The Supply-Side Effect of Immigration on Prices: Evidence from Nursing Homes*

Peter Haan, Julia Schmieder, Izabela Wnuk-Soares

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Abstract

We study how immigration affects prices through changes in labor supply. Using policy-driven increases in immigration to Germany and administrative data covering the universe of nursing homes, we show that an additional foreign-born woman per 100 inhabitants reduces care prices by 2.6 percent. Because the inflow consists of working-age individuals who do not consume care services, the setting isolates the supply-side channel. The effects are concentrated in more competitive market segments. We find no impact on inspection-based quality. Price declines reflect lower labor costs, driven by a compositional shift toward lower-paid foreign workers, and increased competition from the informal sector.

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*Peter Haan: DIW Berlin, Freie Universität Berlin, Berlin School of Economics; e-mail: phaan@diw.de. Julia Schmieder: RFBerlin; e-mail: juliaschmieder@posteo.net. Izabela Wnuk-Soares: RFBerlin, DIW Berlin; e-mail: iws@rfberlin.com.
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1 Introduction

In 2024, more than 160 million people living in OECD countries were foreign-born—about 11.5% of the total population—and the number of new permanent immigrants reached 6.2 million, a historically high level (OECD, 2025). A large body of literature has analyzed how immigration affects the labor market in host countries, with a focus on employment and wages of natives (Dustmann and Schönberg, 2025). Yet, these inflows may also affect the prices of goods and services, which directly shape the cost of consumption and, hence, real income. Understanding these price responses is therefore crucial for assessing the broader welfare implications of immigration.

Specifically, immigration may influence production through a change in labor supply, and in sufficiently competitive markets, such changes should translate into price adjustments. At the same time, immigrants consume goods and services, potentially affecting prices through changes in local demand. Disentangling these two channels is empirically challenging. Credible evidence on the effect of immigration on prices through the supply side therefore requires exogenous variation in immigration, detailed price data, and, crucially, a setting in which supply-driven effects can be separated from demand-side changes (Galaasen et al., 2025).

In this paper, we quantify the supply-side effect of immigration on consumer prices by studying the German nursing home sector during a period of policy-driven increases in immigration. A unique feature of our setting is that the inflows generate essentially no demand shock in this market: the arriving immigrants are overwhelmingly of working age and therefore do not consume nursing care services. This allows us to isolate the supply-side channel through which immigration affects prices.

Our analysis combines high-quality administrative data on facility-level prices and standardized quality inspections with employment and earnings records covering the universe of nursing homes. For identification, we leverage a sharp increase in the number of foreign-born residents between 2009 and 2019, triggered by policy changes in the early 2010s that granted labor market access to workers from the new member states of the European Union (EU-11). These reforms generated substantial spatial variation in foreign-born inflows across regions, which we exploit in a research design combining a shift-share instrument (Card, 2001) with a generalized difference-in-differences approach. The former addresses endogenous immigrant selection into regions, while the latter allows us to test for pre-trends and estimate dynamic treatment effects, addressing concerns about the exogeneity of the shift-share instrument highlighted in recent literature (Borusyak et al., 2022; Goldsmith-Pinkham et al., 2020; Jaeger et al., 2018).

Nursing homes in Germany operate in a market environment that shares key features with other industries exposed to immigration. The sector is highly labor-intensive and non-tradable, making production costs highly responsive to changes in the local workforce (Burstein et al., 2020; Dustmann and Glitz, 2015). Entry into the market is unrestricted. The care providers are predominantly private for-profit or non-profit organizations, with the public sector accounting for only a small share.[1] Average profit margins are approximately 7.3% (IBISWorld, 2025). Despite formalized price negotiations, providers retain considerable discretion in setting prices, resulting in substantial price variation within and across regions. As a consequence, competition plays an important role in shaping prices, and its intensity varies across market segments and regions. We exploit this variation to draw broader conclusions for sectors with comparable levels of competition.[2]

The central finding of our paper is that immigration significantly reduces prices. By 2019, an additional foreign-born woman per 100 inhabitants in 2019 (relative to 2009) reduces the price of care services by 2.6%.[3] The price effects decrease with care intensity, consistent with stronger competition in lower-care segments (Kesternich et al., 2025). The price of low-intensity care services decreases by 4.5% and that of medium-intensity care by 3.3%, while the effect for high-intensity care is not significant. In addition, we show across regions that price effects are larger in initially less concentrated markets, as measured by the pre-reform Herfindahl-Hirschman Index of resident shares across facilities. Our results are robust across alternative regional samples, sets of control variables, and treatment definitions.

To explain the mechanisms underlying the estimated price effects, we investigate four main channels: (i) labor costs, (ii) quality of care, (iii) take-up of nursing home care and related scale effects, and (iv) competition from care provided outside nursing homes, including ambulatory care and informal care. We start by analyzing the labor costs channel using administrative data on employment and earnings covering the universe of workers in the nursing home sector. We show that the overall number of care workers in nursing homes, measured in full-time equivalents, does not change with immigration. However, we document a sizable shift in the composition of the workforce. Immigration significantly increases the share of foreign workers by 4.5 percentage points (88.2%). At

[1] In 2019, 3,949 institutions were for-profit, 4,641 were non-profit, and 455 were public (Federal Statistical Office, 2025a).

[2] Evidence suggests that markups decline as care intensity decreases, indicating stronger competition in lower-care segments (Kesternich et al., 2025).

[3] We focus on female immigration as our main treatment because more than 80% of care workers are women. Results are robust to using overall immigration as the treatment.

the same time, the average wage in nursing homes declines significantly with immigration. By 2019, an additional foreign-born woman decreases the average wage in nursing homes by 3.1%. We show that, on average, the wages of incumbent workers do not change as a result of immigration. Rather, the decline in average wages reflects compositional changes toward a higher share of foreign workers, who, on average, earn lower wages than natives due to occupational sorting into lower-paid assistant positions, lower accumulated experience in Germany, and younger age.

We then examine whether immigration affects nursing home quality. Using data from about 25,000 unannounced inspections, we find no relationship between immigration and an overall measure of quality or its main components, including medical and nursing care, nutrition and hydration, social support, or organizational practices. The absence of a decline in quality despite these compositional workforce changes suggests that foreign workers are not necessarily less qualified. Rather, observed differences may reflect the limited recognition of foreign credentials, which can prevent them from working in higher-paid nursing positions, as well as the fact that experience acquired outside Germany may not be fully credited in formal pay scales.

Furthermore, we study the potential effects of immigration on the size of nursing homes. Larger facility size could, in principle, generate scale effects: as average nursing home size increases, fixed costs—such as administrative overhead, utilities, or building maintenance—can be spread across more residents, thereby reducing average costs per resident and potentially lowering prices. We assess this by analyzing changes in capacity (the number of available places) and occupancy (the number of occupied places). Immigration does not affect either margin, nor does it influence provider entry or exit. There is thus no evidence that expansion in scale contributes to the price effects.

Finally, we test whether immigration affects demand for nursing home care through increased availability of home-based alternatives. Immigration may increase the availability of privately arranged informal care as well as professional ambulatory care, thereby reducing the demand for care in nursing homes (Almuhaisen et al., 2024; Butcher et al., 2022). While we find no effect of immigration on the stock of individuals receiving care from professional caregivers in an ambulatory setting, we observe an increase in the uptake of informal care, by up to 3.9% in 2015. Since informal care is predominantly used for individuals with the lowest care requirements, the estimated negative effect of immigration on nursing home care prices for this group may be partly explained by increased competition between nursing homes and informal care.

This paper makes several contributions to the literature. First, we provide the first causal evidence on the supply-side effect of immigration on prices. Empirical evidence

on the effect of immigration on prices more broadly remains scarce (see Cortés, 2023, for a review). Most notably, Cortés (2008) shows that immigration to the United States reduces prices for household services such as gardening and housekeeping, likely through wage declines among lower-skilled natives and earlier immigrants. In the United Kingdom, Frattini (2008) finds that immigration lowers inflation in non-tradable services such as hairdressing and dry cleaning.[4] In these settings, however, the arriving immigrants also consume the goods and services in question, making it difficult to isolate how immigration affects prices through the supply side.

Our focus on the nursing home sector allows us to overcome this challenge. The arriving immigrants are overwhelmingly of working age and therefore do not consume nursing care services, allowing us to identify the supply-side price effect. In 2009, 99.0% of the foreign-born EU-11 population in Germany was younger than seventy-five, an age at which care dependency generally becomes more common. By contrast, about one in ten natives had already reached that age. While the labor market opening substantially increased the number of working-age foreign-born from EU-11 countries, elderly immigrants continued to represent less than 1% of the immigrant population by 2019.[5] More broadly, few studies isolate the demand and supply channels of immigration: Galaasen et al. (2025) disentangle the roles of demand and supply exposures in the effects of immigration on native labor market outcomes, while Dustmann et al. (2017) study the effect of immigration on native wages induced by a labor supply shock in a context where demand-side effects are constrained. In addition, we provide the first evidence on how market structure shapes the price response to immigration, showing that price effects are concentrated in more competitive market segments.

Second, we contribute to the broader literature on how changes in wages and labor inputs affect consumer prices and the quality of goods and services. A growing body of research examines this question in the context of minimum wage policies across various sectors, documenting that increases in minimum wages translate into higher prices in restaurants (Aaronson, 2001; Aaronson et al., 2008), retail (Leung, 2021; Renkin et al., 2022) and manufacturing sector (Harasztosi and Lindner, 2019), as well as into improvements in quality of child care (Brown and Herbst, 2023) and nursing home care (Ruffini, 2024). We instead study immigration-driven changes in the supply and composition of labor inputs.

[4]Other related work includes Lach (2007), who shows that the influx of immigrants from the former Soviet Union to Israel reduced prices through higher demand elasticity and lower search costs. Evidence for housing markets is mixed: Ottaviano and Peri (2012); Saiz (2003, 2007) find rising rents, whereas Bratsberg and Raaum (2012); Monras (2020) show that low-skilled immigration can reduce housing prices by lowering construction costs.

[5]Own calculation based on Statistisches Bundesamt. GENESIS-Online: Tables 12411-0008 and 12521-0004. Retrieved November 2025, from http://www-genesis.destatis.de.

A related literature studies the effect of immigration on healthcare quality (Castro-Pires et al., 2025; Dodini et al., 2025; Furtado and Ortega, 2026; Grabowski et al., 2026a, b).[6] In contrast to these studies, our setting allows us to *jointly* identify the effects of immigration on prices, quality, and underlying production costs. We show that a compositional shift toward lower-paid foreign workers reduces average labor costs, which translates into lower prices without compromising quality—a pattern consistent with cost pass-through in a labor-intensive service sector.

Finally, we advance the existing literature on immigration and prices methodologically. We use high-quality administrative data on facility-level prices covering the universe of nursing homes, enabling precise estimation at a fine geographic level. Earlier studies rely on CPI-based price data with small regional samples, making them more susceptible to measurement error.[7] In addition, the labor market opening to citizens of EU-11 countries provides a sharp policy change that we exploit using a generalized difference-in-differences design. This allows us to test for pre-trends and estimate dynamic treatment effects, thereby strengthening the credibility of our estimates relative to earlier work based on cross-sectional shift-share designs (Goldsmith-Pinkham et al., 2020).

The remainder of the paper is structured as follows. Section 2 outlines the institutional background of the German nursing home market and summarizes the EU Eastern enlargement, including the regulations governing access to the German labor market for the new member states. Section 3 describes the data sources and presents descriptive evidence. Section 4 details the empirical strategy. Sections 5 and 6 present the baseline results and discuss potential mechanisms. Section 7 concludes.

2 Institutional setting

This section provides the relevant institutional background for our analysis. We begin by describing the structure of the nursing home market in Germany. We then outline the timeline and implications of the opening of the German labor market following the Eastern enlargement of the EU, which we exploit in our empirical strategy.

[6] See also Butcher et al. (2022) and Almuhaisen et al. (2024) on the relationship between immigration and elderly institutionalization.

[7] In particular, Cortés (2008) focuses on 30 large cities to ensure sufficiently large samples for reliable indices.

2.1 Market for nursing homes in Germany

In 2019, 9,045 nursing homes offered permanent care in Germany.[8] Within this group, non-profit and for-profit providers made up 51.3% and 43.6% of these homes, respectively, with the public sector accounting for just 5.1% (Federal Statistical Office, 2025a, b).[9] Entry into the nursing home market in Germany is not restricted. Facilities must meet certain building standards and comply with qualification and staffing requirements, but are otherwise free to operate.[10]

Each nursing home negotiates the overall price for its care services with state-level long-term care (LTC) insurance funds and, in some cases, with local social assistance authorities. These agreements are legally binding and are renewed annually. Within each nursing home, prices are the same for all residents classified into the same care level. The negotiations are based on *expected* costs, including labor, which accounts for approximately 70–80% of total expenditures in these facilities (Haun, 2020), and take into account an appropriate compensation for entrepreneurial risk. Nursing homes are required to disclose their expected cost structures to the negotiating parties (see, e.g., Grant et al., 2021; Heger et al., 2025; Schmitz and Stroka, 2014).[11] For 2025, the average profit margin in nursing homes in Germany was estimated to be approximately 7.3%, with higher margins reported among for-profit providers (IBISWorld, 2025).[12] Market competition can influence both the assumptions underlying cost projections and the size of the risk premium. Negotiated prices also take into account the rates of comparable providers, creating an additional channel through which competition may shape prices. Nursing homes have considerable flexibility in setting prices, as negotiations generally do not impose significant constraints. As a result, there is substantial variation in care prices in nursing homes, both within and across regions. In 2009, the median daily price was €53.76, while the 10th and 90th percentiles were €43.84 and €64.72, respectively. The interdecile range amounted to 38.2% of the mean price.[13] Markups in German nursing homes rise with care

[8] Overall, there exist 11,317 nursing homes, however about 2,000 offer multiple kinds of care (e.g., day care, short-term care). In the empirical analysis, we focus on homes providing permanent (long-term) care only.

[9] In the German setting, Grant et al. (2021) show that non-profit and for-profit homes are substitutes, but competition is much stronger within-type, suggesting that they provide differentiated products.

[10] Staffing requirements regulate both the resident-to-nurse ratio and the qualification mix of the staff. See Sozialgesetzbuch Elftes Buch (SGB XI) § 84 Bemessungsgrundsätze, available at https://www.gesetze-im-internet.de/sgb_11/, last accessed January 2026.

[11] See SGB XI, §§ 82-87.

[12] The profit margin refers to all nursing homes classified under WZ 2008 code 87.30 (residential nursing care), which includes institutions providing long-term residential care for the elderly as well as for persons with disabilities, with elderly care facilities constituting the majority of the sector (around 60% of industry turnover).

[13] Descriptive statistics rely on prices constructed by weighting facility-level average daily prices by the

level, as residents with greater care needs face limited substitution, allowing providers to charge higher prices (Kesternich et al., 2025).

Between 2005 and 2019, wages for care workers in German nursing homes were determined by a combination of collective agreements, statutory minimum wages, and employer discretion. Facilities bound to a collective agreement set wages according to clearly defined pay groups and experience-based steps. Facilities which are not covered by a collective agreement retained greater discretion, but were still legally bound by the sector-specific minimum wage, introduced in 2010 and gradually increased in subsequent years.[14] While the minimum wage established a legal floor, employers could pay higher salaries to attract and retain qualified staff, particularly in response to persistent labor shortages. In 2016, 45% of nursing homes remunerated their employees according to an association-level collective agreement, 18% under an in-house collective agreement, and 37% of nursing homes paid wages without any collective agreement coverage (Bundesministerium für Gesundheit, 2016).

In German nursing homes, the workforce comprises different professional groups with distinct qualifications, responsibilities, and pay. Nurses are a licensed occupation, requiring either a domestic professional qualification (typically three years of vocational training) or the formal recognition of a foreign qualification. As immigrant labor has become an increasingly important feature of the long-term care workforce (Haan and Wnuk, 2024), the recognition of foreign credentials plays a central role. Since 2007, Germany has applied a standardized procedure to assess foreign credentials for regulated professions, including nursing, for EU citizens in line with the 2005 European Directive EC/2005/36a (Anger et al., 2024). To obtain recognition, nurses must demonstrate training equivalent to the German vocational program, sufficient German language proficiency (B2), medical fitness, and personal aptitude (e.g., no criminal record and evidence of reliability). The recognition process is complex, involves fees, and requires submission of documents in German, with translations by sworn or authorized translators.[15] In particular, financial aspects and German language skills pose challenges (Bundesministerium für Bildung und Forschung, 2021). Consequently, some immigrants with foreign nursing degrees may choose to work as (lower-paid) nursing assistants or aides (hereafter "assistants"), as these occupations are not licensed and, hence, do not require formal recognition of

national distribution of care recipients across care levels; see Section 3 for details of the weighting.

[14]The statutory care sector minimum wage in Germany, which applies to qualified nurses, nursing assistants, and care aides, amounted to 8.50 (7.50) Euro/hour in West (East) Germany in 2010 and 11.05 (10.55) Euro/hour in West (East) Germany in 2019, see http://www.iaw.edu/files/dokumente/iaw_abschlussbericht_evaluation_mindestlohnregelungen_pflege_31082011.pdf and http://www.bundesanzeiger.de/pub/publication/O5gBeJjZmKsoNQYr9aD?0, last accessed January 2026.

[15]See https://www.anerkennung-in-deutschland.de/html/en, last accessed February 2026.

qualifications.

Since 2009, German nursing homes have been evaluated regularly by an external institution, the Medical Review Board of the German Statutory Health Insurance, which is responsible for monitoring quality in these facilities. The evaluations are unannounced and conducted by trained inspectors. During these inspections, professionals assess nursing homes across a wide range of criteria, including medical and nursing care, hygiene, nutrition, social support, and documentation practices.[16] The same criteria are applied across all nursing homes, and the reporting of results is standardized. Evaluation results are displayed within the nursing homes and published online via official portals, as legally required.[17] In the following empirical analysis we will use these data to study whether price effects can be explained by changes in care quality.

Care-dependent individuals are free to choose among nursing homes and, even when restricting their search to their own district, they can select from an average of 20 facilities that provide long-term residential care.[18] Residents pay the price of care resulting from the negotiations described above minus—if eligible—a fixed monthly contribution from statutory LTC insurance, depending on their assigned care level.[19] The contribution of the LTC insurance is independent of the nursing home's price. The benefit amount increases with the care level, reflecting the higher intensity of required care. As the price of care typically exceeds the LTC benefit, residents must co-pay, sometimes up to 50% of the total price (Schmitz and Westphal, 2017). In addition, residents pay for food and accommodation as well as investment costs. Facilities may also charge for optional supplementary services. Detailed price information is publicly available for each nursing home via official portals, along with information on quality.[20]

Besides nursing homes, care-dependent individuals can receive care at home either from licensed professionals (ambulatory care) or through informal care provided by family members or others. For those receiving ambulatory care, professional nursing or assistance with daily activities is delivered at home, with expenses fully covered by LTC

[16] These inspections are carried out by the *Medizinischer Dienst* for residents covered by statutory health insurance and by the *PKV-Prüfdienst* for those with private insurance.

[17] Herr et al. (2016) show that quality reporting has a positive effect on quality and provide further details on the inspection procedure.

[18] Schmitz and Stroka (2014) show that location and prices are important determinants of nursing home choice, while quality plays only a minor role.

[19] Eligibility for LTC benefits is determined through a medical assessment conducted by an authorized professional. Individuals must also have been insured in statutory LTC insurance for at least two of the ten years preceding the onset of care dependency. The insurance is mandatory for all residents of Germany. For an overview of the organization of long-term care in Germany, see Geyer et al. (2025).

[20] For example, see https://www.aok.de/pk/pflegeheim-in-der-naehe/uebersicht, last accessed January 2026).

insurance if no additional services are requested. Hence, a change in the price of ambulatory care does not directly impact care-dependent individuals. Individuals opting for informal care can receive a monthly cash payment (Pflegegeld), which they can use to compensate relatives or non-professional caregivers for their assistance (Heinicke and Thomsen, 2013; Kesternich et al., 2025). In 2009, approximately 2.3 million individuals were classified as care-dependent under LTC insurance in Germany. Of these, 1.6 million (about two-thirds) received care at home, including 1.1 million who were solely recipients of cash benefits and around 600,000 who received support through ambulatory care services. Approximately 700,000 (31%) resided in nursing homes. By 2019, the number of care-dependent individuals had increased to 4.1 million, with 3.3 million (80%) receiving home care. Among them, 2.1 million received only cash benefits, while about 1 million received ambulatory care services. Around 800,000 (20%) lived in nursing homes. This increase in the number of care-dependent individuals, particularly among cash benefit recipients, is primarily attributed to the expanded definition of care needs introduced in 2017, which broadened eligibility for LTC benefits, alongside the impact of demographic aging.[21]

2.2 EU Eastern enlargement and labor market access

The Eastern enlargement of the European Union proceeded in three rounds. Eight countries (EU-8)—the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, and Slovenia—joined the EU in May 2004.[22] Romania and Bulgaria (EU-2) acceded in January 2007, followed by Croatia in July 2013. By joining the EU, these countries became members of the European Single Market, which guarantees the free movement of goods, services, capital, and labor. However, old member states had the option to temporarily restrict access to their labor markets for dependent employment and posting of citizens from the new member states for up to seven years following accession.[23] Germany made use of this option, phasing in unrestricted labor market access in three stages: May 2011 (EU-8), January 2014 (EU-2), and July 2015 (Croatia).

From the date of *accession*, citizens of the new member states were entitled to establish businesses—that is, to work as self-employed—and to take up employment through

[21] See http://www.statistischebibliothek.de/mir/receive/DEHeft_mods_00146747, last accessed December 2025.

[22] Cyprus and Malta also joined in 2004 but are not considered because their citizens were granted immediate access to the German labor market upon accession (European Commission, 2006).

[23] A posted worker is an employee sent by an employer located in an EU Member State to carry out a service in another Member State on a temporary basis.

cross-border posting in unrestricted sectors in Germany.[24] In contrast, to take up dependent employment, nationals from the new member states were still required to obtain a work permit.[25] From the date of *labor market liberalization*, nationals from the new EU member states received unrestricted access to the German labor market. Based on the fundamental principle of free movement of labor, they are entitled to look for a job, work, and reside in Germany without a work permit; remain in the country after employment has ended; and enjoy equal treatment with nationals regarding employment, remuneration, and other working conditions.[26] Care workers were generally not exempt from transitional restrictions on dependent employment, which motivates treating the period prior to 2011 as pre-reform in our analysis.

3 Data and descriptive evidence

For the empirical analysis, we combine high-quality administrative data on prices and quality with employment and earnings data from administrative social security records covering the universe of nursing homes in Germany. Below, we describe the data in more detail and present descriptive statistics for the main outcomes.

3.1 Data sources

This section outlines the data sources used to measure long-term care outcomes, nursing home quality, labor costs, immigration, and regional controls.

Variables measuring long-term care outcomes

The data used to construct the LTC outcome variables come from the Long-Term Care Statistics. The official statistical authorities (the Statistical Offices of the States, in cooperation with the Federal Statistical Office) collect data on the universe of inpatient and

[24] In Germany, the posting of workers was restricted—until labor market liberalization—to a limited number of sectors considered vulnerable to disturbances. These included construction, cleaning, and interior decoration, but not the care sector, see https://www.bundestag.de/resource/blob/710928/28f56b6bb65e1542bb424bc118aca74b/WD-6-065-20-pdf-data.pdf.

[25] The German government gradually relaxed access conditions for specific groups of workers. From 2007, nationals from the new member states could obtain a work permit for engineering professions without being subject to the labor market priority check. From 2009, this exemption was extended to all workers with tertiary education from these countries (OECD, 2013).

[26] See http://data.europa.eu/eli/treaty/tfeu_2008/art_45/oj, last accessed November 2025.

ambulatory LTC providers, including all nursing homes in Germany, on a biennial basis. LTC providers report detailed information on their prices, capacities, and residents. All variables are measured with December 15 as the reference date. Participation in data collection is mandatory. Missing or implausible data are verified with respondents, and non-responses are minimal. Consequently, the data are considered highly reliable and of excellent quality (Statistisches Bundesamt, 2020).

In our analysis, we focus on nursing homes that specialize in (inpatient) permanent care, given that this type of care is the most frequent one provided in nursing homes (see Section 2). We use this microdata to build the outcome variables on a modified NUTS-3 level[27], biennially for years 2005 to 2019. For each region-year group, we compute the regional aggregates as simple averages across nursing homes. The first set of outcomes relates to the remuneration of nursing homes, which includes the daily price for care services (including medical care), henceforth called the *price of care*, as well as accommodation and meals. Prices of care are reported by care level, where higher levels reflect greater care needs, ranging from level 1 (low) to level 3 (high). Due to a change in the classification of care levels in 2017, the final two values for prices (for the years 2017 and 2019) have been imputed. We construct the outcome variable *average price of care* using prices by care level, aggregating across care levels with weights based on the national distribution of residents across care groups. The details of this calculation as well as the construction of the average price are provided in Appendix Section B. Finally, unlike the care prices, the price for accommodation and meals is common to all care levels.

The remaining outcomes are as follows. We measure average *capacity* using the number of available places—regardless of occupancy on the reporting date—and average *occupancy* using the stock of permanent care recipients (nursing home residents). To quantify care take-up outside of nursing homes, we construct two regional-level indicators: the number of individuals in informal care who receive cash benefits and the stock of individuals using ambulatory care (i.e., professional care at home).

Variables measuring labor costs

To measure employment and labor costs in nursing homes, we draw on administrative data from the Institute for Employment Research (IAB), which covers the universe of long-term care workers in Germany. We restrict our sample to those older than 16 and

[27] We redefined the 401 NUTS-3 regions in Germany into a set of 377 regions, due to i) data privacy laws of the Federal Statistical Office, ii) joint reporting of the stock of the foreign-born population by a number of regions with a common immigration authority, iii) constructing a balanced panel of regions. For a more detailed overview, see the map in Figure A2.

younger than 67 who work in nursing homes. Using this information, we construct a nursing-home-level panel, which we then aggregate to the regional level by taking within-region means, in line with the procedure used for the Long-Term Care Statistics. We identify care workers in nursing homes using occupational and industry codes.[28] For 2011 and 2012, we rely on imputed occupational codes, as information is temporarily incomplete due to the transition to a new occupational classification.[29] Therefore, results on labor market outcomes for these years should be interpreted with caution; the estimates for the remaining years are unaffected.

We construct several measures related to employment and labor costs, beginning with the share of foreign workers employed in nursing homes. Workers are classified as foreign or native based on their nationality at first observation. In addition, we measure overall nursing home staffing, expressed in log full-time equivalents (FTE), as well as the average labor market experience in Germany.[30] We further compile a set of wage indicators, for which wages are measured as daily wages: the overall average wage and the average wage of incumbent workers (those who began working in nursing homes before 2009). All variables are measured as of June 30 in the respective year.

Variables measuring quality

To explore the impact of immigration on care quality, we utilize data from unannounced quality inspections conducted by official care oversight bodies between 2009 and 2016. We categorize the 74 time-consistent quality criteria into five broad domains: *Medical and Nursing Care; Nutrition and Hydration; Social Support and Quality of Life; Resident Satisfaction and Autonomy; and Organization and Quality Assurance*. We observe these criteria across three waves. Wave 1 contains reports submitted up to April 2011, directly before the first labor market opening (5,242 reports). Wave 2 includes reports from May 2011 to March 2013, capturing potential short-term changes in quality (9,740 reports). Wave 3 comprises reports from February 2014 to March 2016, allowing us to assess longer-term changes in quality scores (10,826 reports). The analysis of nursing home quality focuses on facilities with at least ten residents. Further details on dataset construction and harmonization are

[28] Specifically, care workers are defined as individuals employed in occupations coded 853, 854, and 861 in the German Classification of Occupations 1988 (KldB 1988). Nursing homes are identified using codes 871 and 873 from the Classification of Economic Activities 2008 (WZ 2008).

[29] The imputation is based on the method developed in Haan and Wnuk (2024). Missing occupational codes are filled using the first non-missing lag or lead, conditional on both observations referring to employment episodes with the same employer, first using earlier information and then later reports. For further details, see Haan and Wnuk (2024).

[30] To calculate full-time equivalents, we use a value of 0.5 for all part-time employees, as the data do not contain any information on hours worked.

provided in Appendix C.

To obtain our outcome variables, for each combination of category, region, and wave, we calculate the share of facilities for which no deficiencies were identified during the inspection. In addition, we compute the region-wave share of facilities with no issues across all categories for wave 1 (pre-labor market opening) and waves 2 and 3 (post-labor market opening).

Variables measuring foreign-born inflow and control variables

We use the German Foreigner Statistics (*Ausländerstatistik*), an administrative dataset on all officially registered foreign nationals living in Germany, to observe the stock of foreign-born residents aged 15–65 at the NUTS-3-year level by nationality from 2000 to 2019. Data refer to the reference date of December 31 of each year. We use the change in the stock of foreign-born, overall and by nationality, to measure inflows of immigrants across the German regions.

We also extract several regional demographic indicators from the *Indicators and Maps for Spatial and Urban development (INKAR)* and the *Destatis Genesis* database. In particular, we have information on the old-age-dependency rate, fertility rates, GDP per capita, unemployment rates, proportion of unemployed that are female, total population, and the number of inhabitants aged 75 and older.

3.2 Trends in immigration and long-term care

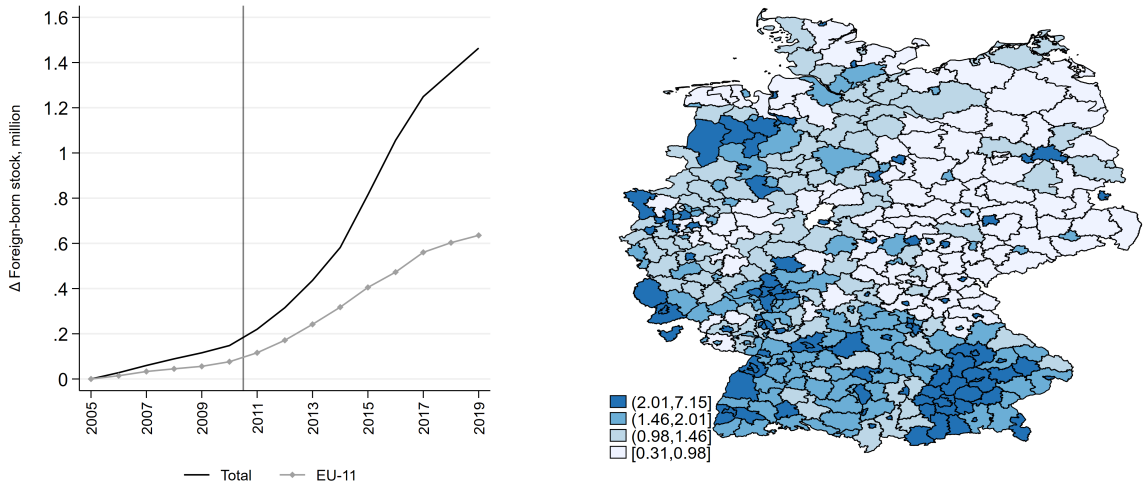
In the empirical analysis, we exploit variation in the stock of foreign-born individuals to identify the effects of immigration across a range of nursing home outcomes, including pricing, staffing, capacity and occupancy. To provide context for this approach, we begin by describing recent trends in immigration to Germany and then outline how key nursing home indicators have evolved over time.

In the main analysis, we focus on female immigration, as over 80% of care workers are women.[31] Panel (a) of Figure 1 shows the evolution of the national-level stock of foreign-born women residing in Germany relative to its 2005 level.[32] The total stock remained relatively stable until 2010, rising by about 120,000 over the five-year period, but grew substantially thereafter—by approximately 1.32 million between 2010 and 2019. Almost half (42%) of this increase reflects a rapid growth in residents from countries that

[31] Our results are robust to using a treatment that includes both female and male immigration, as shown later in the paper.

[32] In absolute terms, the stock of foreign-born women increased from 2.15 million to 3.62 million between 2005–2019.

Figure 1: Immigration of foreign-born women to Germany



(a) Aggregate evolution, 2005–2019

(b) Net change per 100 inhabitants, 2009–2019

Notes: Panel (a) plots the change in the stock of foreign-born female residents in Germany for each year from 2005 to 2019 relative to 2005. EU-11 countries include Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia. Panel (b) displays the net change in the number of foreign-born women (any origin) between 2009 and 2019, measured per 100 inhabitants in 2009 and grouped into quartiles. Based on own calculations using the German Foreigner Statistics and the INKAR database. For maps illustrating changes in the net stock of foreign-born women from EU-11 versus other origins, see Figure A1.

joined the EU in the enlargement rounds from 2004 to 2013. As discussed in Section 2, the modest pre-2011 increase in the stock of foreign-born from the EU-11 may reflect individuals exercising their right to reside or register as self-employed after the EU Enlargement, without entering the German labor market as employees.

Panel (b) of Figure 1 shows changes in the regional distribution of foreign-born women across German NUTS-3 regions, focusing on the net change in their stock between 2009 and 2019. Changes are expressed per 100 inhabitants as of 2009 and grouped into quartiles. The map reveals that the southern and western regions in Germany experienced the largest relative increases in immigrant concentration over the time period studied.

To understand how the long-term care sector evolved alongside these immigration patterns, we next examine trends in nursing home care prices, employment and wages, and capacity. Table 1 reports the average values of the main outcomes of interest for four example years.[33] First, prices increased steadily over time. Depending on the care level, care prices rose by around 5–6% between 2005–2009 and 2009–2013. From 2013–2017, the

[33]We report descriptive statistics of nursing home quality separately in Table A2. Over time, the average regional share of facilities with no quality issues found increased from 70.6% to 85.7%; across categories, this share is consistently lowest for *Medical and Nursing Care* and highest for *Social Support and Quality of Life*.

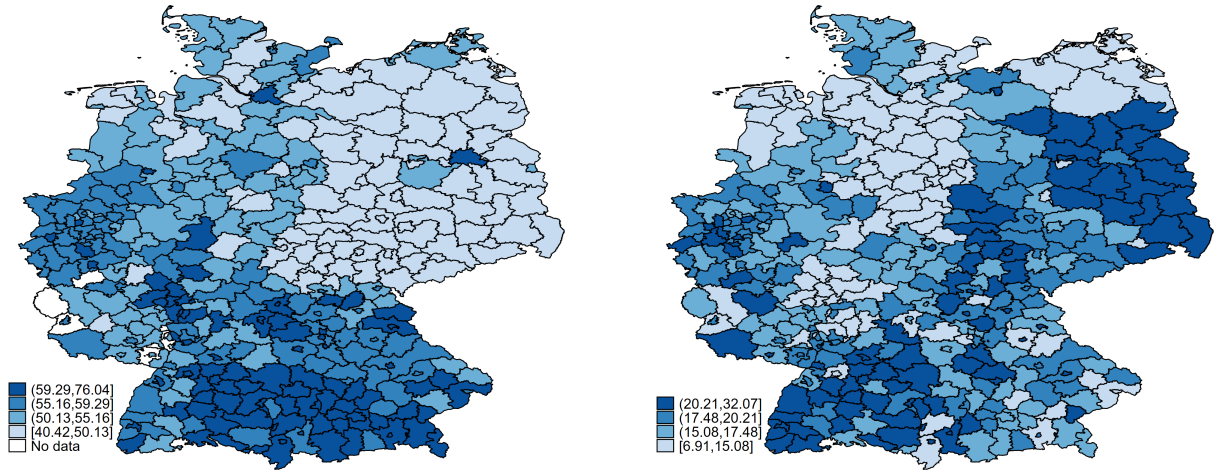
Table 1: Descriptive statistics of nursing home outcomes

Variable	2005	2009	2013	2017
Daily price in nursing homes in euros:				
Average price of care	52.41	54.57	55.93	66.21
	(5.74)	(6.16)	(5.62)	(7.09)
Price of care, care level 1 (low)	42.29	44.66	46.70	54.45
	(5.80)	(6.10)	(5.61)	(7.15)
Price of care, care level 2 (medium)	55.07	58.00	60.90	77.42
	(6.29)	(6.79)	(6.36)	(7.21)
Price of care, care level 3 (high)	68.84	72.26	76.14	85.88
	(6.56)	(7.31)	(7.49)	(7.13)
Price of room and board	18.52	19.44	20.60	22.78
	(3.40)	(3.72)	(4.06)	(4.45)
Worker characteristics in nursing homes:				
Stock of FTE workers	760.76	827.79	913.31	987.20
	(784.59)	(858.13)	(943.68)	(1021.02)
Share of foreign workers	0.047	0.051	0.067	0.106
	(0.046)	(0.047)	(0.057)	(0.079)
Average daily wage	54.97	54.74	57.74	64.22
	(6.18)	(6.10)	(6.54)	(6.55)
Average daily wage of incumbent workers	54.97	54.74	65.94	75.07
	(6.18)	(6.10)	(7.01)	(7.37)
Capacity and occupancy of nursing homes:				
Facility capacity	77.57	76.82	76.39	77.19
	(19.26)	(19.10)	(18.03)	(16.41)
Facility occupancy	68.15	65.73	65.68	69.20
	(17.93)	(16.72)	(15.63)	(14.42)
Regional stock — nursing homes:				
Nursing homes	20.24	22.13	22.85	24.17
	(20.37)	(21.34)	(21.58)	(22.34)
Available places in nursing homes	1537.20	1677.75	1727.55	1845.32
	(1844.65)	(1970.48)	(1991.38)	(2073.11)
Nursing home care recipients	1350.93	1443.63	1509.54	1663.97
	(1614.05)	(1635.50)	(1721.83)	(1850.69)
Number of regions		377		

Notes: The depicted variables are constructed by first aggregating nursing home data within each region-year cell: price, facility capacity and occupancy, employment as well as wage variables are averaged across facilities, while the other outcomes are summed (see Section 3). For this table, we take the average of these variables across regions for the years 2005, 2009, 2013, and 2017. Table A1 reports analogous statistics excluding regions bordering Poland and the Czech Republic. Standard deviations are reported in parentheses in the row below each mean. Based on own calculations.

increase was substantially larger, ranging from 12.8% (care level 3) to 27.1% (care level 2). Room-and-board prices followed a similar pattern, rising by about 5–6% between 2005–2009 and 2009–2013, and 10.6% between 2013–2017. Second, the price increase may be partly related to changes in labor costs. Average wages changed little between 2005–2009 and increased moderately by 5.5% between 2009–2013. From 2013–2017, wages rose substantially by 11.2%. The substantial increase may reflect the introduction of the federal minimum wage in 2015, which could have affected wages of non-care staff, as well as sector-specific minimum wage increases for care staff in 2017. The total number of care

Figure 2: Regional variation in the average price of care



(a) Level, 2009 (b) Changes, 2009–2019

Notes: Panel (a) maps the daily price of care in nursing homes in euros in 2009 across the modified NUTS-3 regions. Panel (b) maps the average change in the daily price between 2009 and 2019, in euros. Both maps display values by quartiles. Regions labeled *No data* have insufficient number of nursing homes to display price levels due to anonymization; this restriction applies only to the maps in Figure 2 and does not affect the empirical analysis.

workers in full-time equivalents increased by around 30% between 2005 and 2017. The share of foreign workers remained almost unchanged between 2005 and 2009, and more than doubled between 2009 and 2017. Third, while average nursing home capacity and occupancy per facility have stagnated, regional stocks of available beds and residents have increased. Between 2005 and 2017, average regional capacity and occupancy rose by 20% and 23%, respectively, driven by an increase in the number of nursing homes. Notably, throughout the entire period, nursing homes operated below capacity on average, potentially reflecting staffing regulation (see Section 2) as a binding constraint.

Finally, Figure 2 shows substantial regional variation in the average price of care, measured by the average price in euros. Panel (a) indicates higher price levels in southern and western Germany and lower prices in eastern Germany, closely aligned with regional differences in the cost of living. Panel (b) presents cumulative price changes between 2009 and 2019 and reveals considerable heterogeneity, with the largest increases occurring in eastern regions as well as in parts of southern Germany.

4 Empirical strategy

To causally estimate the effect of immigration on prices and the other outcome variables, we combine a generalized difference-in-difference model with an instrumental variable approach. In particular, we exploit a sharp increase in the stock of foreign-born (women) after 2010 as a continuous measure of exposure to treatment. To isolate the exogenous variation in this treatment, we use a shift-share instrument, exploiting historical settlement patterns of EU-11 residents in Germany. We explain this procedure in detail below.

In our analysis, we estimate the following equation separately for each observation year t between 2005 and 2019:

$$\Delta log\ y_{r,t} = \alpha_t + \beta_t \Delta F_r + \omega_t X_{r,2009} + \epsilon_{r,t} \tag{1}$$

$\Delta log\ y_{r,t}$ represents the difference in the natural logarithm of a given outcome in region *r*; we take these differences between the final pre-shock year 2009 and year *t*. ΔF_r is the change in the stock of foreign-born women—regardless of their origin—residing in region *r* between the pre-shock year 2009 and 2019, the final year of our data, divided by the local population in 2009 x 100. Thus, β_t measures the approximate percentage change in the outcome between 2009 and year t associated with a one-percentage-point increase in the foreign-born female population (relative to the 2009 population) between 2009 and 2019. $X_{r,2009}$ represents a vector of controls that we fix at their 2009 level. The controls include the regional size of the nursing market (ratio of facilities to residents above the age of 75), the relative size of the population above the age of 75, as well as the old-age dependency rate.[34] By including $X_{r,2009}$, we compare the changes in outcomes in regions with similar pre-treatment characteristics related to care provision, but that had a differential exposure to the immigration shock. We estimate the model in first differences and therefore control for time-invariant unobserved characteristics of the regions.

The structure of the model has two particularly desirable features. First, for the years $t \in [2005, 2007]$, we can explicitly test for pre-trends. Second, for years $t \in [2011, 2019]$, the series of β_t coefficients help us to quantify a potentially dynamic impact of the immigration shock. Relatedly, similarly to Amior and Stuhler (2023), Delgado-Prieto (2024), and Dustmann et al. (2017), we opt for a time-invariant treatment. With a time-varying specification, it is difficult to distinguish between dynamic effects and changes driven by variation in treatment intensity. Moreover, a time-invariant treatment renders the pre-trend estimates more transparent and directly comparable to the post-treatment results.

[34] In Section 5, we show that our results are not driven by a particular choice of $X_{r,2009}$ by employing other regional-level variable sets.

When estimated with OLS, equation (1) likely yields biased results as both the change in long-term care outcomes and foreign settlement patterns are plausibly correlated with unobserved time-varying characteristics of the regions. To isolate exogenous variation in ΔF_r, we employ a shift-share instrument (Card, 2001), relying on the tendency of newly arriving foreigners to settle in areas which are inhabited by previous generations of co-national immigrants. To explicitly exploit the variation in foreign-born residents generated by the Eastern enlargements of the European Union, we build the instrument using *only* the inflows from the EU-11 countries. We construct our instrument for the change in the stock of foreign-born women in region r (ΔF_r), which we label ΔZ_r, by assigning the country-specific change in the stock of foreign-born women on the national level[35] ($\Delta S_{c,-r}$) across the German regions according to the aggregate historical immigrant shares ($s_{c,r,2000}$):

$$\Delta Z_r = \frac{100}{pop_{r,2009}} \sum_c s_{c,r,2000} \, \Delta S_{c,-r}. \tag{2}$$

Here, the subscript c denotes the country of origin—Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia. Finally, as with the raw treatment ΔF_r, we use the total 2009–2019 change in the predicted immigration shock from the EU-11 and normalize it by the local population in 2009 x 100.

We use the spatial variation in foreign-born settlement as in the year 2000, which is eleven years prior to the first labor market opening, and three years before the citizens of the first group of the new member states voted for EU accession. As such, the correlation between the local labor demand during our analysis period and the initial distribution of immigrants used to construct our instrument is plausibly limited. Importantly, before 2009, the stock of foreign-born remained essentially unchanged (see Figure 1a), reducing the likelihood of dynamic spillovers of pre-2009 labor supply shocks (Jaeger et al., 2018).

For the first stage, we estimate the following equation:

$$\Delta F_r = \gamma + \psi \Delta Z_r + \rho X_{r,2009} + \eta_r \tag{3}$$

Both the treatment and the instrument are time-invariant, capturing differences in exposure based on changes between 2009 and 2019. As a result, the first-stage relationship is common across all years.

Recent literature has emphasized that shift-share designs rely on one of two poten-

[35] We follow the literature and exclude the inflow to region r from the national inflow when calculating the change in the national-level stock. In principle, this alleviates the threat that the results reflect any particular region is driving national-level inflows of foreign-born women into Germany. This leave-one-out adjustment makes little difference to the empirical results shown in the paper.

tial identifying assumptions: the exogeneity of shocks (Borusyak et al., 2022) or the exogeneity of shares (Goldsmith-Pinkham et al., 2020). In our setting, we rely on the latter condition and interpret the shift-share design as a *pooled exposure* framework, where the shares capture differential exposure to a set of common shocks.[36] In our context, exposure is based on the historical foreign-born shares $s_{c,r,2000}$ (scaled by the region's 2009 population).

The key identifying assumption is that the past settlement patterns affect changes in LTC outcomes only through their impact on subsequent increases in the foreign-born population, and not through other channels. One way to assess the plausibility of this assumption is to test for differential trends in the outcomes prior to the labor market openings. In addition to testing pre-trends using the overall instrument, we examine pre-trends for origin-specific instruments—focusing on those countries that contribute most to the identifying variation. This check gives us evidence that the null pre-trends hold not only *on average* across the origin countries, but also for each (major) country separately. To identify these key origins, we follow Goldsmith-Pinkham et al. (2020) and calculate Rotemberg weights, which we report in Section 5.1.[37]

A final identification concern relates to the measurement and impact of cross-border commuting. Poland and the Czech Republic, the two EU-11 countries that share a border with Germany, joined the Schengen Area in 2007, eliminating border controls and allowing daily crossings without passport checks. This facilitated commuting in border regions, enabling workers employed in Germany to live in their home country and commute, rather than settle and register in Germany. To the extent that unobserved factors that drive cross-border commuting patterns align with historical settlement distributions, our shift-share instrument may pick up the effects of increases in commuting (besides the effects of immigration), potentially violating the exclusion restriction. Our main sample therefore excludes the 24 regions along the borders with Poland and the Czech Republic. We further show that the results are robust across alternative specifications, notably analyses that use the full sample of regions.

[36] Although we exploit a sharp increase in the foreign population driven by policy changes, the number of shocks in our setting is relatively small—limited to eleven sending countries. As a result, the exogeneity-of-shocks assumption, which is most credible in settings with many independent origin-specific shocks, is not appropriate in our context (Borusyak et al., 2022).

[37] Since the treatment is time-invariant, we calculate the Rotemberg weights using a cross-section of the data rather than the full regional panel. We also include the baseline controls $X_{r,2009}$.

5 Results

In this section, we present the main empirical findings. We first show that our proposed instrument, capturing predicted immigration from the EU-11 countries, is highly relevant for explaining regional changes in the foreign-born population. We then examine the effects of immigration on prices, accounting for the role of competition across market segments and regions. We focus our discussion on the main regional sample, with results for the full sample reported as robustness checks. We also test sensitivity of our results to the choice of controls and the definition of the treatment.

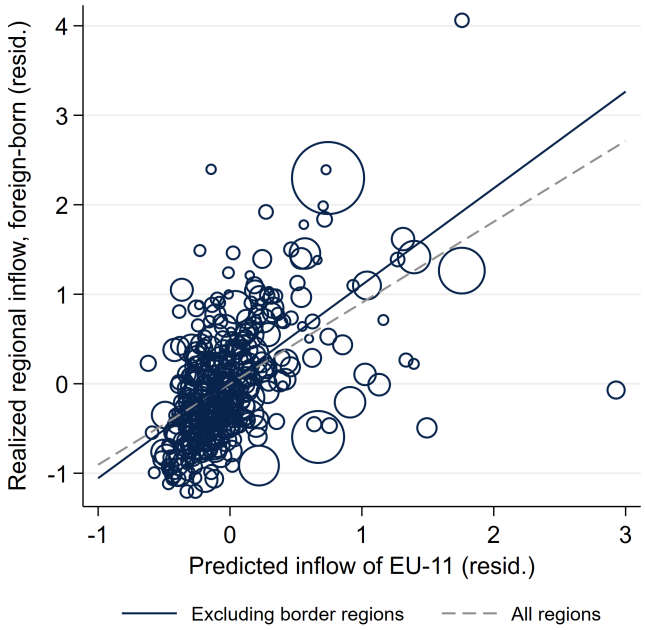
5.1 First-stage results

Figure 3 plots the relationship between our proposed shift-share instrument, the predicted immigration from the EU-11, and the residual change in the overall foreign-born female population, after accounting for baseline controls. To illustrate the contribution of larger versus smaller regions, the size of each dot is scaled by the population of the corresponding region in 2009.

The figure shows a clear positive relationship between the predicted and realized change in the stock of foreign-born women. Importantly, the relationship appears to be driven both by smaller and larger regions, decreasing the probability that the instrument value is reflecting differences in the economic conditions across the regions. This, in turn, strengthens the assumption that the instrument is orthogonal to unobservable shocks that may differ by market size.

Table 2 reports the first-stage results of estimating equation (3) using the instrument as defined in equation (2). Because both the treatment and the instrument are time-invariant, the first stage is identical across years. In column (1), we regress the change in the stock of foreign-born women on the instrument and the set of control variables using our main sample (excluding border regions). The predicted change in the EU-11 immigrant population between 2009 and 2019 strongly and positively predicts the change in the foreign-born population over the same time period. When all regions are included as a robustness check (column (2)), the first-stage relationship remains positive but is weaker, suggesting that historical settlement patterns are less predictive of immigration changes in border regions than in the rest of Germany. To further assess the robustness of the first-stage relationship, we re-estimate the first stage with all regions while consecutively excluding regions with the largest populations. The results removing the most populous region (Berlin) and the ten most populous regions, presented in columns (3) and (4), are remarkably stable across the samples.

Figure 3: Relationship between predicted and realized change in stock of foreign-born women



Notes: The figure plots the relationship between residual ΔF_r and residual ΔZ_r, calculated from separate regressions of ΔZ_r and ΔF_r on controls $X_{r,2009}$. Both variables refer to the change between 2009 and 2019. The size of the points is proportional to the regional population stock as of 2009.

Furthermore, as discussed in Section 4, we compute Rotemberg weights to assess the contribution of each of the eleven origin countries to the identifying variation. We report the results in Table 3; they are nearly identical when all regions are included (Table A3). First, all origins receive positive weights (α_c). Furthermore, the weights are almost perfectly explained by the size of national-level inflows—the correlation between α_c and ΔS_c is 0.982. Finally, three countries of origin—Romania, Bulgaria and Poland—receive a large share (78.8%) of the weight in the estimator and therefore have the highest potential to bias our results. Therefore, in the following we will also present pre-trend estimates separately just using the variation from these countries.

Table 2: First-stage regression results

	Main (1)	All regions (2)	No Top 1 (3)	No Top 10 (4)
Predicted change in stock (ΔZ_r)	1.085***	0.905***	0.884***	0.896***
	(0.140)	(0.175)	(0.174)	(0.195)
N	353	377	376	367
K-P F-stat.	60.190	26.637	25.975	20.987
R^2	0.476	0.440	0.437	0.424

Notes: Table shows the first-stage results of estimating equation (3) using the instrument as defined in equation (2) and the controls. Column (1) uses the main sample that excludes border regions with Poland and the Czech Republic. Column (2) includes all regions. Column (3) includes all regions except Berlin. Column (4) additionally removes Hamburg, Hannover region, Cologne, Munich, Bremen and Bremerhaven, Düsseldorf, Recklinghausen, Frankfurt am Main, and the combined region of Merzig-Wadern and Saarlouis. The sample restrictions are based on 2009 population levels. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 3: Summary of Rotemberg weights

Origin	α_c	ΔS_c	F-stat$_c$
Romania	0.339	196,680	28.489
Bulgaria	0.234	96,405	20.031
Poland	0.215	135,420	20.880
Hungary	0.087	50,325	28.791
Croatia	0.072	41,370	19.431
Slovakia	0.018	10,570	35.121
Lithuania	0.014	13,235	17.073
Latvia	0.012	9,570	7.541
Czech Republic	0.008	5,230	15.961
Estonia	0.001	1,215	16.535
Slovenia	0.000	230	17.109

Notes: The table reports Rotemberg weights (α_c), the aggregate change in the stock of foreign-born individuals between 2009 and 2019 (ΔS_c), and the first-stage F-statistic (F-stat$_c$) by country of origin c. Estimation uses the Stata package *bartik_weight* provided by Goldsmith-Pinkham et al. (2020) and is based on the sample excluding regions bordering Poland or the Czech Republic. For the weights including all regions, see Table A3.

5.2 Effect of immigration on prices of care

We now turn to the second-stage results on nursing home prices. Figure 4 presents the baseline estimates excluding regions bordering Poland and the Czech Republic. For comparison, the figure also reports estimates for the full sample, which serve as a robustness check.

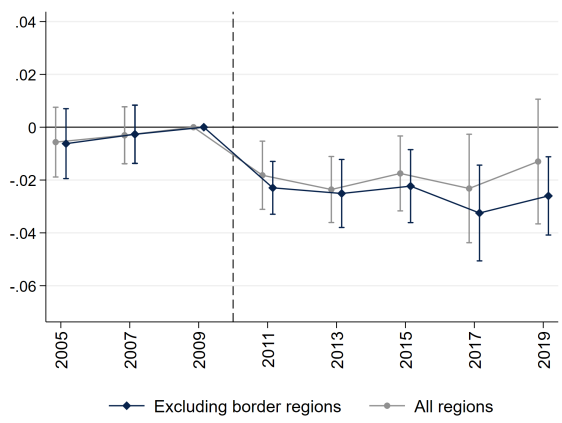
These price effects arise through the labor supply channel of immigration. Since immigrants typically do not consume long-term care services, they generate essentially no shift in demand in the nursing home market. For instance, in 2009, 99.0% of the foreign-born EU-11 population in Germany was younger than seventy-five, an age at which care dependency generally becomes more common. By contrast, roughly one in ten native res-

idents had already reached that age. Although labor market liberalization substantially increased the number of working-age foreign-born individuals from EU-11 countries, elderly immigrants continued to constitute less than 1% of the immigrant population by 2019 (see Figure A3).

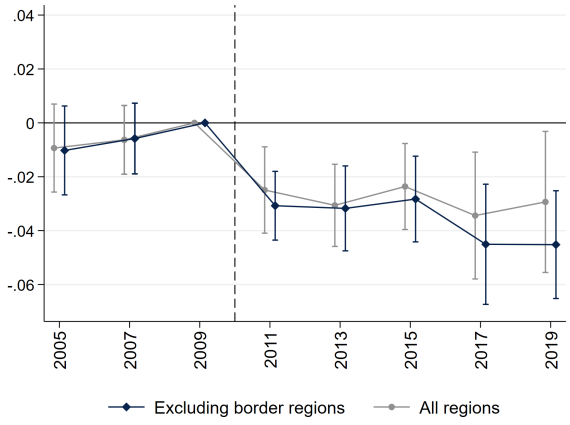
Across all panels, we find no evidence of differential price trends prior to 2009: the rise in the local stock of foreign-born women between 2009 and 2019 does not impact prices of nursing care before the reform period. While estimates are somewhat noisier when using instruments based solely on Romania, Bulgaria, and Poland—the countries with the largest Rotemberg weights—we likewise observe no meaningful pre-trends (Figure A4). Taken together, these findings support our identification assumption that historical settlement patterns of the foreign-born EU-11 population affect price changes only through subsequent increases in the foreign-born population. In particular, they suggest that an increase in work arrangements before labor market liberalization—namely cross-border posting and self-employment—that could have been geographically related to later immigration exposure did not influence the outcomes of interest before 2011.

Turning to the post-reform price effects, Panels (a) to (d) show that immigration reduces the price of care in nursing homes. By 2019, an increase of one foreign-born woman per 100 inhabitants statistically significantly reduces the price of care services by 2.6%. Price responses differ across care intensities. For the low care level, we find the largest effect, with a significant decrease of 4.5% by 2019. The coefficients become slightly larger in absolute terms over the post-reform period; however, they are not significantly different from each other. The price effect for the medium care level follows a similar pattern over time but has a smaller magnitude, with a price reduction of 3.3% in 2019. The point estimates for the high care level are even smaller and only partially significant. They tend to decline in absolute terms after 2015; yet differences over the post-reform period are not statistically significant. As shown in Panel (e), we find no effect of immigration on the price of food and accommodation throughout the post-reform period. Focusing on the sample that includes border regions as a robustness check leads to less precise estimates, but the estimated magnitudes remain comparable.

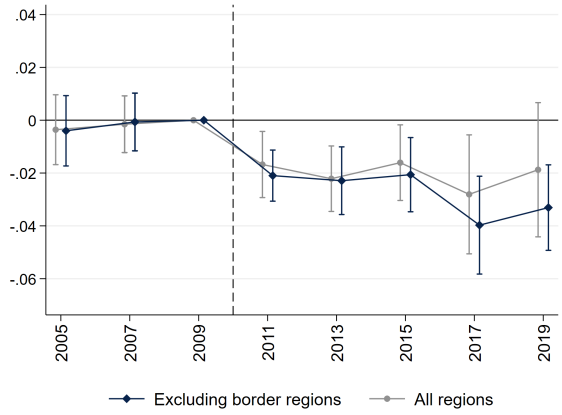
Figure 4: Effect of immigration on price of care and price of room/board



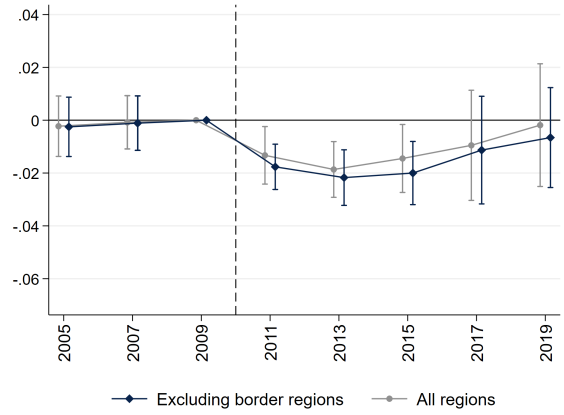
(a) Average price of care



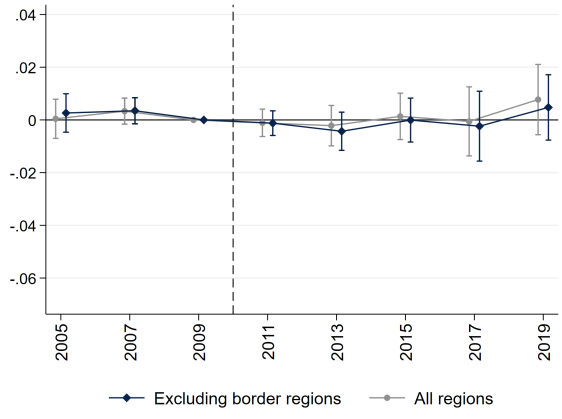
(b) Price of care, care level 1 (low)



(c) Price of care, care level 2 (medium)



(d) Price of care, care level 3 (high)



(e) Room and board

Notes: The figure displays the estimated effects of immigration on the price of care and their 95% confidence intervals, obtained from the second stage of equation (1), based on a sample of 353 regions (377 regions, when including border regions). The outcome variable is defined as the change in the log price of care from 2009 to t. The treatment variable is the instrumented change in the stock of foreign-born women per 100 inhabitants (as of 2009), measured over the period from 2009 to 2019. The estimates shown in the figure are reported in Table A4, along with the corresponding OLS estimates and results from alternative specifications.

The pattern of results across care levels aligns with the competitive structure of the nursing home sector. Existing evidence suggests that markups are lower for low-intensity care, implying stronger competition (Kesternich et al., 2025). Consistent with this, we estimate larger price responses for lower care levels where more competition leads to higher pass-through than for more intensive care.

We provide further evidence for the role of market structure by allowing the treatment effect to vary with market concentration, measured by the Herfindahl-Hirschman Index (HHI) in the baseline year 2009. We compute the HHI as the sum of squared facility-level shares of regional nursing home residents in 2009 and classify regions as high or low concentration using a threshold of 0.15. [38] Figure 5 shows that price effects are larger in regions with low HHI, where pre-treatment concentration is lower. This holds for all care levels. By 2019 in low-HHI regions, an increase of one foreign-born woman per 100 residents reduces prices by approximately 3.0% for the average price, 4.9% for care level 1, and 3.9% for care level 2, whereas the corresponding effects in high-HHI regions are smaller, at 1.8%, 3.7%, and 2.0%, respectively. For care level 3, the effects are small and statistically insignificant in both high- and low-HHI regions.

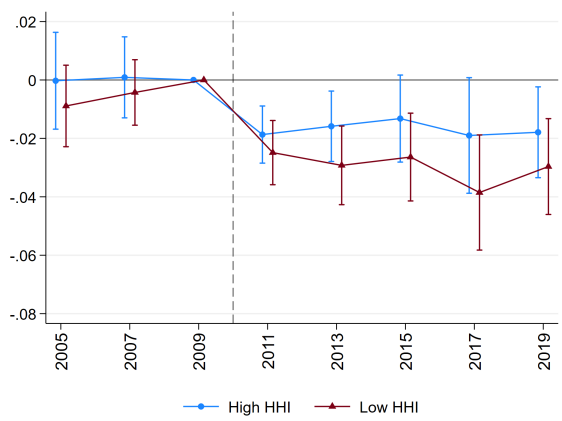
Taken together, these findings indicate that price responses to immigration are strongest in more competitive market segments and regions with less concentration, consistent with greater pass-through in more competitive environments.[39]

To put our estimates into perspective, we compare them to the limited existing evidence on how immigration influences prices. Cortés (2008), for instance, shows that a 10% increase in the share of low-skilled migrants in the U.S. labor force reduces the price of household services by approximately 2%. In comparison, our findings suggest a somewhat smaller effect: a 0.8% decline in the average price for each 10% increase in the share of foreign-born women in the labor force. The estimated price effect of a 10% increase in the share of foreign-born women ranges from a 1.3% decline for care level 1 to a 1.0% decline for care level 2, with no statistically significant effect for care level 3. Given that

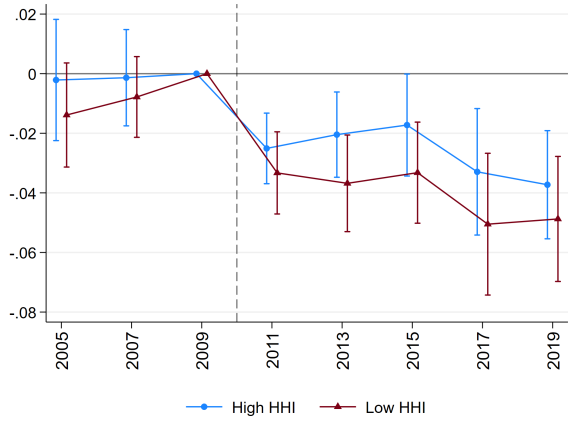
[38] In our setting, the relationship between competition and price pass-through likely operates through the bargaining process between nursing homes and insurance funds. In less concentrated markets, insurers can point to lower-cost alternatives during negotiations, strengthening their position to push prices down when labor costs fall. In more concentrated markets, providers face less pressure to accept price reductions. This mechanism differs from the standard competitive channel in which consumers switch to cheaper providers, but it nonetheless implies that market structure shapes the extent to which cost savings are passed through to prices.

[39] We explore two additional dimensions of heterogeneity, depicted in Figures A5 and A6. First, we split regions by their price level in 2009, using the median of each price measure, and find that price declines are concentrated in regions that were initially more expensive. Second, we classify regions by whether the share of for-profit facilities in 2009 lies below or above the median. We find similar effects in regions with both low and high concentrations of for-profit facilities.

Figure 5: Effect of immigration on price of care by pre-reform concentration



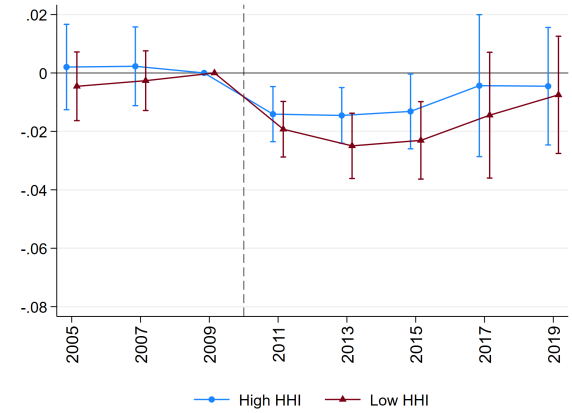
(a) Average price of care



(b) Price of care, care level 1 (low)



(c) Price of care, care level 2 (medium)



(d) Price of care, care level 3 (high)

Notes: The figure displays the estimated effects of immigration on the price of care and their 95% confidence intervals, based on a sample of 353 regions (excluding border regions). The plotted coefficients correspond to interactions between the instrumented treatment in equation (1) and an indicator for high versus low market concentration in 2009 as measured by HHI, where high is defined as HHI ≥ 0.15. The outcome variable is defined as the change in the log price of care from 2009 to t. The treatment variable is the instrumented change in the stock of foreign-born women per 100 inhabitants (as of 2009), measured over the period from 2009 to 2019. *High HHI* and *Low HHI* samples include 56 and 297 regions, respectively.

care prices in Germany are not fully determined by market forces, a more muted response is not surprising.

Finally, we show that our results are not sensitive to changes in the empirical specification. Table A4 reports the main results in column (2) along with robustness checks in columns (3) to (6) for all periods; column (1) presents the OLS results using the main sample. First, including all regions in the analysis leads to slightly less precise second-stage estimates, as depicted in column (2), but the estimated magnitudes remain compa-

rable. Second, the findings—including the insignificant pre-trends—remain stable when we vary the set of regional-level controls included in $X_{r,2009}$. In particular, we test the sensitivity of results to alternative measures of the demographic baseline, replacing the old-age dependency rate and the share of the population aged 75+ with the fertility rate (column (4)); we also extend the baseline control set by including local GDP per capita, unemployment rate and proportion of women among the unemployed (column (5)). The treatment and instrumental variables in our main specification capture the change in the stock of foreign-born women, as most care workers are female and this is therefore the relevant treatment in our setting. If we instead use the change in the stock of all foreign-born individuals, regardless of gender, the pattern of effects remains the same, but the coefficient is roughly half as large (column (6)). This is consistent with the fact that the average change in the alternative treatment is about 2.5 times as large: While the stock of foreign-born women increases between 2009 and 2019 on average by 1.59 per 100 inhabitants (based on the 2009 population), the stock of all foreign-born individuals increases over the same period on average by 4.13 per 100 inhabitants. At the same time, male immigrants do not affect care prices because they hardly work as care workers. Therefore, the halving of the coefficient is plausible.

6 Mechanisms

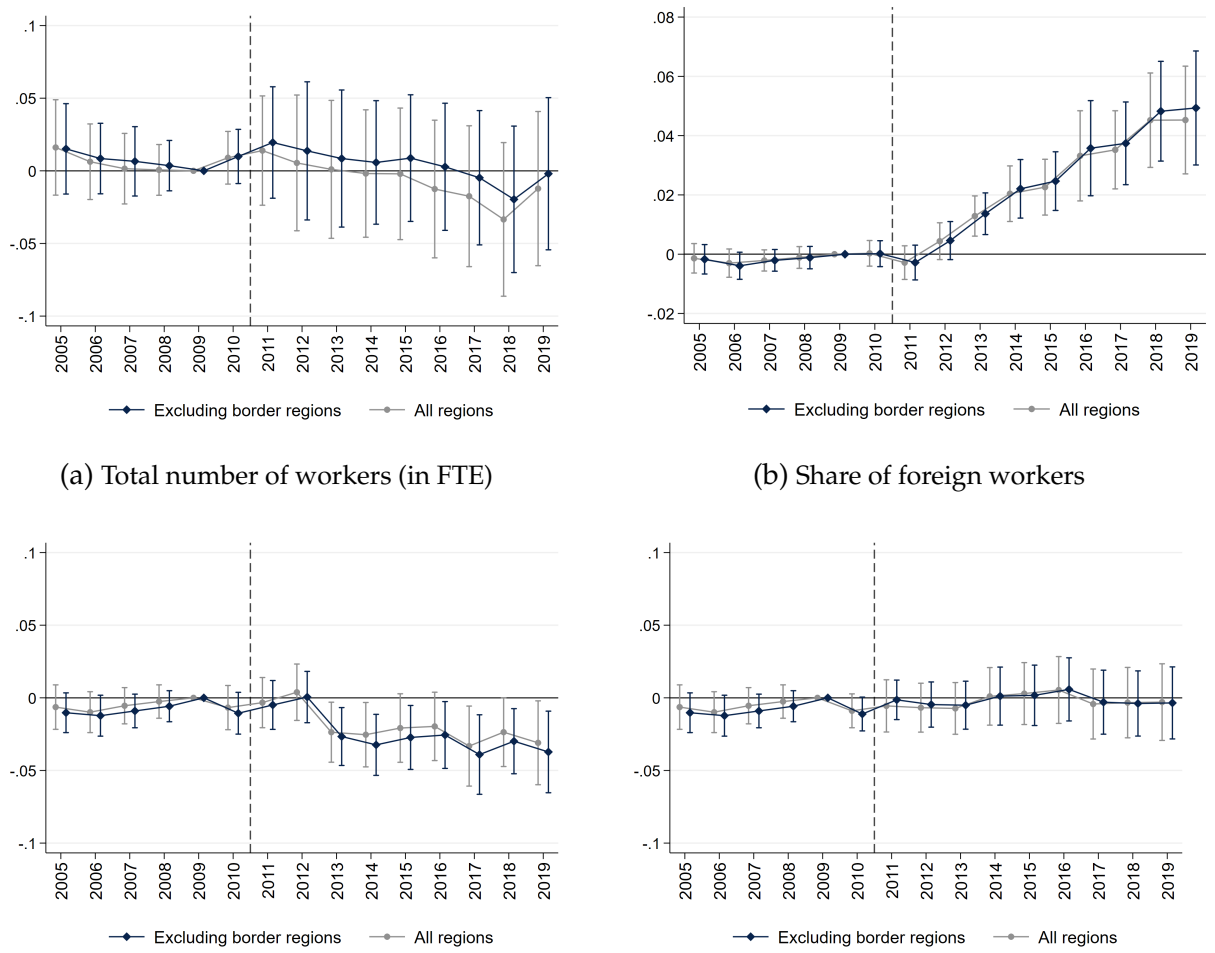
Our analysis has shown that the arrival of immigrant workers decreases the price of care in nursing homes, particularly so for low and medium care levels. In the next section, we explore a number of potential mechanisms, focusing on changes in labor costs, nursing home quality, scale effects, and substitution toward informal or professional care at home.

6.1 Labor costs

Given that labor costs account for the majority of expenditures in nursing homes (see Section 2), a natural starting point for investigating the mechanism behind the effect of immigration on prices is the role of staffing costs. If markets are sufficiently competitive, a reduction in labor costs per worker should lead to lower prices. For this purpose, we use detailed data on employment and earnings in the nursing home sector from administrative social security records and approximate labor cost per worker using average wages.

The results are shown in Figure 6. We report estimates for the main sample excluding border regions and include results for the full sample for robustness. We first show

Figure 6: Effect of immigration on employment and wages in nursing homes



(a) Total number of workers (in FTE)

(b) Share of foreign workers

(c) Average wage

(d) Average wage of incumbent workers

Notes: The figure displays the estimated effects of immigration on the total number of care workers (in full-time equivalents), the average share of foreign workers, the average wage of all and of incumbent workers, along with their 95% confidence intervals, obtained from the second stage of equation (1), estimated separately for each year from 2005 to 2019 based on a sample of 353 regions (377 regions, when including all regions). The outcomes are defined as log differences (difference for the outcome *share of foreign workers*) relative to 2009. The treatment variable is the instrumented change in the stock of foreign-born women per 100 inhabitants (as of 2009), measured over the period from 2009 to 2019. The estimates shown in the figure are reported in Table A5, along with the corresponding OLS estimates and results from alternative specifications.

that the increase in the number of foreign-born women does not affect employment and wages in nursing homes prior to the labor market openings. Furthermore, Panel (a) indicates that the overall number of care workers in nursing homes, measured in full-time equivalents, does not significantly change with immigration after the reform. This stands in contrast to prior work documenting positive effects of immigration on NH staffing, including total employment of nurse professionals (Furtado and Ortega, 2026) and hours per nursing home resident (Grabowski et al., 2026a); conversely, for registered nurses,

Cortés and Pan (2014) document negative effects of immigration on the stock of native workers.[40] However, we observe a sizable shift in the composition of the workforce: Panel (b) documents that the average share of foreign workers rose sharply following the 2011 policy change. By 2019, an additional foreign-born woman per 100 residents increases the average share of foreign workers in nursing homes by 4.9 percentage points using the main regional sample.

This change in the composition is related to a change in average wages paid by the nursing homes. Panel (c) documents the causal effect of migration on average log wages after 2011. By 2019, an increase of one foreign-born woman per 100 residents reduces the average wage in the nursing home sector by 3.5% in the main specification. Following Dustmann et al. (2025), we further decompose this effect by examining wages of incumbent workers, defined as those employed in nursing homes prior to the reform. Panel (d) shows no impact on the wages of incumbent workers. Taken together, the negative effect on the average wages is driven by a change in the composition of the workforce toward a higher share of foreign workers, who on average earn lower wages than native workers.[41]

Notably, the timing of the price and labor cost responses differs for two main reasons. First, nursing home prices are negotiated in advance based on expected labor costs (as noted in Section 2), so anticipated cost reductions following the labor market opening may already be reflected in lower prices in 2011, even if realized labor cost adjustments occur later. Second, differences in measurement contribute to a lag in observed wage responses. Our labor market measures are constructed from administrative data observed on June 30 of each year, while price measures refer to December 15 (see Section 3). Because the first labor market opening occurred in May 2011, the 2011 data likely do not capture meaningful changes in workforce composition or wages. Finally, estimates of labor market outcomes for 2011 and 2012 should be interpreted with caution, as the identification of care workers relies on imputed occupational codes. This is due to substantial missing information during the transitional period from 2011 to 2012 associated with a change in occupational coding (see Section 3). From 2013 onward, when care workers can be reliably identified, we observe a clear and robust adjustment in wages and related

[40] In particular, Furtado and Ortega (2026) document an increase of 21 nurse professionals per a 1,000-person increase in immigration. They further attribute part of this increase to a crowding-in of native workers. Grabowski et al. (2026a) show that an increase of one immigrant per resident raises hours worked per resident by 0.009 for nursing assistants and by 0.002 for registered nurses. Cortés and Pan (2014) document large negative effects, finding that each additional foreign nurse reduces native nurse employment by between one and two workers over a ten-year period.

[41] The results also hold when we extend the sample by including regions that share a border with Poland or the Czech Republic. As further shown in Table A5, these findings are also robust to using a different set of control variables (column (4)), as well as an alternative treatment and instrument definition including all genders (column (5)).

Table 4: Characteristics of Foreign and Native Workers, 2011-2019

Characteristic	Native	Foreign
Average daily wage (in euros)	62.300	55.907
Share full-time (%)	40.074	45.594
Share assistant (%)	34.446	51.551
Average labor market experience (yrs)	22.022	10.895
Average age (yrs)	42.413	38.734

Notes: Values report pooled averages for all long-term care workers observed between 2011 and 2019, separately for native and foreign-born workers. Labor market experience measures the number of years since the worker's first job in Germany. Based on 151,704 distinct foreign and 943,314 native workers (employed across the full sample of regions).

outcomes.

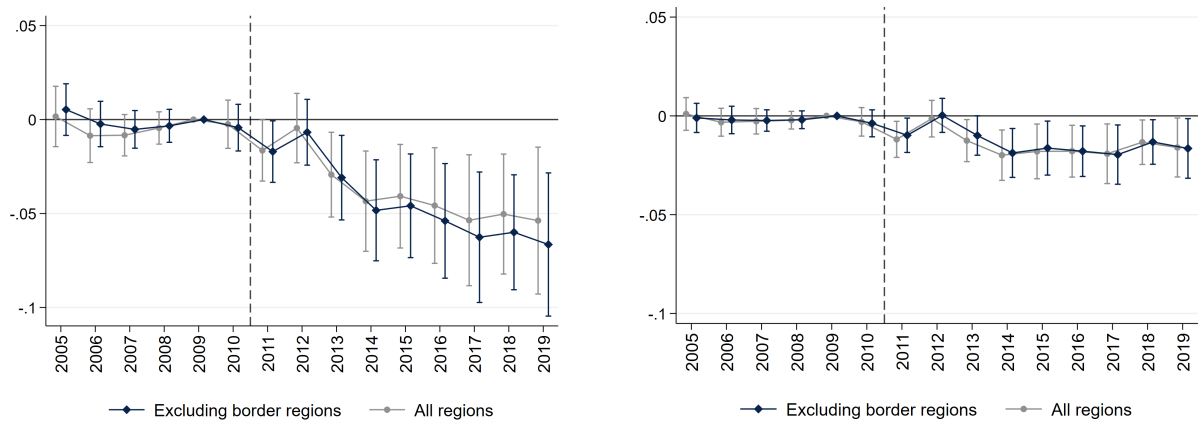
To shed more light on the compositional changes in the workforce, we begin by comparing employment characteristics of the native and foreign LTC workers in Table 4. The table shows that foreign workers earn about 6.4 euros less per day than native workers, despite being more likely to work full-time (45.6% compared to 40.1%). Why are average wages for foreign workers lower, even though most nursing home wages are determined by collective bargaining agreements (see Section 2)? Several factors may contribute. First, there are differences in (recognized) qualifications and responsibilities: foreign workers are substantially more likely to be employed as lower-paid nursing assistants (51.5%) rather than skilled nurses, compared to natives (34.4%). As outlined in Section 2, this may partly result from the requirement of formal recognition of foreign qualifications in order to work as a nurse in Germany, a process that can be administratively and financially demanding. Second, differences in labor market experience in Germany might play a role: native workers have on average 22.0 years of experience, more than twice that of foreign workers.[42] Third, age differences might also matter, although they are less pronounced than the difference in experience. This suggests that foreign workers may have accumulated work experience outside Germany, which is likely not taken into account when determining experience-based wage levels.

Consistent with these differences, we find a causal relationship between immigration and the composition of care workers in nursing homes. Figure 7 shows the effect of immigration on the log average labor market experience (in Germany) and log average age among care workers in nursing homes, depicted in Panels (a) and (b), respectively.[43] By

[42]Our data only captures work experience in Germany, omitting any experience gained abroad.

[43]We cannot estimate the effect of immigration on the share of assistants in nursing homes, since the required information on qualification levels is only available following the introduction of the Classification of Occupations 2010, i.e., from 2012 onward.

Figure 7: Effect of immigration on the composition of the nursing home workforce



(a) Average labor market experience

(b) Average age

Notes: The figure displays the estimated effects of immigration on the average labor market experience and the average age of care workers in nursing homes, along with their 95% confidence intervals, obtained from the second stage of equation (1), estimated separately for each year from 2005 to 2019 based on a sample of 353 regions (377 regions, when including border regions). The outcomes are defined as log differences relative to 2009. The treatment variable is the instrumented change in the stock of foreign-born women per 100 inhabitants (as of 2009), measured over the period from 2009 to 2019. The estimates shown in the figure are reported in Table A6, along with the corresponding OLS estimates and results from alternative specifications.

2019, an additional foreign-born woman per 100 inhabitants decreases average labor market experience by 6.6% and the average age of care workers by 1.6%.

Overall, there is clear evidence for the labor-cost channel: immigration increases the share of foreign workers employed in nursing homes, who earn lower wages on average, thereby reducing average labor costs per worker. The magnitude of the average wage effect is comparable to that of the estimated average price effect of 2.6%, which is plausible given that wages account for 70–80% of total costs.

6.2 Nursing home quality

The arrival of foreign workers could, in principle, affect the quality of care in nursing homes, which may in turn influence pricing. While Furtado and Ortega (2026) and Grabowski et al. (2026a) find that stronger regional immigration inflows improve care quality through higher staffing levels, we observe no change in overall staffing.[44] Instead, there is a shift in staff composition toward a higher share of foreign care workers, who

[44] Furtado and Ortega (2026) and Grabowski et al. (2026a) use health outcomes of nursing home residents, whereas we rely on quality inspections. An alternative measure would be excess mortality among the elderly, but available death statistics do not allow deaths in nursing homes to be separately identified from hospitals. Ultimately, nursing home inspections provide a direct measure of care quality, while health outcomes—including mortality—capture downstream consequences of quality changes.

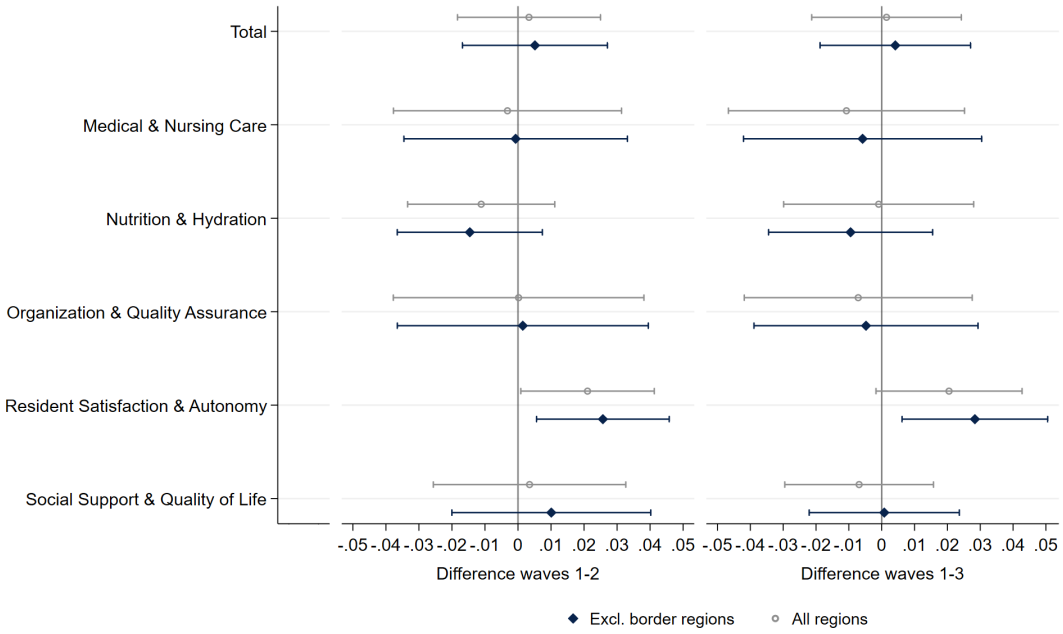
are more likely to work as nursing assistants, have less work experience in Germany, and are younger than native workers. While this pattern could raise concerns about potential quality differences, lower pay does not necessarily reflect lower qualifications, given the potentially limited recognition of foreign credentials (as outlined in Section 2) and the fact that experience acquired outside Germany may not be fully credited in pay scales.

Rather than inferring quality effects from changes in workforce composition, we assess the impact of immigration on care quality directly using the unannounced nursing home inspection reports described in Section 3. We re-estimate equation (1) using the (instrumented) time-invariant treatment and baseline controls. As discussed in Section 3, the quality measures are available in three waves. To match this structure, we adapt the main specification to the lower frequency of the data and compare the change in the share of nursing homes with no issues identified during inspection between waves 2 and 3 (post-labor market opening) and the pre-reform baseline in wave 1.[45] Analogous to the previous analyses, identifying a causal effect requires assuming that past settlement patterns affect the change in nursing home quality only through their impact on subsequent increases in the foreign-born population, and not through any other channels. Unlike for the other outcomes, however, the standardized quality inspections were introduced only in 2009, which prevents us from assessing the plausibility of this assumption by examining pre-trends in the outcome prior to the labor market openings.

Figure 8 reports the main results. We find no effect of immigration on the share of facilities for which no issues were identified in *Medical and Nursing Care, Nutrition and Hydration, Social Support and Quality of Life,* or *Organization and Quality Assurance*. By contrast, immigration is associated with a modest improvement in resident satisfaction and autonomy: in the longer-term, an additional foreign-born woman per 100 inhabitants increases the share of facilities receiving a full score in this domain by 2.8 percentage points. Estimates using the full regional sample yield similar results; furthermore, as shown in Table A7, these effects are also robust to alternative control sets (columns (4)–(5)), an alternative treatment and instrument definition that includes both genders (column (6)), and an alternative harmonization assumption (column (7)).

[45] More precisely, we estimate the following equation separately for each wave $w = \{2, 3\}$: $\Delta share_{r,w} = \alpha_w + \beta_w \Delta F_r + \omega_w X_{r,2009} + \epsilon_{r,w}$, where $\Delta share_{r,w}$ represents the difference in the share of nursing homes with no issues identified during inspection in region *r*; we take these differences between waves $w = \{2, 3\}$ (post-labor market opening) and the pre-reform baseline in wave 1.

Figure 8: Impact of immigration on nursing home quality over short- and long-term horizon



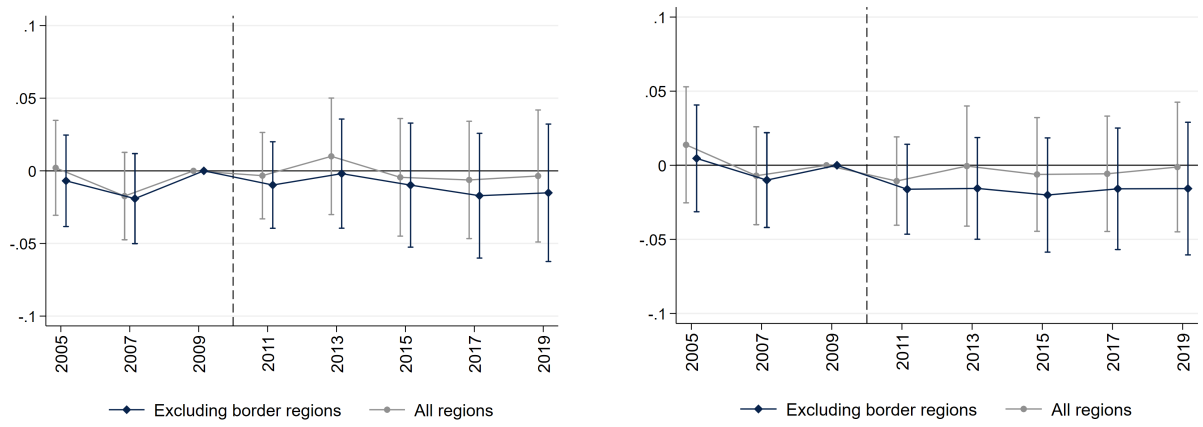
Notes: The figure displays the estimated effects of immigration on the share of nursing homes for which no issues were found across five quality categories, as well as across all categories, along with 95% confidence intervals. Estimates compare changes in these shares in wave 2 (2011–2013) and wave 3 (2014–2016) compared to wave 1 (pre-2011) using two regional samples: all regions (N=369) and a sample excluding regions bordering Poland and the Czech Republic (N=347). For data sources and variable construction, see Appendix C; for the estimates shown in the figure, the corresponding OLS estimates and results from alternative specifications, see Table A7.

6.3 Scale effects

Another potential channel contributing to the decrease in the price of care is the presence of scale effects. If immigration leads to an increase in the number of residents per nursing home, fixed costs, such as administrative overhead, utilities, or building maintenance, are shared by a larger number of recipients. This would lower the average cost per resident, which might translate in lower prices. While we do not directly observe fixed costs, we can investigate whether immigration increases the average capacity and take-up in nursing homes, which would enable scale effects.

To this end, we assess the impact of immigration on average nursing home capacity and the occupancy of nursing home care. As illustrated in Panel (a) of Figure 9, the number of available places in nursing homes does not change with increased immigration after 2011, and no significant pre-trends are detected prior to that. Similarly, we find no effect on the average occupancy of nursing homes in Panel (b). Furthermore, in Figure A7, we analyze a range of auxiliary outcomes related to potential scale effects, including nurs-

Figure 9: Effect of immigration on average nursing home capacity and occupancy



(a) Average NH capacity (available places)

(b) Average NH occupancy (residents receiving care in nursing homes)

Notes: The figure displays the estimated effects on nursing home capacity and occupancy, along with 95% confidence intervals, obtained from the second stage of equation (1), based on a sample of 353 regions (377 regions, when including border regions). The outcomes are defined as log differences relative to 2009. The treatment variable is the instrumented change in the stock of foreign-born women per 100 inhabitants (as of 2009), measured over the period from 2009 to 2019. The estimates shown in the figure are reported in Table A8, along with the corresponding OLS estimates.

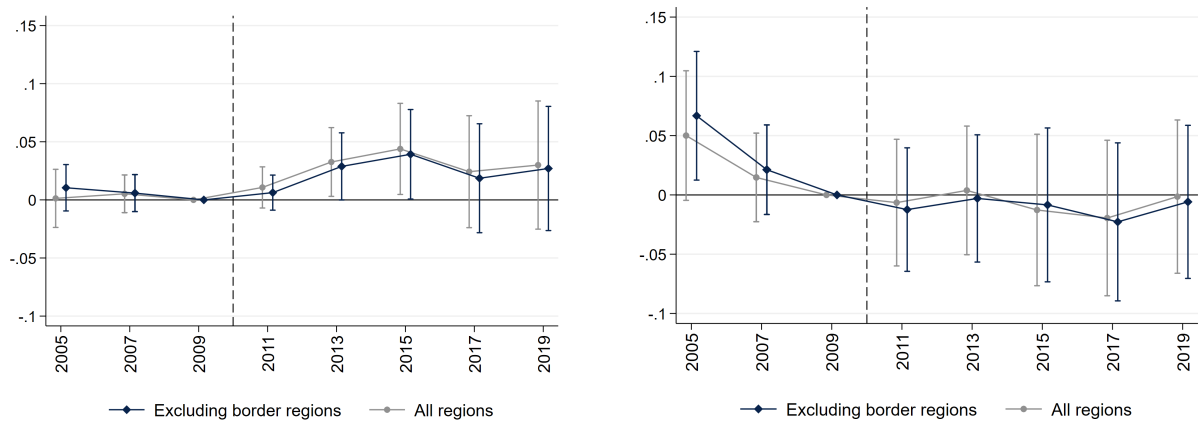
ing home stock, facility entry and exit, regional-level bed capacity, and the regional-level number of care recipients. We find no meaningful effects of immigration on any of these margins.

In sum, we find no evidence that scale effects play a role in price reductions. This finding is consistent with the employment effects documented above, which show no significant change in the number of FTE workers, and hence no change in capacity constraints related to the staffing regulation (see Section 2).

6.4 Substitution effects

We also examine whether inflows of foreign-born individuals affect the take-up of other types of care. With an increase in the number of immigrant workers available to provide home-based care on an informal basis, receiving the cash benefit and arranging care privately may have become more attractive. Although individuals from new EU member states could already provide privately arranged care as self-employed workers or posted workers upon accession, labor market openings may have facilitated immigration. For instance, a spouse's new employment opportunity after 2011 may have enabled their partner to relocate and begin providing this type of care. For ambulatory services provided by professional caregivers, greater staff availability may have allowed providers

Figure 10: Effect of immigration on other types of care



(a) Stock of informal care recipients

(b) Stock of ambulatory care recipients

Notes: The figure displays the estimated effect of immigration on the take-up of care outside of nursing homes, along with 95% confidence intervals, obtained from the second stage of equation (1), based on a sample of 353 regions (377 regions, when including border regions). The outcomes are defined as log differences relative to 2009. The treatment variable is the instrumented change in the stock of foreign-born women per 100 inhabitants (as of 2009), measured over the period from 2009 to 2019. The estimates shown in the figure are reported in Table A8, along with the corresponding OLS estimates.

to expand their capacity, enabling more individuals to access ambulatory care. Both effects could influence competition for care in nursing homes, which could lead to price adjustments.

Figure 10 presents the results. We find a significant positive effect on the take-up of informal care. By 2015, an additional foreign-born woman per 100 inhabitants increases the number of informal care recipients by 3.9%. The point estimates are similar for 2017 and 2019. While the estimates are noisy, the results indicate a clear post-reform level shift. In contrast, we find no effect of immigration on the stock of individuals receiving care from professional caregivers at home.

Previous evidence from the United States documents that immigration affects care arrangements for the elderly. Butcher et al. (2022) show that greater local immigrant availability reduces institutionalization, while Almuhaisen et al. (2024) find that stricter immigration enforcement increases institutionalization rates. Both papers provide indirect evidence on home-based care as the relevant channel, documenting changes in employment and hours worked in the home health and private household sectors. In our setting, we are able to observe a more direct margin through the take-up of cash benefits provided by the long-term care insurance, which are predominantly used to finance privately arranged informal care for individuals with relatively low care needs. We find that immigration increases cash benefit take-up, consistent with an expansion of informal care

provision.

However, in contrast to these U.S. studies, we do not find a decline in the take-up of institutional care. This suggests that, while immigration expands the availability of home-based care, it does not induce substitution away from formal care in Germany. Instead, increased foreign-born labor supply appears to facilitate home-based care arrangements that would otherwise be provided by family members.

Importantly for our main results, greater availability of home-based care plausibly improves the outside option for individuals at lower care levels. This may increase competitive pressure on nursing homes and contribute to the observed price reductions, even in the absence of take-up responses.

7 Conclusion

This paper provides novel evidence on the effects of immigration on prices, focusing on the nursing home sector. To this end, we exploit policy changes in the early 2010s that granted labor market access to workers from the new member states of the European Union. Unlike many sectors where immigrants simultaneously generate both demand and supply shocks, the demographic profile of the EU-11 inflows—predominantly working-age individuals with negligible care needs—allows us to isolate the labor supply channel and, consequently, identify the supply-side effects of immigration.

We show that an inflow of foreign-born women reduces the price of care services, particularly for low-intensity care, while leaving quality unaffected. The decline in prices appears to be driven by a compositional shift in the nursing home workforce toward foreign-born workers, who are generally younger, less experienced, and more likely to occupy lower-wage positions. We find no evidence of scale effects through changes in nursing home capacity. However, we show that immigration increases the uptake of informal care for individuals with low care needs, potentially amplifying competitive pressures on nursing homes and contributing to the observed price declines.

Our findings also shed light on the interaction between market structure and the effects of immigration on prices. Price reductions are largest in low-intensity care and in regions with low market concentration, consistent with the theory that cost savings are more likely to be passed through in competitive markets.

Overall, our results have broader implications for policy and future research. They highlight that immigration can lower prices by increasing labor supply without imposing measurable costs in terms of quality, demonstrating an important mechanism through which immigration can enhance welfare in host-country economies. Moreover, under-

standing potential price effects in the nursing home sector is increasingly important, as population aging and the resulting rise in long-term care needs may exacerbate labor shortages and drive up care prices.

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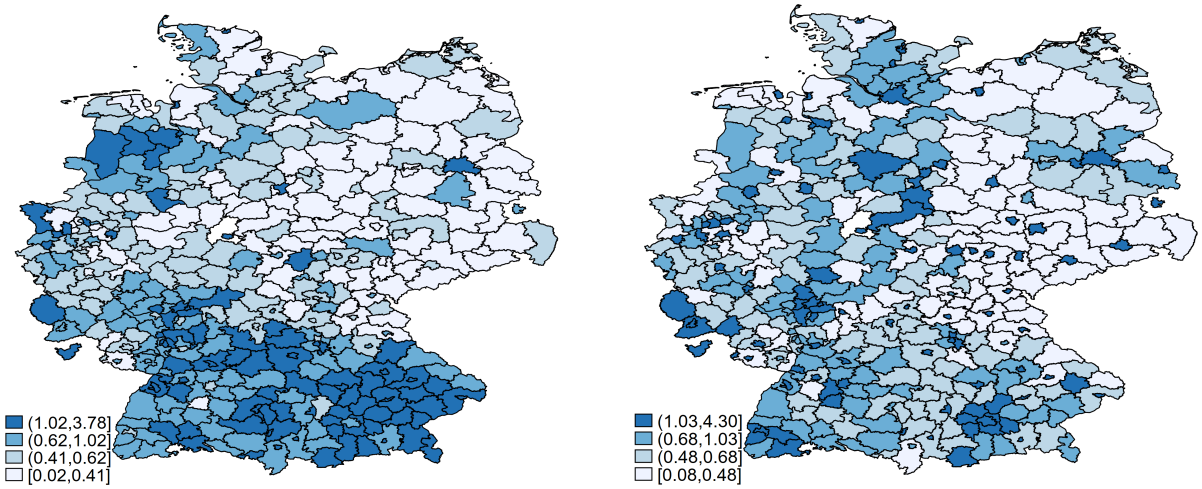
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Online Appendix

A Additional tables and figures

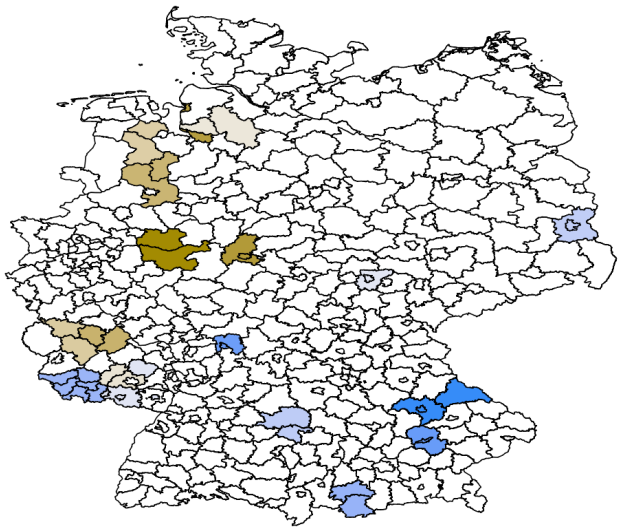
Figure A1: Net change in foreign inflows, 2005–2019



(a) EU-11 (b) Other origins

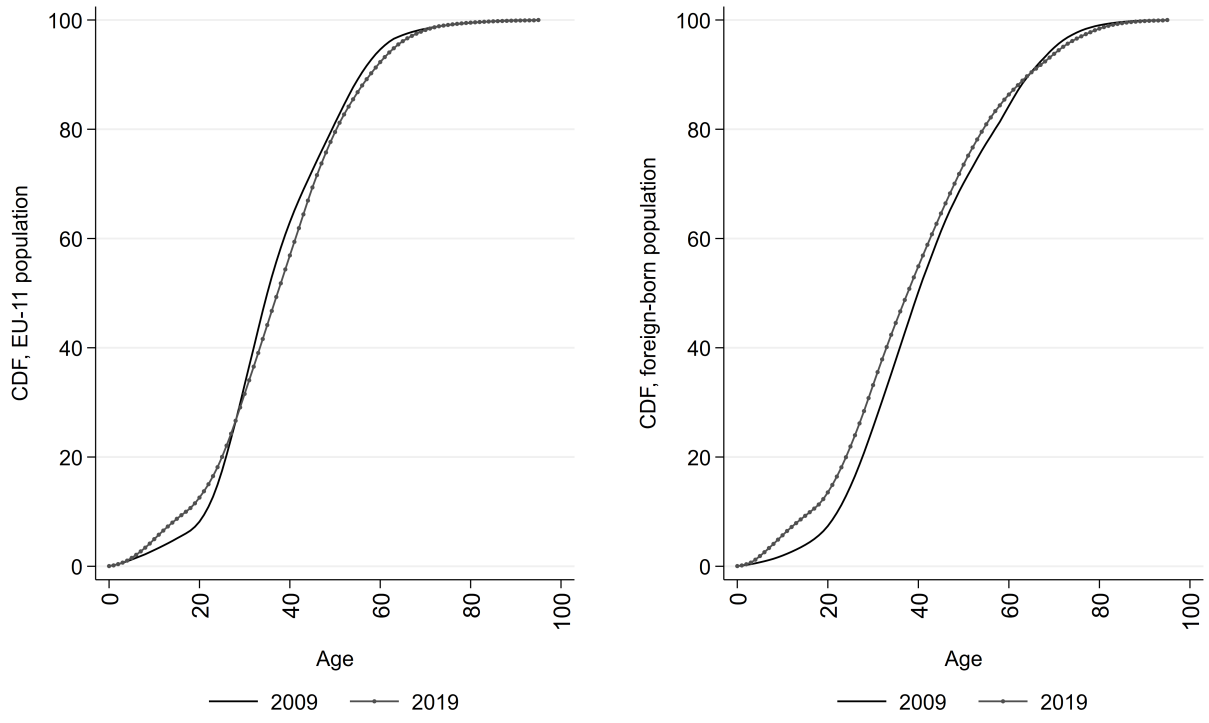
Notes: The maps display the net change in the number of foreign-born women between 2009 and 2019, measured per 100 inhabitants in 2009 and grouped into quartiles. Panel (a) refers to individuals with an EU-11 nationality; Panel (b) refers to migrants from all other origins. Based on own calculations using the German Foreigner Statistics and the INKAR database.

Figure A2: Location and assignment of the combined NUTS-3 regions



Notes: To comply with data privacy regulations, account for joint reporting practices and balance the panel, 42 NUTS-3 regions were combined into 18 larger units. White areas correspond to regions that retained their original boundaries.

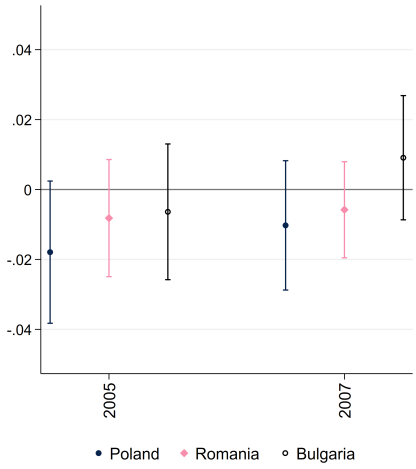
Figure A3: Age distribution by origin



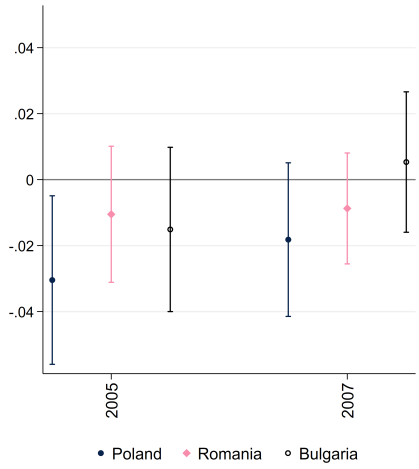
(a) EU-11 (b) All origins

Notes: Own calculation based on Statistisches Bundesamt. GENESIS-Online: Table 12521-0004. Retrieved November 2025, from http://www-genesis.destatis.de/datenbank/online/url/61f40121.

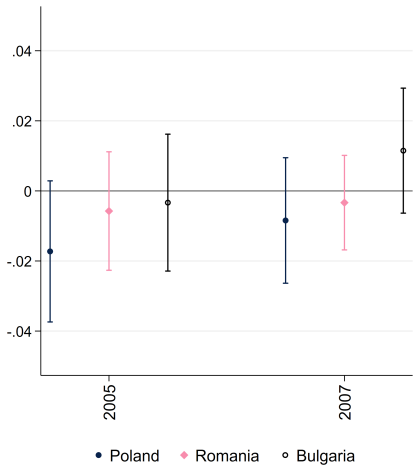
Figure A4: Pre-trend estimates for instruments with highest Rotemberg weights



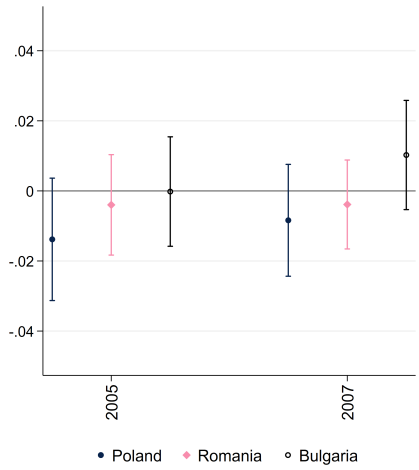
(a) Average price



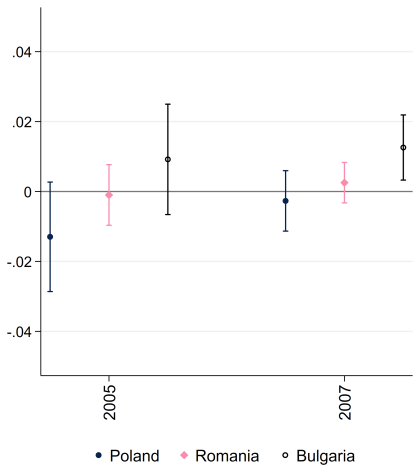
(b) Price of care, care level 1 (low)



(c) Price of care, care level 2 (medium)



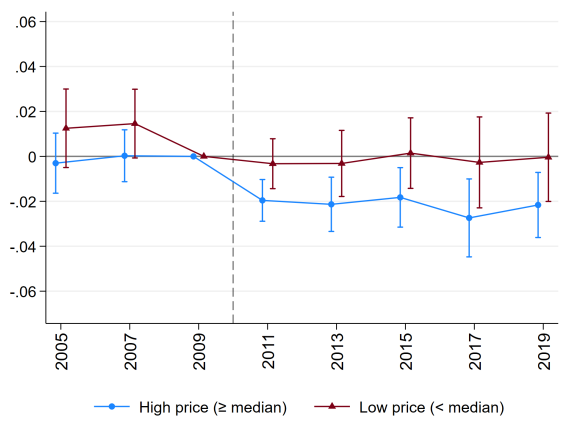
(d) Price of care, care level 3 (high)



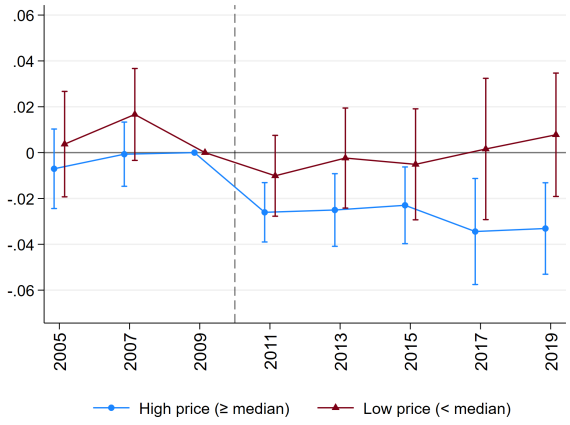
(e) Price of room and board

Notes: Figures plot second-stage coefficients and 95% confidence intervals from estimating equation (1) using shift-share instruments corresponding to the origins with the highest Rotemberg weights: Poland, Romania, and Bulgaria, based on the sample of non-border regions (N=353).

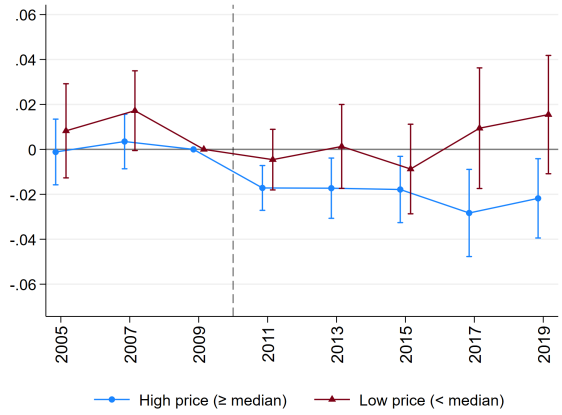
Figure A5: Effect of immigration on price of care by pre-reform price level



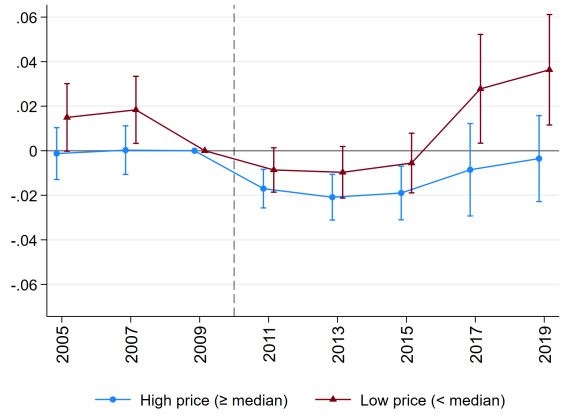
(a) Average price of care



(b) Price of care, care level 1 (low)



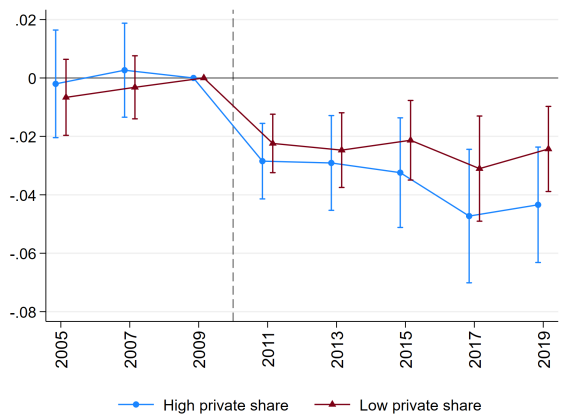
(c) Price of care, care level 2 (medium)



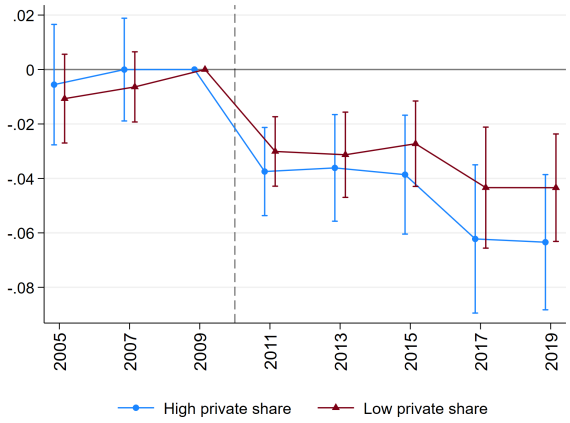
(d) Price of care, care level 3 (high)

Notes: The figure displays the estimated effects of immigration on the price of care and their 95% confidence intervals, based on a sample of 353 regions (excluding border regions). The plotted coefficients correspond to interactions between the instrumented treatment in equation (1) and an indicator for high versus low price level in 2009, where *high* is defined as median regional price or above. The outcome variable is defined as the change in the log price of care from 2009 to t. The treatment variable is the instrumented change in the stock of foreign-born women per 100 inhabitants (as of 2009), measured over the period from 2009 to 2019.

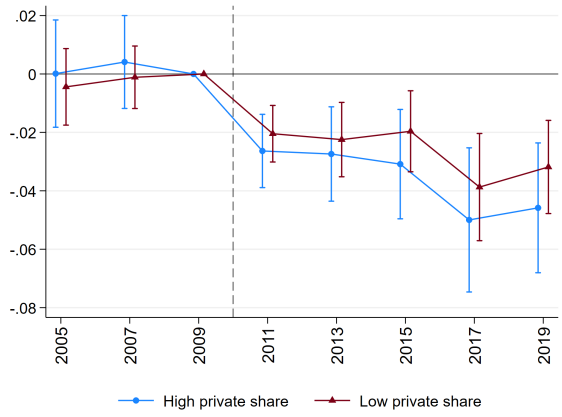
Figure A6: Effect of immigration on price of care by pre-reform regional share of for-profit facilities



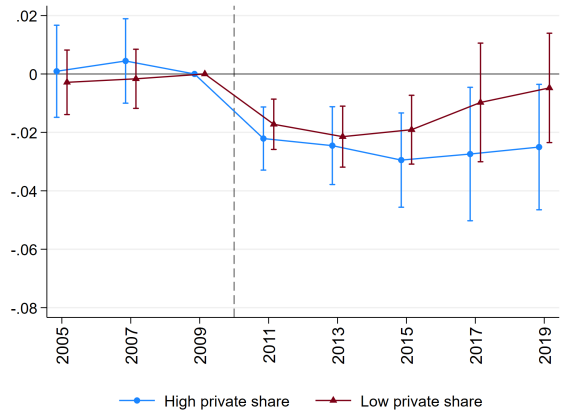
(a) Average price of care



(b) Price of care, care level 1 (low)



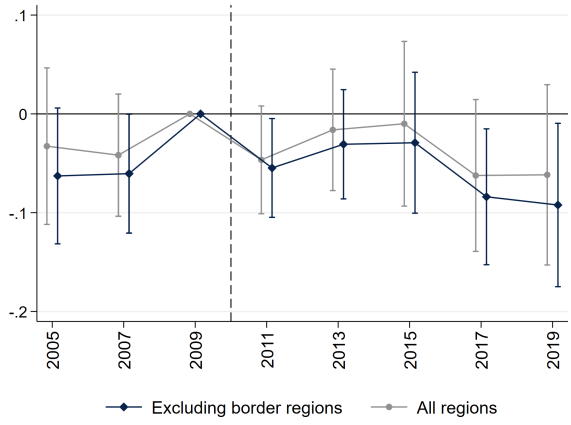
(c) Price of care, care level 2 (medium)



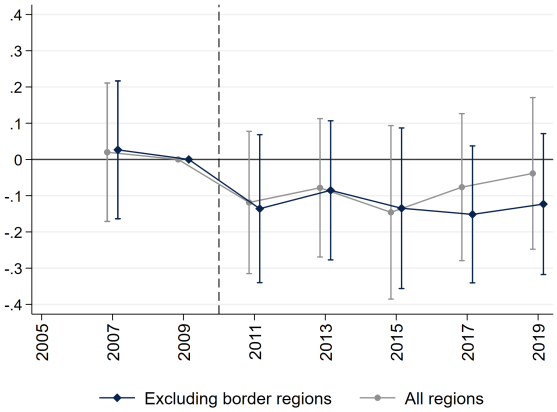
(d) Price of care, care level 3 (high)

Notes: The figure displays the estimated effects of immigration on the price of care and their 95% confidence intervals, based on a sample of 353 regions (excluding border regions). The plotted coefficients correspond to interactions between the instrumented treatment in equation (1) and an indicator for high versus low share of for-profit facilities in 2009, where *high* is defined as median regional share (equal to 0.53) or above. The outcome variable is defined as the change in the log price of care from 2009 to t. The treatment variable is the instrumented change in the stock of foreign-born women per 100 inhabitants (as of 2009), measured over the period from 2009 to 2019.

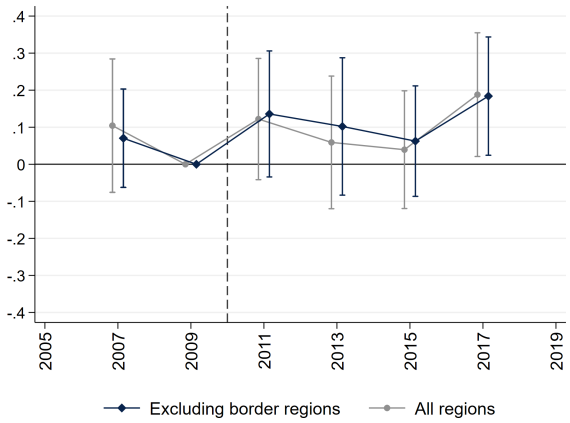
Figure A7: Effect of immigration on nursing home stock, entries and exits



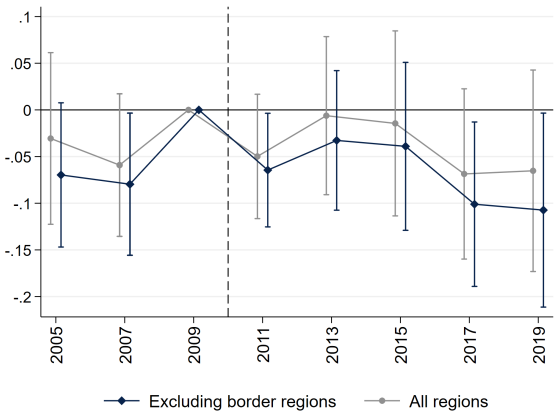
(a) Number of nursing homes



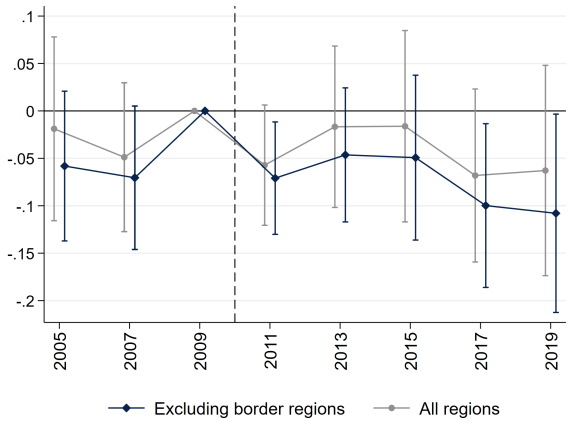
(b) Entries of nursing homes



(c) Exits of nursing homes



(d) Regional stock of available beds



(e) Regional stock of nursing home recipients

Notes: The figure displays the estimated effects on nursing home stock, entries and exits, as well as regional stocks of beds and nursing home recipients along with 95% confidence intervals, obtained from the second stage of equation (1), based on a sample of 353 regions (377 regions, when including border regions). The outcomes are defined as log differences relative to 2009. The treatment variable is the instrumented change in the stock of foreign-born women per 100 inhabitants (as of 2009), measured over the period from 2009 to 2019.

Table A1: Descriptive statistics of nursing home outcomes, sample excl. border regions

Variable	2005	2009	2013	2017
Daily price in nursing homes in euros:				
Average price of care	52.63	54.84	56.17	66.40
	(5.70)	(6.13)	(5.60)	(7.15)
Price of care, care level 1 (low)	42.44	44.87	46.88	54.65
	(5.79)	(6.09)	(5.59)	(7.22)
Price of care, care level 2 (medium)	55.32	58.32	61.19	77.60
	(6.20)	(6.72)	(6.29)	(7.28)
Price of care, care level 3 (high)	69.12	72.61	76.46	86.07
	(6.58)	(7.34)	(7.55)	(7.19)
Price of room and board	18.69	19.63	20.79	23.00
	(3.39)	(3.72)	(4.06)	(4.45)
Worker characteristics in nursing homes:				
Stock of FTE workers	768.81	834.11	921.74	993.02
	(803.50)	(878.76)	(964.95)	(1043.83)
Share of foreign workers	0.05	0.05	0.07	0.11
	(0.05)	(0.05)	(0.06)	(0.08)
Average daily wage	54.92	54.76	57.70	64.17
	(6.21)	(6.08)	(6.48)	(6.53)
Average daily wage of incumbent workers	54.92	54.76	66.02	75.22
	(6.21)	(6.08)	(6.99)	(7.42)
Capacity and occupancy of nursing homes:				
Facility capacity	77.77	77.03	76.25	77.36
	(19.46)	(19.24)	(17.86)	(16.42)
Facility occupancy	68.24	65.72	65.39	69.25
	(18.14)	(16.79)	(15.53)	(14.44)
Regional stock — nursing homes:				
Nursing homes	20.17	22.02	22.70	23.99
	(20.74)	(21.64)	(21.77)	(22.53)
Available places in nursing homes	1538.41	1677.48	1718.76	1839.53
	(1889.93)	(2014.03)	(2026.69)	(2109.88)
Nursing home care recipients	1350.47	1439.07	1495.71	1655.02
	(1653.00)	(1667.16)	(1745.49)	(1879.84)
		353		

Notes: The depicted variables are constructed by first aggregating nursing home data within each region-year cell: price, facility capacity and occupancy, employment as well as wage variables are averaged across facilities, while the other outcomes are summed (see Section 3). For this table, we take the average of these variables across regions for the years 2005, 2009, 2013, and 2017, excluding regions bordering Poland and the Czech Republic. Standard deviations are reported in parentheses in the row below each mean. Based on own calculations.

Table A2: Descriptive statistics of nursing home quality

Category	Wave 1	Wave 2	Wave 3
Medical & Nursing Care	0.541	0.687	0.777
	(0.167)	(0.117)	(0.086)
Nutrition & Hydration	0.753	0.857	0.886
	(0.099)	(0.067)	(0.057)
Organization & Quality Assurance	0.735	0.881	0.921
	(0.113)	(0.047)	(0.041)
Resident Satisfaction & Autonomy	0.777	0.839	0.854
	(0.095)	(0.063)	(0.056)
Social Support & Quality of Life	0.920	0.982	0.992
	(0.074)	(0.022)	(0.016)
Total	0.706	0.814	0.857
	(0.100)	(0.063)	(0.046)
	369	377	377

Notes: The depicted variables are the regional-level averages of the share of nursing homes with no issues found during the inspection, across the three available waves. Based on the sample including all regions. Standard deviations are reported in parentheses in the row below each mean. Based on own calculations.

Table A3: Summary of Rotemberg weights, sample of all regions

Origin	α_c	ΔS_c	F_c
Romania	0.338	201165	15.177
Bulgaria	0.234	98625	6.703
Poland	0.216	141695	5.413
Hungary	0.087	52110	30.093
Croatia	0.073	42240	20.408
Slovakia	0.018	11365	36.695
Lithuania	0.015	13465	19.736
Latvia	0.013	9740	8.706
Czech Republic	0.006	7545	4.287
Estonia	0.001	1250	18.989
Slovenia	0.000	250	17.133

Notes: Table reports Rotemberg weights (α_c), the aggregate change in the stock of foreign-born between 2009-2019 (ΔS_c), and the first-stage F-statistic (F_c) by country of origin c. Estimation uses the Stata package *bartik_weight*, provided in Goldsmith-Pinkham et al. (2020), and is based on the sample of all regions..

Table A4: Effect of immigration on nursing home prices, full results

			IV				
		OLS	Main	All regions	Alternative controls 1	Alternative controls 2	Both genders
		(1)	(2)	(3)	(4)	(5)	(6)
Δ Log average price of care	2005	–0.003	–0.006	–0.006	–0.010*	–0.018	–0.003
		(0.004)	(0.007)	(0.007)	(0.006)	(0.011)	(0.003)
	2007	–0.002	–0.003	–0.003	–0.009*	–0.009	–0.001
		(0.004)	(0.006)	(0.005)	(0.005)	(0.009)	(0.002)
	2011	–0.009**	–0.023***	–0.018***	–0.021***	–0.035***	–0.010***
		(0.004)	(0.005)	(0.007)	(0.004)	(0.010)	(0.002)
	2013	–0.013***	–0.025***	–0.024***	–0.028***	–0.032***	–0.011***
		(0.004)	(0.007)	(0.006)	(0.006)	(0.010)	(0.003)
	2015	–0.011**	–0.022***	–0.017**	–0.019***	–0.031***	–0.009***
		(0.005)	(0.007)	(0.007)	(0.006)	(0.011)	(0.003)
	2017	–0.016***	–0.032***	–0.023**	–0.034***	–0.049***	–0.014***
		(0.005)	(0.009)	(0.010)	(0.008)	(0.014)	(0.004)
	2019	–0.015***	–0.026***	–0.013	–0.031***	–0.042***	–0.011***
		(0.005)	(0.008)	(0.012)	(0.007)	(0.012)	(0.003)
Δ Log price of care, care level 1	2005	–0.004	–0.010	–0.009	–0.013*	–0.023	–0.004
		(0.006)	(0.008)	(0.008)	(0.007)	(0.014)	(0.004)
	2007	–0.002	–0.006	–0.006	–0.012**	–0.014	–0.003
		(0.005)	(0.007)	(0.007)	(0.006)	(0.012)	(0.003)
	2011	–0.011**	–0.031***	–0.025***	–0.028***	–0.045***	–0.013***
		(0.005)	(0.007)	(0.008)	(0.006)	(0.013)	(0.003)
	2013	–0.014***	–0.032***	–0.031***	–0.037***	–0.040***	–0.013***
		(0.005)	(0.008)	(0.008)	(0.007)	(0.012)	(0.003)
	2015	–0.012**	–0.028***	–0.024***	–0.025***	–0.040***	–0.012***
		(0.005)	(0.008)	(0.008)	(0.007)	(0.013)	(0.004)
	2017	–0.025***	–0.045***	–0.034***	–0.041***	–0.069***	–0.019***
		(0.007)	(0.011)	(0.012)	(0.010)	(0.018)	(0.005)
	2019	–0.026***	–0.045***	–0.029**	–0.050***	–0.068***	–0.019***
		(0.007)	(0.010)	(0.013)	(0.009)	(0.017)	(0.004)
Δ Log price of care, care level 2	2005	–0.002	–0.004	–0.004	–0.008	–0.014	–0.002
		(0.004)	(0.007)	(0.007)	(0.006)	(0.011)	(0.003)
	2007	–0.001	–0.001	–0.002	–0.007	–0.005	–0.000
		(0.003)	(0.006)	(0.005)	(0.005)	(0.009)	(0.002)
	2011	–0.008**	–0.021***	–0.017***	–0.020***	–0.031***	–0.009***
		(0.003)	(0.005)	(0.006)	(0.004)	(0.009)	(0.002)
	2013	–0.012***	–0.023***	–0.022***	–0.026***	–0.028***	–0.010***
		(0.004)	(0.007)	(0.006)	(0.006)	(0.010)	(0.003)
	2015	–0.010**	–0.021***	–0.016**	–0.018***	–0.026**	–0.009***
		(0.004)	(0.007)	(0.007)	(0.006)	(0.011)	(0.003)
	2017	–0.021***	–0.040***	–0.028**	–0.046***	–0.052***	–0.017***
		(0.005)	(0.009)	(0.011)	(0.009)	(0.014)	(0.004)
	2019	–0.019***	–0.033***	–0.019	–0.042***	–0.046***	–0.014***
		(0.005)	(0.008)	(0.013)	(0.007)	(0.013)	(0.004)

Notes: The table reports estimates of Equation (1) for our main specification and sample as well as under alternative specifications and samples. Column (1) presents OLS results with baseline controls for the main sample. Column (2) shows second-stage IV results with the same controls for the main sample (also shown in Fig. 4). Column (3) considers an alternative sample including all regions. Column (4) uses an alternative control set: fertility rate and ratio of facilities to elderly above 75. Column (5) extends the baseline control set to additionally include local GDP per capita, unemployment rate, and proportion of women among unemployed. Column (6) builds the treatment and the instrument using both genders. Regressions are based on 353 regions, except for column 3, which uses 377 regions. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A4: Effect of immigration on nursing home prices, full results (continued)

			IV				
		OLS	Main	All regions	Alternative controls 1	Alternative controls 2	Both genders
		(1)	(2)	(3)	(4)	(5)	(6)
Δ Log price of care, care level 3	2005	–0.000	–0.003	–0.002	–0.006	–0.014	–0.001
		(0.004)	(0.006)	(0.006)	(0.005)	(0.010)	(0.002)
	2007	–0.001	–0.001	–0.001	–0.006	–0.007	–0.001
		(0.003)	(0.005)	(0.005)	(0.005)	(0.009)	(0.002)
	2011	–0.007**	–0.018***	–0.013**	–0.016***	–0.030***	–0.007***
		(0.003)	(0.004)	(0.006)	(0.004)	(0.008)	(0.002)
	2013	–0.012***	–0.022***	–0.019***	–0.021***	–0.028***	–0.009***
		(0.003)	(0.005)	(0.005)	(0.005)	(0.009)	(0.002)
	2015	–0.010***	–0.020***	–0.014**	–0.016***	–0.029***	–0.008***
		(0.004)	(0.006)	(0.007)	(0.005)	(0.010)	(0.003)
	2017	–0.003	–0.011	–0.010	–0.017**	–0.023	–0.005
		(0.006)	(0.010)	(0.011)	(0.009)	(0.017)	(0.004)
	2019	–0.002	–0.007	–0.002	–0.015*	–0.018	–0.003
		(0.006)	(0.010)	(0.012)	(0.008)	(0.016)	(0.004)
Δ Log price of room and board	2005	–0.000	0.003	0.000	–0.001	0.001	0.001
		(0.002)	(0.004)	(0.004)	(0.003)	(0.006)	(0.002)
	2007	–0.000	0.003	0.003	–0.001	0.004	0.001
		(0.002)	(0.003)	(0.003)	(0.002)	(0.005)	(0.001)
	2011	–0.003**	–0.001	–0.001	0.002	0.001	–0.000
		(0.001)	(0.002)	(0.003)	(0.002)	(0.004)	(0.001)
	2013	–0.003	–0.004	–0.002	–0.000	–0.006	–0.002
		(0.003)	(0.004)	(0.004)	(0.003)	(0.005)	(0.002)
	2015	0.000	–0.000	0.001	0.006	0.002	0.000
		(0.003)	(0.004)	(0.004)	(0.004)	(0.006)	(0.002)
	2017	–0.001	–0.002	–0.001	0.005	–0.001	–0.001
		(0.004)	(0.007)	(0.007)	(0.006)	(0.009)	(0.003)
	2019	0.001	0.005	0.008	0.013**	0.006	0.002
		(0.004)	(0.006)	(0.007)	(0.006)	(0.010)	(0.003)

Notes: The table reports estimates of Equation (1) under various specifications. Column (1) presents OLS results with baseline controls and regional sample. Column (2) shows second-stage IV results with the same controls (also shown in Fig. 4). Column (3) includes all regions. Column (4) uses an alternative control set: fertility rate and ratio of facilities to elderly above 75. Column (5) extends the baseline control set to additionally include local GDP per capita, unemployment rate, and proportion of women among unemployed. Column (6) builds the treatment and the instrument using both genders. Regressions are based on 353 regions, except for column 3, which uses 377 regions. Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table A5: Effect of immigration on employment and wages, full results

			IV			
		OLS	Main	All regions	Alternative controls 1	Both genders
		(1)	(2)	(3)	(4)	(5)
Δ Log FTE staff	2005	–0.008	0.015	0.016	0.024*	0.007
		(0.010)	(0.016)	(0.017)	(0.013)	(0.007)
	2006	–0.005	0.008	0.006	0.015	0.004
		(0.009)	(0.012)	(0.013)	(0.010)	(0.005)
	2007	–0.002	0.007	0.001	0.011	0.003
		(0.008)	(0.012)	(0.012)	(0.010)	(0.005)
	2008	–0.009	0.004	0.001	0.005	0.002
		(0.006)	(0.009)	(0.009)	(0.008)	(0.004)
	2010	–0.002	0.010	0.009	0.006	0.004
		(0.006)	(0.010)	(0.009)	(0.009)	(0.004)
	2011	–0.007	0.020	0.014	0.021	0.009
		(0.009)	(0.020)	(0.019)	(0.019)	(0.008)
	2012	–0.012	0.014	0.005	0.023	0.006
		(0.013)	(0.024)	(0.024)	(0.024)	(0.010)
	2013	–0.007	0.008	0.001	0.011	0.004
		(0.012)	(0.024)	(0.024)	(0.023)	(0.010)
	2014	0.003	0.006	–0.002	0.001	0.003
		(0.011)	(0.022)	(0.022)	(0.023)	(0.009)
	2015	0.006	0.009	–0.002	0.004	0.004
		(0.012)	(0.022)	(0.023)	(0.024)	(0.009)
	2016	0.007	0.003	–0.013	–0.005	0.001
		(0.012)	(0.022)	(0.024)	(0.025)	(0.009)
	2017	–0.002	–0.005	–0.017	–0.011	–0.002
		(0.012)	(0.024)	(0.025)	(0.026)	(0.010)
	2018	–0.007	–0.020	–0.033	–0.026	–0.008
		(0.013)	(0.026)	(0.027)	(0.028)	(0.011)
	2019	0.006	–0.002	–0.012	–0.009	–0.000
		(0.014)	(0.027)	(0.027)	(0.029)	(0.011)
Δ Share of foreign workers	2005	–0.000	–0.002	–0.001	–0.003	–0.001
		(0.001)	(0.003)	(0.003)	(0.002)	(0.001)
	2006	–0.001	–0.004*	–0.003	–0.005**	–0.002*
		(0.001)	(0.002)	(0.002)	(0.002)	(0.001)
	2007	–0.000	–0.002	–0.002	–0.003*	–0.001
		(0.001)	(0.002)	(0.002)	(0.002)	(0.001)
	2008	0.001	–0.001	–0.001	–0.002	–0.001
		(0.001)	(0.002)	(0.002)	(0.002)	(0.001)
	2010	0.001	0.000	0.000	0.000	0.000
		(0.001)	(0.002)	(0.002)	(0.002)	(0.001)
	2011	–0.000	–0.003	–0.003	–0.003	–0.001
		(0.001)	(0.003)	(0.003)	(0.003)	(0.001)
	2012	0.003	0.005	0.004	0.004	0.002
		(0.002)	(0.003)	(0.003)	(0.003)	(0.001)
	2013	0.006***	0.014***	0.013***	0.013***	0.006***
		(0.002)	(0.004)	(0.003)	(0.003)	(0.001)
	2014	0.011***	0.022***	0.020***	0.021***	0.009***
		(0.002)	(0.005)	(0.005)	(0.004)	(0.002)
	2015	0.013***	0.025***	0.023***	0.024***	0.011***
		(0.003)	(0.005)	(0.005)	(0.005)	(0.002)
	2016	0.017***	0.036***	0.033***	0.036***	0.015***
		(0.004)	(0.008)	(0.008)	(0.007)	(0.003)
	2017	0.022***	0.037***	0.035***	0.039***	0.016***
		(0.004)	(0.007)	(0.007)	(0.007)	(0.003)
	2018	0.028***	0.048***	0.045***	0.049***	0.021***
		(0.004)	(0.009)	(0.008)	(0.008)	(0.004)
	2019	0.030***	0.049***	0.045***	0.052***	0.021***
		(0.005)	(0.010)	(0.009)	(0.009)	(0.004)

Notes: See notes of Table A4 for details. *** p<0.01, ** p<0.05, * p<0.1.

Table A5: Effect of immigration on employment and wages, full results (continued)

			IV			
		OLS	Main	All regions	Alternative controls 1	Both genders
		(1)	(2)	(3)	(4)	(5)
Δ Log mean wage	2005	–0.002	–0.010	–0.006	–0.014**	–0.005
		(0.004)	(0.007)	(0.008)	(0.006)	(0.003)
	2006	–0.008*	–0.012*	–0.010	–0.015**	–0.005*
		(0.004)	(0.007)	(0.007)	(0.006)	(0.003)
	2007	–0.002	–0.009	–0.005	–0.013***	–0.004
		(0.004)	(0.006)	(0.006)	(0.005)	(0.002)
	2008	–0.001	–0.006	–0.003	–0.008*	–0.003
		(0.003)	(0.005)	(0.006)	(0.005)	(0.002)
	2010	–0.003	–0.011	–0.007	–0.007	–0.005
		(0.004)	(0.007)	(0.008)	(0.007)	(0.003)
	2011	–0.007	–0.005	–0.003	–0.002	–0.002
		(0.005)	(0.009)	(0.009)	(0.008)	(0.004)
	2012	–0.005	0.001	0.004	–0.001	–0.000
		(0.005)	(0.009)	(0.010)	(0.008)	(0.004)
	2013	–0.012*	–0.027***	–0.024**	–0.023**	–0.012***
		(0.006)	(0.010)	(0.011)	(0.009)	(0.004)
	2014	–0.011*	–0.032***	–0.025**	–0.028***	–0.014***
		(0.006)	(0.011)	(0.011)	(0.010)	(0.004)
	2015	–0.012*	–0.027**	–0.021*	–0.027***	–0.012**
		(0.007)	(0.011)	(0.012)	(0.010)	(0.005)
	2016	–0.013*	–0.026**	–0.020	–0.030***	–0.011**
		(0.007)	(0.012)	(0.012)	(0.010)	(0.005)
	2017	–0.018**	–0.039***	–0.033**	–0.043***	–0.017***
		(0.007)	(0.014)	(0.014)	(0.012)	(0.006)
	2018	–0.019***	–0.030***	–0.024*	–0.035***	–0.013***
		(0.007)	(0.011)	(0.012)	(0.010)	(0.005)
	2019	–0.021***	–0.037***	–0.031**	–0.039***	–0.016***
		(0.007)	(0.014)	(0.015)	(0.013)	(0.006)
Δ Log mean wage, incumbents	2005	–0.002	–0.010	–0.006	–0.014**	–0.005
		(0.004)	(0.007)	(0.008)	(0.006)	(0.003)
	2006	–0.008*	–0.012*	–0.010	–0.015**	–0.005*
		(0.004)	(0.007)	(0.007)	(0.006)	(0.003)
	2007	–0.002	–0.009	–0.005	–0.013***	–0.004
		(0.004)	(0.006)	(0.006)	(0.005)	(0.002)
	2008	–0.001	–0.006	–0.003	–0.008*	–0.003
		(0.003)	(0.005)	(0.006)	(0.005)	(0.002)
	2010	–0.006*	–0.011*	–0.009	–0.009*	–0.005*
		(0.004)	(0.006)	(0.006)	(0.005)	(0.002)
	2011	–0.002	–0.001	–0.006	0.002	–0.001
		(0.004)	(0.007)	(0.009)	(0.006)	(0.003)
	2012	–0.003	–0.005	–0.007	–0.002	–0.002
		(0.004)	(0.008)	(0.009)	(0.007)	(0.003)
	2013	–0.004	–0.005	–0.007	–0.001	–0.002
		(0.005)	(0.008)	(0.009)	(0.007)	(0.004)
	2014	–0.001	0.001	0.001	0.006	0.001
		(0.006)	(0.010)	(0.010)	(0.009)	(0.004)
	2015	–0.002	0.002	0.003	0.005	0.001
		(0.006)	(0.011)	(0.011)	(0.009)	(0.004)
	2016	–0.005	0.006	0.005	0.008	0.002
		(0.006)	(0.011)	(0.012)	(0.010)	(0.005)
	2017	–0.012*	–0.003	–0.004	–0.003	–0.001
		(0.006)	(0.011)	(0.012)	(0.010)	(0.005)
	2018	–0.012*	–0.004	–0.003	–0.007	–0.002
		(0.006)	(0.011)	(0.012)	(0.010)	(0.005)
	2019	–0.015**	–0.004	–0.003	–0.010	–0.002
		(0.007)	(0.013)	(0.013)	(0.011)	(0.005)

Notes: See notes of Table A4 for details. *** p<0.01, ** p<0.05, * p<0.1.

Table A6: Effect of immigration on the workforce composition in nursing homes, full results

			IV			
		OLS	Main	All regions	Alternative controls 1	Both genders
		(1)	(2)	(3)	(4)	(5)
Δ Log average LM experience	2005	0.015***	0.005	0.002	0.017**	0.003
		(0.005)	(0.007)	(0.008)	(0.007)	(0.003)
	2006	0.008*	–0.002	–0.009	0.005	–0.001
		(0.004)	(0.006)	(0.007)	(0.006)	(0.003)
	2007	0.003	–0.005	–0.008	0.001	–0.002
		(0.004)	(0.005)	(0.006)	(0.005)	(0.002)
	2008	–0.001	–0.003	–0.004	0.001	–0.001
		(0.003)	(0.004)	(0.004)	(0.004)	(0.002)
	2010	0.001	–0.004	–0.003	–0.003	–0.002
		(0.004)	(0.006)	(0.007)	(0.006)	(0.003)
	2011	–0.008*	–0.017**	–0.016**	–0.019**	–0.007**
		(0.005)	(0.008)	(0.008)	(0.008)	(0.003)
	2012	–0.004	–0.007	–0.005	–0.015*	–0.003
		(0.005)	(0.009)	(0.009)	(0.009)	(0.004)
	2013	–0.014**	–0.031***	–0.029**	–0.040***	–0.013***
		(0.006)	(0.011)	(0.012)	(0.011)	(0.005)
	2014	–0.022***	–0.048***	–0.043***	–0.062***	–0.021***
		(0.006)	(0.014)	(0.014)	(0.014)	(0.006)
	2015	–0.026***	–0.046***	–0.041***	–0.066***	–0.020***
		(0.007)	(0.014)	(0.014)	(0.015)	(0.006)
	2016	–0.028***	–0.054***	–0.046***	–0.076***	–0.024***
		(0.008)	(0.016)	(0.016)	(0.016)	(0.006)
	2017	–0.031***	–0.063***	–0.054***	–0.086***	–0.027***
		(0.008)	(0.018)	(0.018)	(0.018)	(0.007)
	2018	–0.036***	–0.060***	–0.050***	–0.085***	–0.026***
		(0.008)	(0.016)	(0.016)	(0.015)	(0.006)
	2019	–0.042***	–0.066***	–0.054***	–0.091***	–0.029***
		(0.009)	(0.019)	(0.020)	(0.019)	(0.008)
Δ Log mean age	2005	0.002	–0.001	0.001	–0.002	–0.000
		(0.002)	(0.004)	(0.004)	(0.003)	(0.002)
	2006	–0.001	–0.002	–0.003	–0.004	–0.001
		(0.002)	(0.004)	(0.004)	(0.003)	(0.001)
	2007	–0.001	–0.002	–0.003	–0.003	–0.001
		(0.002)	(0.003)	(0.003)	(0.002)	(0.001)
	2008	–0.001	–0.002	–0.002	–0.001	–0.001
		(0.002)	(0.002)	(0.002)	(0.002)	(0.001)
	2010	0.000	–0.004	–0.003	–0.000	–0.002
		(0.002)	(0.003)	(0.004)	(0.003)	(0.001)
	2011	–0.005*	–0.010**	–0.012**	–0.008*	–0.004**
		(0.003)	(0.004)	(0.005)	(0.004)	(0.002)
	2012	–0.001	0.000	–0.001	–0.000	0.000
		(0.003)	(0.004)	(0.005)	(0.004)	(0.002)
	2013	–0.005*	–0.010*	–0.013**	–0.009*	–0.004**
		(0.003)	(0.005)	(0.005)	(0.005)	(0.002)
	2014	–0.008***	–0.019***	–0.020***	–0.020***	–0.008***
		(0.003)	(0.006)	(0.006)	(0.006)	(0.003)
	2015	–0.009***	–0.016**	–0.018**	–0.019***	–0.007**
		(0.003)	(0.007)	(0.007)	(0.007)	(0.003)
	2016	–0.009***	–0.018***	–0.018***	–0.020***	–0.008***
		(0.003)	(0.007)	(0.007)	(0.006)	(0.003)
	2017	–0.008**	–0.020**	–0.019**	–0.022***	–0.009***
		(0.003)	(0.008)	(0.008)	(0.007)	(0.003)
	2018	–0.007**	–0.013**	–0.013**	–0.014***	–0.006**
		(0.003)	(0.006)	(0.006)	(0.005)	(0.002)
	2019	–0.009***	–0.016**	–0.016**	–0.016**	–0.007**
		(0.003)	(0.008)	(0.008)	(0.007)	(0.003)

Notes: See notes of Table A4 for details. *** p<0.01, ** p<0.05, * p<0.1.

Table A7: Effect of immigration on nursing home quality

		IV					
	OLS	Main	All regions	Alternative controls 1	Alternative controls 2	Both genders	Different cutoff
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Difference waves 1-2							
Total	0.005	0.005	0.003	0.003	0.002	–0.013	
	(0.006)	(0.011)	(0.011)	(0.010)	(0.005)	(0.018)	
Medical & Nursing Care	0.004	–0.001	–0.003	–0.007	–0.001	–0.042	
	(0.009)	(0.017)	(0.018)	(0.015)	(0.007)	(0.028)	
Nutrition & Hydration	–0.006	–0.015	–0.011	–0.015	–0.006	–0.036*	
	(0.006)	(0.011)	(0.011)	(0.010)	(0.005)	(0.020)	
Organization & Quality Assurance	0.003	0.001	0.000	0.001	0.000	–0.024	
	(0.010)	(0.019)	(0.019)	(0.017)	(0.008)	(0.032)	
Resident Satisfaction & Autonomy	0.017***	0.026**	0.021**	0.029***	0.011**	0.029*	
	(0.006)	(0.010)	(0.010)	(0.009)	(0.004)	(0.017)	
Social Support & Quality of Life	–0.003	0.010	0.004	0.007	0.004	0.020	
	(0.005)	(0.015)	(0.015)	(0.013)	(0.006)	(0.029)	
Panel B: Difference waves 1-3							
Total	0.011	0.004	0.001	0.002	0.001	–0.020	0.001
	(0.007)	(0.012)	(0.012)	(0.010)	(0.005)	(0.018)	(0.012)
Medical & Nursing Care	0.014	–0.006	–0.011	–0.011	–0.004	–0.054*	–0.011
	(0.012)	(0.019)	(0.018)	(0.016)	(0.008)	(0.030)	(0.020)
Nutrition & Hydration	0.001	–0.009	–0.001	–0.014	–0.004	–0.045**	–0.016
	(0.008)	(0.013)	(0.015)	(0.011)	(0.005)	(0.022)	(0.014)
Organization & Quality Assurance	0.009	–0.005	–0.007	–0.008	–0.003	–0.026	–0.006
	(0.011)	(0.017)	(0.018)	(0.015)	(0.007)	(0.030)	(0.017)
Resident Satisfaction & Autonomy	0.019***	0.028**	0.021*	0.030***	0.012**	0.032*	0.028**
	(0.007)	(0.011)	(0.011)	(0.010)	(0.005)	(0.018)	(0.011)
Social Support & Quality of Life	–0.004	0.001	–0.007	0.000	0.000	0.003	0.001
	(0.005)	(0.012)	(0.012)	(0.010)	(0.005)	(0.020)	(0.012)

Notes: The table reports estimates of a modified Eq. (1) (see footnote 45) under various specifications. Column (1) presents OLS results with baseline controls and regional sample. Column (2) shows second-stage IV results with the same controls (also shown in Figure 4). Column (3) includes all regions. Column (4) uses an alternative control set: fertility rate and ratio of facilities to elderly above 75. Column (5) extends the baseline control set with GDP per capita, unemployment rate, and the proportion of women among unemployed. Column (6) builds the treatment and the instrument using both genders. In Columns (1)–(6), we treat a grade of 1.0 in waves 1 and 2 as equivalent to the criterion being satisfied for 100% of residents in wave 3. In Column (7), we lower this threshold to at least 85%. Based on a balanced panel of 347 regions, except for column (3), which uses 369 regions. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table A8: Effect of immigration on outcomes related to availability and use of care, full results

	Δ Log number facilities		Δ Log places available		Δ Log NH residents		Δ Log outpatient care recipients		Δ Log informal care recipients	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
2005	–0.011	–0.063*	–0.006	–0.007	0.003	0.005	0.034**	0.067**	0.009	0.010
	(0.019)	(0.035)	(0.009)	(0.016)	(0.010)	(0.018)	(0.017)	(0.028)	(0.007)	(0.010)
2007	–0.009	–0.060**	–0.009	–0.019	–0.003	–0.010	0.014	0.021	0.002	0.006
	(0.015)	(0.031)	(0.008)	(0.016)	(0.009)	(0.016)	(0.011)	(0.019)	(0.005)	(0.008)
2011	–0.031**	–0.055**	0.006	–0.010	0.001	–0.016	–0.015	–0.012	0.005	0.006
	(0.013)	(0.026)	(0.007)	(0.015)	(0.007)	(0.015)	(0.012)	(0.027)	(0.005)	(0.008)
2013	–0.002	–0.031	0.012	–0.002	0.001	–0.016	–0.015	–0.003	0.016*	0.029*
	(0.016)	(0.028)	(0.009)	(0.019)	(0.009)	(0.018)	(0.013)	(0.027)	(0.008)	(0.015)
2015	0.019	–0.029	0.014	–0.010	0.002	–0.020	–0.021	–0.008	0.026**	0.039**
	(0.018)	(0.036)	(0.011)	(0.022)	(0.011)	(0.020)	(0.015)	(0.033)	(0.011)	(0.020)
2017	–0.003	–0.084**	0.014	–0.017	0.016	–0.016	–0.030*	–0.023	0.024*	0.019
	(0.018)	(0.035)	(0.011)	(0.022)	(0.011)	(0.021)	(0.017)	(0.034)	(0.014)	(0.024)
2019	–0.012	–0.092**	0.018	–0.015	0.016	–0.016	–0.033*	–0.006	0.034**	0.027
	(0.022)	(0.042)	(0.014)	(0.024)	(0.013)	(0.023)	(0.018)	(0.033)	(0.016)	(0.027)

Notes: The table reports estimates of Equation (1). Column (1) presents OLS results with baseline controls. Column (2) shows second-stage IV results with the same controls, where the immigration treatment is instrumented with a shift-share instrument depicted in equation (2). Regressions are based on 353 regions. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

B Harmonizing Care Prices Over Time

The classification of care levels/degrees changed between 2015 and 2017, shifting from three care levels to five care grades (Table B9). As a result, detailed care prices are not directly comparable over the full period. To address this, we use two approaches. First, we collapse the level-specific prices into a single aggregate measure, the *average price*. Second, we construct a harmonized series of prices by care level using an imputation method. Both procedures are described below.

Table B9: Mapping from Care Levels to Care Grades

Care Level until 2015	Care Grade from 2017
Not yet assigned	1
Care Level 0 Care Level 1	2
Care Level 1 with high impairment Care Level 2	3
Care Level 2 with high impairment Care Level 3	4
Care Level 3 with high impairment Care Level 3 Hardship	5

Construction of the average price

We first calculate, for each care level and year, the total number of residents at the national level. From these counts, we derive the within-year resident shares by care level, resulting in three shares until 2015 and five shares from 2017 onward. Using these shares as weights, we then compute a weighted average of the level-specific prices. The resulting aggregate measure, which we refer to as the *average price*, provides a single, time-consistent price series.

Price imputation procedure

We assume that the prices in the new classification are weighted averages of the prices under the old system (according to the diagram), where the weights are relative proportions of the care groups:

$$
\begin{aligned}
p_{5,2} &= \alpha_5 p_{3,1} + (1-\alpha_5) p_{3H,1} \\
p_{4,2} &= \alpha_4 p_{2,1} + (1-\alpha_4) p_{3,1} \\
p_{3,2} &= \alpha_3 p_{1,1} + (1-\alpha_3) p_{2,1} \\
p_{2,2} &= \alpha_2 p_{1,1} + (1-\alpha_2) p_{0,1}
\end{aligned}
$$

Note that we do not use the new price of grade 1 care ($p_{1,2}$) in our imputation procedure. High impairment does not entail any additional payment. Furthermore, $p_{0,1}$ and $p_{3H,1}$ are not observed in our data. We assume that α_5 = 1, which is close to the empirical alpha of over 0.9. For the years 2017–2019, we then impute prices at the *facility* level according to the following procedure:

$$
\begin{aligned}
&\Rightarrow \hat{p}_{3,1} = p_{5,2} \\
&\Rightarrow \hat{p}_{2,1} = \frac{p_{4,2} - p_{5,2}(1-\alpha_4)}{\alpha_4} \\
&\Rightarrow \hat{p}_{1,1} = \frac{p_{3,2} - \hat{p}_{2,1}(1-\alpha_3)}{\alpha_3}
\end{aligned}
$$

if both prices are non-missing. If only one of the prices is known and the other missing—which happens when the facility does not offer a given care level—we set the imputed price equal to the known price. For years 2005–2015, no imputation is needed, so $\hat{p}_{l,1} = p_{l,1}$.

The α parameters are calculated using the counts of dependents $d_{l,0}$ and $d_{l,1}$ at the *national* level, where $d_{l,0}$ denotes dependents in care level l and $d_{l,1}$ denotes those in care level l with high impairment.[46] The dummy for high impairment is only available for years 2013 and 2015. For these years, we can therefore compute α_3 and α_4 directly.

$$
\begin{aligned}
\alpha_3 &= \frac{d_{1,1}}{d_{1,1} + d_{2,0}} \\
\alpha_4 &= \frac{d_{2,1}}{d_{2,1} + d_{3,0}}
\end{aligned}
$$

[46] This way, we allow the regional variation in imputed prices to be driven by changes in the underlying prices, rather than by changes in the composition of dependents at the regional level.

For 2017 and 2019, we assume that α_3 and α_4 follow a linear trend between 2013 and 2015 and extend this trend forward. Concretely, we (1) compute α_3 and α_4 in 2013 and 2015, (2) derive their biennial change over this interval, and (3) use this change to extrapolate the values for 2017 and 2019. In practice, the 2017 values equal the 2015 levels plus one biannual increment, while the 2019 values add two increments.

C Quality reports data

To evaluate the impact of immigration on the quality of care in nursing homes, we rely on quality report data for checks performed between 2009 and 2016. Nursing homes are controlled—through regular and unannounced visits—since 2009, with the results of these checks accessible online in the form of grades to a set of over seventy questions. As historical scores are not readily available, we rely on two sources to build a panel of scores: first, data collected by Herr et al. (2016) for years 2009–2013 (henceforth HNR), as well as data shared by one of Germany's largest health insurers AOK through the online care-home comparison tool Correctiv (henceforth AOK), for years 2014–2016. Due to questionnaire reform starting in 2014, the two data sources feature a somewhat different questionnaire as well as scores system. The below gives details of the sample selection and harmonization of the two sources.

Sample definition

HNR restricts their dataset to fully-inpatient homes with at least 10 residents that require general care, i.e. excluding facilities specialized in particular conditions, such as dementia, or strokes. We perform the same sample restrictions in the AOK data to make it comparable over time. We label reports between 2009-03-02 and 2011-04-28 as wave 1; wave 2 encompasses reports between 2011-05-02 and 2013-03-11; wave 3 contains reports between 2014-02-05 and 2016-03-21. In wave 3, if two or more exams have been performed over the period of data collection, to avoid multiple-counting of facilities, we take the last observed examination and drop the rest.

Assigning facilities to regions

In line with the baseline analysis, we build a regional-level panel dataset. The data from HNR readily contains the information on the region in which a facility is located. For the AOK data, we assign the region according to i) latitude and longitude coordinates of the supplied facility address, using the open-source geo-locator Nominatim, ii) assigning

region to a post-code—if facility cannot be geo-located in step i), iii) manual assignment into regions if previous steps do not yield a unique NUTS-3 region.

Harmonizing and categorizing questions

Until 2014, the questionnaire contained 82 questions, while there were 77 questions in years 2014–2016. 34 questions are found phrased exactly the same in both questionnaires. Another 40 questions are matched manually and rely on a slight sentence rephrasing.[47] Unmatched questions are discarded. Following this procedure leaves us with 74 questions.

To make the results more tractable, in the next step, we categorize these questions into 5 broad categories. We rely on ChatGPT 4o to perform the categorization. The category definitions, together with examples, are depicted in Table C1.

Outcomes

Until 2014, only final grades (for each question) are available. These grades are based on the German schooling grade system, where 1.0 is the best possible grade, and 5.0 is the worst. After 2014, rather than the final grades, reports include the number of nursing home residents for which a given criterion was satisfied or otherwise. We follow HNR and construct a regional-level proportion of facilities that get a perfect score (2009–2013: grade of 1.0; 2014–2016: 100% of those surveyed fulfilled the criterion). We use this proportion as the outcome in a first-difference model, where the difference is taken over both a shorter time horizon (between waves 1 and 2) and a longer time horizon (between waves 1 and 3) .

[47] An example match is as follows: "Sind Ort und Zeitpunkt der Entstehung der chronischen Wunde/des Dekubitus *dokumentiert*?" is matched with "Sind Ort und Zeitpunkt der Entstehung der chronischen Wunde/des Dekubitus *nachvollziehbar*?" (Are the location and time of the chronic wound/pressure ulcer *documented* versus *traced*?).

Table C1: Categories of quality assessment

Category	Description	Example Questions
Medical & Nursing Care	Covers clinical processes including risk management, medication, wound care, fall prevention, and dementia-specific treatment planning.	Is the implementation of treatment and nursing measures in line with medical instructions? Is the provision of medication in line with the doctor's orders? Is active communication with the physician comprehensible if needed?
Nutrition & Hydration	Focuses on assessment and support for nutrition and fluid intake, dietary preferences, meal presentation, and related care routines.	Are individual nutritional resources and risks recorded? Are the necessary measures taken when there are restrictions on independent fluid intake? Are the meals and drinks presented in a way that considers residents' abilities?
Organization & Quality Assurance	Includes facility-level processes like documentation, staff training, room layout, cleanliness, and use of orientation aids.	Are the employees regularly trained in first aid and emergency measures? Are rooms and furnishings clean and appropriately designed? Does the care facility have a complaints management system?
Resident Satisfaction & Autonomy	Covers resident feedback, personal preferences, privacy, hygiene, dignity, and self-determination in daily routines.	Is it possible for residents to design their daily routines individually? Is privacy respected in intimate care situations? Can residents express their wishes and have them taken into account?
Social Support & Quality of Life	Involves social integration, family/community engagement, onboarding, group/individual activities, and emotional support.	Are suitable group activities offered as part of social care? Are relatives or persons of trust adequately involved in care? Are there activities to maintain contact with the local community?