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The contribution of rural natural capital to quality of life of urban-to-rural migrants:
combined empirical evidence from national- and municipality-scale studies in Japan
using social surveys and geospatial analyses

（地域の自然資本による、地方移住者の生活の質向上効果：日本全国および市町村規模の
社会調査と地理空間情報解析を用いた統合的実証研究）

Introduction

The recent unprecedented urban population concentration across the world has several social and ecological consequences. These include land and sea conversion to make space for urban development, increasing biodiversity footprints of high-consumption urban lifestyles, decreasing affinity with nature among urban residents due to the loss of contact with nature. In Japan, continuous urban population shift over the past half century caused paralleled rural depopulation, with the urban population rate exceeding 90% in 2010 (The World Bank, 2019). This led to widespread abandonment of agricultural and forest lands managed historically for centuries (MAFF, 2024), which resulted in loss of agricultural biodiversity and ecosystem services (Sasaki et al., 2021).

Nevertheless, since the 1960s, there has been a relatively small but steady number of people who move from urban to rural areas in search of higher quality of life (QoL), which scholars have described as lifestyle or amenity migration. The latest report (Population Strategy Council of Japan, 2024) showed that the number of municipalities in serious population decline has reduced in a decade, but is still overall in a concerning rate. Efforts by the national and local governments under the Act on Overcoming Population Decline and Vitalizing Local Economy in Japan (2014), focusing on direct support to urban-to-rural migrants, might have played its role in this slight improvement. These, however, have yet fully utilized the opportunities ahead to amplify the trend, due the limited understanding of the factors that aspire urban residents to move to rural areas, in which we postulate QoL is key.

There is accumulating literature on urban-to-rural migration, and on environmental contributors to QoL respectively, but barely none on their interactions. Descriptive literature on urban-to-rural migration is plentiful (Benson & O'Reilly, 2016; Gosnell & Abrams, 2011). In Japan, urban-to-rural migration trend is explained by national demographic data (MIC, 2018), and cases focusing on policy efforts and their outcomes are provided (Kasami, 2022; Odagiri

& Tsutsui, 2016; Sakuno, 2016). Tanigaki (2018) investigated the characteristics of rural municipalities across Japan that contributed to the number of arriving migrants, but its scope did not include natural capital factors. Environmental contributors to QoL is extensively studied using ‘four-capital framework’ (Costanza et al., 2007), which provides a comprehensive theoretical foundation regarding the pathways in which natural, built, human and social capital create opportunities for people to satisfy their various human needs, and thereby contributes to QoL. The two threads of literature on migration and QoL, when converged, would enable more in-depth understanding of the underlying factors of urban-to-rural migration trend.

Hence, the study aims an integrated analysis of urban-to-rural migration and QoL, focusing on values and motivations of urban-to-rural migration, as well as the opportunities for the migrants to realize their values and motivations in the rural destinations. More specifically, the first aim is to reveal the motivation for urban-to-rural migration, as well as the variety in the values held by migrants that may influence their motivation, in a popular urban-to-rural migration destination site in Japan. The second aim is to explore natural and other various types of capital assets in the same site that support migrants to realize their values, and ultimately to increase their QoL, within mind variety in their values. The third aim is, building on the outcomes of the studies on the former two aims, to assess the magnitude and pathways in which natural and other types of rural capital across the nation increase migrants’ QoL.

Study area and methods

Study area

The studies on the first two aims, among the three presented above, were carried out in Hokuto City of Yamanashi Prefecture, Japan. Hokuto City is located around 158 km west of Japan's capital, Tokyo, a journey of approximately 2 hours by highway or direct express train (Figure 2.1). The area of Hokuto City is approximately 602 square kilometers, encompassing mostly forest land (76%), some agricultural land (9%), as well as urban and other areas (15%) (MAFF, 2015). The City is surrounded by three major scenic mountain chains, i.e., the Yatsugatake Mountains (peak elevation: 2899 m) to the north, Chichibu Mountains (2601 m) to the north-east and the Japanese Southern Alps (3192 m) to the southwest, which are designated as national and regional parks. The City had a population of 46,748 (21,405 households) as of January 2020 (Hokuto City, 2020). The primary production sector is the smallest after service and manufacturing sectors, as is the case in many Japanese municipalities, but provides by far the highest proportion of employment (15.9%) compared to the national average (3.8%).

Hokuto City is the ideal site for the study, as it is one of the most popular urban-to-rural migration destinations across Japan, and hence enabled sampling of sufficient number of urban-to-rural migrant samples for a quantitative analysis. The role of rural natural capital to attract migrants was implied, such as scenic mountains ranges, a comfortable climate and rich local food and other resources (MLIT 2015c). Importantly, support from the Hokuto City

government enabled the current study, particularly the provision of the survey dataset which was used for the study to address the first aim. The study was also motivated to inform the Hokuto City government to further develop and implement effective population and rural revitalization policies.

Conceptual models

This research applied two main theoretical frameworks to construct conceptual models. The value-expectancy research model (De-Jong & Fawcett, 1981) was applied to the analysis of motivation for urban-to-rural migration and underlying values held by migrants. Furthermore, the four-capital framework (Costanza et al., 2007) was used to investigate rural environmental contributors to QoL. In its application, the four-capital framework was extended to include two additional capital types, i.e., cultural and financial capital, referring to the community capitals framework (Flora et al., 2018). The study referred to the six types of capital, i.e., natural, built, human, social, cultural and financial, collectively as rural capital.

Data collection and analysis

To collect migrants' perception-based data, I used different survey methods that were best suited for the subject of each of the three subsets of the study. To investigate the values of migrants that underly their migration motivation, the first study used a dataset of an all-out survey of new residents at the resident registration desk of the municipality office from April 2017 to January 2019, which was provided by the Hokuto City government. The second study used a paper-based questionnaire survey with quasi-random sampling from houses along all streets across the Hokuto City territory. The third study used a nation-wide online survey of urban-to-rural migrants, which applied a stringent screening process to identify urban-to-rural migrants who met a detailed operational definition used for the study.

Biophysical data for the metrics of natural and other rural capital, used for the investigation of environmental contributors to QoL in Hokuto City and across the nation were acquired from commercial and public sources.

Various statistical models were used to validate the conceptual models used for the respective studies. Basic multivariate analysis methods were used for the first and second studies, such as PCA, Cluster Analysis, Multiple Correspondence Analysis (MCA) and Canonical Discriminant Analysis. In addition, the second study used ANCOVA and ANOVA for hypothesis testing. The third study used Structural Equation Modelling (SEM) with Exploratory Factor Analysis (EFA) and Path Analysis for an integrated analysis of rural capital contributors to migrants' QoL.

Results

Diverse values of urban-to-rural migration: A case study of Hokuto City, Japan

Statistical analyses of 742 valid responses to an all-out survey in Hokuto City identified common values that underlie their migration decision, i.e., nature, housing and food. It also revealed heterogeneity in priority values among migrants in different age groups, such as employment for singles in ages between 16 and 29, natural child raising environment for married couples in their 30s and 40s, and staying with or near family for retirees in or over 60s. The centrality of nature in the common values of migration implied the need of further investigations into the rural natural capital elements that are salient to these migration values.

Spatial exploration of rural capital contributing to quality of life and urban-to-rural migration decisions: A case study of Hokuto City, Japan

An integrated analysis of the 414 responses to a resident questionnaire survey in Hokuto City, conducted from April to May 2020 amid the COVID-19 outbreak, and open and commercial geospatial datasets representing natural, built, human, cultural and financial capitals revealed the contribution of specific rural capital elements to individuals' QoL. These are natural capital (farmland, symbolic natural features, mountain peak view, lower temperature and tranquility), built capital (highways, railway stations, shops and restaurants) and financial capital (enterprise). Many of these are related to the reasons that migrants chose their present home location, indicating their increased QoL by migration. One-way migrants, among others, are located predominantly on higher-up mountain slopes with lower temperatures, higher forest cover and near natural parks and symbolic natural features, yet close to railway stations and business concentrations.

The contribution of rural natural capital to quality of life of urban-to-rural migrants in Japan: Structural equation modelling using a nation-wide survey and public geospatial data

Structural equation modelling using standardized datasets generated by a nation-wide online survey, which obtained 1,315 valid responses, and geospatial datasets from 11 public sources identified five rural capital factors and five human need factors, as well as the pathways and relative strength in which these factors contribute to migrants' quality of life. Among the five human need factors, rural amenity, which principally derives from rural natural capital, contributes the strongest to increased quality of life, followed by urban and socio-cultural utilities of a mix of various rural capital. The contribution of household income to quality of life was confirmed but marginal as compared with the above three factors. Furthermore, the results imply the role of rural touristic capital, which is comprised of unique natural and cultural assets of rural areas, to complement limited urban and human capital assets.

Discussion

Synthesis

As a total, results from the above three studies have important mutual complementarities. Particularly, the first study revealed migrants' endogenous values that underly their migration motivation, whereas the second study identified their exogenous factors, i.e., natural and other rural capital elements in a rural migration destination, that provide opportunities to put their values and motivations into practice. The third study revealed weighted causal relationships between the endogenous and exogenous factors using nation-wide data collection and path analysis. The second study at municipality-scale has strength in high-resolution geospatial analyses that consider distance effects and viewsheds, whereas the third study at a national scale enabled a far wider scope to explore the QoL contributors from among a large variety of unique local setting across the nation, and therefore substantially improved the reliability and generalizability of the model outcomes. Findings from the three studies are consistent in that nature is the primary, but not the sole, contributor to rural QoL. It works with social, cultural, built and financial capital to increase migrants' QoL. Also, the findings of the differences in these contributions by the migrants' demographic and socio-economic attributes are consistent. The consistency across the three studies demonstrates the robustness of these key findings.

Academic significance and remaining knowledge gaps

These findings contribute to filling important knowledge gaps in the literature on urban-to-rural migration and QoL. One of the two major knowledge gaps was the contribution of natural and other various types of capital to QoL in rural context and their causal links. The second study identified specific natural, built and financial capital elements that were found contributing to QoL in Hokuto City, while third revealed the contribution of specific elements of rural natural, built, human, cultural and financial capital to QoL across Japan. A comparison of the rural capital contributors to migrants' QoL between the two studies reveals local uniqueness of rural capital contributors to QoL. For example, farmland cover and mountain peak view contributed to QoL in Hokuto City, which were not explicit in the nation-wide study. Conversely, national heritage and other cultural assets contributed to QoL in the nation-wide study, which were not found in Hokuto City. The difference might be caused by prominent mountain peaks and farmlands that characterize the Hokuto City's landscape, as well as relatively low accumulation of cultural heritage as compared with the national average.

The other critical gap mentioned was a missing link between migration and QoL literature. This causal link was validated by the third study, which revealed increase in SWB caused by urban-to-rural migration of those with specific socio-demographic traits, i.e., senior, child-raising, male and house ownership. This SWB consequence of urban-to-rural migration supports my initial hypothesis that better QoL constitute key property of urban-to-rural migration motivation, at least for the migrants falling under these socio-demographic categories. Hence, rural capital contributors to QoL, as specified above, can also be regarded as

contributors to migration motivation. It already has been well known that rich natural environment in rural areas is one of the primary motivations for urban-to-rural migration (MIC, 2018), but not exactly what constitute such natural environment. Therefore, with the above interpretation, the current study is highly valuable in that it specified measurable natural and other types of rural capital that factor in motivation of migration. These factors can be used as key predictors of migration motivation, or ultimately migration decision. Likewise, other distinctive rural capital contributors to QoL would also contribute to migration motivation, implying that the areas with significantly different landscapes may have other sets of rural capital contributors to migration motivation, beyond those identified by the present study. For example, beach access and ocean view can be important contributors to migration motivation in coastal municipalities. It, however, requires deeper investigation to unpack the details of local uniqueness, such as appropriate classification of rural landscapes and comparison of rural capital contributors to QoL between the areas that fall under different landscape classes.

My achievement in addressing the two critical gaps in the knowledge of urban-to-rural migration and QoL, as outlined above, provides important implications to future studies, particularly to understand the feedback from nature to human behavior in social ecological systems. My results suggest the potential use of specific metrics of natural and other rural capital as the predictors of individual migration decisions, and ultimately QoL from the individual migrants' perspective. Future studies in that direction would benefit from a research design that fit for the purpose, such as longitudinal design to capture both pre- and post-migration phases, as well as targeted sampling from different population groups, such as urban population who have never considered, or considered but ended up not, to migrate to rural areas, and part of rural population who have migrated out to urban areas.

Practical implications

Halting rapid rural population decline has long been a priority policy agenda for Japanese national and local governments. Act on Overcoming Population Decline and Vitalizing Local Economy in Japan (2014) provides the foundation for strategies and plans for rural revitalization. On this legal basis, the General Strategy for Overcoming Population Decline and Vitalizing Local Economy in Japan (Cabinet Office, Government of Japan, 2022) prescribes a strategy with four objectives, i.e., increasing number and quality of employments, increasing rural migration and related population, enhancing child-raising support and creating safe and high-quality living environment. Municipalities have formulated their own population visions and general strategies aligned to the national-level strategy. For example, Hokuto City has its Population Vision and General Strategy (Hokuto City, 2018) which focuses on child-raising support, housing support, employment creation, increasing migration and related population, as well as creating comfortable and ecological living environment. These commonly bring together relevant policies and practices from across sectoral departments to

provide direct life and business support, but are not clear about the real needs and aspirations of residents, particularly urban-to-rural migrants which the very strategy aims to increase.

Direct business and life support from governments are undoubtedly important, but may not be sufficient to meet the ends: to attract migrants from urban areas who intentionally give up a convenient urban life and chose an inconvenient rural life. It rather would be more important to understand what motivate urban residents to migrate to rural areas, and to strengthen the comparative advantages of rural areas over urban areas that accommodate their motivations. Inspired by this question, the current study attempted to capture the comparative advantages of rural areas by natural, built, cultural and other capital assets of rural areas which I termed collectively as rural capital. As the result, I identified specific rural capital elements that contribute to QoL, and thereby factor in migration motivation, in Hokuto City and across Japan. Further, the comparison of such rural capital elements between municipal and national scales revealed their potential local uniqueness. These findings have significant practical implications, including for the implementation and future revision of municipality-level population vision and general strategies. The findings are particularly relevant when municipalities apply the fourth objective of the national strategy to their own strategy, which is to create safe and high-quality living environment that leverage local authenticity deriving from unique local resources. More specifically, a set of lists of rural capital contributors to migrants' QoL can be used by local governments and stakeholders when they identify and plan the effective use of various rural capital. Furthermore, my results suggest potential difference in such rural capital contributors in different landscapes, implying the importance of the efforts to explore other rural capital elements within each municipality that characterize the uniqueness, or authenticity, of the area.

Nevertheless, I would highlight two key caveats in rural vitalization and population interventions centered on unique rural capital. One is the need of coherent policy and planning to enhance the value and utility of rural capital, and to avoid conflicting developments. For example, Hokuto City government envisages being an environmental pioneer city, centering on four major capital assets in which the City is ranked first among other Japanese municipalities, i.e., scenic mountain views, a habitat of the largest population of the Japan's national butterfly Great purple emperor (*Sasakia charonda*), clean and abundant water, as well as the longest sunshine duration (Hisai, 2020). Leveraging the longest sunshine duration, the City has developed the Hokuto City Renewable Energy Vision (Hokuto City, 2016) to upscale renewable energy production, particularly by the photovoltaics (PVs). This, and the renewable energy feed-in tariff (FIT) by the national government resulted in rapid and uncontrolled expansion of large-scale PV facility which, by 2018, mostly occurred on the former forest (71%) and agricultural (24%) lands (Hirota, 2019). The PV expansion substantially transformed rural landscapes, seriously hampering three other rural capital flagships, i.e., scenic beauty, forest biodiversity and water which well correspond to motivation for migration to Hokuto City, and invited strong confrontation from the residents (Hirota, 2019). The arguments led to the

promulgation of the Hokuto City Ordinance on the Photovoltaic Plant Development and Nature Conservation (2023) which prescribes administrative procedures to regulate PV developments. This case provides an important lesson to rural vitalization and population interventions, particularly the need of a landscape design that ensure coherent interventions to enhance core rural capital and that provides pre-emptive measures to potentially conflicting developments. My results would help rural municipal governments and stakeholders identify core rural capital on which rural vitalization and population strategies are centered.

The other caveat is that increased urban-to-rural migration does not always result in sustainability outcomes. Here I reiterate the importance of intentional efforts to ensure sustainability and QoL outcomes of urban-to-rural population shift. For example, increased migrants can hamper ecological sustainability if it comes with new land and infrastructure development. However, in the Japanese rural context where land and housing abandonment is widespread due to rapid population decline, existing developed lands and infrastructure can desirably and effectively be used by new residents, and where possible concentrating such uses to realize a compact city, in accordance with the General Strategy for Overcoming Population Decline and Vitalizing Local Economy in Japan (Cabinet Office, Government of Japan, 2022). The formerly developed and now abandoned lands could desirably be used for sustainability purposes, such as renewable energy production and ecosystem restoration. Furthermore, creating local circular economy, e.g., by promoting local food consumption, would help reduce ecological footprint leakage.

Likewise, although I pointed out the need to reverse the ongoing rural population decline to maintain domestic food and material production, only a few migrants from urban areas across Japan take up farming or other primary sector jobs. Nevertheless, Hokuto City presents slightly different facts where commercial food enterprises have been establishing increasing number of large-scale vegetable factories, taking advantage of the availability of abandoned farmland, long sunshine duration, clean and abundant groundwater and labor (Goto, 2023). This demonstrates the possibility to leverage rural population and natural capital to boost domestic food production, and hence reduce ecological footprints of food consumption. Yet, vegetable factories and their operation significantly transform the use of land, water, energy and labor from the former open land cultivation and can hamper other core rural capital elements. This would not be as problematic as uncontrollable PV developments because vegetable factories are usually developed on abandoned farmlands, not by replacing forests, and are more firmly established, but would still require careful consideration of its interactions with other core rural capital elements.

Conclusions

The value of the present study rests on filling critical knowledge gap in our understanding of urban-to-rural migration, QoL and their causal relationships, particularly the contribution of natural and other various types of capital to QoL in a rural context, as well as a missing link between migration and QoL literature. Filling these gaps provides important implications to future studies, particularly to understand the feedback from nature to human behavior in social ecological systems, such as the validation of a hypothetical causal link from natural capital to deurbanization, an expression of a collection of urban-to-rural migration decision for better QoL at scale. That validation would enable modelling of deurbanization scenarios, including alternative future population projections for depopulating rural areas that consider the effect of natural and other rural capital.

The findings from the current study has important practical implications to rural vitalization and population interventions, particularly those planned and implemented under the Act on Overcoming Population Decline and Vitalizing Local Economy in Japan, and associated national and municipality strategies. These are: (i) exemplary elements of core rural capital that contribute to migration motivation and migrants' QoL; (ii) the need of an overarching area design that ensure coherent interventions to enhance core rural capital; and (iii) the importance of intentional efforts to ensure sustainability outcomes of urban-to-rural population shift. These are mutually supportive components of deurbanization pathway, and therefore can create positive feedback loop to put a deurbanization pathway into practice.