Comparison of Japanese and German nursing homes: Implications of demographic and policy differences

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Comparison of Japanese and German nursing homes: Implications of demographic and policy differences

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Abstract

Background

This research provides a comparative study of Japanese and German nursing homes. Although these two aging countries share similar long-term care policies based on social insurance, descriptive statistics show the existence of a large difference in the outcomes of their nursing home sectors. This research pursues the reason behind these observations, looking at demographic and policy differences between the two countries.

Methods

To shed light from multiple angles, we conduct empirical analysis using three methods: regression, the Blinder-Oaxaca decomposition, and data envelopment analysis using regional data from the past decade.

Results

Our empirical results find that different outcomes are driven by both demographic and policy differences.

Conclusions

The results from the demographic elements indicate that the process of ageing will have a severer consequence for Germany than for Japan when Germany would catch up with the age profile of Japan. Among the policy elements, our result is consistent to the existence of moral hazard in Germany due to a generous welfare program.

Keywords: Japanese and German nursing home care; long-term care insurance; data envelopment analysis; Blinder-Oaxaca decomposition; moral hazard; comparative study

Background

Facing rapidly aging populations, developed countries provide varied public policies on elderly care. These policies have country-wise differences, which may result in different outcomes. Thus, international comparison could reveal rich implications for the construction of an efficient and robust policy. In this research, we compare nursing home care in Japan and Germany.

These two aging countries established mandatory social long-term care insurance (LTCI) as a main policy for elderly care. Germany established LTCI in 1995, and Japan followed in 2000. As summarized in Tamiya et al [1], the Japanese government learned many aspects from the preceding German experience, and these programs have many factors in common. However, descriptive statistics show the existence of a large difference between the outcomes of their nursing home sectors. Specifically, in Germany, a higher number of elders enter nursing homes with higher costs.

This research pursues the reasons behind these observations, looking at demographic and policy differences between the two countries. With respect to demography, Japan faces a more rapidly aging population than Germany. In addition, because LTCI provides different coverage based on the required level of care, the demographic elements can have different institutional effects on the outcomes.

In terms of policy, there are differences in both the LTCI and non-LTCI elements in Japan and Germany. The LTCI programs in these countries govern their national nursing home sectors differently, resulting in a different market segmentation of nursing homes. Furthermore, there is a difference in coverage of the social welfare program for nursing home care which is supplemental to LTCI.

To validate the effects of these demographic and policy differences on nursing home care from multiple angles, we adopt three empirical analyses using regional data. First, we employ regression analyses in which explanatory variables include demographic and policy factors. To analyze the demand side and supply side of the nursing home industry, our dependent variables are likelihood to enter a home and nursing home costs, which correspond to the decisions of consumers and providers, respectively.

Second, to obtain more quantitative implications from the regression results on demographic variables, we employ the Blinder-Oaxaca decomposition [2,3] for international comparison. Using this method, we can distinguish the effects of the demographic difference into the effects of endowment difference and institutional difference. Third, we use data envelopment analysis (DEA) to obtain more information on the supply side of the nursing home sector. The method is commonly used in analyzing the efficiency in nursing homes [4]. DEA is also shown to be a useful tool for the

international comparison of health economic sectors by Steinmann, Dittrich, Karmann, and Zweifel [5] in their comparative study between Swiss and German hospitals.

Our empirical results imply that both demographic and policy factors contribute to the different outcomes. Among the demographic elements, it is indicated that the process of ageing will have a severer consequence for Germany than for Japan when Germany would catch up with the age profile of Japan.

Among the policy elements, our results are consistent to the existence of moral hazard in both demand and supply sides in Germany. Specifically, we find that the demand and per-resident costs for nursing home care are shown to be higher in poorer areas. For the demand side, poorer consumers, who are more likely to have access to a social welfare program, can have more access to institutional care in Germany. This situation implies the existence of demand-side moral hazard, where elderly people might choose to enter a nursing home because this is a reasonable option relative to the alternatives, such as informal and formal care at home, due to the generous welfare program, *Hilfe zur Pflege* (help for care), in Germany. For the supply side, German nursing homes exhibit moral hazard in that they assign higher prices in poorer areas, where care providers are less exposed to price competition because the share of those who are eligible for social welfare is higher.

Our finding on the interaction between the welfare program and long-term care insurance provides implications applicable to other developed countries. In South Korea, which also has LTCI, Kim, Kwon, Yoon, and Hyun [6] showed that subsidies to the low-income population affected patterns of service utilization of LTCI users. In the US, which does not have social insurance for long-term care, Brown and Finkelstein [7] showed that Medicaid for the low-income elderly has a crowding out effect on private long-term care insurance. For the US nursing homes that accept both private-pay and Medicaid residents, Grabowski and Gruber [8] analyzed moral hazard, similar to our research.

This research contributes to the growing literature on long-term care policies via LTCI. Several studies provide descriptive analyses to compare countries with an LTCI system, such as Germany, the Netherlands, South Korea, and Japan. Specifically, Campbell, Ikegami, and Gibson [9] described Japan and Germany; Alders, Costa-Font, de Klerk, and Frank [10] considered the Netherlands and Germany; and Rhee, Done, and Anderson [11] compared South Korea, Germany, and Japan. Quantitative empirical research for comparative study are rare, because of difficulty in data collection. As an exception, a study closely related to ours is from Bakx, de Meijer, Schut, and Doorslaer [12], who analyzed LTCI in the Netherlands and Germany via the Blinder-Oaxaca decomposition.

Different outcomes from Japanese and German nursing homes

Table 1 here

Table 1 shows national-level descriptive statistics for the nursing home outcomes, with the detailed definitions and sources described in Section 4 and Appendix A1. Columns (1) and (2) show the likelihood of entering a nursing home and the annual nursing home costs per resident in purchasing power parity in USD for 2009, 2011, and 2013, respectively. We clearly see differences in the likelihood of entering a nursing home and the nursing home costs between Japan and Germany. From Column (1), the likelihood of entering a home in Germany is twice that of Japan. Furthermore, as of 2007, the average duration of stay in nursing homes was 3.4 years in Germany [13] and 4.0 years in Japan [14] and the nationwide capacity of nursing homes was 799,059 in Germany [15] and 418,114 in Japan [14]. Because the duration did not differ much, these statistics reflect the larger supply of nursing homes in Germany.

Column (2) reports that nursing home costs in Germany are 1.5 times larger than those in Japan. In short, Germany has a larger and more expensive nursing market. As the two countries share LTCI as their basic long-term care policy, the existence of such large

differences in nursing home outcomes motivates our empirical investigation.

Demography and its implications in LTCI

Figure 1 here

Germany and Japan are both considered to be aging countries, even among developed countries, but the demographic situations are not equivalent. Figure 1 shows the rates of the elderly (65+) among the overall populations in Germany, Japan, and the G-7 countries, as taken from OECD data. Germany has had a larger rate than the G-7 countries as a whole since 1970, and the rates have grown almost in parallel since that time. Japan started from a lower rate than the G-7 countries in 1970. However, due to rapid aging, Japan overtook the G-7 in 1994, and Germany in 2000. As a result, during our observation periods, the rate of the elderly was ultimately larger in Japan than in Germany.

Furthermore, not only general life expectancy, but also health expectancy (disability-free life expectancy) is different in these two countries. The World Health Organization [16, p.47] showed that health expectancy at birth in 2013 was 71 for Germany and 75 for Japan. In summary, there is a demographic difference in that Japan faces a more rapid aging of its population than Germany. We call this country difference in stages for aging as the endowment difference.

In addition to the above endowment difference of the demographic element, the two countries also have institutional differences for the treatment of the elderly population. Specifically, there is a general tendency toward LTCI being more generous in Japan than in Germany. The two countries' LTCI programs have similar frameworks of payment mechanisms such that the volume of available benefits and unit costs depends on care-need levels. Japanese LTCI had six levels until 2006 and seven levels since then, while the German LTCI had three care levels until 2016 and five levels since then. Masuda [17] claimed that the heavier three levels (Care Required 3, 4, and 5) in Japanese LTCI roughly correspond 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 lighter 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 care services at home in addition to institutional care.

Nursing home segmentation and costs in LTCI

In the LTCI of the two countries, the nursing home sector has a clear difference in market segmentation. Japanese LTCI has two different sectors within the nursing home market. One is the market for non-profit nursing homes, while another is the market for for-profit

156 nursing homes[3]. For-profit homes and non-profit homes are ruled by different systems.
157 The functions of non-profit homes are completely defined by LTCI, while only a limited
158 number of functions, namely direct care, of for-profit homes are ruled by LTCI. In this
159 research, we focus on the non-profit nursing homes for Japan because we do not have
160 access to cost data for for-profit homes.

161 On the other hand, German LTCI establishes a unified nursing home sector
162 which consists of public homes, for-profit homes, and non-profit homes. Unlike Japanese
163 LTCI, German LTCI treats these homes equally and does not create market segmentation.
164 In this sense, German nursing homes seem to be rather homogeneous in terms of
165 efficiency and quality, in spite of the ownership difference.

166 For nursing homes in both countries, there are two payment elements, care costs
167 and hotel costs, which consist of the lodging and food costs. In both countries, care costs
168 are at least partly covered by the LTCI benefit, while hotel costs are not. For the care
169 costs, LTCI in both countries have ceilings of coverage, which depend on users' care-
170 need levels. The ceilings are predetermined by the national government as a fixed amount

[3] Sugawara [18] provided an analysis of the industrial organization for for-profit nursing homes. Non-profit and for-profit nursing homes are the translated terms of *Kaigo Roujin Fukushi Shisetsu* and *Yuuryou Roujin Houmu*. In Sugawara [18], the non-profit and for-profit nursing homes are called public and private nursing homes, taking account of the payment resource.

171 across all regions.

172 Japanese non-profit nursing homes assign a homogeneous price for care costs
173 based on a uniform remuneration system across the country under LTCI, while the for-
174 profit homes can set their own prices for many parts. Therefore, costs in non-profit
175 nursing homes can be differentiated at the resident-level in limited ways through the
176 provision of optional care services, such as dementia care and medical care, care-need
177 level, or hotel costs. For German LTCI, the situation is similar in that the care cost is fixed
178 by LTCI, while the hotel cost is determined based on negotiation between LTCI funds
179 and nursing home owners[4].

180 *Table 2 here*

181 Table 2 summarizes the portion of LTCI benefits and the other sources for nursing
182 home costs. As shown in Column (1), LTCI covers a greater percentage of nursing home
183 costs in Japan (70%) than in Germany (50%). For the remaining portion of the nursing
184 home costs, the share of the hotel costs in Column (2) show only a 6-7% point difference
185 between the two countries. What differs more is the care costs, which are not covered by

[4] In Germany, since 2017, nursing home cost differentiation is limited as any copayment within a nursing home has to be independent of the residents' individual care-need level (*Einrichtungseinheitlicher Eigenanteil*). Hence, nursing home price differentiation is allowed only to reflect the nationwide LTCI remuneration differences according to care-need level. There is ongoing discussion to reverse the LTCI design so that copayments are fixed while LTCI remuneration is residual with respect to nursing home costs.

LTCI. As seen in Column (3), this share is three times larger in Germany than in Japan. Such a large difference is caused by the different ceilings of the LTCI benefits for care costs.

Social welfare programs for nursing home costs

In addition to the difference in LTCI, there is a clear distinction between Japan and Germany with respect to the social welfare program, which is a supplement to LTCI. In both countries, the portions of nursing home costs not covered by LTCI are co-payments and are paid by a combination of out-of-pocket expenses of residents and a social welfare program other than LTCI. Their composition is clearly different in these two countries.

In Japanese non-profit nursing homes, the main contributor for the costs not covered by LTCI is the out-of-pocket expense. Although social welfare exists for the low-income elderly, the amount of such exemptions is rather limited. For the hotel costs, the amount of governmental expenses depends on the type of facility. Hotel costs for the older facilities (*juurai-gata*), which mainly consist of shared rooms with multiple beds, can be supported by the government, depending on the income levels of residents, while hotel costs for the newer type of facilities (*unit-gata*), which consist only of individual rooms, are paid only as out-of-pocket expenses by residents.

For Germany, Social Assistance, the means-tested social welfare program, has a comprehensive role of compensating for the limited benefit of LTCI. In cases where the financial resources of residents or their relatives are not enough, according to the Social Security Code XI (SGB XI), there is governmental social assistance called *Hilfe zur Pflege* (help for care), which is provided by the respective municipality or some supraregional carrier responsible for social welfare. According to data from the Federal Statistical Office of Germany, the number of residents getting at least some payment amount from Social Assistance increased to over 40% in 2015.

As a result, nursing home sectors in Japan and Germany have clear differences, which are caused both by LTCI and non-LTCI policies. In Japan, the sector has three layers: for-profit homes, non-profit homes with individual rooms, and non-profit homes with multiple beds. The welfare program supports only non-profit homes with multiple beds. On the other hand, the German nursing homes are homogeneous, and Social Assistance covers the amount of costs which residents or their relatives cannot afford.

As a consequence of the above properties of their nursing home markets, the two countries have distinct situations with respect to waiting lists for homes. In Japan, non-profit homes show long waiting lists, while for-profit homes do not. Specifically, in 2013, 524,000 people were waiting for non-profit 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 [19]. In contrast, for Germany, waiting for nursing homes does not appear to be a severe social problem.

Methods

The first method of our empirical analysis is a regression analysis to detect elements affecting the different outcomes of nursing home sectors. As dependent variables, we adopt the likelihood of entering a nursing home for the elderly in the region and the nursing home costs per resident. The former dependent variable corresponds to the consumer decision on the demand side, while the latter corresponds to the decision of nursing home owners on the supply side.

We employ regression analysis separately on regional data for each country using pooled data with cluster standard errors for each region for our main analysis. There is a concern over whether differences in regional sizes affect the estimation results, as we do not use individual data, but rather regional data. To handle this issue, we employ the weighted least squares (WLS) estimation for regression analysis. In the WLS, we adopt the ratio of the number of elderly people in the region in relation to the number of elderly people in the country as a regional weight. For a robustness check, we also provide the fixed effect estimates in Appendix 2.

Our second empirical method is the Blinder-Oaxaca decomposition based on the WLS estimates. The expected difference between groups *J* and *G*, which stand for Japan and Germany, for the dependent variable *y* can be written as:

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

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

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

The Blinder-Oaxaca decomposition can provide quantitative implications for interpreting the effects of demographic factors. For the explanatory variables on demographic characteristics, the first term on the right-hand side reflects the country difference of the average of variables**.** This term directly captures the effects of the endowment difference of the demographic variable. The second term reflects the difference of their coefficients. This term captures the institutional difference in the treatment of the demographic elements. The third term is called the interaction effect, which captures the interaction of endowment and institutional effects. A comparison of the first and second terms on the demographic variables can provide implications regarding whether demographic or institutional difference is the main driver of the different outcomes.

The third method of our empirical analysis is to obtain the efficiency levels of the nursing homes in each region using DEA. Using DEA, we can provide further investigation on the supply side of nursing homes. DEA is an approach to determine the efficient frontiers by maximizing the distance between inputs and outputs, as summarized in Coelli, Rao, O'Donnell, and Battese [20]. In this study, we use DEA with constant returns to scale. Although the efficiency frontier analysis originally aimed at handling data of individual decision makers, the methodology is applicable to regional data, as in Karmann and Roesel [21].

Data[5]

Our sample units for Germany are the states (*Bundesländer*), which are the political units at the administration level with legislative power for care provision. We adopt prefectures (*Ken*) for Japan, which have the authority to give permission for nursing home operations. Although there are municipalities, which are smaller administrative units in both countries, we adopt states and prefectures as our sample units which allows to internalize otherwise potentially misleading spatial correlations between nursing homes caused by border-crossing entrance of residents and socio-demographic idiosyncrasies, as mentioned in Baltagi and Yen [22].

[5] To save space, we provide a detailed description for the construction of our datasets in Appendix A1. The descriptive statistics are shown in Table A1 in the Appendix.

We utilize regional data of 47 prefectures in Japan and 16 states in Germany. Observation times are all years from 2008 to 2014 for Japan and odd years from 2001 to 2015 in Germany. We conduct DEA separately for observation years 2009, 2011, and 2013, where data for Germany and Japan are jointly available. To see more details of regional variation, we conduct a subsample analysis of sparse and dense regions with respect to population densities.

In choosing the explanatory variables for the regression analysis, we adopt the following two criteria. First, we need to include elements affecting regional averages because the dependent variables for the regression are measured on a per-resident or per-home basis. On the other hand, variables at an aggregate level, such as the size of the market, might not have a direct effect on these dependent variables. We include aggregate information only when an aggregate variable can capture an indirect effect, such as externalities from other markets. Second, to obtain a meaningful result from the Blinder-Oaxaca decomposition, the supports of explanatory variables have to overlap between two countries [23].

Following the above criteria, we include three categories of explanatory variables: demography, policy, and the other control variables. The regression analysis provides general information for the effects of these factors on nursing home outcomes. For the

demographic variables, the Blinder-Oaxaca decomposition provides further implications as mentioned in Section 3.

For demographic variables, we incorporate the rates of the elderly (65+) and of the very old (80+) within the population. Along with the demographic situation, these two variables capture the status of regional economies because the aging regions are likely to have less active economies. Furthermore, the rate of the very old also controls the health status of the general elderly population, which must affect the choice of care options because the very old elders are more likely to be disabled.

The second category of variables reflects policy elements. To capture the policy differences, 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. More direct measurements, such as the coverage rate of the social welfare program in the region, have very different values in Japan and Germany and thus violate our criteria for variable selection. Because the relative GDP takes similar values in both countries, it is a proper variable for our analysis.

The third category is the other control variables, which include two explanatory variables. First, we adopt population density. This variable is included for considering the

310 effects of externalities, such as effects of general wage levels of the regional economy. In
311 addition, to measure the indirect effect via externalities, the accessibility of those home
312 care services that can act as alternatives to nursing home care might be related to
313 population density. Second, for the regression on nursing home costs, we adopt the
314 percentage of nursing home residents with light care-need. This variable reflects the
315 average health status among the elderly and is likely to affect the choice of care options.
316 This variable is used only for the regression on nursing home costs because information
317 on the current residents does not have a clear relationship to the decision making of
318 elderly people who are yet to stay in a nursing home.

319 For the DEA exercise, two input variables and three output variables are adopted. The
320 input variables consist of the number of workers and total costs for nursing home care in
321 a region. For the first input variable, the number of workers is evaluated as the full-time
322 equivalent number. For output variables, we adopt the number of residents in nursing
323 homes for each care level. We analyze input efficiency using two inputs and three outputs.
324 For output efficiency, we constructed the total number of nursing home residents and
325 analyzed the output efficiency using this one output and two inputs.

Results

Regression results

Table 3 here

Table 3 shows the WLS results for the likelihood of entering a nursing home and the nursing home costs per resident. The most striking result is that the coefficients for the relative GDPs have opposite signs in Japan and Germany. For the likelihood to enter a home, we obtain a significantly positive coefficient at the 10% level for Japan and a significantly negative coefficient at the 1% level for Germany. For the per capita nursing home costs, we obtain a significantly positive coefficient at the 1% level in Japan and a significantly negative coefficient at the 5% level in Germany. These results indicate that welfare program coverage has different effects in Japan and Germany. We also employed a fixed effect estimation, as shown in Appendix A2, and obtained consistent signs on this point, although the coefficient for nursing home costs in Japan is not significant.

These results can be interpreted as a consequence of moral hazard on the demand and supply sides in Germany. In a natural setting, we expect to obtain a positive coefficient for this variable as in Japan, because wealthier consumers can afford more costs and are more likely to choose institutional care, which is more expensive than care at home. Instead, moral hazard is a natural interpretation for the negative coefficients in Germany.

The negative coefficient in Column (2) suggests that elders who are more likely to receive the welfare benefit are more likely to enter a home. Such a behavior seems to be distorted by social welfare, and we interpret this as a sign of moral hazard of consumers. On the other hand, the negative coefficient in Column (4) suggests that the increasing share of the regional population who are eligible for welfare benefits correlates to the higher costs of nursing homes. Such a relation seems to reflect a distorted supply behavior which would be a sign of moral hazard of nursing homes.

Next, we consider coefficients for demographic variables. In Columns (1) and (2) on the likelihood of entering a nursing home, the rate of elderly people (65+) has negative coefficients for both countries. This result can be interpreted as illustrating that in economically more inactive areas, the elderly, at least up to certain age, try to use care in their own homes more often to avoid paying for expensive institutional care. The rate for the very old (80+) has significantly positive coefficients for both countries, which is also a natural result because the very old generally require more intensive care.

In Columns (3) and (4) on the nursing home costs, the rates of elderly people and the very old in Germany have a negative and positive coefficient, respectively. These results can be interpreted in a similar manner to the discussion about these variables for the likelihood of entering a nursing home. On the other hand, we have insignificant

362 coefficients for these variables in Japan. The large volume of LTCI coverage in Japan
363 seems to play a sufficient role in achieving almost uniform long-term costs among the
364 Japanese elderly. Once we control for the relative GDP, the rates of the elderly and the
365 very old do not conceivably affect nursing home costs in Japan.

366 For population density, Japan has a significantly negative coefficient on the likelihood
367 of entering a nursing home. As mentioned in Section 2, there are various services for care
368 at home that might offer an alternative to institutional care in Japan. The services for care
369 at home are likely to be located more in urban areas because of low transportation and
370 other operating costs. Consequently, the existence of alternative services in populated
371 areas decreases the likelihood of utilizing a nursing home. Furthermore, population
372 density has significantly positive coefficients on nursing home costs in both countries.
373 The positive effect is a natural result because in areas with higher conglomeration, and
374 thus, typically higher activity levels, people can afford higher costs. Also, there is a
375 possibility that these areas are associated with higher wages, which increase costs for
376 nursing homes.

377 The rate of light disability has significantly negative and positive coefficients in Japan
378 and Germany, respectively. If the nursing home costs are mainly covered by LTCI, this
379 variable might have a negative effect, because LTCI provides lower benefit ceilings for

380 those with lower care-needs. Thus, the positive coefficient for lighter disability in
381 Germany implies the important role of payment sources other than LTCI.

382 *Table 4 here*

383 To see more details of moral hazard, Table 4 shows the regression for subsamples of
384 dense and sparse regions. We only show the WLS results for Germany because subsample
385 results for Japan, with respect to signs of the coefficients for the relative GDP, are
386 equivalent to those in Table 3.

387 The results for the likelihood of entering a home in Columns (1) and (3) are generally
388 consistent with those in Column (2) of Table 3. In particular, we obtain similar
389 coefficients for the relative GDP, which is consistent to a hypothesis that the demand-
390 side moral hazard is a general phenomenon in the whole of Germany. Comparing
391 Columns (1) and (3), a sign of demand-side moral hazard is shown to be stronger in sparse
392 regions. The sparse areas have lower population density and generally show lower income.
393 Because of the sparse population, many elderly people have limited access to home care
394 services which may result in higher demand for nursing home care.

395 Results for the nursing home costs in Columns (2) and (4) indicate that the relative
396 GDP has a significantly positive coefficient at the 1% level in the sparse regions and a
397 significantly negative coefficient at the 1% level in dense regions. These results are

consistent to a hypothesis that the supply-side moral hazard typically occurs in dense German states. The dense areas include only two former East German states out of nine states, while the sparse areas include four former East German states out of seven states. Thus, it seems that moral hazard behavior of nursing home owners might not typically occur in eastern Germany.

Results for Blinder-Oaxaca decomposition

Table 5 here

Based on the above WLS estimates, we conduct the Blinder-Oaxaca decomposition and depict the estimation results for demographic variables in Table 5. There are three blocks in the table, where the upper block (Endowment effect), the middle block (Coefficient effect), and the lower block (Interaction effect) correspond to the first, second, and third terms on the right-hand side of Equation (1), respectively. The explanatory variables, other than demographic variables, are also included in the Blinder-Oaxaca decomposition, but we do not show their results[6] because our main concern is with the demographic variables, as mentioned in Section 3.

Columns (1) and (2) of Table 5 show the decomposition results for the likelihood to enter a nursing home and nursing home costs, respectively. The endowment effects are

[6] The detailed results are available upon request.

415 significant at the 5% level for all variables. Thus, the fact that Japan is aging at a higher
416 rate than Germany, as described in Subsection 2.2, has a considerable impact on the
417 nursing home outcomes of usage and costs.

418 On the coefficient effects, for the likelihood to enter, the rate of the elderly is not
419 significant and the rate of very old is significantly negative at the 1% level. These results
420 correspond to the WLS results in Table 3, in which for their coefficients, the signs are the
421 same and the magnitudes are similar for the rate of the elderly and different for the rate
422 of the very old. The significantly negative coefficient effects of the rate of the very old
423 on the usage implies that very elderly in Germany are more likely to enter nursing homes
424 than those in Japan.

425 On the other hand, the coefficient effects for nursing home costs are significant for
426 both demographic variables. As mentioned in the last section, long-term care costs in
427 Japan do not diverge with respect to age if we control the care-need level, because of the
428 wide LTCI coverage. On the other hand, the influence of age still remains relevant in
429 Germany due to limited coverage of LTCI. As a result, for Germany, the share of the very
430 old would drive costs up rather than the share of general elderly population.

431 In summary, both the endowment and institutional difference of the demographic
432 variables are drivers of the different outcomes of nursing homes. It is important to note

that we find not only the endowment effect, but also the institutional effect. There is a possibility that Germany will catch up to Japan on aging in the near future. However, our finding implies that even when the endowment effect is removed, there still is a country difference caused by the institutional effect. Specifically, because the share of the very old has cost-increasing effects as a larger institutional effect in Germany, we can expect that German nursing home costs will be increased along with the future population aging. Therefore, the process of ageing will have a severer consequence for Germany than for Japan when Germany would catch up with the age profile of Japan.

DEA results

Using a sample with all regions, we find that the means and standard deviations of input efficiencies are 0.969 and 0.030 for Japan and 0.751 and 0.082 for Germany, respectively. For the output efficiencies, the means and standard deviations are 0.940 and 0.028 for Japan and 0.56 and 0.080 for Germany. Figures A1 and A2 in the Appendix show the histograms of the input and output efficiencies in the overall regions for Japan and Germany. Combining the above results with findings from the descriptive statistics in Table A1 in the Appendix, we clearly find that Japanese nursing homes are more efficient than those in Germany. Such general inefficiency of German homes provides another supportive sign of the supply-side moral hazard in Germany.

The estimation result is consistent to a hypothesis that the supply-side moral hazard might be produced by the behaviors of German nursing home owners, such as employing more workers, caring less about price competition, or exerting less managerial power. Conversely, the higher DEA efficiency in Japan seems to also result from more homogeneous pricing which forces Japanese nursing home owners to equalize their input resources to run their homes.

Discussion

The above estimation results show several major findings. For the demographic variables, our Blinder-Oaxaca decomposition results reveal that both the endowment and institutional effects are considerable driving forces on the different outcomes of the nursing home sectors. For the policy elements, the regression results imply that both LTCI and social welfare programs affect the nursing home outcomes differently in Japan and Germany. In particular, it is implied that the social welfare program might cause demand-side and supply-side moral hazard in Germany.

For supply side moral hazard, the subsample regression in Table 4 and the DEA provide further supporting evidence. Dense areas have more economic activity, and hence, more room for managerial efforts, which the DEA detected as a potential source of

469 supply-side moral hazard. For example, dense areas have a rich labor market for care
470 givers. Using these managerial resources, nursing home owners might be able to provide
471 excessive institutional care.

472 Our empirical analysis provides several policy implications. From the perspective of
473 German long-term care policy, Germany is expected to face a higher long-term care
474 burden for nursing home care than the current status of Japan due to their institutional
475 characteristics. In contrast to nationwide LTCI, Social Assistance is a regional policy tool
476 aimed at securing the share of the regional population in need of care from insolvency
477 risk. The poorer this share of the population, the higher the coverage of this type of Social
478 Assistance, which might stimulate demand-side moral hazard of the regional population,
479 mimicking the textbook example of behavior close to the full insurance benchmark in
480 contrast to a non-insurance situation. On the other side, regional income typically
481 constrains the regional supply of services. However, in case of Social Assistance of the
482 type described here, regional suppliers of nursing homes are partially insured against a
483 ceteris paribus over-supply risk, and any additional unit of care service offered is less
484 risky than without Social Assistance.

485 Our results provide complementary insights to Bakx et al. [12], who indicated that
486 access to formal care is more difficult for the low-income elderly in Germany than in the

487 Netherlands. In addition, our results for the likelihood of entering a nursing home show
488 that the low-income elderly have more access to nursing home care in Germany. A
489 possible source of this different result might be the fact that data for Bakx et al. [12]
490 include both institutional and home care,[7] while our research concentrated only on
491 nursing home care. Thus, our findings imply the importance of considering home and
492 institutional care separately in empirical analysis.

493 On the other hand, the results for Japan indicate that there could be the design for
494 social security in long-term care provision, which does not produce moral hazard by
495 limiting the coverage of the social welfare program to a specific category of services. As
496 described in Section 2, nursing home sectors in Japan provide limited support for the low-
497 income elderly as the welfare program is provided only for multiple-bed rooms in non-
498 profit homes, which might prevent moral hazard.

499 Conclusion

500 This research presents an international comparison for Japanese and German nursing
501 home care, which shows different outcomes in spite of similar national policies based on
502 LTCI. Our Blinder-Oaxaca decomposition result shows that both endowment and

[7] 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 users can be reported out in SHARE.

503 institutional differences matter for demographic variables in explaining the different
504 outcomes. For Germany, according to the severe cost increasing effects of ageing, a
505 prominent task would be to identify appropriate measures. One of them might be to
506 remove the regional differences in the resource use, as shown in our DEA result. For the
507 policy elements, the regression results imply that both LTCI and social welfare programs
508 affect the nursing home outcomes differently in Japan and Germany. In particular, it is
509 implied that the social welfare program might cause demand-side and supply-side moral
510 hazard in Germany.

511 # List of abbreviations

512 **LTCI**: Long-term care insurance

513 **DEA:** data envelopment analysis

514 **WLS**: weighted least squares

515 **GDP**: gross domestic product

516 # Ethics Declarations

517 **Ethics approval and consent to participate**

518 Because data except nursing home costs for Japan are obtained from public domain
519 homepages, ethics approval is waived. A variable nursing home costs are created using
520 micro data "the Survey on Institutions and Establishments for Long-Term Care" which

521 come from the Japanese Ministry of Health, Labour and Welfare (MHLW). An ethical
522 review of the Survey on Institutions and Establishments for Long-Term Care is not
523 required, based on the 'Ethical Guidelines of Epidemiological Research' of the Japanese
524 government [24].

525 **Consent for publication**

526 Not applocable.

527 **Competing interests**

528 All authors declare that they have no commercial or other associations that may pose a
529 conflict of interest.

530 **Authors' contributions**

531 SS carried out data analyses. AK and SS drafted the manuscript. All authors read and
532 approved the final manuscript.

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Availability of data and materials

Data except nursing home costs for Japan are available upon request. A variable nursing home costs for Japan are created using micro data "the Survey on Institutions and Establishments for Long-Term Care" which come from the Japanese Ministry of Health, Labour and Welfare. Ministry of Health, Labour and Welfare does not allow us to disclose the data to anyone outside the research team. However, one can obtain the same data from Ministry of Health, Labour and Welfare on the basis of Article 33 of the Statistics Act, if his/her research project receives a grant from Ministry of Health, Labour and Welfare or Ministry of Education, Culture, Sports, Science and Technology.

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Tables and Figures

	Likelihood to enter a home		Nursing home cost per resident	
	%		Cost (2000 USD-PPP)	
	(1)		(2)	
	Japan	Germany	Japan	Germany
2009	1.81	3.97	21,726	34,476
2011	1.89	4.21	21,473	35,954
2013	1.89	4.24	21,920	38,535

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

	% LTCI		% other than LTCI			
			% Hotel cost		% Care cost	
	(1)		(2)		(3)	
	Japan	Germany	Japan	Germany	Japan	Germany
2009	72.30	51.82	19.80	26.34	7.90	21.84
2011	71.97	51.88	20.08	26.56	7.96	21.55
2013	70.94	50.46	21.06	26.54	8.00	23.00

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 http://www.portal-sozialpolitik.de/, accessed in September 2, 2019, for Germany.

Dependent variable	Likelihood to enter a home				Nursing home cost			
	Japan		Germany		Japan		Germany	
	(1)		(2)		(3)		(4)	
Relative GDP	0.002*	(0.001)	-0.005***	(0.002)	19.667***	(3.304)	-49.331**	(23.791)
Population density(log)	-0.073***	(0.021)	0.032	(0.039)	144.546*	(82.577)	2,413.278***	(465.628)
Rate of elderly (65+)	-0.067***	(0.011)	-0.081**	(0.035)	26.894	(35.054)	-2,543.959***	(403.331)
Rate of very old (80+)	0.202***	(0.022)	0.412***	(0.077)	-39.025	(72.712)	9,732.064***	(940.188)
Rate of light disability					-32.089***	(9.089)	555.025***	(130.911)
Constant	2.393***	(0.222)	3.914***	(0.559)	20,363.465***	(788.425)	9,227.715	(7,703.134)
Observations	329		128		329		128	
R-squared	0.453		0.311		0.134		0.774	

Table 3. Weighted least squares estimates for likelihood to enter a nursing home and nursing home costs. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Area	Population density<200				Population density>=200			
	Likelihood to enter		Nursing home costs		Likelihood to enter		Nursing home costs	
	(1)		(2)		(3)		(4)	
Relative GDP	-0.025***	(0.003)	183.142***	(60.308)	-0.004***	(0.001)	-80.866***	(30.333)
Population density(log)	0.880***	(0.287)	2,890.612	(4,410.976)	0.217***	(0.031)	2,361.318***	(784.273)
Rate of elderly (65+)	-0.197***	(0.044)	2,804.530***	(816.566)	-0.113***	(0.034)	-3,328.271***	(509.070)
Rate of very old (80+)	0.601***	(0.106)	-4,534.005*	(2,351.823)	0.524***	(0.084)	10,729.555***	(1,026.072)
Rate of light disability			1,383.146***	(145.970)			756.440***	(187.601)
Constant	3.106**	(1.469)	-83,174.086***	(22,057.168)	2.528***	(0.456)	16,445.883	(10,539.885)
Observations	56		56		72		72	
R-squared	0.698		0.930		0.588		0.857	

Table 4. Weighted least squares estimates for Germany, on subsamples of sparse and dense regions. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

	Likelihood to enter a home (1)		Nursing home costs (2)	
	Estimate	S.E.	Estimate	S.E.
Endowment effects				
Rate of elderly (65+)	-0.432**	0.193	-4,931***	1,717
Rate of very old (80+)	1.275***	0.275	13,680***	2,554
Population density(log)	0.001	0.004	52	93
Coefficient effects				
Rate of elders (65+)	0.395	0.806	20,499***	6,915
Rate of very old (80+)	-1.237**	0.485	-24,148***	4,395
Population density(log)	-0.549**	0.276	-3,698*	2,222
Interaction effects				
Rate of elderly (65+)	0.097	0.199	5,065***	1,727
Rate of very old (80+)	-0.707**	0.278	-13,789***	2,564
Population density(log)	-0.006	0.011	-43	78
Total	-0.652***	0.142	-5,183***	1,699

Table 5. Blinder-Oaxaca decomposition results for demographic variables on the likelihood to enter a nursing home and nursing home costs. The explanatory variables other than demographic variables are also included in calculation but abbreviated.

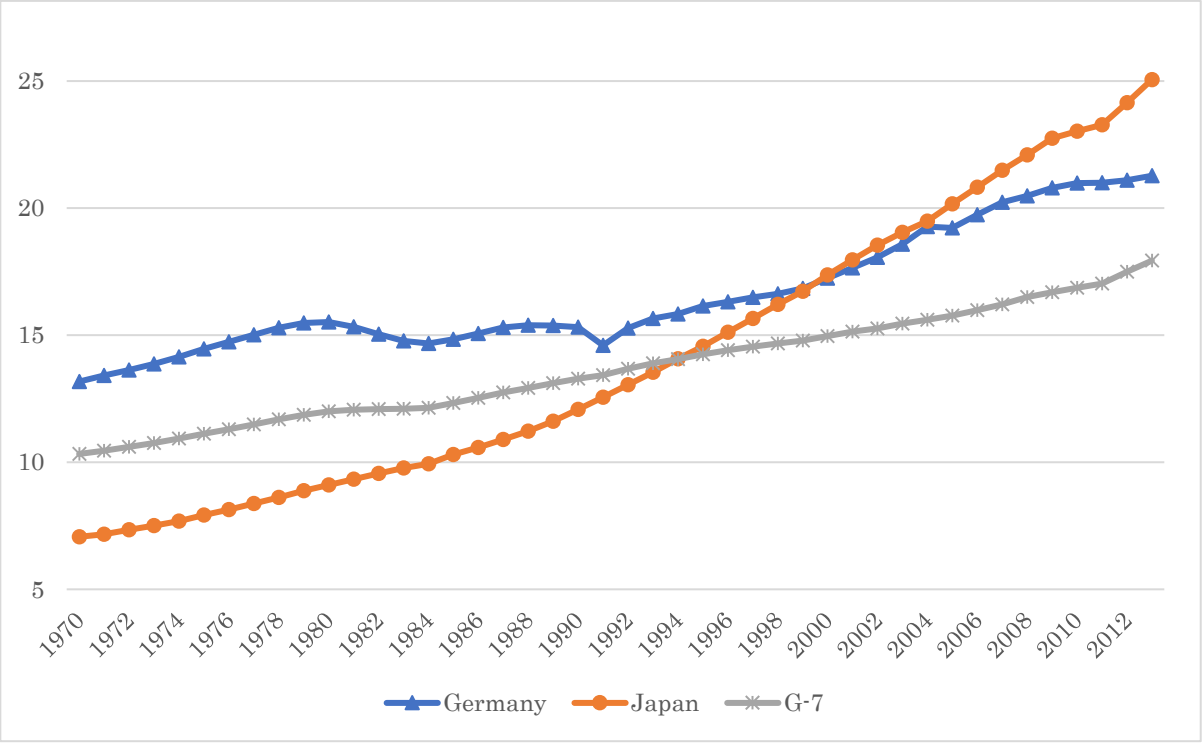

Figure 1. Elderly population (% of population)

Supplementary Files

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