論 文 内 容 の 要 旨

Chapter 1　Introduction

Shopping is an indispensable daily activity in our lives. The hollowing-out of urban commercial centers has been a growing economic-geographical problem over the past several decades. Local governments in Japan regard the hollowing-out as a severe urban problem because it is hard for them to promote compact cities where the hollowing-out is ongoing. In order to promote socially efficient compact cities with urban policies for shopping, we need to elucidate which policies agglomerate firms into downtown areas and increase social welfare.

Market mechanism for locations of retail stores has been explored for almost a century since Hotelling (1929). The model developed by Hotelling (1929) is called the spatial competition model. Various spatial competition models have been developed to capture some unique economic mechanisms.

The prototype of the spatial competition model, however, does not consider that consumers purchase several goods from stores in a marketplace. This behavior is called multipurpose shopping. Multipurpose shopping is ubiquitous in the real world. Spatial price competition models with multipurpose shopping have been developed. In these models, there are marketplaces where retail stores operate, and several goods are sold in the marketplaces, unlike the spatial competition model developed by Hotelling (1929). These marketplaces are interpreted as department stores, shopping streets, or shopping malls.

Turning our attention to urban policies, we can regard most urban policies as spatially dependent policies. Examples of spatially dependent policies are road improvement policies and subsidizing retail stores operating in the downtown area of a city. Both of the policies have been applied in the real world. It is essential to investigate the welfare impacts of spatially dependent policies. Nevertheless, spatially dependent policies have been beyond the scope of theoretical analysis with multipurpose shopping.

This motivates the theoretical study of the welfare impacts of spatially dependent policies for retail agglomeration. The present thesis aims to elucidate how local governments should apply spatially dependent policies that drive the agglomeration of retail stores in cities.

The present thesis aims to address the following issues. Spatially dependent policies focused on the issues are applied worldwide.

・How does an improvement sequence on a road network affect the agglomeration patterns of retail stores and social welfare?

・Which place-based policies increase social welfare, and which decrease social welfare?

The present thesis fills the gap regarding policy analysis between theoretical and empirical research in terms of analyzing the welfare impacts of spatially dependent policies for retail agglomeration.

Chapter 2 Two-dimensional Geographical Position as a Factor in Determining the Growth and Decline of Retail Agglomeration

I build on the spatial competition model proposed by Tabuchi (2009). This model comprises a homogeneous space, monopolistic competition among retail stores, and a dynamical system that describes changes in the sizes of marketplaces where the retail stores are located. Tabuchi (2009) shows that the self-organization of the retail stores, which can be interpreted as the emergence of subcenters, occurs as a result of their competition in the homogeneous space.

The contribution of this chapter is twofold. First, I show that a difference in improvement sequences in the road network generates a difference in agglomeration patterns in equilibrium even for the same travel costs parameters. Conducting bifurcation analysis to explore market equilibria, I demonstrate that all the retail stores agglomerate in the center if the radial roads are improved first. In contrast, the stores are located in the center as well as in several suburbs if the ring road is improved first. Second, I show that the scale of agglomeration of retail stores in each marketplace as well as the two-dimensional location pattern of marketplaces in which stores operate at a market equilibrium differ from those at the first-best situation particularly when the travel costs are low. This implies that policymakers should guide stores to form an appropriate location pattern with policies such as land-use regulation.

Chapter 3 Satellite Region Formation for Spatial Economic Models: Bifurcation Mechanism in a Hexagonal Domain

In order to investigate how geographical space in the real world affects resource allocation in equilibria, I focus on the first nature (Cronon, 1991) of the space, which is observed in cities: downtown areas and suburbs. There is a downtown area in each city; the downtown has the advantage of being convenient for consumers to visit. Such first nature is generated by road networks embedded in a two-dimensional space and is ubiquitous in cities worldwide. In fact, it is observed that the center of the road network is the downtown area, and the suburbs are in peripheral zones.

I aim to theoretically elucidate how and where satellite regions emerge in a two-dimensional space. I employ a regular-hexagonal domain where discrete locations are evenly distributed. I introduce two viewpoints: (1) the bifurcation mechanism of the full agglomeration at the center in this domain (mono-center), which produces satellite regions around this center, and (2) the existence of invariant patterns (Ikeda et al., 2018), which are equilibria for any value of transport cost parameter. I focus on various patterns of satellite region formations that one-dimensional spatial platforms cannot express completely.

The contribution of this chapter is twofold. First, the city system comprising one large central city and satellite regions (core-satellite pattern) is theoretically found and shown to be stable by comparative static analysis for the spatial economic model proposed by Forslid and Ottaviano (2003) (the FO model). The transitions of stable equilibria as the transport cost changes are observed.

Second, I demonstrate that invariant patterns of mono-center, twin cities, three cities, and racetrack cities are predominant stable equilibria in the two-dimensional space. It is noteworthy that these patterns are those which have been studied extensively in spatial economics. The twin cities, three cities, and racetrack cities are absorbed into the mono-center as the transport cost decreases, thereby displaying the progress of the formation of a large city at the geographical center. In particular, it is demonstrated that only the core-satellite pattern is stable in this progress. Most of the conventional spatial platforms, such as two place (Krugman, 1991), three places (Castro et al., 2012), and racetrack (Ikeda et al., 2019) have no geographical center and cannot express such central city formation. These transitions are an intrinsic feature observed in the two-dimensional spatial platform with the geographical center.

Moreover, the theoretical results of Chapter 3 indicate that the spatial setting of a geographical space can determine equilibrium. Since the setting can affect the allocation at equilibrium, this setting also affects the results of policy analyses depending on the allocation.

Chapter 4   How should place-based policies be designed for efficiently promoting retail agglomeration?

I evaluate the welfare impacts of place-based policies for retail agglomeration by developing a multipurpose shopping model. In the model, retail stores are under monopolistic competition, and consumers are free to choose where to reside. I focus on two place-based policies which have been adopted by local governments. One is location subsidies to consumers, and the other is location subsidies to stores. I evaluate the welfare impacts of these policies in terms of social surplus. The welfare impacts of adopting place-based policies can be decomposed into three terms, according to Harberger's welfare change measurement formula (Harberger, 1971). The first term is the total change in deadweight losses caused by the price distortions of the varieties supplied in marketplaces. The second term is the net social benefit generated by so-called variety distortion (e.g., Kanemoto, 2013). The third term is the migration fiscal externality generated by income transfer inefficiency by a place-based policy (Boadway and Flatters, 1982; Kono et al., 2007).

Results show that whether or not place-based policies are socially efficient depends on the recipients of the subsidies, even if the policies promote downtown retail agglomeration. Specifically, with the constant elasticity of substitution (CES) utility function of varieties, location subsidies to consumers is harmful from the viewpoint of welfare, whereas location subsidies to stores is desirable. Location subsidies to stores is desirable because positive net benefits generated by variety distortions necessarily exceed the negative deadweight losses caused by price distortions. On the other hand, location subsidies to consumers is harmful because they cause negative net benefits. In order to validate the theoretical results, I numerically evaluate the welfare impacts with the CES utility function. I show that the numerical results are the same as the theoretical results. Moreover, I conduct numerical analyses with a variable elasticity of substitution (VES) utility function in order to examine whether or not relaxing the assumption regarding the elasticity affects the welfare impacts. I show that the welfare impacts are qualitatively the same as the results of the CES function. In the numerical analyses as well as the theoretical derivation, I decompose the welfare change into net benefits generated by the price distortion and the variety distortion by using Harberger's welfare measurement formula. With the location subsidies to residents, both net benefits are negative. With subsidizing retail stores, the former and the latter are negative and positive, respectively, and the latter exceeds the former.

As the results of Chapter 3 indicate, geographical space affects the allocation at equilibrium. Although the results of our welfare analyses depend on the allocation in general, I show that the results of Chapter 4 hold for any geographical space.

Chapter 5 Quantitative Welfare Analyses of Place-based Policies

I aim to quantitatively evaluate the welfare impacts of place-based policies to agglomerate retail stores in the downtown area of a city. Building the multipurpose shopping model developed in Chapter 4, I quantitatively evaluate the following place-based policies:
 • Location subsidies to households residing in the downtown area.
 • Location subsidies to retail stores operating in the downtown area.
The quantitative results show that the welfare impacts are qualitatively the same as the theoretical results shown in Chapter 4.

This chapter relates to quantitative research that focuses on what drives retail agglomeration (e.g., Davis, 2006; Koster et al., 2019). For example, Koster et al. (2019) show the existence of shopping externality with the data for the number of pedestrians that pass shops in shopping streets. They evaluate the welfare impact measured by the profits of retail stores of a retail policy that subsidizes retail stores. In contrast to Koster et al. (2019), I focus on households' location choices as well as the stores' location choices in order to evaluate the welfare impacts of place-based policies. Our welfare evaluation, moreover, is based on a general equilibrium framework.

Some quantitative studies evaluate the welfare impacts of place-based policies (e.g., Busso et al., 2013) with quantitative spatial equilibrium models. These studies focus on spatial households' commuting and residing patterns in order to evaluate the welfare impact of policies to promote the growth of a business area. In contrast to these studies, I focus on spatial households' residing patterns affected by retail agglomeration in order to evaluate retail place-based policies. In particular, I focus on the agglomeration economy driven by the agglomeration of retail stores in marketplaces.

Chapter 6 Concluding Remarks

Chapter 6 summarizes the main results of the present thesis and suggests a direction of future research.

論文審査結果の要旨

　国内外の様々な地方都市において，中心（都心）市街地空洞化が進行している．中心市街地を活性化させるための地方自治体の取り組みの中で近年特に顕著なのが，地域差別的，特に都心（中心）付近で活動する経済主体を優遇する交通政策や経済政策の実施である．地方自治体が経済効率性に優れた地域差別政策を立案するためには，地域差別政策に関する理論的知見の蓄積が必要である．学位申請者は，小売企業の立地と消費者の買い物行動をミクロ経済学的基礎に基づいて分析することで，経済効率的な地域差別政策を解明した．本論文の内容は，従来の都市経済学で構築された商業集積理論を基礎として地域差別政策を分析した独創的な研究をまとめたものである．本論文は全6章で構成される．

　第1章は序論である．

　第2章では，都市内の道路整備が与える商業集積と社会厚生への影響を分析している．二次元空間上の環状線と放射線から形成される正六角形状の道路ネットワークと，集積の経済を基礎とする商業立地モデルを構築し．厚生分析している．道路整備の順序が経済厚生に影響することと，道路整備政策単体では最適な商業集積の配置を達成できないことを示している．

　第3章では，道路ネットワークなど，地理空間の構造が経済の資源配分に影響することを示している．これにより，道路ネットワークの空間構造が，道路整備をはじめとした経済政策の厚生面の結果に影響しうることを示している．

　第4章では，内生的消費者立地を考慮した商業立地モデルの構築と厚生分析を実行している．地域差別的な経済主体への補助金政策（e.g., 都心付近に立地する家計への補助金）を厚生分析している．分析を通じて，小売企業への補助金の交付は厚生を改善させる一方で，消費者への交付は厚生を悪化させることを示している．

　第5章では，4章で焦点を当てた地域差別政策の実施により発生する便益を計算するための，定量モデルを構築している．定量分析の例として，仙台市の都心（仙台駅周辺）と郊外（泉パークタウン周辺）を取り上げ，地域差別政策実施により発生する便益を評価している．

　第6章は博士論文全体のまとめである．

　本論文内でまとめられている研究成果は、地域差別政策と商業集積に関する研究領域を開拓する成果であるとともに，経済効率性に優れる都市政策を立案する際に参考となるものである．そのため、本論文を博士（学術）の学位論文として合格と認める．