.3	4.57	0.47	13.8	10.3	4.57	0.47
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	10,948	10,948	10,948	10,948	10,948	10,948	10,948	10,948	10,948	10,948	10,948	10,948

[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 $E_r = \frac{g_{r,1993,1999} * LTCClaims_{r,1999} - HzP_{r,1993}}{65andOlderPopulation_{r,1993}}$.

Notes: This table summarizes the results of alternative specifications to the baseline results reported in 1, A12, and Table 2. Displayed are λ_t coefficients, obtained from estimating different versions (as specified in column titles) of the difference-in-differences specification in Equation (2). Outcome variables include the number of regular nursing home workers, part-time and full-time nursing home employment, and the number of nursing home establishments, per 1,000 individuals age 65 and older. The results in columns (1)-(4) are visualized in the bottom row of Figure A8 and the results in columns (5)-(12) in Figure A9. All specifications include county and year fixed effects. Standard errors clustered at the county level are reported in parentheses.
Source: Own calculations.

Table A4.: Event Study Results: Count of New Nursing Home Hires By Origin

	Outcome (per 1,000 Age 65+ Population)					
	Count New NH Hires[a]	Among New Nursing Home Hires[a], Count of				
		Employed & in HC in $t-1$	Employed & Not in HC in $t-1$	Unemployed in $t-1$	Temporarily Not in LF in $t-1$	Never in LF before t
	(1)	(2)	(3)	(4)	(5)	(6)
Pooled Coefficients						
δ_{97-08}	9.37	1.32	1.02	1.93	3.91	1.19
	(1.82)	(0.74)	(0.53)	(0.42)	(0.52)	(0.43)
Event Study Coefficients						
1-Year Effect, λ_{1997}	8.38	3.10	-0.04	2.35	2.37	0.60
	(4.05)	(3.14)	(0.75)	(0.54)	(0.53)	(0.49)
3-Year Effect, λ_{1999}	7.52	0.89	1.26	1.69	2.96	0.73
	(1.93)	(0.72)	(0.56)	(0.56)	(0.66)	(0.49)
5-Year Effect, λ_{2001}	10.4	1.03	2.25	1.96	3.54	1.60
	(2.27)	(1.03)	(0.67)	(0.53)	(0.68)	(0.47)
10-Year Effect, λ_{2006}	8.81	0.64	0.51	2.03	4.13	1.50
	(2.15)	(0.84)	(0.60)	(0.55)	(0.68)	(0.53)
Level of Outcome in 1993						
Mean	6.85	1.28	1.30	1.13	2.05	1.09
S.D.	2.94	0.84	0.78	0.64	0.93	0.63
Years	1977 - 2008	1977 - 2008	1977 - 2008	1977 - 2008	1977 - 2008	1977 - 2008
No. of Observations	10,304	10,304	10,304	10,304	10,304	10,304

[a] "New Hires" are individuals who were not employed in a nursing home in the year before each index year.

Notes: The top panel displays pooled δ_{97-08} coefficients 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. E_r 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 and median of E_r =0.69). The geographic variation in E_r is visualized in Figure A4. The outcome variables are counts of new regular Nursing Home hires per 1,000 population age 65 and above by employment status before each index year, as specified in the column titles. The second panel displays λ_t coefficients of the event study in Equation (2). Coefficients were normalized to zero in year $t = 1993$. Results from equivalent specifications, using the share of hires from a respective origin rather than counts as outcomes, are presented in Table 5. All specifications include county and year fixed effects. Standard errors clustered at the county-level are reported in parentheses.
Source: Own calculations.

Table A5.: Details of the MVPF Calculation

	A. Inputs[50]		Sources & Comments
	Patients		
A	Share patients receiving cash benefits	0.51	Statistisches Bundesamt (1999b), p.6
B	Share patients receiving outpatient benefits	0.21	ibid
C	Share patients receiving inpatient benefits	0.28	ibid
D	Cash benefit (EUR per capita / year)	4,126	Bundesministerium für Arbeit und Soziales (2011), Anlage 3; Statistisches Bundesamt (1999b), p.6
E	Outpatient benefit (EUR per capita / year)	9,391	ibid
F	Inpatient benefit (EUR per capita / year)	14,305	ibid
G	Count of LTC patients, any type of care	1,563,209	Statistisches Bundesamt (1999b), p.6; Statistical Office of Bavaria (1999)
H	Cash [A * G]	796,759	
I	Outpatient [B * G]	322,001	
J	Inpatient [C * G]	444,448	
K	Count of patients with *Hilfe zur Pflege* assistance	525,740	Statistisches Bundesamt (1993), p. 96; Statistical Office of Bavaria (1993), p. 297; 1993-1999 growth rate of age 65+ population (8%) as collected from state-level sources
L	Implied share of patients with pre-existing coverage [K / G]	0.34	Aggregate share versus mean share in row U
	Workers		
	Inpatient care only		
M	Count inpatient workers	234,436	Table 2 (Nursing Home Sample); NH worker count adjusted to workers who are more likely to be serving only patients with inpatient benefits; see table notes for details
N	Mean daily inpatient full-time wage (EUR)	99.4	Table 3 (Nursing Home Sample); assume same mean wage as in the full NH worker sample
	Full economy		
O	Total wage bill (EUR billion / year)	684.8	Table 6 (Labor Market Sample)
P	Labor force size (workers in employment and unemployment spells)	22,304,840	ibid
Q	Mean UI benefit (EUR / year)	9,300	Labor Market Sample
R	Total worker tax and SI rate	0.39	Bundeszentrale für Politische Bildung (2023), Rates for singles with no children
S	Total government tax and SI collection rate	0.60	ibid
T	Reservation raise	0.90	Mui/Schoefer (2024)
	Causal estimates of insurance expansion effects		
U	Mean of E_r (across counties)	0.69	Statistisches Bundesamt (1993), p. 96; Statistical Office of Bavaria (1993), p. 297; 1993-1999 growth rate of age 65+ population (8%) as collected from state-level sources
V	Variation in exposure E_r (difference in mean across counties)	0.09	ibid
W	Estimated percent change in the count of NH workers per capita age 65+ under full exposure	92%	Table 2 (Nursing Home Sample)
X	Share new NH hires from non-employment	0.62	Table A4 (Nursing Home Sample)
Y	Estimated percent change in the wage bill payout in the whole economy (lower bound, full expansion) [(ATT - 1.96 * SE) * U / V]	6%	Table 6 (Labor Market Sample)
Z	Estimate change in the rate of unemployment in the whole economy (upper bound, full expansion) [(ATT + 1.96 * SE) * U / V]	-0.02	ibid
	B. Long-term care market		
	Inframarginal patients		
AA	Cash [A * K]	267,967	Assuming 0 inframarginal cash patients who are not eligible
AB	Receiving the new subsidy, not eligible for *Hilfe zur Pflege*	0	for *Hilfe zur Pflege*
AC	Outpatient [B * K]	108,296	Assuming 0 inframarginal outpatient patients who are not
AD	Receiving the new subsidy, not eligible for *Hilfe zur Pflege*	0	eligible for *Hilfe zur Pflege*
AE	Inpatient [J / (1+W)]	231,412	Out of these, 149,477 are inframarginal due to *Hilfe zur Pflege* eligibility
AF	Receiving the new subsidy, not eligible for *Hilfe zur Pflege* [AE - C * K]	81,935	Assume that inframarginal patients value in-kind inpatient subsidy at 50%
	Marginal patients		
AG	Cash [H - AA]	528,793	Assume that marginal patients value cash subsidy at 100%
AH	Outpatient [I - AC]	213,705	Assume that marginal patients value outpatient in-kind subsidy at 50%
AI	Inpatient [J - AF]	213,037	Assume that marginal patients value inpatient in-kind subsidy at 50%
	Inpatient workers		
AJ	Count of inframarginal inpatient workers [M / (1+W)]	122,064	
AK	Count of marginal inpatient workers [M - AJ]	112,372	
AL	Count of marginal inpatient workers coming from non-employment [X * AK]	69,983	
AM	Marginal wages paid to inpatient workers (EUR billion / year) [N * AL * 365]	2.54	
AN	WTP of marginal inpatient workers (EUR billion / year) [AM * (1-R) * (1-T)]	0.15	
AO	Marginal tax collected from inpatient workers (EUR billion / year) [S * AM]	1.53	For the partial equilibrium calculation, ignore UI savings
	C. General equilibrium labor market effects		
AP	Marginal wages (EUR billion / year) [O * Y]	42.4	
AQ	Marginal worker WTP (EUR billion / year) [AP * (1-R) * (1-T)]	2.57	
AR	Marginal tax collected (EUR billion / year) [S * AP]	25.5	
AS	Change in the count of unemployed [P * Z]	-514,009	
AT	Change in UI spending (EUR billion / year) [Q * AS]	-4.74	

Notes: Details for row M: We adjust down the number of nursing home workers in our sample to approximate the number of workers in licensed inpatient care facilities according to SGB XI. The adjustment factor is equal to the ratio of licensed inpatient care facilities as reported in government statistics (Bundesministerium für Gesundheit (2001), Anlage 8) and the count of nursing home establishment in our baseline sample. Government statistics reports 6,564 establishments; we count 11,401 establishments in our sample (Table 2, Nursing Home Sample).
Source: Own calculations.

A2 Model Details

A2.1. Equilibrium Wages and Queues

This section provides additional details on the characterization of equilibrium wages. To simplify the exposition, we abstract away from clearing output markets and solve the following, simplified optimization problem:

$$\max_{w^{\phi},q^{\phi}} U_{ij} \tag{A1}$$

$$s.t. \quad \eta(q_j^{\phi}) \times ((P_j - mc_j) \times \phi - w_j^{\phi}) - c_j(\phi) = 0 \tag{A2}$$

$$w_j^{\phi} = \underline{w_j^{\phi}} \quad \text{if } j \text{ is constrained by wage floor} \; . \tag{A3}$$

The setup differs slightly from the theoretical framework outlined in Section 5.2.1 as we include a few components that are considered in the empirical model (Section 5.2.2). First, we consider non-wage marginal costs mc that may capture differences in firm objectives (Lakdawalla/Philipson, 1998). The free entry entry condition thus changes to Equation (A2). Second, we consider compensating differentials in worker preferences over jobs, ξ_j, and consider the value of home production when unemployed, ξ_u, in addition to the unemployment benefit, b. We denote the overall flow payoff from unemployment by $\tilde{b} = b + \xi_u$. We thus assume that the utility from applying to sector j is given by:

$$U_{ij} = \mu(q_j^{\phi}) \times \Big((1-\tau) \times w_j^{\phi} + \xi_j\Big) + (1 - \mu(q_j^{\phi})) \times \tilde{b} + \epsilon_{ij} \; . \tag{A4}$$

To simplify the notation, we suppress worker and sector indices i and j in the following derivation.

Equilibrium wages:

Considering sectors that are not constrained by collective bargaining, we solve Equation (A2) for wages and plug this into the worker's utility given by Equation (A4). Our characterization of flow payoffs considers taxes τ and compensating differentials, as outlined in Section 5.2.2, 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

$$U = \mu(q) \times \Big((1-\tau) \times (P - mc) \times \phi + \xi\Big) - \frac{c}{q} \times (1-\tau) + (1 - \mu(q)) \times \tilde{b} + \epsilon\,. \quad \text{(A5)}$$

We note that

$$\partial\mu(q)/\partial q = \partial \frac{\eta(q)}{q} / \partial q = \frac{\eta(q)}{q^2} \times (\epsilon - 1) = \frac{\mu(q)}{q} \times (\epsilon - 1), \quad \text{(A6)}$$

where $\epsilon = \frac{\eta'(q) \times q}{\eta(q)}$ is the elasticity of the matching function. Using this and maximizing Equation (A5) 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 (A2)) 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

$$w^{\phi,*} = \begin{cases} \underline{w^{\phi}} & if \text{ j is constrained by collective bargaining} \\ \epsilon \times (P - mc) \times \phi + \frac{1-\epsilon}{1-\tau} \times (\tilde{b} - \xi) & else \end{cases} \, . \tag{A7}$$

We note that that the elasticity of the matching function, ϵ, depends on the equilibrium queue length, q. Hence, conditional on output prices, the free entry condition (Equation (A2)) and Equation (A7) jointly determine equilibrium queue lengths and wages.

Discussion:

Focusing on the case without collective bargaining, we see that equilibrium wages are determined by a weighted average of 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.

A2.2. Estimation and Model Fit

This section provides additional detail on the estimation strategy and the model fit.

Estimation:

As mentioned in the main text, our estimation strategy proceeds in two steps. Our approach to step 1 takes advantage of the closed form expressions for equilibrium wages, see Equation (A7). We parameterize the wages determined via collective bargaining, as a second order polynomial in the marginal revenue product net of non-wage marginal costs:

$$\underline{w_j^{\phi}} = \beta_0 + \beta_1 \times \phi \times (P_j - mc_j) + \beta_2 \times \Big(\phi \times (P_j - mc)\Big)^2 .$$

We only observe output prices and quantities in nursing home care for the post-reform period, hence we cannot condition on (all) prices in estimation. Instead, we treat output prices as parameters in the first step and impose the product market clearing conditions in the second step. Our goal for the first step 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.

We use three sets of moment conditions. 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 nursing home revenues and prices in the post-reform period. Second, we use the estimated partial equilibrium reform effects on nursing home employment, wages, and experience, but also the estimated general equilibrium reform effects on unemployment and labor force participation. Third, we impose that the 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 individuals covered by *Hilfe zur Pflege*, the observed long-term care price subsidy, and by imposing the market clearing conditions in the product market, conditional on the estimated equilibrium prices.

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, defining 19 distinct skill groups. For each experience level and sector, we calculate the mean full-time wage. To construct full-time employees, we assume that individuals either consider full-time or part-time employment and assume that two part-time positions are equivalent to one full-time position. 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.

We present the model fit of monthly wages and employment shares by sector and years of health care experience in Figure 6. The solid lines denote the estimated full-time equivalent average wages and sector employment shares based on IAB data in 1999. The dashed lines denote the corresponding model-simulated quantities. The horizontal axis denotes the number of completed years of health care experience. In Figure 6a we present the log average wage for full-time employees. Our quantitative model closely tracks the observed wage profiles in nursing homes (combining for-profit and not-for-profit nursing homes) and the outside sector. Further details are presented in Table A6, which distinguishes between wages in for-profit and not-for-profit nursing homes by years of health care experience. Columns (2)-(4) present the monthly wages in 1,000 EUR in 1999. Columns (5)-(7) show the corresponding model estimates. Column (1) presents the total (working age) population in millions.

In Figure 6b we present full-time equivalent employment shares by sector and health care experience. Our quantitative model can reconcile the higher share of more experienced workers in nursing providers. More details are again provided in Table A7. Columns (2)-(5) present the corresponding shares in 1999 as measured in the IAB data. We distinguish between employment in for-profit and not-for-profit nursing homes, employment in the outside sector, and also present the share of the population that is out of the labor force. These shares do not sum to 1, the residual share denotes the share of individuals that are unemployed. Columns (6)-(9) show the corresponding model-simulated counterparts. Column (1) again presents the total (working age) population in millions.

Other Moments:

We target several other key moments, outlined in Table A8. We first target the monthly nursing home price in 1,000 EUR in 1999 as well as monthly nursing home revenues.[51] Second, we target several reform estimates discussed above. The third row considers the estimated change in wages among new hires. The first column of Table 3 suggest an 17% decline in wages among new hires. Scaling the point estimate by average exposure of 69% we expect an $17\% \times 69\% = 12\%$ decline in wages. The next row considers the relative change in nursing home employment. The out-of-sample estimates from column 2 in Table 2 suggest an increase of 30.5 workers per 1,000 elderly. Compared to a baseline of 33.13 workers per 1,000 elderly suggests that employment roughly doubles $(30.5 + 33.13)/33.13 = 1.92$, see the fourth row. Next, we consider the reform's effect on experience. The estimate from column 8 in Table 4 suggest a 0.44 year decline in experience. Scaling the effect size by 69% and dividing by the pre-reform mean of 1.01 years, we expect a $(0.69 \times 0.44)/(1.01) = 30\%$ decline in experience, see the fifth row.

[51] 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.

Table A6.: Monthly Wages by Experience and Sector in 1999

Experience	Population (1)	DataFP (2)	DataNFP (3)	DataOUT (4)	ModelFP (5)	ModelNFP (6)	ModelOUT (7)
0	29.6	2.29	2.46	4.10	2.34	2.42	4.09
1	0.81	2.58	2.75	3.27	2.62	3.10	3.24
2	0.47	2.76	3.07	3.15	2.74	3.20	3.32
3	0.39	2.86	3.41	3.41	2.86	3.30	3.40
4	0.31	3.10	3.62	3.55	3.03	3.40	3.52
5	0.26	3.17	3.77	3.61	3.10	3.51	3.55
6	0.24	3.24	3.86	3.72	3.13	3.61	3.56
7	0.22	3.38	3.91	3.74	3.24	3.71	3.64
8	0.19	3.45	3.95	3.82	3.30	3.81	3.66
9	0.17	3.54	4.03	3.86	3.46	3.91	3.78
10	0.14	3.54	4.06	3.88	3.46	4.01	3.75
11	0.12	3.69	4.19	3.96	3.60	4.11	3.85
12	0.11	3.69	4.27	4.05	3.65	4.21	3.87
13	0.10	3.88	4.35	4.13	3.81	4.31	3.98
14	0.08	3.86	4.40	4.16	3.86	4.41	4.00
15	0.07	4.08	4.51	4.21	4.03	4.51	4.12
16	0.07	3.97	4.49	4.31	4.00	4.61	4.08
17	0.06	4.16	4.43	4.28	4.15	4.71	4.18
18	0.41	4.34	4.56	4.49	4.39	4.81	4.36

Notes: This table shows full-time equivalent monthly earnings in 1,000 EUR by years of health care experience and labor market in the post-reform years (1999). Column (1) denotes the (working age) population in millions. Columns (2)-(4) denote full-time equivalent monthly wages based on the Labor Market Sample for for-profit nursing homes (column 2), not-for-profit nursing homes (column 3), and the outside sector (column 4). Columns (5)-(7) present corresponding estimates based on the quantitative model.
Source: Own calculations.

Next we examine changes in unemployment and gains in labor force participation relative to the estimated changes in nursing home employment. We consider the most conservative estimates supported by the confidence intervals in column (1) of Table 6. We consider a $0.00534 - 2 \times 0.00177 = 0.00299$ p.p. decrease in the unemployment share. We benchmark this to the relative gain in nursing home employment. Using our partial equilibrium estimates from Table 2, we estimate an increase of 38,979 workers. Divided by the 1993 labor force of 22.7 million, we estimate an increase of 0.00172 p.p. This suggests that the drop int UI exceeds the gains in nursing home employment by 0.00299/0.00172=1.74, see the sixth row. Our estimated model can only reconcile a smaller reduction in unemployment. Likewise, we construct conservative increase in labor force participation based on the estimates in column 3 of Table 2. Dividing the gain by the gain in nursing home employment, we find a ratio of 2.94, see the seventh row.

We also ensure that the job filling and vacancy filling rates are bounded between 0 and 1, see Figure A17.

Table A7.: Employment Share by Experience and Sector in 1999

Experience	Population (1)	DataFP (2)	DataNFP (3)	DataOUT (4)	DataOOL (5)	ModelFP (6)	ModelNFP (7)	ModelOUT (8)	ModelOOL (9)
0	29.6	0.0004	0.0007	0.53	0.41	0.0004	0.0007	0.54	0.41
1	0.81	0.01	0.02	0.39	0.49	0.01	0.02	0.39	0.50
2	0.47	0.02	0.03	0.42	0.45	0.02	0.03	0.42	0.47
3	0.39	0.02	0.04	0.43	0.44	0.02	0.04	0.44	0.44
4	0.31	0.03	0.05	0.44	0.43	0.03	0.05	0.43	0.42
5	0.26	0.03	0.05	0.45	0.43	0.03	0.05	0.44	0.41
6	0.24	0.03	0.06	0.45	0.42	0.03	0.06	0.43	0.41
7	0.22	0.03	0.06	0.47	0.40	0.03	0.06	0.46	0.38
8	0.19	0.03	0.07	0.48	0.39	0.03	0.07	0.46	0.38
9	0.17	0.03	0.07	0.49	0.38	0.03	0.07	0.48	0.35
10	0.14	0.03	0.07	0.48	0.39	0.03	0.07	0.47	0.36
11	0.12	0.03	0.07	0.51	0.37	0.03	0.07	0.49	0.34
12	0.11	0.02	0.07	0.52	0.36	0.02	0.07	0.51	0.33
13	0.10	0.03	0.06	0.55	0.34	0.03	0.06	0.54	0.31
14	0.08	0.02	0.07	0.57	0.31	0.02	0.08	0.56	0.29
15	0.07	0.02	0.07	0.58	0.30	0.02	0.07	0.57	0.27
16	0.07	0.03	0.07	0.59	0.29	0.03	0.07	0.59	0.27
17	0.06	0.03	0.08	0.60	0.26	0.03	0.08	0.60	0.25
18	0.41	0.02	0.07	0.67	0.21	0.02	0.07	0.67	0.21

Notes: This table shows full-time equivalent employment shares by years of health care experience and labor market in the post-reform years (1999). Column (1) denotes the (working age) population in millions. Columns (2)-(5) denote employment shares based on the Labor Market Sample for for-profit nursing homes (column 2), not-for-profit nursing homes (column 3), the outside sector (column 4), and the share that is out of the labor force (column 5). Columns (6)-(9) present corresponding estimates based on the quantitative model.
Source: Own calculations.

A2.3. Parameter Estimates

In this section, we present further details on the calibrated and the estimated parameters.

Calibrated parameters:

Table A9 summarizes the calibrated parameters. First, we calibrate the fraction of patients insured via *Hilfe zur Pflege* in the post-reform to 31%. Second, 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 1,200 EUR 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.[52] This implies a wedge between total costs to the employer and the net takehome pay for workers of in 1999 of $\tau = \frac{18.6\% + 2 \times 20.6\%}{1 + 20.6\%} = 50\%$.

[52] See .

Table A8.: Other Moments

Moment	Data (1)	Model (2)
Monthly NH Price Post in 1k Euro	2.03	2.00
Monthly NH Revenues Post in bn Euro	1.14	1.46
% Change in NH Wage	-0.12	0.02
NH Employment Post/ NH Employment Pre	1.92	1.92
% Change in Experience among NH Workers	-0.30	-0.13
Drop in UI Recipients/ Change in NH Employment	1.74	0.19
Change in LF/ Change in NH Employment	2.94	3.04

Notes: This table presents the model fit on various other targeted moments. Column (1) denotes the data estimate and column (2) presents the model-simulated counterpart. The first two rows present average nursing home prices and overall nursing home revenues in 1999. The third row considers the reform-induced relative change in full-time nursing home wages. The fourth row considers the reform-induced relative change in nursing home employment. The fifth row considers the reform-induced relative change in the average number of years of health care experience among nursing home workers. The sixth row considers the reform-induced relative change in the the number of individuals claiming unemployment benefits, relative to the reform-induced change in nursing home employment. The seventh row considers the reform-induced relative change in labor force participation, relative to the reform-induced change in nursing home employment. More details are provided in the text.
Source: Own calculations.

Finally, we set the unemployment benefits in 1999 to 775 EUR per month.

Table A9.: Calibrated Parameters

Moment	Data (1)
Share Hilfe-zur Pflege Post	0.31
LTC Price Subsidy in 1,000 Euro per month: s	1.21
% Tax and Social Security Contributions: τ	0.50
Unemployment benefits in 1,000 Euro per month: b	0.78

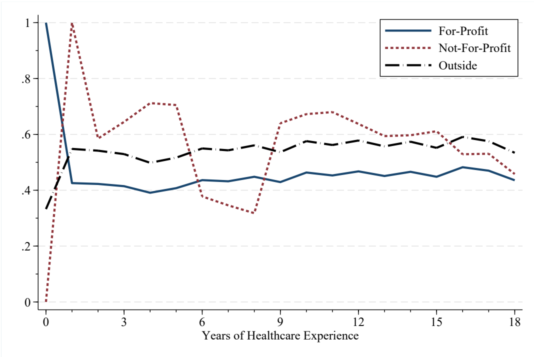
Notes: This table presents calibrated parameters. The first row presents the fraction of nursing home patients insured via *Hilfe zur Pflege*. The second row presents the price subsidy for inpatient nursing home care in the post-reform period. The third row presents income taxes and social security contributions as a share of the total labor costs to the employer. The last row presents the unemployment benefits per month in 1,000 EUR.
Source: Own calculations.

Parameter Estimates:

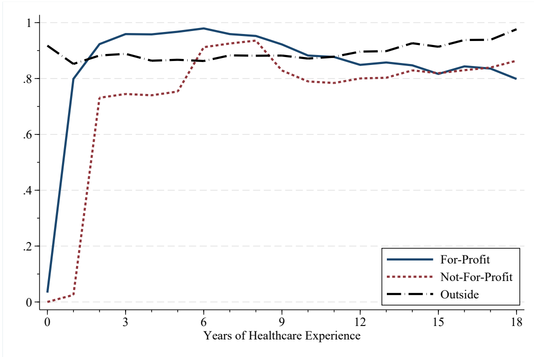
Next, we turn to the estimated parameters. We present the estimated λ parameters governing the matching technology and the vacancy posting costs c, by years of health care experience and sector, in columns (1)-(6) in Table A10. The λ parameters are

Figure A17.: Job Finding and Vacancy Filling Probability

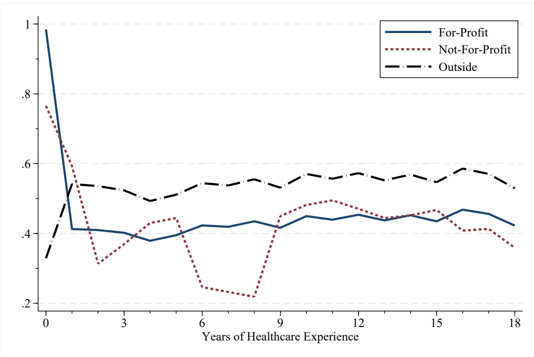
(a) Pre-Reform Vacancy Filling Rate in Nursing Homes



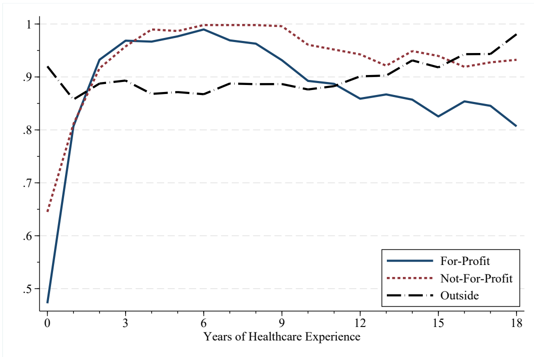
(b) Pre-Reform Job Finding Probability in Nursing Homes



(c) Post-Reform Vacancy Filling Rate in Nursing Homes



(d) Post-Reform Job Finding Probability in Nursing Homes



Notes: This figure presents the estimated vacancy and job finding probability by sector and years of health care experience. For-profit nursing homes and not-for-profit nursing homes are denoted by 'For-Profit' and 'Not-for-Profit', respectively. Figures A17a and A17c display the equilibrium vacancy filling rate, $\eta(q_{jt}^{\phi})$, for the pre- and the post-reform period. Figures A17b and A17d display the equilibrium job finding probabilities, $\mu(q_{jt}^{\phi})$, for the pre- and the post-reform period.
Source: Own calculations.

presented for for-profit nursing homes (column 1), not-for-profit nursing homes (column 2) and firms in the outside sector (column 3). Likewise, the vacancy posting costs c are presented for for-profit nursing homes (column 4), not-for-profit nursing homes (column 5) and firms in the outside sector (column 6). The last two columns present the worker skills ϕ, as detailed in Equation (13), in nursing homes (column 7) and the outside sector (column 8).

The remaining parameter are summarized in Table A11. The first three parameters govern the demand of the representative agent, see Equations 19-21. The next eight parameters govern the worker's utility function, see Equations 15-18. Our empirical specification adds non-wage marginal costs to the firm profit Equation (5):

$$\pi_j^{\phi} \quad = \quad \eta(q_j^{\phi}) \times ((P_j - mc_j) \times \phi - w_j^{\phi}) - c_j(\phi). \tag{A8}$$

Table A10.: Matching Technology and Hiring Costs Parameters

Experience	LambdaFP (1)	LambdaNFP (2)	LambdaOut (3)	cFP (4)	cNFP (5)	cOut (6)	SkillsNH (7)	SkillOUT (8)
0	0.50	0.82	0.90	0.16	0.06	0.16	1.65	2.19
1	0.96	0.81	0.81	0.34	0.21	0.34	1.72	1.85
2	0.83	0.91	0.79	0.35	0.12	0.35	1.79	1.90
3	0.81	0.84	0.79	0.35	0.16	0.35	1.86	1.95
4	0.82	0.77	0.84	0.32	0.20	0.32	1.93	1.99
5	0.80	0.77	0.82	0.36	0.23	0.36	2.00	2.04
6	0.78	0.87	0.80	0.43	0.14	0.43	2.07	2.09
7	0.80	0.88	0.79	0.44	0.14	0.44	2.14	2.13
8	0.79	0.89	0.77	0.49	0.14	0.49	2.21	2.18
9	0.83	0.76	0.79	0.46	0.30	0.46	2.28	2.22
10	0.84	0.76	0.77	0.56	0.34	0.56	2.35	2.27
11	0.86	0.76	0.78	0.55	0.37	0.55	2.42	2.32
12	0.87	0.78	0.75	0.61	0.37	0.61	2.49	2.36
13	0.88	0.82	0.76	0.58	0.37	0.58	2.56	2.41
14	0.88	0.79	0.73	0.64	0.39	0.64	2.63	2.46
15	0.92	0.79	0.75	0.60	0.43	0.60	2.70	2.50
16	0.87	0.85	0.70	0.73	0.39	0.73	2.77	2.55
17	0.89	0.84	0.72	0.71	0.41	0.71	2.85	2.60
18	0.95	0.87	0.72	0.61	0.37	0.61	2.92	2.64

Notes: This table presents estimated matching technology parameters, λ, hiring costs parameters, c, and worker skills, ϕ, by sector and years of health care experience. For-profit nursing homes are abbreviated by ‘FP’, not-for-profit nursing homes are abbreviated by ‘NFP’, and the outside sector is abbreviate by ‘Out’. We assume that workers skills are homogeneous between for-profit and not-for-profit nursing homes, conditional on experience, which we hence denote by ‘SkillsNH’, see Equation 13. More details are provided in the text.
Source: Own calculations.

and the next three rows of Table A11 present the corresponding marginal cost estimates.

Building on the marginal cost estimates, we can express the wages paid by not-for-profit and public nursing homes, which are determined via collective bargaining. As discussed in the main text, we model wages, determined via collective bargaining, as a second order polynomial in the marginal revenue product net of non-wage marginal costs:

$$\underline{w_j^{\phi}} = \beta_0 + \beta_1 \times \phi \times (P_j - mc) + \beta_2 \times \Big(\phi \times (P_j - mc)\Big)^2 \ . \tag{A9}$$

The next three parameters in Table A11 show the corresponding parameter estimates. Finally, we present the estimated equilibrium output prices in the last four rows. ‘Post’ refers to the post-reform prices and ‘Pre’ refers to pre-reform environment without universal LTC insurance, where LTC support is only provided via *Hilfe zur Pflege*. Prices in nursing homes and the outside sector are denoted by 'NH' and 'OUT', respectively.

Table A11.: Parameter Estimates

Parameter	Estimate (1)
Demand: α_{NH}	2.71
Demand: α_{OUT}	5.85
Demand: σ	1.19
Workers: Flow Payoff Unemployment $(b + \xi_u)$	1.01
Workers: Nesting Paramter γ	0.49
Workers: Standard Deviation Shocks ρ	0.03
Workers: ξ_{FP}	-0.15
Workers: ξ_{NFP}	-0.09
Workers: κ	7.64
Workers: κ_1	-0.47
Workers: ν	1.14
Wage: β_0	2.42
Wage: β_1	0.71
Wage: β_2	0
Firms: FP	0.002
Firms: NFP	0
Firms: OUT	0.05
NH Price Pre	1.87
NH Price Post	2.00
OUT Price Pre	2.11
OUT Price Post	2.14

Notes: This table presents the parameter estimates governing the quantitative model. The first three parameters α_{NH}, α_{Out}, and σ demand of the representative agent, see Equations 19-21. The next 8 parameters govern worker's utility function, see Equations 15-18. $b + \xi_u$ denotes the flow-payoff from unemployment, γ is a scaling parameter, ρ governs the correlation between utilities for working across long-term care sectors. ξ_{FP} and ξ_{NFP} denote compensating differentials for working in for-profit and not-for-profit nursing homes (relative to working in the outside sector). ν captures an extra compensating differential for workers with some health care experience to work in nursing homes, see Equation (15). The next three rows of Table resent estimates for the non-wage marginal costs by sector, mc_j, see Equation (A8). They are followed by the parameters governing the collective bargaining wage profile described in Equation (A9). Finally, we present the estimated equilibrium output prices in the last four rows. 'Post' refers to the post-reform prices and 'Pre' refers to pre-reform environment without universal LTC insurance, where LTC support is only provided via *Hilfe zur Pflege*. Prices in nursing homes and the outside sector are denoted by 'NH' and 'OUT', respectively.
Source: Own calculations.

A2.4. Counterfactuals

In this section, we discuss the counterfactual analysis in more detail. We start with a discussion of baseline outcomes before turning to a discussion of additional counterfactual exercises.

Baseline results:

We start with a more detailed discussion of our baseline environment and present the model-simulated outcomes with and without universal LTC insurance in the first two columns of Table A12 (copied from Table 9). We estimate that increasing long-term care insurance coverage from 31% to 100% creates an additional 164,000 nursing home jobs.

About 32,000 individuals are removed from unemployment and labor force participation increases by 497,000 individuals. Put together, overall employment increases by 529,000 individuals implying substantive employment gains in other sectors of the economy. This is because the reform boosted incomes among new nursing home hires who then spend their incomes on all goods in the economy generating positive spillover effects to other sectors.

Figure A18a plots the reform-induced employment expansion in nursing homes by experience. We find that the increase in nursing home employment was concentrated among lower experienced workers, suggesting that the baseline result is partially driven by the considerable slack in the labor market among people who were previously out-of-the labor force and thus held little health care experience.

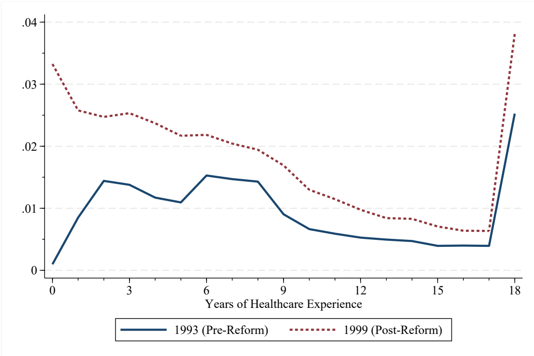
Figures A18b-A18d illustrate that labor markets do not 'just' clear in wages and instead depend on job posting decisions by firms. Figure A18b illustrates pre-reform and post-reform nursing home employment but also counterfactual nursing home employment had wages not adjusted. We find that more than half of the increase in nursing home employment can be attributed to changes in vacancy postings. Unemployment would have decreased even further, had wages remained the same, Figure A18c. In contrast, a larger fraction of the increases in labor force participation can be attributed to changes in wages, see Figure A18d, suggesting that changes in vacancy posting played less of a role for the employment gains in other sectors.

Marginal counterfactuals:

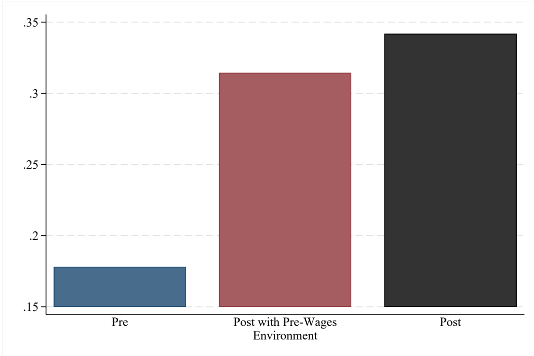
We complement the discussion of the counterfactual analysis in the main text with added results for more marginal policy interventions. Table A12 is structured as Table 9 in the main text but considers additional interventions. Starting with the results for UI benefits, we now consider a 1% reduction in UI benefits (columns 4-6) in addition to the 100% reduction in UI benefits (columns 7-9) discussed in the main text. In regards to the role of income taxes, we now consider a 1% reduction in income taxes (columns 10-12) in addition to the 50% reduction in income taxes (columns 13-15) discussed in the main text. Finally, and in regards to the role of productivity shocks, we now consider a 10%

Figure A18.: Mechanisms

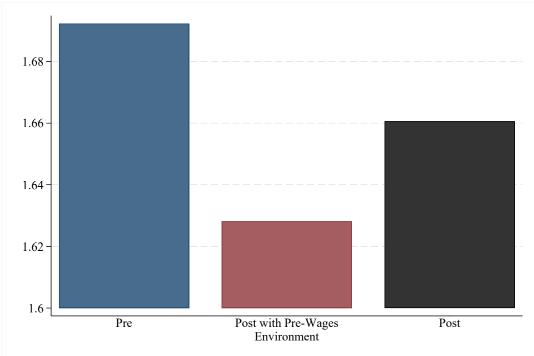
(a) Nursing Home Employment (Millions)



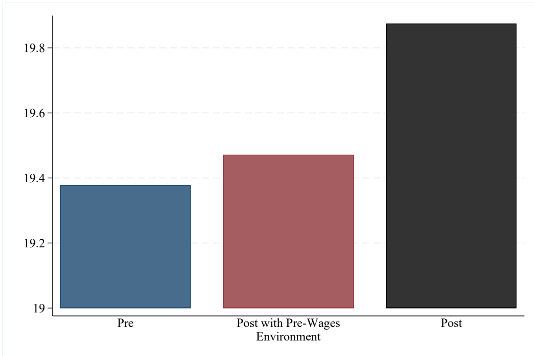
(b) Nursing Home Employment (Millions)



(c) Unemployment (Millions)



(d) Labor Force (Millions)



Notes: Figures A18a -A18d provide more details on compositional changes in nursing home employment and the role of search and matching frictions, based on estimates from the quantitative model. Figure A18a presents full-time equivalent nursing home employment in millions with and without universal LTC insurance by years of healthcare experience. Figures A18b-A18d display full-time equivalent nursing home employment, unemployment, and labor force participation in millions for three economic environments. The first bar denotes equilibrium outcomes in the pre-reform period (without universal LTC insurance) and the third column shows equilibrium outcomes in the post-reform period (with universal LTC insurance). The center column presents outcomes using post-reform equilibrium queue lengths but pre-reform wages.
Source: Own calculations.

increase in the productivity of the outside sector (columns 16-18) in addition to the 50% increase in productivity (columns 19-21) discussed in the main text. The reform effects for the more marginal interventions here are directionally consistent with the findings presented in the main text, but smaller in absolute magnitude.

The last three columns consider one additional counterfactual combining the role of productivity shocks and income taxes. Specifically, we lower income taxes by 50% and also increase the productivity in the outside sector by 50%. We now find almost no expansion in labor force following the reform suggesting that the reform is mostly relocating workers from the outside sector to the nursing home sector. This reduces allocative efficiency and in turn results in a welfare loss.

Table A12.: Counterfactuals and Welfare

	Baseline			1% Reduction in UEB			100% Reduction in UEB			1% Reduction in Income Tax			50% Reduction in Income Tax			10% Increase in Productivity			50% Increase in Productivity			50% Incr. in Prod., 50% Decr. in Inc. Tax		
	Insurance			Insurance			Insurance			Insurance			Insurance			Insurance			Insurance			Insurance		
	No	Yes	Diff	No	Yes	Diff	No	Yes	Diff	No	Yes	Diff	No	Yes	Diff	No	Yes	Diff	No	Yes	Diff	No	Yes	Diff
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
Panel A: Employment and Earnings																								
Nursing Home Employment (million FTE)	0.18	0.34	0.16	0.18	0.34	0.16	0.19	0.34	0.16	0.18	0.35	0.17	0.23	0.47	0.24	0.20	0.38	0.18	0.25	0.36	0.11	0.26	0.37	0.12
Total Labor Costs to Employers (billion EUR/month)	70.6	73.6	2.99	70.6	73.6	2.99	68.8	71.9	3.04	71.7	74.7	3.02	111.5	114.4	2.81	92.0	95.4	3.43	178.7	182.1	3.36	195.1	197.6	2.55
Unemployment (million FTE)	1.69	1.66	-0.03	1.69	1.66	-0.03	0.73	0.72	-0.006	1.70	1.67	-0.04	1.85	1.80	-0.05	1.60	1.52	-0.08	0.88	0.85	-0.04	0.62	0.59	-0.03
Labor Force (million FTE)	19.4	19.9	0.50	19.4	19.9	0.50	18.6	19.1	0.53	19.7	20.2	0.50	30.3	30.5	0.28	22.6	23.0	0.46	30.8	31.0	0.20	33.6	33.6	0.02
Panel B: Welfare (billion EUR/month)																								
Consumer Welfare	81.0	80.3	-0.69	81.0	80.3	-0.69	81.7	81.0	-0.69	82.4	81.7	-0.70	130.2	129.1	-1.10	105.5	104.6	-0.89	203.0	201.3	-1.72	223.5	221.6	-1.90
Worker Welfare	148.7	149.2	0.59	148.6	149.2	0.59	147.7	148.3	0.60	149.0	149.6	0.60	172.1	173.5	1.35	152.9	153.6	0.70	175.4	176.5	1.12	222.7	224.6	1.82
Government Surplus	33.4	34.3	0.88	33.4	34.3	0.88	33.9	34.8	0.88	33.6	34.5	0.88	25.9	25.7	-0.25	44.2	45.2	1.06	87.8	88.8	0.99	47.5	47.5	-0.08
LTC Subsidy Spending	-0.42	-1.05	-0.63	-0.42	-1.05	-0.63	-0.43	-1.06	-0.63	-0.42	-1.07	-0.64	-0.42	-1.41	-0.99	-0.44	-1.15	-0.71	-0.57	-1.28	-0.71	-0.59	-1.34	-0.74
UI Spending	-1.31	-1.29	0.02	-1.31	-1.28	0.02	0	0	0	-1.32	-1.29	0.03	-1.44	-1.40	0.04	-1.24	-1.18	0.06	-0.68	-0.66	0.03	-0.48	-0.45	0.03
Tax Revenues	35.2	36.7	1.49	35.2	36.7	1.49	34.3	35.8	1.51	35.4	36.9	1.49	27.8	28.5	0.70	45.8	47.6	1.71	89.1	90.7	1.67	48.6	49.2	0.64
Total Welfare	263.1	263.9	0.78	263.1	263.9	0.78	263.3	264.1	0.78	265.0	265.8	0.78	328.2	328.2	-0.01	302.5	303.3	0.86	466.2	466.6	0.38	493.8	493.6	-0.16

Notes: This table summarizes the model-simulated effects of a universal LTC expansion to on a number of outcomes in different economic environments. For each environment, we present outcomes (i) without universal LTC insurance, where LTC support is provided via *Hilfe zur Pflege* only and (ii) with universal LTC insurance coverage captured by the subsidy s=1,200 EUR per month of the cost of nursing home care for individuals who would otherwise pay out-of-pocket. This exercise maintains support via *Hilfe zur Pflege*. We also present the difference between these outcomes. We consider eight environments. Columns (1)-(3) present results for our baseline economic environment, columns (4)-(6) revisit the results after reducing the UI benefits by 1% and columns (7)-(9) present results after reducing UI benefits from 775 EUR per month to zero. Columns (10)-(12) (13-15) revisit the results after reducing the income taxes by 1% (50%, from about 50 p.p. to 25 p.p.). Columns (16)-(18) (19-21) revisit the results after increasing the productivity in the outside sector for each skill segment, $\phi_{out}, (e_{hc})$ by 10% (50%). Finally, columns (22)-(24) revisit the results after increasing the productivity in the outside sector by 50% and reducing income taxes by 50%. For each environment, we present nursing home demand in 1m patients, nursing home employment in 1m full-time equivalent employees, total gross wage earnings in bn EUR per month, number of employment individuals in 1m, and labor force participation in 1m individuals. Next, we present the partial equilibrium welfare effect in bn per month. Turning to welfare in general equilibrium, we denote the equivalent variation (consumer surplus) in bn per month, holding income fixed at the pre-reform level. We then present the worker surplus in the labor market in bn per month. Turning the fiscal externalities, we present government LTC subsidy spending in bn per month, government spending on UI benefits in bn per month, income tax revenues in bn per month, and overall net spending government spending in bn per month. Finally, we combine the equivalent variation, the labor market surplus, and the net impact of government spending which comprises the net welfare effect in general equilibrium in bn per month.
Source: Own calculations.

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