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COMPARING THE GERMAN AND JAPANESE NURSING HOME SECTORS: IMPLICATIONS OF DEMOGRAPHIC AND POLICY DIFFERENCES

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Comparing the German and Japanese nursing home sectors: Implications of demographic and policy differences

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Abstract

This research provides a comparative study of the Japanese and German nursing home sectors. Faced with aging populations, both countries share similar long-term care policies based on social insurance. However, descriptive statistics indicate significant differences in the outcomes and costs in their respective nursing home sectors. This research aims to identify the reasons for this state of affairs by examining demographic and policy differences between the two countries. To shed light on the subject from multiple angles, we conduct three types of empirical analysis—regression, the Blinder-Oaxaca decomposition, and data envelopment analysis—on regional data from the past decade. Our findings indicate that the different outcomes are driven by both demographic and policy differences where policy relates to long-term care as well as to additional welfare aid. In terms of policy, a key difference is found in the designs of the welfare programs for low-income elders. In Germany, our results are consistent with moral hazard due to the generous design of the welfare program, while in Japan, our results do not indicate moral hazard, which may be due to strict nursing home admission rules for welfare recipients.

Keywords: Japanese and German nursing home sectors, long-term care insurance, Blinder-Oaxaca decomposition, comparative study, moral hazard, welfare policy

JEL: I13; I18; J14

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1 Introduction

In this study, we compare nursing home care in Japan and Germany. In response to demographic changes, developed countries have established various public policies on elder care. These policies differ from country to country, which may result in different outcomes. Thus, an international comparison could yield useful results for the construction of efficient and robust public policy tools.

Faced with rapidly aging societies, both Japan and Germany have established mandatory social long-term care insurance (LTCI) as a foundation of elder-care policy. Germany established LTCI in 1995, and Japan followed in 2000. As summarized in Tamiya et al. (2003), the Japanese government learned much from Germany's previous experience, and thus these programs have many factors in common. Yet descriptive statistics reveal a significant difference in the outcomes of their respective nursing home sectors. Specifically, in Germany, a higher number of elderly people enter nursing homes that offer care at higher costs.

This research explores the factors behind these observations, looking at demographic and welfare policy differences between the two countries. With respect to demography, Japan faces a more rapidly aging population than Germany. In addition, as LTCI provides different kinds of coverage in terms of the level of care, demographic elements such as regional population typically have different institutional effects on the respective outcomes.

Furthermore, Japan's and Germany's welfare policies differ in both LTCI and non-LTCI elements. Each country's unique LTCI program shapes its national nursing home sector, resulting in different segmentations of their nursing home markets. Even more importantly, there are substantial differences in the designs of their social welfare programs for nursing home care that supplement LTCI: there are stricter rules for Japanese than for German residents to receive government benefits in the event that they cannot augment their social care by making out-of-pocket payments.

To validate the effects of these demographic and welfare policy differences on the nursing home sector from multiple methodological angles, we employ three empirical analyses using regional data. First, we employ regression analysis in which the demographic and policy factors are included as explanatory variables. Our dependent variables are the

utilization rates of nursing homes and nursing home costs per resident, i.e., the extensive margin of participating in nursing home care in relation to the intensive margin of the price asked for these services.

In this regression analysis, our primary interest is in the correlation between the dependent variables and the welfare policy, which is captured by two explanatory variables, regional gross domestic product (GDP) and the rate of welfare coverage. In a natural setting, regions where the average household income is low may impose more restrictions on receiving nursing home care due to severe budget constraints; hence, the correlation would be positive. If, on the other hand, we find a negative correlation from the regression analysis, a possible interpretation would be ex-post moral hazard (Zweifel and Manning, 2000), meaning that poorer regions in which more people are covered by welfare programs or in which higher welfare support is issued to account for lower income levels may use more nursing home care and at higher costs. To avoid spurious correlations in this analysis, we control for, in addition to demographic variables, regional health status, the accessibility of at-home care, regional competition among nursing homes, and the amount of labor input in nursing homes.

Second, in addition to the above regression-based analysis, we follow previous studies such as Nyman and Bricker (1989) by using data envelopment analysis (DEA) to obtain more information on the supply side of the nursing home sector. If moral hazard exists, nursing homes face a less competitive environment because social assistance offers security for home managers against insolvency by welfare payments, which contribute to running costs. Thus, we expect more relaxed home management and subsequent lower efficiency of nursing homes.

Third, to derive more quantitative implications from the regression results on demographic variables, we employ the Blinder-Oaxaca (B-O) decomposition (Blinder, 1973; Oaxaca, 1973) for international comparison. This allows us to decompose the impact of demographic differences into the effects of endowment and institutional differences. We highlight the role of aging and of institutional differences based on the various features that characterize the country-specific LTCI and welfare systems and use such information to run a simulation on nursing home perspectives.

Our empirical results suggest the existence of moral hazard in Germany, especially in densely populated regions. Specifically, we find that the utilization rates and costs of

nursing homes are higher in poorer areas or regions with wider welfare coverage. On the demand side, this result corresponds to social policy issues since, in Germany, care-dependent persons with lower incomes are eligible for social assistance (the *Hilfe zur Pflege* or Help for Care program), which covers residual copayments, at least in part. In addition, the professional care provided in nursing homes—though significantly more costly— was more frequently utilized than at-home professional care (indeed, this was one of the focal points of LTCI reform in 2017).[3] Hence, this scenario amounts to moral-hazard behavior of care-dependent persons and/or their family members who, despite having access to the less expensive alternative of at-home care, demand nursing home care while being backed from social assistance (Konetzka et al., 2019, p. 235)—and, perhaps additionally, while thereby taking advantage of the fewer within-family burdens home care typically involves.

On the supply side, our findings seem to reflect the fact that care providers are exposed to less price competition the greater the regional relevance of welfare due to poor household income. In our analysis, this result also holds when considering, instead of income, the percentage of persons eligible for social assistance, a variable which also indicates regional wealth. Hence, higher costs observed in poorer areas may result from a less cost-sensitive care provision due to moral hazard behavior on the part of nursing home managers: the large size of welfare contribution, typically accompanied by a high number of clients eligible for social assistance, protects the managers from the risk of a decline in utilization rates.

In addition to the moral hazard, our empirical results show that both demographic and welfare policy factors contribute to the difference in outcomes. Among the demographic factors, the increase in the elderly portion of the population has considerable monetary implications for welfare policy in Germany, especially if the increase in Germany's aging population begins to resemble that of Japan.

This research contributes to the growing literature on policies on long-term care and welfare. Our findings on the interaction between a country's welfare program and its long-

[3] Within our sample period of 2001 to 2015, according to data from Pflegestatistik, the share of formal care, which consists of nursing home care and formal at-home care, remained around 52%. Thereby, utilization of nursing home care, starting at 30% in 2001, decreased only slightly to 28% in 2015, leaving a 24% share for professional at-home care. The share of informal care at home was always about 48%.

term care insurance are applicable to other developed nations. In the US, nursing home care is mainly covered by Medicaid, a public insurance provider for low-income individuals. Grabowski, Gruber, and Angelelli (2008) showed that state-level differences in Medicaid benefits do not affect the individual choice to utilize a nursing home. Moreover, Grabowski and Gruber (2007) demonstrated that there is no difference in the quality of nursing home care for residents with Medicaid coverage or private insurance. In summary, these studies do not provide evidence for moral hazard caused by Medicaid. Recently, Hackman (2019) showed that the quality of nursing home care increases when a nursing home has more residents with Medicaid, possibly because nursing homes can avoid excessive competition, which is often a major factor driving markets with high fixed costs. In addition, Hackmann and Pohl (2018) indicated that Medicaid users prolong their nursing home stays instead of transitioning to community-based care while the nursing home providers try to shorten the stay of Medicaid users in order to admit more profitable out-of-pocket patients. In short, these studies imply that Medicaid did not result in a straightforward type of moral-hazard behavior.[4]

On the other hand, some studies do indicate the existence of moral hazard caused by welfare policies in LTCI. For instance, in South Korea, which also has LTCI, Kim, Kwon, Yoon, and Hyun (2013) showed that subsidies for low-income populations affected patterns of service utilization among LTCI users. Furthermore, in Japan, Fu and Noguchi (2019) showed that the Japanese welfare program caused moral hazard for long-term care in general.

Several studies have provided descriptive analyses to compare countries with LTCI systems, such as Germany, the Netherlands, South Korea, and Japan. Specifically, Campbell, Ikegami, and Gibson (2010) examined Japan and Germany; Alders, Costa-Font, de Klerk, and Frank (2015) considered the Netherlands and Germany; and Rhee, Done, and Anderson (2015) compared South Korea, Germany, and Japan. The quantitative empirical research on which to base comparative studies is rare because of the difficulty of collecting compatible data. In one exception, though, a study closely related to ours is that of Bakx, de Meijer, Schut, and Doorslaer (2015), who analyzed LTCI and at-home care in the Netherlands and Germany via the B-O decomposition.

[4] Following previous studies, such as Grabowski and Gruber (2007), we do not consider the income effect to be a source of moral hazard, as suggested by Nyman (1999).

2 Background

2.1 Different outcomes from Japanese and German nursing homes

Table 1 here

Table 1 shows national-level descriptive statistics for nursing home outcomes, with detailed definitions and sources described in Section 4. Columns (1) and (2) display the utilization rate of nursing homes and the annual nursing home costs per resident in USD with purchasing power parity for selected years in our sample. The detailed definition of "nursing home costs" can be found in Section 2.3.1. We clearly see differences in utilization rate and nursing home costs between Japan and Germany. Column (1) shows that the utilization rate in Germany is twice that of Japan. Furthermore, as of 2007, the average duration of a nursing home stay was 3.4 years in Germany (Schulz, 2010) and 4.0 years in Japan (Ministry of Health, Labor and Welfare, 2008), while the nationwide capacity of nursing homes was 799,059 in Germany (Rothgang, 2010) and 418,114 in Japan (Ministry of Health, Labor and Welfare, 2008). Because the duration of the average stay does not differ much between Japan and Germany, these statistics highlight the larger supply of nursing homes in Germany.

Column (2) reports that the average nursing home costs per resident in Germany are 1.5 times higher than those in Japan. In short, Germany has a wider and more costly nursing market. As both countries have LTCI as the basis of their long-term care policies, we take this as the starting point for our empirical investigation.

As is well known, the general demand for long-term care is driven by demographic and financial factors. However, the type of long-term care depends on societal and infrastructural factors. Therefore, the next three subsections focus on these country-level differences. The first subsection analyzes for both countries the demographics that constitute the major components of the endowment-effect variables. Next, we analyze the differences in the two welfare systems by focusing on LTCI and social welfare as the most prominent institutional characteristics. Other factors include societal and infrastructural characteristics that are not directly identified in our study but which are broadly reflected by the types of regions: low population density corresponds to predominantly rural areas, typically

accompanied by a lower level of care infrastructure and a richer multigenerational family structure, whereas high population density corresponds to predominantly urban areas, typically accompanying a more complete care infrastructure, more diversified labor markets, and higher living costs.[5] We account for these factors using regional variation by separating densely and sparsely populated regions.

2.2 Demography and its implications for LTCI

Figure 1 here

Germany and Japan both have aging populations, but their demographic trajectories are different. Figure 1 shows the proportions of elderly (65+) people among the overall populations in Germany, Japan, and the G7 countries, as taken from Office for Economic Co-operation and Development (OECD) data. Germany has had a larger proportion of elderly persons than the G7 countries as a whole since 1970, and the proportion of the elderly has increased almost in parallel in Germany and the G7 countries since that time. Japan started out with a lower share of elderly people than the other G7 countries in 1970. However, due to rapid aging, Japan took second place among the G7 countries in 1994 and surpassed Germany in 2000.[6] As a result, during our observation period, the share of the elderly was larger in Japan than in Germany.

Furthermore, both general life expectancy and health expectancy (disability-free life expectancy) differ between these two countries. The World Health Organization (2015, pp. 46–47) showed that health expectancy for those born in 2013 was 71 and 75 years (while general life expectancy was 76 and 79 years) in Germany and Japan, respectively. In

[5] Important overall-country differences are family structure and informal care. In Germany, the proportion of elders (65+) living in multigenerational households is seemingly low (approximately 0.25% within population), as a comparative study of Europe and North America demonstrates (see Rodrigues et al., 2012). Although we do not have directly comparable measures for Japan, the proportion of households where elderly people co-reside with a child out of all elderly households was 42.3% for Japan in 2010 (Nakamura and Sugawara, 2016). As a result, the overall percentages of children among informal caregivers were 60% in Japan in 2001 and 28% in Germany in 1998 (see Huber 2005, p. 35), while higher shares can be assumed for rural areas.

[6] Chen et al. (2012) provided detailed forecasts for Japan that show that the aging trend will continue in the near future.

summary, the key demographic difference is that Japan has a higher percentage of elderly people than Germany because of the longer life and health expectancy of Japanese people.

In addition to the above-mentioned demographic differences, the two countries also have institutional differences in their treatment of the elderly population. Specifically, there is a general tendency for LTCI to be more aligned in Japan than in Germany. The two countries' LTCI programs have similar payment mechanisms; for example, the number of available benefits and the unit cost depend on the level of care needed. Japanese LTCI had six levels until 2006 and has had seven levels since then, while German LTCI had three care levels until 2016 and has had five levels since then. Masuda (2013) claimed that the higher three levels (Care Required 3, 4, and 5) in Japanese LTCI broadly corresponded to the German levels 1, 2, and 3 before 2016. As indicated by the fact that Japanese LTCI has more care-need levels, Japanese LTCI offers wider coverage for less serious disabilities than the German program. To satisfy the demand from the elderly population with lighter care needs, the Japanese program provides a wide variety of at-home care services in addition to institutional care.

2.3 Policies for nursing homes

2.3.1 Market segmentation, care costs, and LTCI

In comparing the LTCI of the two countries, the nursing home sector reveals a clear difference in market segmentation. Japanese LTCI contains two sectors within its nursing home market. One is the market for nonprofit nursing homes, while the other is the market for for-profit nursing homes.[7]

Nonprofit nursing homes and for-profit nursing homes are ruled by different systems. The functions of nonprofit nursing homes are generally covered by LTCI, while only a few of the functions of for-profit nursing homes, namely direct care, are covered by LTCI. As a result, nonprofit nursing homes are less expensive, whereas for-profit homes are more

[7] Nonprofit and for-profit nursing homes are translations of the terms *kaigo roujin fukushi shisetsu* and *yuuryou roujin houmu*. In Sugawara (2017), nonprofit and for-profit nursing homes are called "public" and "private" nursing homes, reflecting the payment resources.

expensive and attract wealthy customers. In addition, as noted by Sugawara (2017), many for-profit nursing homes require advance payments toward lifetime rents as soon as a resident enters the home. This requirement dictates that Japanese for-profit nursing homes have a completely different payment mechanism from Japanese nonprofit nursing homes or German nursing homes, whose costs are based on monthly payments.

In this study, we focus on the nonprofit nursing homes of Japan because of the different payment mechanism and lack of accessibility to cost data among for-profit nursing homes. As Sugawara (2017) demonstrated, the average monthly out-of-pocket expense for for-profit homes in 2009 was 308,000 yen (100 yen = 1 USD), which did not include care costs for the LTCI service. On the other hand, calculation from our data show that the average monthly out-of-pocket expense for nonprofit homes in 2019 was 20,193 yen. The wide gap between these two prices implies that nonprofit and for-profit homes attract people with different levels in their assets, and hence these markets might be completely distinct. Therefore, we expect that the elimination of for-profit homes does not distort our analysis.

German LTCI, on the other hand, has established a unified nursing home sector that consists of public homes, homes owned by charitable organizations, and for-profit homes. Unlike Japanese LTCI, German LTCI treats these homes equally and does not segment the market for institutional care, although there is no formal regulation of the upper limits of the prices that providers may charge.

For nursing homes in both countries, there are two payment elements, care costs and hotel costs, the latter of which pertains to the costs of lodging and food. In both countries, care costs are at least partly covered by LTCI benefits, while hotel costs are not. For care costs, LTCI in both countries have ceilings of coverage, which depend on the level of care needed. The ceilings are predetermined by the national government across all regions.

Japanese nonprofit nursing homes assign a fixed price for care costs, which depend on the care-need level of each resident, based on a uniform remuneration system across the country[8] under LTCI, while for-profit homes can set their own prices for the most part. Thus, costs in nonprofit nursing homes can be differentiated at the resident level based on the care services provided (such as dementia care and medical care), care-need level, or hotel costs.

For German LTCI, the situation is relatively similar. Care arrangements are fixed

[8] In the remuneration system, exchange rates between remuneration points and Japanese yen have slight regional differences to reflect regional price differences.

within the country, while nursing home costs are locally determined based on negotiations between the individual homeowner and the main regional funding institutions, i.e., regional representatives of LTCI and social welfare, an element which at least favors homogeneous price settings and, thus, homogeneous copayments to be paid for those costs not covered by LTCI.[9] As reported by LTCI companies, the within-region variations in hotel costs for their insured residents are extremely small, while across-region variations in costs are driven more by cost-of-living considerations and by state-specific regulations than by ownership.[10] In this sense, at least from a resident perspective, German nursing homes appear to be more homogeneous in terms of efficiency and quality, despite the variety of ownership.

2.3.2 Social welfare programs and the nursing home sector

In addition to the difference in their LTCI systems, there is a clear distinction between Japan and Germany with respect to the social welfare programs they use to supplement LTCI. In both countries, the share of nursing home costs not covered by LTCI take the form of copayments and are paid by a combination of residents' out-of-pocket payments and social welfare programs outside of LTCI. The respective compositions of costs covered by LTCI, residents, and supplementary social welfare programs differ markedly in the two countries.

In Japan, LTCI covered 90% of care costs, while 10% were paid for out-of-pocket, during our research period.[11] The eligibility for LTCI is determined solely by care need and there is no means-test. In addition, there exists a social welfare program called "public

[9] Each nursing home has to negotiate the cost breakdown with the LTCI funds and the respective supra-local carrier of social welfare. In this way, the costs for the services of long-term care are oriented to the benefits provided according to the Social Security Code. The hotel costs are formally less restricted and charged in the form of copayments. In Germany, since 2017, nursing home cost differentiation has been limited, as copayments within a home have to be independent of the care-need level (*Einrichtungseinheitlicher Eigenanteil*). There is ongoing discussion regarding the possibility of reversing the LTCI design in order to fix copayments while LTCI remuneration is residual within each country.

[10] For example, AOK Plus, the largest health insurance company in the State Saxony, reports that the range of hotel-cost variation among nursing homes was below 5% in 2015, based on the interview with the author. Even total costs seem to vary only fractionally within Germany, as indicated in Mennicken et al. (2014, Table 3) by a below-10% standard deviation of costs.

[11] The ratio of out-of-pocket expenses increased to 20% in 2015 and 30% in 2018 for those with higher incomes.

assistance" (*seikatsu hogo*), which covers people whose household income is below a specific amount. The beneficiaries of public assistance are freed from having to pay the costs of care not covered by LTCI. For hotel costs in nursing homes, the coverage of public assistance depends on the type of facility. Hotel costs for the older facilities (*juurai-gata*), which mainly consist of shared rooms with multiple beds, are covered by public assistance, while hotel costs for the newer type of facilities (*unit-gata*), which consist only of private rooms, have to be paid for out-of-pocket by residents, even if they are recipients of public assistance.[12]

On the relationship between LTCI and public assistance, Fu and Noguchi (2019), using claims data for LTCI, showed that 18% of LTCI claims are covered by public assistance. Furthermore, they show that 50% of elderly citizens had at some point received public assistance coverage, while 97% of the elderly experienced non-public assistance payment for LTCI. In other words, elderly people start to use LTCI without public assistance but often become eligible for it later in life.

In Germany, there is a means-test of care level for which LTCI pays a within-country fixed but limited amount of benefits. This covers approximately 70% of nursing home costs, meaning copayments account for around 30% (see Table 2). To cover these remaining copayments, the German social welfare program plays a major role in cases where the financial resources of residents or their relatives are not sufficient. According to the Social Security Code XI (*Sozialgesetzbuch* XI), there is a governmental social assistance program, called Help for Care *(Hilfe zur Pflege*), which is provided by the respective municipality or by a supra-local carrier responsible for social assistance and refinanced by the federal government. Thereby, social assistance is paid if the copayments due exceed the needy person's family net income minus a family-specific deductible for necessary subsistence. For example, a single person having a deductible of EUR 110 per month and being confronted with own monthly copayments of EUR 982 (care level 2 in Saxony 2015) receives social assistance in case his income falls below EUR 1.092. This allows elderly citizens to close the gap between income and necessary subsistence.[13] The share of residents receiving at least

[12] The larger share of the multiple bed rooms is another distinguished property of Japanese nursing homes. Huber (2005, p.49) shows that the average numbers of persons per room were 2.8 in Japan in 2002 and this is double of the figure in Germany in 2001.
[13] Data provided by the welfare representative in Saxony, *Komunaler Sozialverband Sachsen*.

some relief from this form of social assistance was approximately 32% within our sample period.[14]

2.3.3. Possible impact of welfare programs on demand and supply of nursing home care

In this research, we investigate whether the welfare programs may cause ex-post moral hazard. Because LTCI achieves universal coverage,[15] it does not cause moral hazard. On the other hand, the welfare programs devoted to low-income households can cause moral hazard among persons eligible for social assistance and thus lead to excess utilization of nursing home care. A reason for this might be that this form of care allows family members who prefer higher labor force participation to do so.[16] In regions with a high share of welfare recipients, poorer families often have much experience of other social welfare programs. This encourages them to opt for outside care in case a family member becomes in need of care, as the needy person typically is eligible for social assistance and the family circumstances would make it difficult to provide care at home, at least from family members perspective.

Ex-post moral hazard can also occur by increasing care costs per resident: we demonstrate that this holds for Germany in regions where population coverage increases, but also in regions where income levels decrease. In Japan, although the price for basic nursing home care is fixed, there is a possibility that nursing homes provide optional services to increase the costs for PA recipients. In Germany, our findings on nursing home accommodation seem to parallel the development of rents demanded in social housing: in both cases, the residents are captive consumers prone to abrupt rises in accommodation prices (see Rothgang 2005, p. 74), and it is the federal government who finally pays the bill by

[14] In 2015, the total amount of benefits was about 3.01 billion EUR for 329,000 LTCI beneficiaries, hence about 9,300 EUR per beneficiary. For these statistics, see e.g. Bundesgesundheitsministerium (2015).
[15] In Germany, over 90% of population is covered by LTCI, while the others may choose private LTCI. Our data are confined to data with respect to LTCI coverage.
[16] A detailed discussion of how to prevent at-home care from restricting the labor participation of family members is given in Fu and Noguchi (2017) and Geyer and Korfhage (2018).

means of its welfare program, while the social-aid representatives at the municipality level more or less pass on price increases until first-level administration.

Table 2 here

Table 2 summarizes the share of LTCI and social welfare programs used to cover nursing home costs, which is a sum of care costs and hotel costs. As shown in Column (1), LTCI covers a higher percentage of nursing home costs in Japan (70%) than in Germany (50%). For the remainder of nursing home costs, the share of the hotel costs out of total costs in Column (2) reveals only a 5% to 7% difference between the two countries. What differs more are the out-of-pocket costs that a representative resident has to pay for expenses not covered by LTCI. As seen in Column (3), this share is three times larger in Germany than in Japan. This remarkable difference, caused by the relatively low ceiling on LTCI benefits in Germany, again demonstrates the ability of the respective German social welfare program to account for the national cap on LTCI.

There are crucial differences between the nursing home sectors in Japan and Germany caused by both LTCI and non-LTCI policies. In Japan, the sector has three layers: for-profit homes, nonprofit homes with private rooms, and nonprofit homes with multiple beds per room. The welfare program supports only nonprofit homes with multiple beds. German nursing homes, by contrast, are more homogeneous, and Help for Care covers the costs that residents or their relatives cannot afford.

As a consequence of the above-mentioned aspects of their nursing home markets, the two countries experience differences with respect to waiting lists for nursing homes. In Japan, nonprofit homes have long waiting lists, while for-profit homes do not. Specifically, in 2013, 524,000 people spent time waiting to be admitted to nonprofit homes, where the number of incumbent residents was 602,700. Long waiting lists for nursing homes are also reported in other countries, such as Spain (Peña-Longobardo, Oliva-Moreno, García-Armesto, and Hernández-Quevedo, 2016). By contrast, in Germany, wait times for nursing homes do not appear to be as severe a social problem. Because social assistance is issued quickly so as to open facility spaces, it is often the case that even more expensive but free home places are filled by needy persons eligible for Help for Care.

3 Methods

The first step of our empirical analysis is to conduct a regression analysis to detect the elements affecting the different outcomes of the nursing home sectors in Germany and Japan. As dependent variables, we adopt the utilization rate of nursing homes for the elderly in the region and the nursing home costs per resident.

For our main analysis, we employ regression analysis separately on regional data for each country using pooled data. We employ the ordinary least squares (OLS) estimation for regression analysis. The reason we employ pooled regression despite having panel data is to be able to conduct B-O decomposition. In a robustness check, we also provide the fixed-effect estimates.

The second method of our empirical analysis aims to identify the level of technological efficiency of nursing homes in each region using DEA. By using DEA, we can further investigate the supply side of nursing homes. DEA is an approach that determines the efficient frontiers by maximizing the distance between inputs and outputs, as summarized by Coelli, Rao, O'Donnell, and Battese (2005). In this study, we use DEA with constant returns to scale. Although the efficiency frontier analysis was originally intended to handle the data of individual decision-makers, the methodology is applicable to regional data if regional governments are the decision-makers (e.g., Karmann and Roesel, 2018). In Germany, LTCI is mainly operated by the state government and this assumption holds true. In Japan, although the main operators of LTCI are municipalities, prefecture governments also have the power to permit operation for and audit each nonprofit home. Thus, Japanese prefectures can also be considered decision-makers in the nursing home sector.

The DEA can measure either input efficiency or output efficiency. We employ DEA separately for each country but pool for years of common observations (see Section 4). For input efficiency, we analyze observations $\boldsymbol{x}_k$ and $\boldsymbol{y}_k$, which are vectors for input and output variables for each k=1, ..., K, where K is a product of the number of regions in the country and the number of years, respectively. The number of elements for $\boldsymbol{x}_k$ must exceed the number of elements for $\boldsymbol{y}_k$. We also define X and Y as matrices, where their k th rows are $\boldsymbol{x}_k$ and $\boldsymbol{y}_k$. The DEA for the input efficiency solves the following problem:

$$\min_{\theta} \quad \theta$$
$$\text{s.t. } \theta x_k \geq X\lambda, \quad Y\lambda \geq y_k, \quad \lambda \geq \mathbf{0}$$

where θ is a measurement of the input efficiency of k, $\boldsymbol{\lambda}$ is a real-valued vector, and all inequalities hold element-wise. Exchanging the role of $\boldsymbol{x}_k$ and $\boldsymbol{y}_k$, we can evaluate the output efficiency, where the number of elements for $\boldsymbol{y}_k$ must exceed the number of elements for $\boldsymbol{x}_k$.

Our third empirical method is B-O decomposition based on the OLS estimates. The expected difference between groups J and G (which stand for Japan and Germany) for the dependent variable y can be written as:

$$E(y_J) - E(y_G) = \left[E(\boldsymbol{x}_J) - E(\boldsymbol{x}_G)\right]'\boldsymbol{\beta}_G + E(\boldsymbol{x}_G)'(\boldsymbol{\beta}_J - \boldsymbol{\beta}_G) + \left[E(\boldsymbol{x}_J) - E(\boldsymbol{x}_G)\right]'(\boldsymbol{\beta}_J - \boldsymbol{\beta}_G) \quad (1),$$

where $\boldsymbol{x}$ is a vector of the explanatory variables and β is their OLS coefficient. We can further decompose the right-hand side into the sum for each explanatory variable.

To interpret demographic factors in the explanatory variables, the B-O decomposition can provide quantitative implications. For the explanatory variables on demographic characteristics, the first term on the right-hand side reflects the country-specific difference in the average of variables**.** This term, which is called the "endowment effect," directly captures the effects of the endowment difference in the demographic variables. The second term, dubbed the "institutional effect," reflects the difference in their coefficients, thus capturing the institutional difference in the treatment of the demographic elements. The third term is called the "interaction effect" and it captures the interaction of endowment and institutional effects. A comparison of the first and the second terms on the demographic variables can provide implications regarding whether demographic or institutional differences are the main driver of the respective outcomes.

4 Data

For the regional units, we have 16 states (*Bundesländer*) in Germany and 47 prefectures (*ken*) in Japan. Our sample units for Germany are the states, i.e., political units

operating below the federal level but which also have legislative power and which typically administer the regulation of care provision. For Japan, we used prefectures, which have the authority to grant permission to carry out nursing home operations. Although both countries have municipalities, which are smaller administrative units, adopting states and prefectures as our sample units allows us to internalize otherwise potentially misleading spatial correlations between nursing homes and the regions they are located in due to the border-crossing behaviors of residents and socio-demographic idiosyncrasies, as mentioned in Baltagi and Yen (2014).

Moreover, the time period being studied was defined differently for the two countries due to data availability. For Japan, we look at the period from 2008 to 2014 because we could not uncover sufficient prefecture-level statistics on LTCI before 2008 and because there was an amendment of Japanese LTCI in 2015, which changed the rate of out-of-pocket expenses for care costs, as mentioned in footnote 9. For Germany, we study odd-numbered years from 2001 to 2015[17] because the state-level statistics for LTCI are not collected in even-numbered years. We conduct DEA separately for 2009, 2011, and 2013, years in which data for both Germany and Japan are available.

Although LTCI in both countries also covers younger people who require long-term care, for simplicity's sake, this research concentrates on people who are 65 years or older. In both countries, some residents have short stays at nursing homes, but this study concentrates on permanent residents. We include residents receiving all levels of care in both countries.

To examine regional variations in greater detail, we will conduct subsample analyses of regions with respect to population densities in a later section. We consider two categories of population density from 2007. The first category consists of sparsely populated regions with a population density of fewer than 200 residents per square kilometer. A total of 38% of Japanese prefectures and 43% of German states are included in this category, including the extremely large regions of Hokkaido (Japan) and Bayern (Germany).

The second category consists of densely populated regions with a population density of 200 or more residents per square kilometer. In Germany, states that consist only of a city—

[17] For Germany, 2015 was the latest year for which data on the three-care-level system are available. In 2017, a new law on care (PSG II) came into force, laying out more levels of care and care allowances; 2015 is also the only year for which residents' out-of-pocket costs on the state level was published (see Bundesgesundheitsministerium, 2015).

Bremen, Hamburg, and Berlin—are included in this category. Japanese prefectures with large cities, such as Tokyo and Osaka, are also included in this category. As a result, seven German states and 18 Japanese prefectures can be categorized as sparsely populated, while nine German states and 29 Japanese prefectures are categorized as densely populated. We utilize this categorization to analyze details of estimation results in the next section.

Karmann and Roesel (2018) showed that there are regional differences in hospital productivity between former West and East Germany. We can provide additional research on this topic using subsample analysis. In the above subsamples, among the seven sparse and nine dense states, four and two of them, respectively, are located in former East Germany; hence, East Germany is most prominently represented in the sparse regions of our subsample.

To save space, we provide detailed descriptions and definitions of our variables in Appendix 1. For regression and B-O decomposition, we incorporate two dependent variables: the utilization rate of nursing homes in a region and the per-resident annual costs for nursing home care. The cost variables are inflation-adjusted, as explained in Appendix 1.

In choosing the explanatory variables, we apply two criteria. First, we include elements affecting regional averages because the dependent variables for the regression are measured on a per-resident basis. On the other hand, variables at aggregate levels, such as the size of the market, might not have a direct effect on these dependent variables. We include aggregate information only when the corresponding variable can capture an indirect effect, such as the externality from another market relevant for our dependent variable. Second, to obtain a meaningful result from the B-O decomposition, the supports of explanatory variables must overlap between two countries (Fortin, Lemieux, and Firpo, 2011).

Following the above criteria, we include three categories of explanatory variables: relevance of welfare, demography, and other control variables. The variables in the first category reflect elements of the welfare policy. To capture the differences in policy, we adopt regional wealth as a proxy for consumer wealth, which should be negatively correlated with the number of welfare recipients. The variable is defined as the relative gross domestic product (GDP) of the region, a ratio of per capita GDPs at the regional level to the national GDP.

Because the relative GDP might be a vague variable by which to gauge regional wealth and the relevance of welfare, we also employ another explanatory variable: the

percentage of welfare recipients in each region. This variable is seemingly unrelated to relative GDP as shown by low but somewhat positive correlation, thus covering different aspects of wealth. Despite the fact that this percentage variable represents the coverage of welfare policy more directly than relative GDP, it is not employed as our main variable because it is available only for limited periods and, in addition, cannot be used in the B-O decomposition because it violates the common support condition.

The second category of variables is demographical. We include the shares of the elderly (65+) and of the very old (80+) within the population as well as the population density. The former two variables capture the status of regional economies because the regions whose populations are aging the most are likely to have less robust economies. Furthermore, the share of the very old also affects the general health status of the elderly population because the very old are more likely to be disabled. The population density is included in order to consider the effects of externalities, such as general wage levels in the regional economy.

The third category consists of control variables. We control for health status, market competition, and labor input in the regions. In determining health status, we adopt two variables: the ratio of elders who need high levels of care and the life expectancy of the total population.

In terms of market competition, we control for the number of providers of at-home care per elder and the number of professional care-providing institutions per elder.[18] The former variable is intended to measure the availability of care providers outside of nursing homes, while the latter variable is meant to control for competition among nursing homes. Both the number of providers of at-home care and the number of providers of institutional care are divided by the number of elders in the region. We only control for at-home care for the regression of the utilization rate because, while the existence of an outside option may affect the choice of whether or not to enter a nursing home, there is no obvious hypothesis as to how it would affect the costs of nursing homes.

Regarding labor input, we include the number of workers per resident in nursing homes. We only adopt this variable for the regression of nursing home costs: while this

[18] Due to data availability, the number of care-providing institutions includes, for both countries, the total number of nursing homes or other care institutions including daycare. For Germany, the number also includes care institutions for the handicapped (see also Appendix A.1.1).

variable is a cost shifter in a natural setting, there is no intuitive explanation of how this variable would affect the consumer's choice to use a nursing home or not. This holds especially true for Japan, where consumers face a long waiting list and do not know in advance which nursing home they will be able to enter.

For the DEA analysis, two input variables and three output variables are adopted. The input variables are the number of workers and the total costs of nursing home care in a region. For the first input variable, the number of workers is evaluated as the full-time equivalent number. For both countries, we include all persons employed in nursing homes, not only nurses and caregivers but also other workers, such as maintenance and management workers.

The second input variable is total nursing home costs, which was defined in the previous subsection. For output variables, we adopt the number of residents in nursing homes for each care level. We analyze input efficiency using two inputs (the number of workers and total costs for the nursing home) and three outputs (number of residents in each of three care-need levels), while output efficiency cannot be calculated from three outputs and two inputs. Thus, we construct the total number of nursing home residents as our output variable and analyze output efficiency using this output and two inputs.

Table 3 here

Table 3 shows the descriptive statistics for our sample. For the dependent variables, we see the same tendency toward the national-level statistics as seen in Table 1. We can also calculate the number of residents per worker as approximately two for Japan and 1.5 for Germany. This suggests that Germany has higher costs than Japan.

For the explanatory variables of the regression analysis, Table 3 shows that the supports for all variables overlap in Japan and Germany, a necessary prerequisite to employee the B-O decomposition. In terms of relative GDP, Germany shows a larger sample mean, but also a larger standard error, and hence more regional income variation than Japan. This statistic further confirms that considering regional differences in incentives is valuable when analyzing the question of potential moral-hazard behavior. Concerning the percentage of residents receiving welfare, we see that the average is approximately three times larger for Germany. These descriptives support further evidence that the German welfare program plays a prominent role in cofinancing the national nursing home sector.

5 Results

5.1 Outcome differences: regression results

5.1.1 Results on relative GDP and welfare coverage

Table 4 here

Table 4 shows the regression estimates of coefficients and robust standard errors[19] for the utilization rate of nursing homes and the nursing home costs per resident. The most striking result is that the coefficients for the relative GDPs for Japan and Germany have opposite signs. For per-capita nursing home costs, we obtain a significantly positive coefficient at the 1% level for Japan and a significantly negative coefficient at the 1% level for Germany. Although they are not significant, for the utilization rate, we obtain a positive coefficient for Japan and a negative coefficient for Germany. These results indicate that welfare coverage has different effects in Japan and Germany.

In a standard framework, we would expect to find positive relationships between income and nursing home utilization and between income and nursing home costs within a region, as regression shows to be the case in Japan. The negative coefficient in Germany may be interpreted as a sign of moral hazard. A higher rate of regional nursing home utilization in the lower-income regional populations, as indicated by the negative coefficient in Column (2), is compatible with moral hazard, as less regional wealth would suggest a higher level of social assistance for care-dependent persons insured by welfare who are thus able to receive professional care in nursing homes. Choosing out-of-home care may even allow the family members of the needy person to profit through higher labor participation. Similarly, a standard understanding of moral hazard would imply a negative relationship between regional wealth and the nursing home costs, as indicated by the negative coefficient in Column (4) found in the case of Germany, because nursing home managers are insured to a

[19] We also adopt the cluster standard errors on regions and have insignificant coefficients for the relative GDP in this analysis. This might be because of a small number of regions in Germany, as in the fixed effect model in the robustness check. On the other hand, we obtain significant coefficients for the relative GDP in the subsample analysis, which corresponds to Table 5, even with the cluster standard errors. This analysis supports the robustness of our findings on moral hazard in the dense areas.

higher degree with respect to copayments not covered by LTCI which are then taken over without risk as governmental contributions while otherwise to be contributed by residents and their families.

As mentioned in Section 4, we also analyze an alternative estimation by using the percentage of social welfare recipients as explanatory variable[20]. The estimated coefficients and standard errors are 0.108 (0.118) and 1.056 (0.400) for Japan and Germany on the utilization rate, and -2,281(619) and 20,150 (10,313) for Japan and Germany on the nursing home costs, respectively. The coefficients are significant on German utilization rate, Japanese costs, and German costs at 5%, 1% and 10% levels, respectively. In summary, the variable has coefficients whose signs are opposite to relative GDP in Table 4 for the utilization rate in Germany and for nursing home costs in both countries, while the coefficient is not significant only for the utilization rate in Japan. This implies that in Japan, the regions with wider welfare coverage have significantly lower costs for nursing homes, while in Germany, the regions with wider welfare coverage have significantly higher utilization rates and costs for nursing homes. This result is consistent with our findings, shown above, that moral hazard prevails in Germany alone.

Table 5 here

Table 5, pertaining to details about moral hazard, shows the regressions for regional variation in subsamples of densely and sparsely populated regions. We only show the regression results for Germany because subsample results for Japan, with respect to the signs of the coefficients for the relative GDP, are equivalent to those in Table 4.

Results from these subsample analyses are consistent with the hypothesis that moral hazard typically occurs in densely populated German states. Both for utilization rate and for nursing home costs, the relative GDP has significantly positive coefficients in sparsely populated regions and significantly negative coefficients in densely populated regions. The dense areas consist of nine states, only two of which are former East German states, while the sparsely populated areas consist of seven states, including four states from former East

[20] Full presentation of results is available upon request.

Germany. Thus, it seems that moral hazard might not typically prevail in former East German states.

5.1.2 Results on demographic and control variables

Next, we consider the coefficients for demographic variables. For Table 4, in Columns (1) and (2), the share of elderly people (65+) has significantly negative coefficients for both countries on the utilization rate. This result can be simply interpreted as showing that in economically inactive areas, people might use care at home more often to avoid taking expensive institutional care. The proportion of the very old (80+) has a positive coefficient for utilization rate in both countries, although it is significant only for Germany, which is an expected result because the very old generally require more intensive care. Furthermore, the coefficients are smaller in Japan for both age profiles, which might imply that age is less relevant in Japan than in Germany. This is because the large volume of LTCI coverage in Japan plays a sufficient role in achieving almost uniform long-term costs among Japanese people.

In Columns (3) and (4), it is shown that the proportion of the very old in Germany has a positive coefficient on nursing home costs, which can be interpreted in a similar manner to the variable for the utilization rate. On the other hand, we find a significantly positive coefficient for the share of elders and a significantly negative coefficient for the share of very old in Japan due to the wide scope of LTCI coverage. In Germany, LTCI coverage—even when accounting for care level—does not seem to be sufficiently wide to outweigh level-specific cost differentials to the same extent. On the other hand, once we control for the relative GDP, the share of the very old does not increase but rather decreases nursing home costs in Japan. The large negative value of the estimated coefficient might imply that Japanese LTCI provides more equal treatments to residents of different ages than the German system does.

For population density, Germany has significantly positive coefficients for utilization rate and costs. This result can be interpreted to mean that economically active areas experience greater demand for expensive institutional care. Japan, by contrast, has

insignificant coefficients both for the utilization rate and costs. As mentioned in Section 2, there are various services providing at-home care that might offer an alternative to institutional care in Japan. These at-home care services are likely to be located in urban areas because of low transportation and other operating costs. Consequently, the existence of alternative services in populated areas decreases the utilization rate. Furthermore, population density has a significantly positive coefficient for nursing home costs in Germany. The positive effect is an expected result because in higher-density areas (with typically higher activity levels), people can afford greater expenses. In addition, these areas are typically associated with higher wages, which will lead to more expensive institutional care.

For the other control variables, the proportion of those needing high levels of care has always significantly positive coefficients, which is natural because serious disabilities correspond to more intensive care. Similarly, life expectancy has significantly positive coefficients for many cases, although it has a significantly negative coefficient for the utilization rate in Germany, which we address in our subsample analysis below.

For the number of at-home care providers, we obtain a negative coefficient for the utilization rate in each country, although it is only significant for Japan. This result is naturally interpreted to mean that the existence of outside options decreases the demand for nursing homes. For the number of institutional care providers, Columns (1) and (2) show positive coefficients for utilization rates. This implies a positive association between regional demand and the regional availability of nursing homes. For nursing home costs, this variable has significantly negative coefficients in both countries, which indicates that competition decreases costs for nursing homes in Japan and Germany. The numbers of workers have significantly positive coefficients for nursing home costs, which is also intuitive.

In Table 5, among the other explanatory variables for the subsample analysis, life expectancy has significantly negative coefficients for the utilization rate only in sparsely populated states. This indicates that the negative coefficient in Table 4 is caused by the sparsely populated regions. Among sparsely populated regions, all four former East German states have shorter life expectancies than any of the former Western German states. Thus, the negative coefficient of life expectancy seems to be related to the situation of former Eastern

German states, where life expectancy, being still lower than in the West, slowly increased, which is a sign of better health and stepwise reduction of care need.[21]

5.2 Managerial strength: DEA results

Figures 2 and 3 here

Using an all-regional sample, we find that the means and standard deviations of input efficiencies are, respectively, 0.969 and 0.030 for Japan and 0.744 and 0.083 for Germany. For the output efficiencies, the means and standard deviations are 0.940 and 0.028 for Japan and 0.644 and 0.077 for Germany. Figures 2 and 3 show the histograms of the input and output efficiencies across all regions for Japan and Germany. Thus, we find that Japanese nursing homes are more technologically efficient than those in Germany.

The DEA results indicate that efficiency degrees vary considerably within Germany, reflecting that states differ with respect to nursing home organization. This result is at least consistent with the signs observed for moral hazard behavior of nursing homeowners as caring less about price competition and exerting less managerial oversight. Admittedly, using more care staff might in part be attributable to administrative rules, which slightly differ among states, while it could also be the case that cost differences, to a certain degree, reflect cost-of-living differences between states. Conversely, the higher DEA efficiency in Japan seems to result from more consistent pricing, which forces Japanese nursing homeowners to standardize their input resources in order to effectively run their nursing homes.

5.3 Demographic elements on the future of aging: B-O decomposition results

Table 6 here

[21] We also obtain a positive coefficient for life expectancy on the utilization rate in an additional regression in which the East German states are eliminated. Plus, when we control regions' fixed effects, we obtain a positive coefficient for the life expectancy on the utilization rate in Germany. Both these results support our hypothesis that the negative coefficient reflects the specific situation of East German states, while, for the others, the results are as expected.

Based on the above OLS estimates, we conduct the B-O decomposition and depict the estimation results and show the results for the demographic variables in Table 6.[22] There are two blocks in the table: the upper block (endowment effect) and the lower block (institutional effect) correspond to the first and second terms on the right-hand side of Equation (1), respectively.[23]

Columns (1) and (2) of Table 6 show the decomposition results for utilization rate and nursing home costs, respectively. The endowment effects are significant for the share of the elderly on the utilization rate at the 5% level and for the share of the very old on the utilization rate at the 1% level and costs at the 5% level. Thus, the fact that Japan is aging at a higher rate than Germany, as described in Section 2.2, has a considerable impact on the nursing home outcomes of usage and costs. Specifically, the negative endowment effect for the share of elderly persons widens the gap between the utilization rates of Japan and Germany, while the positive endowment effect for the share of the very old reduces these outcome gaps.

In terms of the institutional effects, for both utilization rate and costs, the share of the elderly is not significant, and population density and the share of the very old are significantly negative at the 1% level. The significantly negative institutional effects of population density indicate that Germany seems to have higher costs in dense regions than Japan. Therefore, there is evidence that a tendency toward higher agglomeration would have more adverse effects for Germany than for Japan. The significantly negative institutional effects of the share of the very old on nursing home usage imply that the very old in Germany are more likely to enter nursing homes than they are in Japan, thereby causing an even higher cost burden for the German system, as the significantly negative coefficient for costs indicates.

In summary, both the endowment and institutional differences in the demographic variables contribute to the difference in the outcomes of nursing home care. It is important

[22] Because the relative GDP is calculated as relative values within a country, we cannot obtain intuitive insights for results on this variable from the B-O decomposition. Also, some of the control variables are not defined equivalently in the two countries, as explained in the Appendix. Thus, for this joint composition of both countries, we refrain from interpretation and concentrate on the demographic variables as shown in Table 6 (full presentation of results is available upon request).
[23] To save space, we also calculated but do not show the interaction effect, which corresponds to the third term on the right-hand side of Equation (1) (full version is available upon request).

to note that we identify not only the endowment effect but also the institutional effect. Indeed, the existence of significant endowment effects shows that demographic differences play some role in explaining the difference in the outcomes of current nursing home markets in Japan and Germany, while the existence of significant institutional effects shows that institutional differences also matter when explaining outcome differences.

Furthermore, for the institutional effects of the constant term, we find a significantly negative coefficient at the 1% level for the utilization rate and a significantly positive coefficient for nursing home costs at the 1% level. These results indicate that there are unobserved elements that cause difference between nursing home outcomes in Germany and Japan.

Based on the above results of the B-O decomposition, we can conduct a simple simulation analysis for future nursing home care in Germany, at least under the German LTCI system (valid until 2017). There is a possibility that Germany will catch up to Japan in terms of population aging in the near future. Under this scenario, because the difference in the averages of the shares of elderly people and the very old will diminish, the endowment and interaction effects will be reduced to zero. However, this finding implies that even when these effects are removed, there are still country-specific differences caused by institutional effects.

Having said this, the B-O decomposition does not directly provide the answer to whether nursing home costs would increase or decrease for Germany under this catching-up scenario because significantly negative and positive institutional effects are obtained for the shares of elderly persons and the very old, respectively. However, we can directly calculate the value of $E(\boldsymbol{x}_G)'(\boldsymbol{\beta}_J - \boldsymbol{\beta}_G)$ using the sample average of the explanatory variables in Japan during our research period for $E(\boldsymbol{x}_G)$ and the difference of coefficient estimates for $\boldsymbol{\beta}_J - \boldsymbol{\beta}_G$. Substituting these values, which are found in Tables 3 and 4, we obtain the institutional effect for the share of elders and the share of very old, which are 7193 and -10,166 respectively, and hence their sum is -2,973 for nursing home costs. The negative institutional effect implies that, under this scenario, the nursing home cost per resident is likely to rise even higher in Germany. This means that the pronounced high usage of nursing home care by the very old would drive per-resident costs further up than gains in terms of cost relief through the effect of presumably unbalanced LTCI coverage for the other—younger—residents in Germany.

For the duration of our research period it was found that the average proportions of elderly persons and the very old in Japan are 25.23 and 7.74, respectively (see Table 3). For Germany, forecasts by the Federal Statistical Office[24] state that these shares will reach 26.05 and 7.39, respectively, by the end of 2030—figures that are similar to the Japanese averages. Thus, in the near future, Germany is likely to face a similar demographic age structure as Japan, and our simulation can be seen as a realistic forecast for the future of nursing home care in Germany.

5.4 Discussion

The above estimation results point to several major findings. For the demographic variables, our B-O decomposition results reveal that both the endowment and institutional effects are considerable driving forces behind the different outcomes of the nursing home sectors. For the welfare policy aspects, the regression results suggest that, at least for our sample period, the existing frameworks of LTCI and social welfare led to varied behaviors among care recipients as well as nursing homeowners in the two countries. In particular, welfare programs such as the German social assistance program Help for Care might lead to moral hazard, as indicated by our regressions. This result is obtained even if we control for various elements of regional characteristics, specifically regional health status, the accessibility to at-home care, regional competition among nursing homes, and the amount of labor input in nursing homes.

We find further support for moral hazard among nursing home providers in the regional variation between densely and sparsely populated German regions in Table 5. Predominantly urban areas are characterized by higher levels of economic and societal activity, which affords nursing home managers more discretion and higher flexibility in providing appropriate care and hiring skilled nursing staff. This typically increases the

[24] The forecasts are taken from population projection (variant 1 / G2L2W1) of the Federal Statistical Office, https://www-genesis.destatis.de/genesis//online?operation=table&code=12421-0002, accessed on January 6, 2022. The population projection also predicts that the share of the very old will rise to 12% by 2050.

running costs.[25] However, if the share of residents who benefit from Help for Care increases, as is to be expected from decreasing regional wealth, providers can compensate by charging higher prices to residents without risk of reducing the utilization rate of their homes. This reasoning suggests a negative relationship between regional wealth and home costs, as does our regression. Second, the aforementioned difference in managerial discretion is typically accompanied by a wider range of resources used—a result illustrated by the DEA efficiency scores, which are less homogeneous for Germany than for Japan.

Our empirical analysis provides several policy implications. From the perspective of federal LTCI policy, Germany is expected to bear a higher long-term burden for nursing home care when it reaches the same distribution of ages as Japan, at least given the LTCI system that prevailed during our observation period. Social assistance, as administered at the district level, is a policy tool aimed at protecting the share of the regional population in need of care from insolvency risk. The poorer the region, the higher this share of the population and the higher the coverage and contribution of regional social assistance. From the demand side, this might stimulate moral hazard, mimicking the textbook example of behavior approaching the fully insured benchmark in contrast to the non-insured case. On the other hand, regional income typically constrains the regional supply of services. However, with regards to social assistance of the type described, regional providers of nursing home care are partially insured against the risk of financial losses accrued by providing quality care at the expense of cost-cutting measures.

A lesson to be drawn from this may be to better regulate access to the so-called hotel services in nursing homes by implementing extra charges. As is known from public economics (for a summary, see Balestrino, 1999), in social policy, there is a variety of suitable combinations of governmental transfer and out-of-pocket expenses, for which appropriate selection mechanisms must be designed. A typical method would be to provide access to higher-quality goods in exchange for additional out-of-pocket expenses from the beneficiaries. In this vein, the Japanese nursing home system has two levels. On the first level, there is a separation between for-profit homes with limited LTCI coverage and nonprofit homes with comprehensive LTCI coverage. On the second level, among nonprofit homes,

[25] Within federal states, there seems to be a close association between prices and quality (see, e.g., Herr and Hottenroth, 2016).

the new types of facilities with private bedrooms require out-of-pocket expenses for higher-quality services, while the older facilities with shared bedrooms are already covered by governmental transfer. By contrast, the German system has no selective mechanism for the beneficiaries of social assistance to differentiate between private- and shared-bedroom services. This lack of selection mechanism is likely to increase the moral hazard behavior of residents.

For Germany, it may be helpful to redesign the national welfare policy like Japan in order to discriminate between standard institutions, which are covered by social welfare, and more expensive institutions, which are only eligible for those who can afford out-of-pocket expenses, though it might be somewhat uneasy to implement under the principle of equitable access, as required by Social Code I (*Sozialgesetzbuch I*) and German Basic Law (*Grundgesetz*). Another approach could be that in price negotiations with individual nursing homes, the respective LTCIs and supra-local welfare agencies base their remunerate offers on rather strict cost averages, which are collected within larger areas. Such policies, together with encouraging people to stay at home, might help Germany to relieve the cost burden, which is prominently driven by the share of younger elders (65 to 80 years old) in nursing homes, as the endowment effect in the B-O decomposition indicates.

It must be said that, in terms of Japan's welfare, the above selection mechanisms scarcely outweigh the existence of long waiting lists at nonprofit nursing homes—a fact that may also contribute to the comparatively low figures in our descriptive statistics for the utilization rate in Japan. However, capacity considerations are beyond the scope of this paper.

Our results provide complementary insights to those of Bakx et al. (2015), who indicated that access to formal care is more difficult for the low-income elderly in Germany than in the Netherlands. Conversely, our focus on the utilization rate reveals that a decrease in regional prosperity does not limit de facto access to nursing home care in Germany. A possible explanation for the somewhat differing results might lie in the fact that the data in Bakx et al. (2015) comprises formal care given in nursing homes as well as at home,[26] while our research concentrates on care within nursing homes. Thus, our findings point to the

[26] Due to data construction, institutional care beneficiaries were included in SHARE only when they participated in the previous waves before institutionalization. Thus, the number of nursing home residents can be inaccurate in SHARE.

importance of considering formal at-home care and care in facilities separately in empirical analysis. Furthermore, Fu and Noguchi (2019) identified moral hazard among Japanese LTCI users as a consequence of the welfare program. The difference in their findings comes from the fact that they analyzed the entire long-term care sector, including at-home care, while we concentrate solely on nursing homes.

5.5 Robustness check

Table 7 here

To check the robustness of our estimation results, this section provides an additional empirical analysis. Table 7 summarizes the estimation results for the fixed effect model, focusing on coefficients of the relative GDP. Because it is technically challenging to consider B-O decomposition using the fixed-effect estimates, we report these results only to support the robustness of the OLS estimation. The results are consistent with our earlier results for the relative GDP, although the coefficients are not significant at the 10% level.[27] Thus, our findings concerning moral hazard are valid only in Germany.

6 Conclusion

This research presents an international comparison of Japanese and German nursing home care that reveals different outcomes despite similar national policies of LTCI. Our B-O decomposition results show that both the endowment and the institutional differences matter in explaining the different outcomes.

For Germany, appropriate measures should be taken to address the severe and sometimes expensive effects of population aging, as identified in our observation period. Policies have already been enacted to reduce costs through the LTCI reform in 2017 (PSG II), implementing a more variegated system of care levels and making at-home care more attractive by increasing the benefits provided. A more regulation-oriented measure would be

[27] We also adopt the bootstrap standard errors for this analysis, but still obtain insignificant coefficients,which might be due to a small sample size, especially in the case of Germany.

to reduce the seemingly high cross-state variation in resource use, as indicated by our DEA, through more consistent across-the-board legal stipulations at the federal state level, which besides might also enforce the principle of equitable access, as required by the German Social Code. To better smooth regional social assistance expenditures being caused by decisions at the municipality level and passed on for remuneration at the federal level, a closer coordination at the level of federal administration may be helpful. In contrast, access restrictions preventing needy persons eligible for social assistance from demanding higher-class accommodation without contributing out-of-pocket, are rather challenging to implement under the prevailing social legislation.

Our research indicates that the Japanese mechanism, which restricts the number of institutions available for public assistance recipients, might play a role in preventing moral hazard. For Japan, however, the scope of our research is limited to nonprofit nursing homes, and further analysis that includes data from for-profit nursing homes is required to account for a wider swath of considerations in the Japanese nursing home sector.

Finally, a closer look at the effects of social welfare design might help to further identify the channels of moral hazard. Such research is especially valuable because, despite controlling for many elements, there seem to be unobserved elements that further affect the dependent variables, such as socio-cultural differences associated with the role of family in care (Leitner, 2003, Estevez-Abe and Naldini, 2016). This, of course, would require more data on the lower levels of administrative division to become publicly available.

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and DEA are employed using Stata packages *oaxaca* by Benn Jann and *malmq* by Kyong-Rock Lee, Byung-Ihn Leem, Choon Woo Lee, and Choonjoo Lee, respectively.

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Tables and Figures

	Utilization rate of nursing homes (%) (1)		Nursing home cost per resident (2000 USD-PPP) (2)	
	Japan	Germany	Japan	Germany
2009	1.81	3.89	21,726	34,425
2011	1.89	4.11	21,473	35,890
2013	1.89	4.12	21,920	38,451

Table 1. National-level descriptive statistics. Costs for Germany do not include investment costs.

	% LTCI (1)		% Other than LTCI % Hotel cost (2)		% Care cost (3)	
	Japan	Germany	Japan	Germany	Japan	Germany
2009	72.30	51.82	19.80	26.39	7.90	21.79
2011	71.97	51.87	20.08	26.62	7.96	21.51
2013	70.94	50.43	21.06	26.61	8.00	22.96

Table 2. Share of payment options for nursing home costs. The information for LTCI benefits is obtained from the Survey of Long-Term Care Benefit Expenditures for Japan and from Pflegestatistik of the Federal Statistical Office for Germany.

	Japan				Germany			
Variable	Mean	S.D.	Min	Max	Mean	S.D.	Min	Max
#Residents of nursing homes	12,008	9,195	3,400	52,600	39,846	35,969	4,343	151,693
Utilization rate of nursing homes, %	2.00	0.28	1.38	2.90	3.94	0.42	3.17	5.19
Nursing home costs (million USD-PPP)	260	204	75	1,170	1,360	1,400	126	7,020
Per-resident nursing home costs	22,458	712	20,491	24,536	32,271	5,447	21,691	46,980
Relative GDP	0.90	0.17	0.59	1.87	0.97	0.28	0.63	1.81
Percentage of welfare recipients	0.14	0.07	0.04	0.34	0.39	0.10	0.23	0.62
Population	2,716,928	2,660,555	574,000	13,400,000	5,114,852	4,694,973	652,182	18,100,000
Population density	655	1,167	69	6,112	663	1,014	69	3,948
Elder (65+) population	644,105	565,639	152,000	3,011,000	1,007,599	899,612	123,854	3,679,054
Share of elders (65+), %	25.23	2.92	17.20	32.69	20.23	2.20	15.02	25.14
Share of very old (80+), %	7.74	1.62	3.98	11.76	4.93	0.80	2.95	7.16
#Care institutions per elder	0.12	0.02	0.06	0.22	0.07	0.02	0.05	0.12
#Care at home per elder	0.08	0.02	0.04	0.16	0.08	0.02	0.04	0.14
Ratio of heavy care-need	0.81	0.18	0.45	1.37	0.83	0.15	0.48	1.19
Life expectancy	83.32	0.70	80.97	85.15	79.51	1.12	76.80	82.00
#Workers per resident	0.50	0.03	0.37	0.59	0.63	0.05	0.53	0.77
N	329				128			

Table 3. Descriptive statistics. For the percentage of welfare recipients, descriptive statistics for Germany are calculated using 64 observations from the years 2009, 2011, 2013, and 2015.

Dependent variable	Utilization rate				Nursing home costs			
	Japan		Germany		Japan		Germany	
	(1)		(2)		(3)		(4)	
Relative GDP	0.029	(0.031)	-0.032	(0.099)	607.957**	(245.283)	-3,147.926**	(1,214.731)
Population density (log)	0.013	(0.009)	0.116***	(0.015)	58.474	(54.338)	1,243.475***	(222.147)
Share of elders (65+)	-0.010*	(0.006)	-0.038**	(0.017)	158.335***	(32.863)	-197.197	(226.056)
Share of very old (80+)	0.005	(0.015)	0.143***	(0.046)	-422.459***	(73.597)	1,640.387**	(666.622)
Ratio of heavy care-need	1.040***	(0.063)	0.444***	(0.106)	2,269.720***	(285.658)	4,007.320**	(1,691.065)
Life expectancy	0.069***	(0.011)	-0.015	(0.021)	399.548***	(64.969)	2,456.748***	(230.666)
#Care institutions	23.491***	(1.875)	23.079***	(0.935)	-71,035.398***	(13,785.604)	-74,822.266***	(18,314.051)
#Care at home	-1.758***	(0.327)	1.135	(0.750)				
#Workers per resident					3,104.777**	(1,337.279)	47,736.898***	(7,290.510)
Constant	-4.879***	(0.889)	2.419	(1.581)	-14,224.531***	(5,354.291)	-199,493.313***	(16,808.434)
Observations	329		128		329		128	

Table 4. Ordinary least squares estimates for utilization rate of nursing homes and nursing home costs. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Area	Population density<200				Population density>=200			
	Utilization rate		Nursing home costs		Utilization rate		Nursing home costs	
	(1)		(2)		(3)		(4)	
Relative GDP	0.816***	(0.203)	4,562.873*	(2,623.015)	-0.253**	(0.116)	-5,485.419***	(1,009.112)
Population density (log)	0.065	(0.274)	-883.948	(730.821)	0.145***	(0.032)	2,191.765***	(287.261)
Share of elders (65+)	0.028	(0.026)	-446.243*	(234.965)	-0.102***	(0.034)	-1,316.357***	(336.108)
Share of very old (80+)	0.126*	(0.066)	1,966.088***	(543.943)	0.333***	(0.087)	5,322.944***	(952.878)
Ratio of heavy care-need	0.370**	(0.146)	-5,199.831*	(2,983.907)	0.263	(0.194)	2,201.760	(1,983.275)
Life expectancy	-0.150***	(0.025)	2,657.431***	(458.035)	0.015	(0.028)	2,772.083***	(223.698)
#Care institutions	23.561***	(0.820)	10,651.325	(25,152.855)	12.339***	(3.356)	-189,371.125***	(42,068.676)
#Care at home	0.211	(4.201)			2.788**	(1.253)		
#Workers per resident			10,066.113	(9,471.672)			59,253.195***	(6,605.736)
Constant	11.597***	(3.002)	-182,637.172***	(30,308.637)	1.158	(2.259)	-223,334.844***	(17,428.459)
Observations	56		56		72		72	

Table 5. Ordinary least squares estimates for Germany on subsamples of scarcely populated and densely populated regions. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

	Utilization rate		Nursing home costs	
	(1)		(2)	
	Estimate	S.E.	Estimate	S.E.
Endowment effects				
Population density (log)	0.008	0.013	82	142
Share of elders (65+)	-0.188**	0.086	-986	1,131
Share of very old (80+)	0.403***	0.132	4,616**	1,885
Total	-0.959***	0.095	10,638***	1,785
Institutional effects				
Population density (log)	-0.585***	0.102	-6,786***	1,315
Share of elders (65+)	0.560	0.366	7,193	4,622
Share of very old (80+)	-0.684***	0.241	-10,166***	3,308
Constant	-7.298***	1.814	185,269***	17,641
Total	-1.014***	0.093	-13,879***	726

Table 6. B-O decomposition results for demographic variables on the utilization rate of nursing homes and nursing home costs. We also include the relative GDP and the other control variables, specifically the ratio of heavy care-need, life expectancy, the number of care institutions, the number of providers for care at home, and the number of workers per resident, but do not show results for them. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Dependent variable	Utilization rate				Nursing home costs			
	Japan		Germany		Japan		Germany	
Relative GDP	0.001	(0.001)	-0.007	(0.005)	2.491	(8.182)	-3.353	(41.287)

Table 7. Estimation results for the fixed effect regression. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

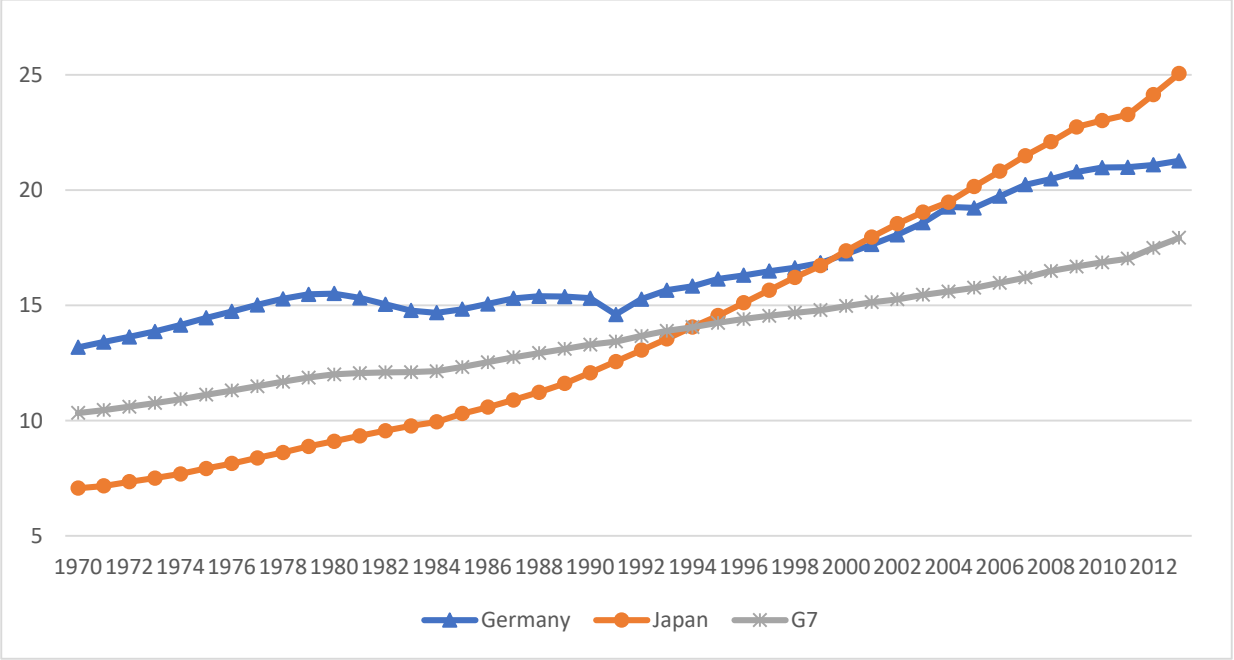

Figure 1. Elderly population (% of population)

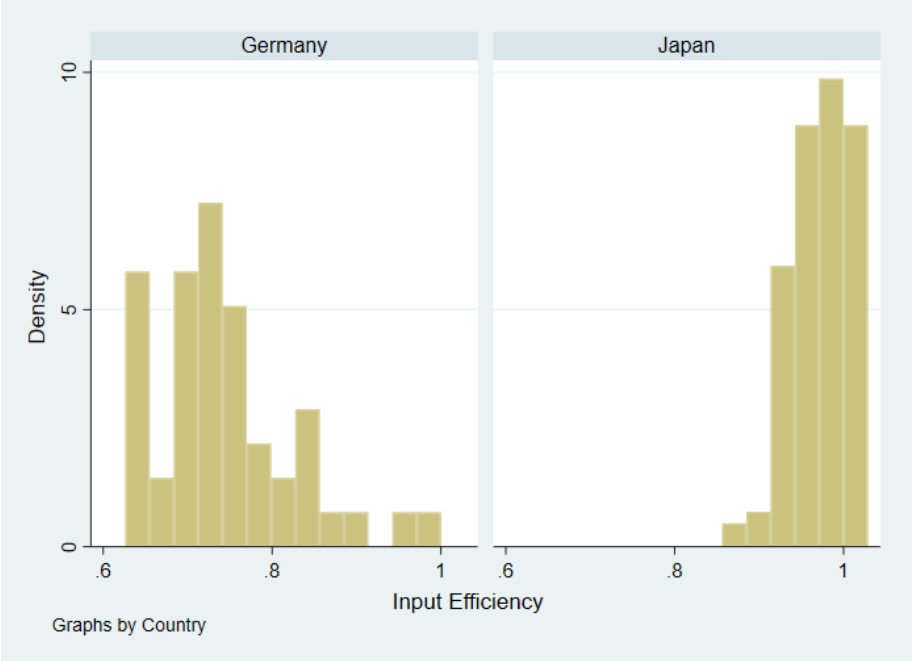

Figure 2: Input efficiencies

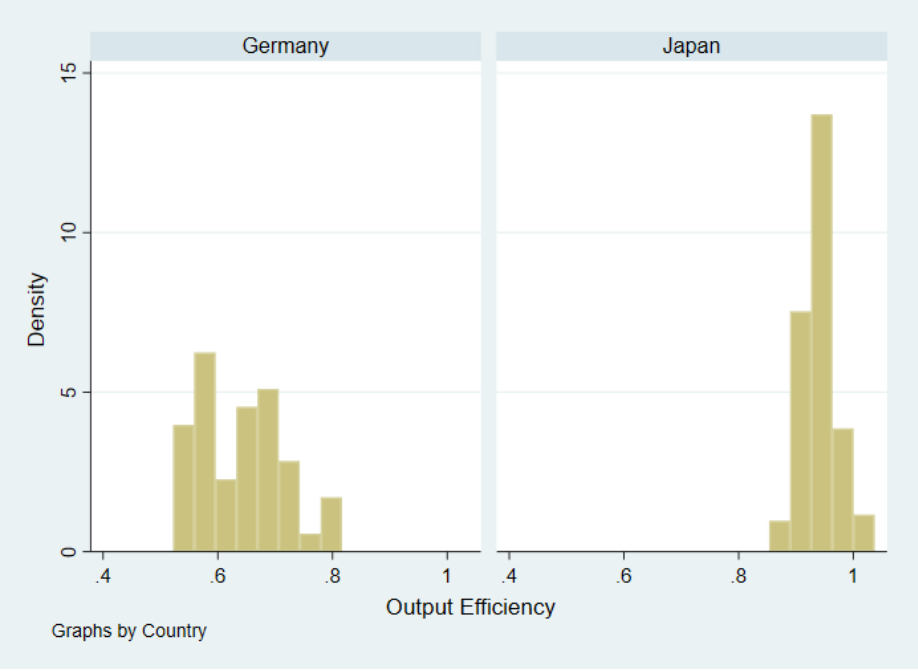

Figure 3: Output efficiencies

Appendix

A. 1 Data

A.1.1 Definition of variables for regression and the B-O decomposition

For regression and the B-O decomposition, we incorporate two dependent variables. The first dependent variable is the nursing home utilization rate in a region. Because the raw value of this variable is very small, we multiply the value by 100 and utilize the % unit as our dependent variable. This variable is constructed by dividing the number of nursing home residents by the number of elderly persons (65+). The denominator, the number of elderly people, is taken from the Census for 2010 and from population estimates made by the Statistical Bureau for the remaining years for Japan and the Federal Statistical Office of Germany. The numerator of this dependent variable is the number of residents. For Japan, we construct this variable using the Survey of Long-Term Care Benefit Expenditures. For Germany, this figure is obtained from the Health Reporting of the Federal Republic of Germany.

The second dependent variable is the per-resident annual costs for nursing home care. The nursing home costs include care costs and hotel costs, as described in Section 2. We consider not only the LTCI coverage but also employ the total costs, including out-of-pocket expenses and governmental expenses, which are additional to LTCI.

For Japan, the care costs for each care level are obtained from the Survey of Long-Term Care Benefit Expenditures. We multiply these amounts by the number of residents for each care level. We do not directly observe the number of residents for each level but rather obtain two numbers: the total number of residents for each year and the number of utilizations for each care level. We then calculate the ratio of each care level from the number of utilizations and obtain the number of residents for each care level and multiply the total number of residents by these ratios. For the hotel costs, as we do not have access to published regional statistics, we construct the information using firm-level microdata from the Survey on Institutions and Establishments for Long-Term Care. The data include the number of rooms, the capacity of a room, and the room fee for all types of rooms in each nursing home. Using these microdata, we calculate the average room fee in each region. The food fee is also reported in this dataset.

For Germany, we obtain the regional average daily care costs for each care level and hotel costs, which are obtained from the Federal Statistical Office of Germany. The 2009 cost data for Bremen are not available; therefore, we used values imputed by the Federal Statistical Office of Germany.

In Germany, there is another cost component, called the investment cost, which pays for annuities resulting from building or modernizing nursing homes. These investment costs are

partially supported by the respective states. This especially holds for the former East German states as they are also subsidized by the federal government. The remaining portion of the investment costs is covered not by LTCI but by out-of-pocket expenses and Help for Care. We can only access 2015 information for the investment costs from the Federal Statistical Office of Germany. The 2015 statistics show that national average per-day care costs for CL1, CL2, CL3, hotel costs, and investment costs were 44.45, 61.06, 77.44, 13.4, and 8.63 euros, respectively. Considering the relatively low investment costs, and to ease comparison with the Japanese data, we confine our research to care costs and hotel costs.

To obtain a compatible variable for international comparison, we adjust the units of costs via two steps. The first step adjusts for inflation, whereby we evaluate the nursing home costs using the 2000 consumer price index. The indices are obtained from the Statistical Bureau of Japan and the Federal Statistical Office of Germany. The second step transforms the inflation-adjusted costs for each country to PPP in US dollars. We use the exchange rate provided by the OECD.

For the explanatory variables, the regional GDP values were obtained from the Annual Report on Prefecture Account by the Japan Cabinet Office and the Federal Statistical Office of Germany. The percentage of welfare recipients is defined as the ratio of the number of welfare recipients over the population for each region. For the numerator, the number of welfare recipients is measured as the annual count among nursing home residents; for Germany, this is the number of nursing home residents who receive at least some Help for Care, which is taken from the Federal Statistical Office of Germany. Recipients of other forms of social assistance, such as the basic provisions for pensioners (*Grundsicherung*), the relevance of which has decreased in recent years, are not included.[28] For Japan, this is the number of people who receive public assistance to cover LTCI payments, which is taken from the Report on Social Welfare Administration and Services up to 2011 and the National Survey on Public Assistance Recipients from 2012. Because the numerator variable includes not only elderly persons but also younger people who are covered by LTCI, we adopt the entire population as the denominator.[29]

Although this variable represents the coverage by welfare policies more directly than relative GDP, we utilize this variable only in an alternative analysis because of its limited availability. For Germany, we can access these data only for 2009, 2011, 2013, and 2015, while our main analysis uses data for the odd years from between 2001 and 2015. Specifically, the full data set of welfare coverage on state level provided by the Statistical Office of the Federation and the Laender starts in year 2009. Information regarding long-term care for Bremen in 2009 is missing and we utilize the estimated values.

For the share of the elderly (65+) and of the very old (80+) within the population, the denominator and numerator variables are taken from the Census for the relevant years and from population estimates by the Statistical Bureau for the remaining years for Japan and by

[28] There is no information on how many people receive the LTCI benefits and, in addition, any type of social assistance.

[29] We also employ regression analysis, adopting the number of elderly people as the denominator, and obtain consistent results.

the Federal Statistical Office of Germany. The population density[30] is also constructed from the Census.

We define the ratio of elders with heavy care-need as the ratio between nursing home residents with heavier care-need level, namely Care Required 5 for Japan and care level 3 for Germany, and the number of all elders in the region. In this definition, we assume that the following care-need levels are comparable: Care Required 1, 2, and 3 (Japan) and care level 1 (Germany); Care Required 4 and care level 2; and Care Required 5 and care level 3. Germany has another level called "hardship" within care level 3, which refers to individuals who need assistance with daily living activities (Schultz, 2010) and provides an LTCI ceiling higher than that of care level 3. As we were unable to distinguish the care costs for hardship specifically, we combine this level with care level 3. For Japan, we construct these variables using the Survey of Long-Term Care Benefit Expenditures. For Germany, these numbers are obtained from the Health Reporting of the Federal Republic of Germany.

The numerator is taken from the Annual Report on Long-Term Care Insurance by the Ministry of Health, Labor, and Welfare for Japan and from the Federal Statistical Office for Germany. For the life expectancy, we use information on the average life expectancy at birth. For Germany, this variable is taken from INKAR data (Bundesinstitut für Bau-, Stadt- und Raumforschung, 2020). For Japan, the information is calculated from the Prefecture Life Table by the Ministry of Health, Labor, and Welfare. The Life Table is published every 5 years. We construct annual values of life expectancy using the moving average from the 2005, 2010, and 2015 Life Tables.

For the number of providers of at-home care per elder, we include home care providers in Japan. For Germany, we include providers of ambulant nursing and care services in one's own home. For the number of providers of institutional care per elder, we include adult daycare and nonprofit nursing homes for Japan. For Germany, we include all nursing homes (which typically also provide daycare)[31] and care institutions for handicapped persons.[32] The number of these providers is taken from the Survey of Institutions and Establishments for Long-term Care by the Ministry of Health, Labor, and Welfare for Japan and the Federal Statistical Office of Germany for Germany. As the 2001 data for Bremen and Rheinland-Pfalz were missing, we interpolate them using the average of the 1999 and 2003 values.

The number of nursing home workers is evaluated as full-time equivalents. For both countries, we include all people employed in nursing homes, not only nurses and caregivers but also other workers, such as maintenance and management workers. For Japan, we directly obtain the number of full-time equivalents in the Survey of Institutions and Establishments for Long-Term Care. For Germany, we only observe the number of (1) full-time workers, (2) part-time workers working more than 50% of the normal working time, (3) part-time workers

[30] We also observe the share of agricultural workers in both countries. However, we do not include this in our explanatory variables because it has different supports for the respective values in Japan and Germany.

[31] In Germany, there are no care institutions that specialize only in providing daycare.

[32] The number of providers for these institutions is very small. The German statistics used here only provide combined information on nursing homes and specialized homes for handicapped people.

working 50% or less of the normal working time, (4) marginally occupied workers, and (5) other workers, such as interns, from the Health Reporting of the Federal Republic of Germany. To obtain the total number of full-time equivalents, we calculated a weighted average for these numbers using 75%, 25%, 13%, and 50% weights for (2), (3), (4), and (5), respectively.

A.1.2 Definition of variables for the DEA

For the DEA exercise, two input variables and three output variables are used. The input variables are the number of workers at nursing homes and the total cost for nursing home care in a region. The definition of the number of workers is the same as in the explanatory variable for the regression. The second input variable is total nursing home costs; the definition of this is the same as for the dependent variable in the regression. For the output variables, we adopt the number of nursing home residents at each of the three care-need levels. The care levels of each country were assumed to be comparable, as described for the explanatory variables (i.e., Japan care-required 1, 2, and 3 comparable with Germany care level 1; Japan care-required 4 with Germany care level 2; and Japan care-required 5 with Germany care level 3).

A.1.3 Discussion on the relative GDP and the welfare coverage rate

As mentioned in Section 4, we use two variables, the relative GDP and the welfare coverage rate, to characterize the welfare policy. Indeed, there may be counter-vailing effects involved: considering the variable relative per capita GDP as a regional index for cost of living, which also may measure the per-capita support social assistance regionally provides. Then, under rising inequality, lower family income can be compensated by higher labor participation of the family while making family members poorer and thus eligible for welfare, thereby increasing the percentage of regional welfare recipients.

We obtain a somewhat positive correlation between relative GDP and the welfare coverage rate. Specifically, the across-country correlation of the two variables (0.4) fell to 0.10 when excluding the most densely populated regions. The positive correlation seems to be most prevalent in densely populated states. We can guess that two things come together. First, income inequality may increase when areas become more densely populated, as figures on GDP and share of beneficiaries suggest (BBSR, Federal Institute For Research on Building, Urban Affairs and Spatial Development). Second, regional labor demand is stronger in urban areas, especially for high-skilled workers, while in rural areas there is relatively more demand for low-skilled workers. To simplify the discussion, assume an equal distribution of skills and an unsaturated market for high-skilled labor. Then, in urban areas, low-skilled workers will need welfare more often because their labor supply exceeds local demand. Thus, the local relevance of welfare will increase because the share of the population eligible for welfare increases and/or the per capita welfare support increases. The latter includes the case that the local share of persons eligible for welfare locally may even

decrease. However, because of the high demand for high-skilled labor, the wages of high-skilled workers also increase, and so does relative GDP. In rural areas without much industry, the supply of low-skilled labor exceeds the demand, so the welfare coverage rate is high and relative GDP is low. Conversely, if there is industry, the welfare coverage rate is low while relative GDP is high. The mix between urban and rural areas with and without industry would then lead to a correlation close to or even above zero, as obtained in our data set.

One may note that the impact of welfare programs on supply side reaction is not fully covered by regression result in Table 5: under increasing income inequality, regional GDP may increase while the number of welfare beneficiaries decreases but in need of higher per-capita benefits, and this may result in higher total welfare contributions and its potential impact on nursing homeowners on their pricing behavior. I.e., the regression in Table 5 may underestimate the supply-side reaction of regional welfare contributions on pricing.

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