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Incentive for Gatekeepers and Their Demand Inducement: An Empirical Analysis of Care Managers in the Japanese Long-Term Care Insurance

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Incentive for gatekeepers and their demand inducement: An empirical analysis of care managers in the Japanese Long-Term Care Insurance

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This study analyzes incentives and supplier-induced demand of care managers, middlemen between consumers and service providers in the Japanese social insurance program for long-term care. Care managers can be considered as pure gatekeepers in that their function is limited to referral to specialists and they themselves do not provide care. Rewards for care managers are rendered by capitation, which is considered as a cost-effective payment mechanism for insurers. However, many care managers actually work for firms that also operate service provision sectors. The service providers are rewarded by the fee-for-service payment and have motivation to induce excess consumer demand. Thus, the violation of neutrality of care managers might yield an financial burden on social insurance. In this study, we empirically analyze the behavior of care managers by checking whether they cause supplier-induced demand. Our estimation results detect the existence of care manager-induced demand for care managers who work for firms that jointly operate in service provision sectors; however, those who operate only care management do not induce demand. Based on the estimation results, we conduct a quantitative analysis and show that the care manager-induced produces a considerable financial burden on social insurance.

Keyword: Elderly care; Gatekeepers; Incentive; Supplier-induced demand; Japanese Long-Term Care Insurance program; Care managers

JEL classification codes: I18; I11; J13

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1. Introduction

In response to the overwhelming concern with population aging, the Japanese government established the radical Long-Term Care Insurance (LTCI) program in 2000. This mandatory program with universal coverage instantaneously created new markets for various formal elderly care services such as home care, day care services, and short-stay care. To guide consumers in this newly created and complicated market, the LTCI introduced middlemen, called care managers, between consumers and service providing firms. This study investigates whether care managers promote efficiency of the social insurance program.

Care managers can be considered as gatekeepers who make appropriate referrals to formal care providers for consumers. In the health care sector, gatekeepers are commonly seen as primary care physicians, such as managed care in the United States and general practitioners in the United Kingdom National Health Service. For long-term care, several developed countries have gatekeepers in mechanisms of case management that guide elders who return home after hospitalization, as reviewed by OECD (2005) and Johri et al. (2003). However, gatekeepers were not a part of social insurance programs for long-term care in the Netherlands, Germany[1], or the recent program in Korea.

Our study offers a unique perspective on the provision of formal elderly care using gatekeepers through the radical social insurance experience of Japan, the country that faces fastest population aging globally. Considering the nature of required treatments, gatekeepers can be a suitable tool in elderly care. Unlike medical care in which one hospital or one doctor is responsible for comprehensive care, long-term care requires various services. Thus, the existence of gatekeepers can promote efficiency in matching the care needs of the elderly and service providers, as opposed to direct visits to specific service providers. In addition to supply side variety, consumer heterogeneity complicates provision of elderly care. Since long-term care is not aimed at a unique purpose of cure, appropriate treatments are more patient-specific than medical care. Therefore, consumer characteristics, besides health status, need to be considered for constructing a suitable combination of many available services. For example, the presence of a coresident family caregiver can decrease the demand for home care, while day care service might be preferred as a respite for the caregiver.

Additionally, because of the difficulty involved in collecting information on the quality of providers, search costs for preferable providers might be larger for elderly care than medical care for consumers. In many cases, new consumers do not have sufficient time to choose preferable providers, especially when the demand for long-term care emerges instantaneously after a sudden illness like a heart attack or accidental injury. Furthermore, it is not always helpful to accumulate information on a specific service sector, because suitable services continuously change in response to the unstable health status of the elderly.

The gatekeeper mechanism also has an advantage specific to the Japanese LTCI. The

[1] In 2008, the German program introduced a sector that is translated as *Information center* (Rothgang, 2010). According to Campbell et al. (2010), this sector played a role similar to that of the care managers and was "partly based on Japan's experience."

LTCI has a short history and thus, not much information is accumulated on it. Furthermore, the LTCI program has been amended every three years. Its complicated and unstable rules have widened the knowledge gap between consumers and care providers, making it more costly to collect information on the LTCI than on ordinary doctor–patient relationships in health care.

In spite of the desirable aspects outlined above, the asymmetric information problem common to the health care sector creates several difficulties to design the care management mechanism. As knowledge on health status is available only for a doctor, the expert agency problem is often generated in the health care sector. Furthermore, in health economics, there is a double agency problem which arises not only between patients and doctors but also between doctors and insurers, as formulated by Blomqvist (1991). For example, a doctor who is the perfect agent of a patient must exaggerate the care provided up to socially wasteful levels. On the other hand, if a doctor is a perfect agent for the insurer, treatment levels must be lower than the social optimum. These expert agency and double agency problems are also present in the LTCI.

The information problem might be addressed by designing an incentive mechanism that ensures socially desirable behavior of agents. Regardless of the contents of a care plan, care managers in the LTCI receive a fixed reward for each care plan. While such capitation payments are considered cost-effective for insurers, the total reward of care managers, even at best, does not seem sufficient to run an office that is specific to care management under the current program.

Then, many care managers actually work for firms who also own a service provision sector. These care managers are likely to offer referrals to corresponding providers. If the choice of a care manager directly corresponds to the choice of providers, this mechanism is equivalent to direct service supply by specialists. Rewards for these care managers might be based on fee-for-service payments by which service providers are rewarded. The fee-for-service payment is known to cause supplier-induced demand, which has been actively studied in health economics, as summarized by McGuire (2000), and creates a financial burden for social insurance.

This study empirically validates the existence of supplier-induced demand to check whether care managers are actually compensated via the fee-for-service payment. The demand inducement by suppliers can occur in the market under information asymmetry where suppliers, typically physicians, only have access to information about the quality of services. When suppliers face an event, such as accelerated competition, to shift the supply curve upward, they control consumer demand to compensate for their income up to the level before the supply-side shock occurs. In the LTCI, there are broadly two categories of care managers with respect to their payment. The first category consists of independent care managers who work only as care managers and are rewarded by capitation payment. The second category consists of dependent care managers who work for firms that also operate in service provision sectors. The dependent care managers might be compensated by the fee-for-services payment. The detection of supplier-induced demand implies that neutrality of care managers is violated and hence, the current care management mechanism does not work for cost reduction.

Our empirical analysis is conducted using regional data of local insurers. We employ

a regression analysis on the regional density of care managers for dependent variables that measure regional consumer demand for care services. A similar analysis based on regional data was utilized by classical studies such as Fucks (1978) and Cromwell and Mitchell (1986) to detect supplier-induced demand. Yamauchi (2004) and Yuda (2005) analyzed supplier-induced demand by home care providers in the Japanese LTCI based on this approach and found contradicting results. The former study detected induced demand while the latter did not.

In the empirical literature of the supplier-induced demand, however, the use of regional data is criticized from the perspective of identification by studies like Dranove and Wehner (1994). This problem of regional data prompted recent studies such as Gruber and Owings (1996), SØrensen and Grytten (1999), and Iversen and Lurås (2000) to adopt microdata of individual suppliers or consumers. For the Japanese LTCI, Noguchi and Shimizutani (2009) analyzed home care providers using microdata and did not find demand inducement.

Owing to limited data availability, we adopt regional data and carefully handle the following two problems to justify our analysis using regional data. The first problem is that the regional data ignore price heterogeneity. Our analysis of Japanese care managers is free from this problem since price heterogeneity is controlled by the natural-experimental setting of the LTCI, which formulates a uniform pricing for care services. The second problem is a danger of simultaneity bias caused by the possibility of more care managers being attracted to markets with higher profit. We deal with this simultaneity problem via the instrumental variable method. We use the lagged value of the care manager density using the advantage of panel data, which works as an ideal instrument.

Our empirical analysis reveals the existence of the care manager induces demand, especially for elders with heavier care requirements and day care services. These results can be naturally interpreted as implying that demand in more beneficial categories becomes a target of demand inducement. We also detect that introduction of a penalty to encourage neutrality of care managers does not have considerable impacts on the situation. On the contrary, we decompose care manager densities and detect that while independent care managers do not cause induced demand, dependent care managers do.

Based on the estimation results, we conduct the following quantitative analysis. An increase in the number of care managers per 1,000 population, generates approximately JPY 3,987 additional demand per year, which implies additional JPY 399 as out-of-pocket expenses. Although this amount may be neglected by an individual consumer, it can produce JPY 90 billion excess aggregate costs for the social insurance budget. Given the large impact of care manager induced demand, independence of care managers deserves more attention for removing the financial burden.

Our study contributes to an active literature on the role of gatekeepers. A decade since a classic survey by Scott (2000) noted the lack of studies on gatekeepers in health economics, many theoretical studies have been generated, such as Garicía-Marinñoso and Jelovac (2003), Malcomson (2004), Blomqvist and Léger (2005), Brekke et al. (2007), González (2010), and Allard et al. (2011). Although these works of research have not reached a consensus on whether gatekeepers are preferable or not from an economic perspective, many studies agreed that there is a difficulty in designing an efficient in-

centive mechanism for gatekeepers. In the empirical literature, Mitchell and Sass (1995) detected demand inducement caused by vertical integration of primary care and specialized hospitals, which might indicate the loss of cost-effectiveness of gatekeepers. Croxson et al. (2001) reported that introduction of a new payment mechanism for gatekeepers in the UK changed their behavior. On the other hand, Grytten and SØrensen (2001) compared the behavior of salaried and fee-for-service physicians in Norway, and did not find demand inducement even for the fee-for-service physicians. In short, empirical studies have also not arrived at a consensus.

Our study makes a unique contribution to the existing literature and provides a more focused view on the role of gatekeepers. While the previous studies were concerned with primary care physicians, who themselves provide patient care, care managers are*pure* gatekeepers who do not provide any care service and specialize in referrals. To the best of our knowledge, this category of pure gatekeepers is not seen in any other field of health economics. Therefore, we believe that our study on care managers will generate a clear understanding on the little known role of gatekeepers.

The remainder of this paper is organized as follows. In Section 2, we provide a brief review of the LTCI and the role of care managers. Section 3 presents our econometric framework and the dataset. Section 4 summarizes empirical findings. Section 5 concludes.

2. Care manager incentive in the Japanese LTCI program

2.1. The role of care managers

The Japanese LTCI is a market-oriented program geared toward satisfying the growing demand for elderly care. Unlike the programs in Germany, the LTCI does not allow for direct cash transfers to elders or care givers. Instead, the coverage is limited only to care services purchased through the formal market. This property of the LTCI has created a large demand for long-term care services and enabled the care sector for the elderly to instantaneously become a big industry[2].

The LTCI originally covered institutional care and home-based care sectors. It was amended every three years, and we have summarized previous amendments on care managers in Appendix A. The 2006 amendment was a major reform and created two additional sectors for the LTCI. The first is the preventive care sector for the elderly with lighter care needs, and the second is community-based care in which local authorities have more administrative powers than the other sectors. Considering the fact that most developed countries have a major formal market only for permanent institutional care, the wide variety of available services is a unique property of Japanese elderly care.

To guide consumers in this newly created, complicated market, the LTCI introduced the care manager as a middleman between consumers and service providers. Care man-

[2]Ikegami and Campbell (2000) described details of the original LTCI and Tsutsui and Muramatsu (2007) provided extensive information about the 2006 amendment. Tamiya et al. (2011) presented a comprehensive review of the current LTCI. For English translations of Japanese legal terms about the LTCI, we have referred to Sumii and Sawada (2012).

agers present a menu of services called the *care plan*[3] to each consumer. The care plan prescribes the amount of services and the firms who provide the services. To create an appropriate care plan, care managers are required to make a careful prior assessment and hold a meeting of providers. After creating a care plan, care managers should visit each consumer at least once a month to monitor the plan and to update it if necessary.

The care managers are associated with three workplaces: preventive care, institutional care, and home-based care sectors. Care managers in the preventive care sector belong to the community comprehensive care center (*Chiiki Houkatsu Shien Center*), which is operated by either a local authority or a corporation entrusted by the authority. In the home-based care sector, care managers work for the home-based care management office (*Kyotaku Kaigo Shien Jigyousho*). This study concentrates on care managers in the home-based care sector. The number of active establishments and active care managers in home-based care management increased from 17,176 and 27,542, respectively, in 2000 to 27,961 and 65,178 in 2009, respectively[4].

The main services in the home-based care sector are home care (*Houmon Kaigo*) and day care service (*Tsuusho Kaigo*). Home care is a service in which paid caregivers visit the elderly and provide long-term care at home. The day care service provides long-term care to the elderly in a facility during the daytime, without overnight stay. Unlike institutional care, the lack of requirement for beds promotes a scale merit to provide care for more number of consumers at once. This property indicates that day care services can be benefited by good management. Detailed information on the management practice of these services can be obtained from the Survey of Long-Term Care Management (*Kaigo Jigyou Keiei Jittai Chousa*), which is a sampling survey for establishments conducted by the Japan Ministry of Health, Labour and Welfare (JMHLW) , for every three years. The results for 2005 and 2008 show that the average profit of home care establishments is approximately zero, while day care services rewards are 7% greater than cost.

In the 2006 amendment, two policies were assigned to encourage substitution of costly institutional care by home-based care. The first is the Regulation of Volume (*Souryou Kisei*), which prohibits new establishments[5]. This is not a formal rule; it is just an announcement made by the government meant for each insurer, a regional unit of authority to operate the LTCI. The second policy is assigning room fees and board expenses for institutional care, which were covered by the LTCI before the amendment, as out-of-pocket expenses for institutional care. These policies increasingly popularized day care services as a convenient alternative to institutional care.

[3] Although anyone can create a care plan, including consumers, mostly care plans are made by care managers.

[4] These figures are taken from publicly accessible aggregate data of the Survey on Institutions and Establishments for Long-Term Care.

[5] See Sugawara (2013) for details of the Regulation of Volume and its impact on the nursing home industry

2.2. Incentive of care managers

The LTCI is a social insurance program with universal coverage. Whenever long-term care is needed, the elderly person requests assessment to obtain a LTCI classification level. A classification level is assigned to the elderly based on several items, including activities of daily living (ADL) and instrumental activities of daily living (IADL). Before the 2006 amendment, there were six classification levels, assistance-required and care-required 1 to 5. The latter levels cover costs for more intensive care. The 2006 reform redefined lighter levels, namely, assistance-required and care-required 1 to assistance-required 1 and 2 and care-required 1. Assistance-required 1 and 2 were subsequently distributed to the new preventive care sector.

The assigned classification level prescribes a set of available care services and an upper bound of the monetary coverage of insurance. The upper bounds have not changed since the launch of the LTCI. Out-of-pocket expenses are 10% of the costs within the bound, and the rest are covered by the LTCI. After obtaining the classification level, the elderly choose a care manager for a care plan. The elderly can choose any care manager and can switch the care manager at any moment.

Service providers are rewarded via the fee-for-service payment; however, prices for services are controlled by the government. Similar to medical care in Japan, the LTCI adopts a detailed remuneration point system to determine rewards for services. As a result, most elderly care services are provided at a fixed price in Japan. The only element that produces price difference is the regional variation in exchange rate between remuneration points and money[6]. In this study, we adopt the remuneration point to measure consumer demand to regional price differences.

Unlike the service provision with fee-for-service payment, care management itself is paid via capitation. In other words, regardless of the contents of a care plan, care managers receive a fixed reward for each care plan, with few exceptions of special bonuses. Ignoring bonuses, care managers today receive approximately JPY 10,000 per consumer for each month. As summarized in Appendix A, care managers are limited to see at most 39 consumers after the 2006 LTCI amendment. Thus, the total reward of a care manager, at best without a bonus, is less than JPY 400,000 per month. This reward does not seem sufficient to run an office which is specific to care management.

Consequently, many care managers work for firms who also own service provision sectors. These care managers are likely to refer consumers to corresponding providers. If the choice of a care manager directly corresponds to the choice of providers, this mechanism is equivalent to direct service supply by providers. Therefore, the care managers might be compensated with fee-for-service payment as a part of service providers if the neutrality of care managers cannot be guaranteed.

The LTCI amendments have changed the remuneration points for home-based care management, as summarized in Appendix A. Especially, two important policies have been introduced to encourage neutrality of care managers. The first policy is to differentiate rewards by additional bonus for care plans in difficult situations. For example, a

[6]Originally, there was no regional difference in the exchange rate and all points were exchanged with JPY 10. The regional difference, introduced in 2003, is continued till date.

care plan for an elderly person who has just withdrawn from hospital receives a bonus. In 2009, the bonus consisted of 12% of the total payment for home-based care management[7]. The impact of the bonus seems minor and thus, we ignore it in this study.

The second policy is a penalty if a care management office employs a specific provider in more than 90% of their care plans. The rate is measured not on the basis of the amount of service provision, but on whether the provider is employed or not. For example, suppose a care management office produces the following two care plans: A care plan employs provider A for 100 points and provider B for 1 point, while another care plan employs provider B for 1 point. In this case, the occupancy rates for provider A and B are 50% and 100%, respectively. Therefore, care managers can concentrate on their corresponding providers in terms of service quantity and avoid the penalty.

3. Empirical framework

3.1. Econometric model

To analyze the effects of incentive design on behavior of care managers, this study check the existence of supplier-induced demand. In the LTCI, neutral care managers do not have motivation to control consumer demand owing to capitation payment. Instead, demand inducement is likely to correspond to fee-for-service payment, which is associated with dependency of care managers on service providers.

It is worth noting that our research concentrates on the financial efficiency of care managers for the social insurance program and does not investigate two other important topics. The first topic is reduction of the effort level of care managers by capitation, an aspect which is conventionally studied in health economic theories such as Malcomson (2004) and Blomqvist and Léger (2005). The second topic is the normative aspect of interpretation. There is a possibility that the induced demand can create positive impacts on the health of the consumer, as discussed in Labelle et al. (1994). Since we do not have data for detailed purchase schedules or health status of individuals, we do not examine these two aspects in this study; these remain future topics of research.

Our empirical analysis is based on regional pooled panel data. The unit of regions is the insurer, who is a local authority to exercise the administrative power in the LTCI program. Insurers mainly comprise individual municipalities, but some municipalities enter into multi-municipal collaborations to operate the LTCI. The collaborations involve municipalities that consent to work together for the specific purpose of local administration. Thus, these collaborations, as insurers, have authority specific to the operation of the LTCI. There are two legal forms of collaboration, the Wide Area Unions (*Koiki Rengo*) and the Partial-Affairs-Associations (*Ichibu Jimu Kumiai*). These two forms basically have the same set of functions and we do not pursue their difference in this study[8].

[7] The figure is taken from Survey of Long-Term Care Benefit Expenditures (*Kaigo Kyuufu-hi Jittai Chousa*)

[8] Jacobs (2004) provided a detailed description of multi-municipal collaboration in Japan. We have referred to CLAIR and GRIPS (2010) for the English terms of the Wide Area Unions and the Partial-Affairs-Associations.

The Japanese municipalities experienced active mergers during the first half of the 2000s. The number of municipalities decreased from 3,229 on November 1, 2000 to 1,727 on April 1, 2010[9]. Owing to this political change, we have an unbalanced panel dataset of insurers. In other words, the sample consists of N insurers where the ith insurer was observed for T_i years.

For this sample, we employ a simple linear regression analysis. The dependent variable is remuneration points for home-based care per care plan. The remuneration points measure the quantity of utilized services. Because prices for formal care services are fixed in the LTCI, the quantity exactly corresponds to consumer demand. We adopt observable characteristics of regions as explanatory variables. Our main interest is the effect of the care manager density. If this variable has a positive coefficient for the consumer demand, it indicates the existence of care manager-induced demand.

There can be simultaneity among the dependent variable and the care manager density, because highly profitable areas might be attractive to care managers. To eliminate the simultaneity bias, we incorporate the instrumental variable method. Taking advantage of availability of panel data, we utilize the lagged value of the care manager density as an ideal instrument. As a consequence of the choice of this instrument, we can only include samples with lagged observations. Then, insurers who experienced a merger can be included in our sample after one year of the merger date. It indicates that we have many insurers with small values of T_i. Thus, we pool our sample with respect to time periods and do not control the regional fixed effect.

3.2. Data

To construct regional panel data of insurers, we carefully define the sample unit to handle municipality mergers. We need to trace several important variables from the Census[10], which is held each five years, for new municipalities established by mergers[11]. The new municipalities are defined even if they share the same name as a municipality before the merger. In addition, if municipalities experienced a change without physical difference, such as a change in the name or a change to the other section of the local authority, we do not treat them as new municipalities. For multi-municipal collaborations[12], we have

[9] Jacobs (2011) provided details of Japanese local authorities and their history, including the recent mergers.

[10] Census information for Miyake Village in Tokyo prefecture could not be obtained in the 2000 round since all dwellers were evacuated owing to the volcanic eruption. We eliminate information about this insurer until the next 2005 Census round.

[11] The merger records can be obtained from the homepage of the Japan Ministry of Internal Affairs and Communications, `http://www.soumu.go.jp/gapei/gapei.html`, accessed October 6, 2013. Kamikuisshiki village in Yamanashi prefecture experienced a splitting and merger at once in 2006. We eliminate municipalities of Kofu city and Fujikawaguchiko town, which appended a part of the former Kamikuisshiki village. All mergers except this are simple aggregation of areas and we can trace their pre-merger status.

[12] Information for changes in composition of municipalities for multi-municipal collaboration is taken from the web page of the Japan Ministry of Internal Affairs and Communications `http://www.soumu.go.jp/kouiki/kouiki1.html` and WAM NET, which is a government-owned web page disclosing information about medical and long-term care, `http://www.wam.go.jp/content/wamnet/pcpub/top/`,

created new samples if there is a change in the composition of municipalities. However, if there are mergers within the comprising municipalities, we do not treat the collaboration as a new sample.

We define the insurer as a unit for which there is a possibility to induce consumer demand. A potential weakness of our study is the possibility of existence of the border crossing problem, which is criticized by Dranove and Wehner (1994) as a weakness emerging from the use of regional data to detect supplier-induced demand. Home-based care management offices and care providers must declare their area of operation, which is not limited to the insurer they are located in. It is not rare for home-based care management offices to include multiple insurers in their operation area. Further, when there is a request from outside the operation area, the home-based care management office can accept the offer with additional transfer fees. Therefore, there can be consumers who access from outside the insurer. Since we do not have access to information of the operation area, this problem remains unsolved in this study.

Our dependent variable is remuneration points for home-based care per care plan. The numerator is the number of remuneration points for home-based care services, while the denominator is the number of care plans that were created by home-based care management offices. Both numbers are taken from the Annual Report on LTCI (*Kaigo Hoken Jigyou Joukyou Houkoku*). Because the Annual Report on LTCI provides only prefecture level information on the number of care plans in 2000, we utilize data from 2001. The remuneration points are annual aggregate values for the entire home-based care sector minus the points for the home-based care management. The number of care plans is measured by the annual number of recipients of the home-based care management, which includes not only new care plans, but also monitoring for ongoing care plans and bonuses.

Furthermore, we analyze care plans for detailed categories. We separately consider care plans for the elderly with lighter and heavier care requirements based on the LTCI classification level. The heavier care requirements were defined as care-required 2 or more. The definition of lighter care requirements was changed by the 2006 amendment. This category consisted of assistance-required and care-required 1 before the amendment, while it consists of only care-required 1 after the amendment, because assistance-required 1 and 2 were distributed to new preventive care sector by the amendment. For time-consistency, we mainly analyze care plans for the elderly with heavier care requirements in our empirical study.

The above definition of the dependent variable might be distorted owing to the complicated legal system in the home-based care sector. For example, care plans for dementia group homes and private nursing homes are made by care managers belonging to these services, and not by home-based care management offices, although those institutions are categorized in the home-based care sector. However, the Annual Report on LTCI does not provide information for individual services for several years. Then, we construct dependent variables for more specific services, namely the demand for home care and day care service, which are major services and have time-consistency in their definition.

accessed October 6, 2013.

Our main explanatory variable is the care manager density for each insurer. We define this variable as the number of care managers per 1,000 population. The number of care managers for home-based care management offices in each region is calculated using microdata of establishments from the Survey on Institutions and Establishments for Long-Term Care (*Kaigo Sabisu Sisetsu Jigyousho Chousa*). This is an annual survey conducted by the JMHLW for all the establishments of formal care services. Because we have access until the 2009 round of this survey, our analysis uses data from 2001 to 2009. Furthermore, our sample starts from 2002, because we need the one-year lagged value of the care manager density as an ideal instrument.

The number of care managers in each establishment is calculated in terms of the counts of full-time workers. Part-time workers and workers who are also engaged in other jobs are counted as "one full-time worker" if the sum of their working hours reaches the scheduled working hours of full-time workers in each establishment. Several offices also work as community centers and there can be an overlap in care managers for home-based care and preventive care. In the Survey on Institutions and Establishments for Long-Term Care such an overlap is separated in this definition of variables and does not provide a measurement error.

Owing to availability of microdata, we also construct an alternative density variable for care managers who belong to independent care management offices. The independent office is defined as an office that does not have a service-providing sector for home-based services, plus multifunctional long-term care in a small group home, which belongs to the community care sector but is referred by care plans of home-based care management. Among the home-based care sector, however, we exclude two services in the definition of independent care managers. First, the visiting nurse service is eliminated because the Survey on Institutions and Establishments for Long-Term Care from the 2003 round does not ask the home care management sectors about joint operation with this sector. Second, we also do not include care in private nursing homes. There can be motivation for the private nursing home sector to attract home care consumers as future institutional care consumers. However, this motivation does not induce demand for home-based care services. Furthermore, we also construct the density for care managers in care management offices which also operate home care and day care service provision sectors.

We also adopt the following explanatory variables. Three variables are adopted to measure the general market size of insurers. The first variable is regional population density. Regional population from the Basic Resident Registration is taken as the numerator of population density. For the denominator, data on regional areas are taken from annual reports of the Land Survey of Prefectures Shi, Ku, Machi, and Mura (*Zenkoku Todoufuken Shikuchouson Betsu Menseki Shirabe*).

The other two variables on market size measure the potential size of the elderly care sector and are taken from the Census. A variable is ratio of the households which consist only of a single elder among other households which have at least an elderly member. An elder is defined as a person aged 65 or more. Another variable is the ratio of the households which consist only of an elderly couple among other households which have at least an elderly member. An elderly couple is defined as a husband aged 65 or more and a wife aged 60 or more. These variables are referred to as the single elderly household

ratio and the elderly couple household ratio, respectively.

The economic status of insurers is incorporated into our analysis by the following two explanatory variables. The first variable is the rate of workers in primary industries, which is taken from the Census. The second variable is the municipality local tax (*Shi Cho Son Min Zei*), which is taken from the Annual Statistics on Municipal Tax(*Shi Cho Son Zei Kazei Joukyou Tou no Shirabe*). This tax amount includes the fixed asset tax and inhabitant taxes for individuals, corporates, and small components[13]. We cannot separately obtain these detailed tax components before 2007 and use the aggregate value. We divide this variable by the regional population to control difference of areal scales. We also adopt the squared term for this variable in the empirical analysis.

As mentioned in the previous section, we do not control fixed effects of regions because of the lack of time-series observations. Instead, we include year dummies to handle trend components. Additionally, to incorporate the distinction between administrative units, we include a dummy explanatory variable that takes unity if the insurer is a multi-municipal collaboration. Since we do not have any intuition about the effects of year dummies and the administrative units, we do not provide interpretation for them in the following empirical analysis.

Table 1 here

Table 1 shows descriptive statistics. Columns (1), (2), and (3) show sample means and standard deviations for variables of all periods between 2002 and 2009, periods before the 2006 amendment, and periods after the 2006 amendment, respectively. For dependent variables, remuneration points per care plans were drastically increased after 2006. It is a natural consequence of diffusion of the formal elderly care service market, which was suddenly created by the launch of the LTCI. Furthermore, home care and day care service occupied about half of home-based care plans for heavier care requirements. The rest of the points were provided by services with smaller shares, such as ambulatory rehabilitation, short-stay care, welfare equipment rentals, home modification, day care service for the demented, and so on, but we do not analyze these relatively minor services in this study.

For independent variables, care manager densities before and after the 2006 amendment were increased from 0.482 to 0.613. In addition, the average number of home-based care management office shows an increase from 8.526 to 14.25. This is another evidence of the ongoing diffusion of the LTCI over this period. Among care managers, independent care managers occupied about one third.

4. Estimation result

4.1. Coefficient estimates

Table 2 here

[13]See Harada (2009) for details on Japanese local taxation.

Table 2 shows estimation results of baseline regression analysis for the remuneration points per care plan. Columns (1), (2), and (3) report estimated coefficients and their standard errors where dependent variables are remuneration points for all care plans, care plans for the elderly with heavier care requirements, and care plans for the elderly with lighter care requirements, respectively. The significantly positive coefficient of the care manager density in (1) indicates the existence of care manager-induced demand. (2) and (3) imply that care plans for heavier requirements are the source of demand inducement, while care plans for lighter requirements do not reveal induced demand. For the lighter classification levels, the upper bounds of LTCI coverage might be too low to be a beneficial source of demand inducement. For heavier classification levels, even within the classification level, there can be enough room to induce consumer demand because of loose upper bounds. Owing to this result and since definition of lighter care requirements is not time-consistent before and after the 2006 amendment, we hereafter concentrate on the heavier care requirements.

For the other explanatory variables, the population density positively affects consumer demand for home-based care. It is naturally interpreted as follows. In more urbanized areas, people have more opportunities to obtain a better job. When there is a need of long-term care for coresident family members, workers who are satisfied with their job are likely to outsource the care requirements to formal sectors[14]. Thus, formal care through the market dominates informal family care for regions with an active economy. This effect causes the correlation between population density and consumer demand for formal care. The effects of remaining explanatory variables are considered later.

Table 3 here

Table 3 decomposes the above baseline result of higher care requirements into more detailed categories. Columns (1) and (2) report estimation results where dependent variables are remuneration points per care plans of home care and day care service sectors, respectively, for the elderly with heavier care requirements. We clearly see that demand inducement occurred only in day care services. Because of low profitability, home care might not be an attractive source for demand inducement. In addition, because home care is frequently provided under the sight of family members, it is difficult to induce unnecessary demand. On the other hand, day care service is relatively profitable and provided out of sight of the family members. Considering these factors, our finding fits the intuition.

The coefficients for explanatory variables are interpreted as follows. The single elderly household ratio has a positive effect on home care demand and a negative effect on day care service demand, while the ratio of workers in primary industries shows opposite effects. These effects can be a result of the existence or non-existence of a coresident caregiver. Without a coresident caregiver, home care is the main service among all other home-based elderly care. In contrast, if there is a coresident caregiver, demand for the

[14]Sugawara and Nakamura (2013) showed a consistent result for this explanation and noted that female regular workers increased their working hours while non-regular workers decreased their working hours when their coresident elderly person required long-term care.

day care service provides respite for the caregiver. Single elderly households do not have a coresident caregiver and are more likely to use home care rather than day care service. On the other hand, rice is the main agricultural crop in Japan and it requires labor intensity; households engaged in primary industries tend to show more coresidence of family members. In addition, owing to the absence of commuting, family care is easily provided in agricultural households. Therefore, the signs of coefficients for these explanatory variables are a natural consequence.

Elderly couple household ratio has significantly negative effects on demand for both home care and day care service. For such households with only an elderly couple, it becomes difficult for a single elderly person to support the other severely disabled elder. These households are likely to utilize institutional care instead of home-based care, and become single elderly households. Therefore, demand for home-based care in households that still consist of only an elderly couple might concentrate on care for lighter needs.

The per-capita municipality tax and its squared term in the logarithm have significant estimates of coefficients both for home care and day care services. Considering the shape of the quadratic functions as follows, we generally find positive impacts of this variable for both sectors. To see this, 25% and 75% percentiles for this variable are 4.401 and 4.924, respectively. For home care, the remuneration points per home care plan are a concave function of the per-capita municipality tax and the function achieves its maximum at 4.953, which is above the 75% percentile. On the other hand, for day care services, the quadratic function is a convex function whose minimum is attained at 4.207, which is below the 25% percentile. Furthermore, as the per-capita municipality tax increases, its positive impact decreases for home care and increases for day care service. This finding is consistent for lower profitability of home care in comparison with day care service.

Columns (3) and (4) in Table 3 separately consider the period before and after the 2006 amendment, respectively. The coefficients for the care manager density are not largely different in these two periods. This result implies that the penalty for concentration of providers, which was introduced by the 2006 amendment, did not work effectively to prohibit demand inducement.

Table 4 here

To consider the impact of the incentive design for care managers, Table 4 decomposes care manager densities into finer categories. Column (1) incorporates densities of independent and dependent care managers. Their estimated coefficients show that only dependent care managers induce consumer demand, while independent care managers do not induce demand. This finding is consistent with the hypothesis that the dependent care managers who work under fee-for-service payment cause demand inducement, whereas independent care managers who work with capitation payment do not induce demand.

Column (2) in Table 4 considers more detailed densities of care managers who belong to offices that also operate day care services. The result shows that dependent care managers induce more consumer demand. However, although its effect is much smaller, the density of care managers who are independent from day care service operation also

has a significantly positive coefficient. An explanation is that this positive effect is caused by the shortage of care managers. If the number of care managers is much smaller than the appropriate figure, it is difficult for care managers to spend enough time to provide considerable care plans. On the other hand, in regions with a sufficient care manager density, care managers are free from such time constraint and can create relatively substantial care plans. In this situation, care manager density will demonstrate its positive effect, but this is not harmful for the insurance budget.

To validate the above hypothesis, we separate the sample before and after the 2006 amendment. Columns (3) and (4) in Table 4 indicate that demand inducement by care managers independent from operation of day care services disappeared in the recent years. As shown in the descriptive statistics in Table 1, there was a large growth in the number of care managers. Since the disappearance of induced demand corresponds to an increase in care managers, this finding is a supportive evidence for our hypothesis.

4.2. Impact of care manager-induced demand on the LTCI budget

Using the baseline result in Column (1) of Table 2, we can consider the quantitative impact of care manager-induced demand. An increase in the number of care manager per 1,000 population causes an increase of 734.2 points per care plan. The annual average induced demand per care plan can be calculated as a product of three terms: regional average for the number of care managers, the estimated induced remuneration points per care manager, and exchange rate between remuneration points and money. We ignore the regional difference of the exchange rate and utilize the minimum value for simplicity. The, we obtain the average induced demand as $0.543 \times 734.2 \times 10 \simeq 3,987$. Thus, the annual cost per care plan increased by JPY 3,987, of which JPY 399 was out-of-pocket expense, by the care manager-induced demand. This expense may be ignorable for many consumers. However, if this cost is levied on all care plans, on an average, this excess payment constitutes a large burden for the social insurance finance. In 2009, there were 22,704,322 care plans made by home-based care management offices. This number is taken from the Annual Report on LTCI. On multiplying this number with the average cost increase by induced demand, we obtain a total loss figure of JPY 90 billion or approximately USD 0.9 billion per year.

Our results also show that independent care managers do not induce demand. Therefore, we can claim that care managers with capitation payment are not harmful for the LTCI budget. Instead, the problem is that the current mechanism cannot guarantee neutrality of care managers, which is necessary for efficiency to finance the social insurance. The problem is that the reward for care managers is too small to support independent care management.

5. Conclusion

This study analyzed the behavior of care managers, who can be considered as pure gatekeepers, in the Japanese social insurance program for elderly care. The insurance program was originally designed such that care managers would be compensated by

capitation payment, which is cost-effective for the insurance budget. However, there is a possibility that care managers are actually rewarded by fee-for-service payment, which might be a financial burden on insurance via supplier-induced demand. We investigated the existence of supplier-induced demand using regional pooled-panel data of insurers. Our empirical study revealed that care manager-induced demand actually exists and imposes a large financial burden on the social insurance program.

As an empirical study, the limitation of our research is access to only regional data of insurers. Microdata on individual care managers or individual care plans will enable investigation of more intensive topics. For example, an important topic we could not cover is the quality of care plans. Previous studies such as Malcomson (2004) showed that capitation payment can cause lower efforts by gatekeepers; however, our study cannot examine such behavioral differences among individual care managers. These studies based on microdata remain topics of future research.

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Appendix

A. Remuneration points for care management

This appendix summarizes remuneration points of home-based care management. The LTCI was revised every three years, and there were four revisions between 2000 and 2013. In the first season of the LTCI from April 2000 to March 2003, care management was assigned different remuneration points according to the LTCI classification level of the elderly, which is determined based on care requirements. There were six classification levels in the first season, assistance-required and care-required 1 to 5, where the latter levels required more intensive care. The rewards for care plans were 650 points for assistance-required; 720 points for care-required 1 and 2; and 840 points for care-required 3, 4, and 5.

In the second season between April 2003 and March 2006, price discrimination through the classification level was eliminated and all care plans were rewarded 850 points. Instead, a bonus and a penalty were introduced. As a bonus, additional 100 points were assigned for care plans that combined four or more services. As a penalty, 30% of rewards were canceled in case of violation of rules.

The third season between April 2006 and March 2009 drastically changed as a result of the major amendment of the LTCI in 2006. Price discrimination through the classification level was revived. The rewards for care plans were 1000 points for care-required 1 and 2; 1300 points for care-required 3, 4, and 5; and 850 points for transitive care-required. Assistance-required was transferred to the preventive care sector, but home-based care management offices could see preventive care consumers upon request from the community comprehensive care center. The care plan for preventive care was rewarded 400 points.

There were bonuses for entire offices as well as each care plan. Offices who satisfied several requirements that proved hardship and quality of care management received additional 200 points for all care plans. Care plans for consumers in specific regions, like isolated islands and heavy snow areas, received extra 15% reward. Additional 250 points were assigned for care plans for new consumers or consumers who experienced an instantaneous rise of classification levels in two or more levels. Further, additional 600 points were allocated for care plans for those who returned home from hospitals or institutional care sectors after staying for 30 days or more. The bonus for combination of four or more services was eliminated.

There were three penalties. First, the penalty for violation of rules continued from the previous season, and became more severe. After one month with 30% reward reduction, offices faced an increased penalty of 50% reward reduction in subsequent months if the situation was not fixed. The second was the penalty of volume. The reward was decreased to 60% for each care plan if home-based care management offices created between 40 and 59 care plans per care manager on an average. The reward was further decreased to 40% if offices created 60 or more care plans. A consumer of the preventive care management is counted as 0.5 people and a consumer was allowed to create up to eight preventive care plans. The third was the penalty for concentration of providers. 200 points were decreased for all care plans if a care management office employed a specific provider in more than 90% of their care plans in each half year, without a comprehensive reason. More details of this penalty are described in Section 2.

In the third season between April 2009 and March 2012, many bonuses were revised and added. For revised bonuses, the bonuses for offices to prove hardship and quality were separated to two levels, 500 points for the first-level offices and 300 points for the second-level offices. The bonus for new consumers was increased to 300 points. The bonuses of care plans after hospitalization was also separated to two levels, 400 points for less than 30 days of stay and 600 points for 30 days or more.

Bonuses for operation in mesomountaineous (*Chuusankan*) areas were introduced as additional 10 points for offices located in such areas and additional 5 points for care plans for consumers living in those areas. New bonuses were introduced for difficult care plans. Plans for dementia patients and for single dwelling elderly persons received additional 150 points. Collaboration with the medical sector and multifunctional long-term care in a small group home were rewarded with additional 150 and 300 points, respectively. On the other hand, the volume penalty became more severe. The reward was decreased to 50% and 30% for offices with 40 to 59 care plans per care manager or 60 or more care plans, respectively.

In the fourth season between April 2012 and March 2015, the bonus for collaboration with a medical sector is separated for the first and second classes that are rewarded 200 and 100 points, respectively. To obtain the first class, a care manager needs to make a physical visit to the hospital. The bonus of care plans after hospitalization has been made uniform; however, this bonus can now be assigned for at most three times for each consumer. A new bonus of 200 points has been introduced for holding an emergency conference of service providers. Additionally, collaboration with a new service called multiple-service providers has been assigned a bonus of 300 points. The penalty for

concentration of providers has become more severe and a penalty of 100% is imposed from the second month.

B. Figures and tables

Variable		(1)All periods		(2)Before 2006		(3)After 2006	
		Mean	S.D.	Mean	S.D.	Mean	S.D
# Points per care plan	All care	10415.9	(2941.7)	8566.4	(1871.6)	12581.3	(2447.3)
	Lighter care	6320.5	(2027.5)	5172.7	(1143.9)	7664.2	(2010.9)
	Heavier care	13797.5	(3010.5)	12515.7	(2630.7)	15298.2	(2719.6)
	Home care, heavier care	2127.7	(1326.2)	2385.2	(1332.7)	1826.3	(1253.2)
	Day care service, heavier care	3756.3	(1615.3)	3304.9	(1505.2)	4284.8	(1579.2)
# Home-based care management offices		11.16	(19.33)	8.526	(16.48)	14.25	(21.72)
Care manager density	All	0.543	(0.364)	0.482	(0.406)	0.613	(0.292)
	Independent	0.163	(0.254)	0.145	(0.297)	0.184	(0.190)
	Dependent	0.380	(0.294)	0.337	(0.297)	0.429	(0.284)
	Joint office with day care	0.240	(0.239)	0.216	(0.224)	0.269	(0.252)
	Non-joint office with day care	0.302	(0.332)	0.266	(0.381)	0.344	(0.257)
Independent variables	Population (Log)	1004.2	(2317.6)	953.3	(2216.3)	1063.8	(2429.6)
	Single elderly household ratio (%)	18.22	(7.359)	17.27	(7.397)	19.34	(7.156)
	Elderly couple household ratio (%)	23.80	(6.997)	22.95	(7.208)	24.80	(6.604)
	Primary industry rate (%)	13.02	(10.88)	13.56	(11.1)	12.39	(10.59)
	Per-capita local tax (1,000 yen)	118.9	(70.61)	111.0	(60.5)	128.2	(79.87)
	N	13057		7042		6015	

Table 1: Descriptive Statistics

Dependent variable:	(1)	(2)	(3)
Points per care plan	All care	Heavier care	Lighter care
Care manager density	734.2***	1,123***	-44.29
	(161.2)	(169.5)	(131.5)
Population density (Log)	367.2***	477.4***	144.0***
	(17.42)	(22.76)	(13.78)
Single elderly household ratio (%)	-10.83***	23.30***	-6.037**
	(3.635)	(5.037)	(2.916)
Elderly couple household ratio (%)	-30.72***	-1.060	-1.708
	(3.780)	(5.075)	(3.019)
Rate of workers in primary industry (%)	-3.939	13.03***	-4.199**
	(2.504)	(3.475)	(2.028)
Per-capita local tax (Log)	88.64	494.8	-1,090**
	(627.4)	(849.3)	(536.1)
Per-capita local tax (Log Squared)	14.34	-35.98	115.6**
	(63.43)	(86.10)	(54.85)
N	13,057	13,057	13,057

Table 2: Estimation results for home-based care remuneration points per care plan. Year dummies are included but abbreviated. Robust standard errors in parentheses. $***$, $**$ and $*$ denote $p < 0.01$, $p < 0.05$ and $p < 0.1$, respectively.

Dependent variable:	(1)	(2)	(3)	(4)
Points per care plan	Home care	Day care	Day care	Day care
			Before 2006	After 2006
Care manager density	48.45	1,516***	1,501***	1,539***
	(76.99)	(130.6)	(146.3)	(223.5)
Population density (Log)	202.8***	68.23***	51.15***	85.25***
	(10.74)	(13.50)	(17.71)	(20.40)
Single elderly household ratio (%)	67.35***	-55.79***	-56.87***	-54.43***
	(2.862)	(2.983)	(4.236)	(4.217)
Elderly couple household ratio (%)	-18.81***	-16.60***	-12.56***	-22.37***
	(2.396)	(3.238)	(4.758)	(4.396)
Rate of workers in primary industry (%)	-2.922**	5.528***	5.271**	5.519*
	(1.273)	(2.021)	(2.570)	(3.246)
Per-capita local tax (Log)	771.7**	-2,864***	-3,614***	-1,942**
	(346.5)	(561.1)	(710.0)	(905.1)
Per-capita local tax (Log Squared)	-77.90**	340.4***	418.3***	249.2***
	(34.28)	(57.07)	(73.20)	(89.92)
N	13,057	13,057	7,042	6,015

Table 3: Estimation results for remuneration points per care plan for detailed services. Year dummies are included but abbreviated. Robust standard errors in parentheses. $***$, $**$ and $*$ denote $p < 0.01$, $p < 0.05$ and $p < 0.1$, respectively.

Dependent variable: Points per care plan		(1) Day care	(2) Day care	(3) Day care Before 2006	(4) Day care After 2006
Care manager density	Independent office	242.1			
		(160.5)			
	Dependent office	2,046***			
		(138.2)			
	Joint office with day care		2,623***	2,921***	2,367***
			(139.7)	(164.0)	(230.0)
	Non-joint office with day care		319.3**	347.5*	292.7
			(130.9)	(189.6)	(180.6)
Other variables	Population density (Log)	66.61***	69.57***	61.57***	79.96***
		(12.87)	(12.37)	(16.66)	(18.83)
	Single elderly household ratio (%)	-59.11***	-51.42***	-54.19***	-48.22***
		(2.923)	(2.839)	(3.865)	(4.200)
	Elderly couple household ratio (%)	-10.73***	-13.30***	-10.37**	-18.25***
		(3.151)	(3.008)	(4.255)	(4.383)
	Rate of workers in primary industry (%)	6.391***	3.658*	2.940	3.949
		(1.994)	(2.017)	(2.451)	(3.363)
	Per-capita local tax (Log)	-2,156***	-2,288***	-2,701***	-2,025**
		(529.1)	(566.4)	(713.4)	(898.2)
	Per-capita local tax (Log Squared)	270.3***	280.0***	327.5***	249.7***
		(53.66)	(57.99)	(73.89)	(89.95)
N		13,057	13,057	7,042	6,015

Table 4: Estimation results for remuneration points per care plan for day care services. Year dummies are included but abbreviated. Robust standard errors in parentheses. $***$, $**$ and $*$ denote $p < 0.01$, $p < 0.05$ and $p < 0.1$, respectively.