Research Journal of Education
ISSN(e): 2413-0540, ISSN(p): 2413-8886
Vol. 8, Issue. 2, pp: 24-32, 2022
URL: https://arpgweb.com/journal/journal/15
DOI: https://doi.org/10.32861/rje.82.24.32

Academic Research Publishing Group

Original Research Open Access

Monopolistic Competition and the University Industry the Determinants of University Choice by Students and the Choice of University Location

Takaharu Ishii
Business Breakthrough University, Japan
Email: takaharuishii7@yahoo.co.jp

Article History
Received: 9 February, 2022
Revised: 27 March, 2022
Accepted: 19 April, 2022
Published: 25 April, 2022

Abstract

This study applies the state of the Japanese university industry to a theoretical model of monopolistic competition. Using a model of spatial economics, it is possible to identify how and why an increasingly competitive university environment leads to university agglomeration and dispersion. The study analyses whether the location of universities will be less unevenly distributed in cities and whether the number of universities and students in rural areas will increase. Using a model of spatial economics, the study analyses two aspects: the demand aspect of the choice of universities by students and the supply aspect of location by universities. A decrease in the number of students per university results in a decrease in the quality of education through a decrease in university income. The results of this study can also explain the impact on the quality of education. The analysis leads to the following conclusions. The higher the cost of inter-regional travel during the job search, the fewer students are willing to move from one region to another to find a job, and the lower the number of students enrolled. When the substitutability between university varieties is weak, the number of universities increases because prospective students need more variety, and the number of students per university decreases. When fixed inputs are low, e.g. when the fixed costs of a university are low due to online etc., the number of universities increases because it is easier to establish new universities and the number of students and graduates per university decreases. In a model that assumes two types of students within the same university who want to work in their region or another region, there will be more students who move between regions. The location of universities is determined by the balance between market size and the level of competition. As people move from one region to another in the course of their job search, there will be competitors in the other region, and the effect of new competition will be weaker in regions with more universities than in regions with fewer universities. Thus, regions with more universities will have a larger market relative to the level of competition, and more universities than their share of the population will be located there. Even in a model with two regions, one with universities in higher education and the other with homogeneous goods in non-university production, the region with the largest population has a larger share of university enrolments than its share of the population. This means that even if the two regions have the same level of technology and resources, they will experience a reduction in enrolment simply because of their small population size. Smaller universities in rural areas mean that a negative spiral of declining enrolments will occur.

Keywords: Monopolistic competition; Location; Spatial economics; University; Market share; Travel cost.

1. Introduction

This study theoretically analyses whether the location of universities will be less unevenly distributed in cities and whether the number of universities and students in rural areas will increase. Using a spatial economics model, the study analyses both demand and supply: a decrease in the number of students per university will lead to a decrease in the quality of education as a result, of a decrease in university revenues. The results of this study can also explain the impact on the quality of education. In Japan, policy changes, such as the relaxation of criteria for establishing universities, have encouraged market competition among universities. The results of this study also provide theoretical content for policy effects in Japan.

Japan's economic growth has been slowing for some time now, and there are indications that household incomes are stagnating, with the number of working families increasing. The employment rate of graduates has become an important criterion for university subsidies, and many universities are offering practical courses and courses to acquire qualifications to increase the employment rate.

For students, the most popular companies to work for are those with a high profile, and many of these are concentrated in urban areas. It can be attractive to work for a well-known company to increase your income and have a stable income.

On the other hand, many students know that to get a job, they need to go to an interview, which is often held in an urban area rather than near the university. To get an interview, even if the chances of getting one are low, it is necessary to go to a city, and the transportation costs to the city are not small for students. It is also common for students to make more than one visit to a city before receiving a job offer from a company of their choice.

The above situation is an inducement for students who wish to work in urban areas to choose urban universities and an inducement for universities that place importance on employment rates and job opportunities to locate in urban areas. This study assumes a private university where the university can choose where to locate.

If the region in which a prospective student wishes to work is one of the most important factors in their choice of university, the policy of revitalizing regional universities will be limited. Regional universities have a major impact on regional development because of their importance for local consumption and employment. This study theoretically clarifies the choice of university locations and the choice of universities by prospective students using a model of monopolistic competition in the context of the diminishing returns and differentiation of university education. The Ministry of Education, Culture, Sports, Science, and Technology (hereafter referred to as MEXT) is the regulatory authority for educational institutions, including universities, in Japan.

This study applies the state of the Japanese university-industry to a theoretical model of monopolistic competition. The model of monopolistic competition considers the recent increase in the number and diversification of universities and the geographical distribution of universities. By applying the model of monopolistic competition, we will examine whether MEXT's goal of regional development through universities can be achieved through the deregulation of university establishment and the policy of subsidy distribution according to the quality of education.

As part of the findings of this study, it is shown that increased market competition, when it occurs among universities responsible for higher education, increases the number of policy regional universities and decreases the number of students per regional university. It also shows that this trend is particularly pronounced in regions with weak substitutability of university variety. These results are consistent with those of Ishii (2022), whose empirical analysis shows that, as a result of policy, the number of universities in Japan has increased in urban areas and the number of students per institution has decreased in rural areas. The results also show that the competitive environment differs between large, medium, and small universities and that smaller universities are likely to have weaker substitutability for variety. The higher the deviation of high school students before entering university, the more they are inclined to enroll in large universities in urban areas, while the lower the deviation of high school students, the more they are inclined to enroll in small universities in rural areas where they live. The results of this study show that the balance between market size and level of competition determines the location of universities. In other words, it is possible that for high school students, the higher their deviation, the more the university they wish to enroll in intends to cover the whole of the country and the larger the market size. Chapter 2 describes the changes in the Japanese university-industry that will be addressed in this study. The results of this study can be applied to all countries where universities and well-known companies are currently concentrated in urban areas and the cost of traveling from rural to urban areas is high for university students. In Chapter 3, the first part of the basic model deals with the demand side of the model, i.e. the choice of universities by prospective students. The second half of the chapter deals with a model of location choice by universities, the supply side. Substitutability between varieties is introduced into the model, but university variety for university students is often based on whether a university is well-known or not, or on the criteria for admission to a university, i.e. whether it has a high deviation score. Policies such as relaxing the rules for establishing universities increase the number of universities. However, newly created universities are less attractive to university students when they are first established, as the universities are not well-known and the deviation values of the universities are low. In other words, the newly created universities established as a result of the policy are a weak substitute for a variety of university students. As a result of the increase of only universities with weak variety substitutability, the number of students per university decreases, and deviation values remain low. Only universities with weak variety substitutability When the number of universities increases, this is because high school students cannot tell the difference between each university and therefore diversify the universities they wish to enter so that they do not have to compete in pre-entry examinations. The model in this chapter is a model that can predict policy effects from the weak substitutability of variety. Furthermore, an increasing number of universities offer internet-only classes, which results in lower fixed costs for universities. Furthermore, in an environment such as the COVID-19 expansion, universities may be able to lower their fixed costs in the long term by reducing face-to-face teaching. The study will also identify the long-term effects of lower fixed costs for universities, including the expansion of internet classes mentioned above. Chapter 4 introduces a model consisting of two symmetrical universities and assumes two types of students who want to find a job in their region and another region within the same university. In Chapter 5 we introduce a model in which homogeneous goods exist. It considers the impact of introducing industries outside the university. Chapter 6 deals with the results of the theoretical analysis of this paper.

2. The Evolution of the University Industry in Japan

Despite a declining birth rate and an aging population, the number of universities in Japan has more than doubled since the 2000s, despite a declining population of 18-year-olds. The increase in the number of universities was triggered by the broadening of the criteria for the establishment of universities in 1991. Before the introduction of the new standards, the university system was based on the names of faculties, bachelor's degrees, curricula, etc.

The MEXT had a policy of restraining the increase in the number of universities, but the government has been promoting decentralization and deregulation since the 1980s. In 1986, the Provisional Council on Education issued a report calling for the individualization and diversification of higher education. The 1991 revision of the Standards for the Establishment of Universities was followed by a revision of the Standards for the Establishment of Universities in 1991, which significantly eased regulations on universities, allowing each university to set its subject categories and number of credits, and increasing the number of names of faculties from 69 in 1979 to over 500 today. The number of degree titles has also increased from 69 in 1979 to over 500 today, and the number of degree titles has diversified to over 700. In response to the prolonged low growth of the economy, the government announced in 2003 the Basic Policy for Special Zones for Structural Reform that universities would not be required to have their school buildings provide a variety of education. In 2005, MEXT was approved to establish professional graduate schools (professional universities and professional junior colleges in 2020) to provide practical education that enables students to work in a global environment. As a condition for the establishment of professional graduate schools, at least 30% of all full-time faculty members are required to be practitioners with at least five years of business experience (40% for professional universities).

The deregulation of the establishment of universities led to the diversification of universities and an increase in the number of universities. To clarify the difference between universities and preparatory schools for qualifications and vocational schools, the establishment of a system of quality assurance of education was required. 2004 saw the start of the accreditation system. the university enrolment rate increased from 17.1% in 1970 to 25.5% in 1991 and 58.1% in 2019. The number of universities increased from 405 in 1974 to 499 in 1989 and 804 in 2019. In the course of the increase in the university enrolment rate, the system has become more diversified. In recent years, the rate of university enrolment has reached a plateau and by 2040 the estimated number of university enrolments will fall to around 510,000 (74% of the current figure for 2021). The increase in the number of universities and the decline in university enrolments due to the declining birth rate has led to an increase in the number of universities with limited capacity. The number of students entering without academic exams has increased and the quality of education has reportedly declined. Amid a parallel wave of university mergers and new university establishment, MEXT's 2012 University Reform Action Plan set out a policy of allocating priority subsidies to universities that train global human resources and regional development leaders and taking strict action against private universities with poor management and educational environments. In 2019, the government announced the introduction of free higher education, a grand design for higher education towards 2040, and guidelines for academic management in 2020. These policies were introduced to achieve three goals: increasing university enrolment, improving the quality of higher education, and a diverse university.

Many of the universities that have increased in urban areas were originally vocational schools or junior colleges that can graduate in two years. The curricula originally used as vocational schools or junior colleges were converted into universities by changing some of the curricula. Unlike traditional universities, which emphasized liberal arts and professional education, these schools had practical educational content that could be used immediately in business.

Until now, the mainstream theoretical models have focused on the demand for university education, but there is a need for models that reflect the changes in the supply side described above. There are representative studies on human capital theory such as Becker (1964), review papers by Hanushek and Welch (2006), Hanushek and Woessmann (2011), Hanushek *et al.* (2016), and Epple and Romano (1998) on education vouchers. (2016), and Epple and Romano (1998) on education vouchers. This study applies the theory of monopolistic competition to universities and examines the impact of inter-university competition on the geographical distribution of university and college students and the possibility of a decline in the quality of education. The theoretical basis of spatial economics is the monopolistic competition model of Dixit and Stiglitz (1977). Spatial economics can explain agglomeration and regional disparities, such as the mechanisms that lead to the concentration of industry and population in cities, Dixit and Stiglitz (1977) not only introduced a utility function into Chamberlin (1933) model of monopolistic competition, they also introduced a The introduction of economies of scale and transport costs led to unconventional results; Helpman and Krugman (1985) introduced transport costs into trade theory. They found that large countries with large market sizes become net exporters of differentiated products through the agglomeration of firms. Their model can be treated as a unified Heckscher-Oline model and Krugman model.

3. Basic Model

3.1. Models of University Choice by Prospective Students

Goods can be divided into two categories: the costs of higher education and the costs of non-higher education. It is assumed that all goods spent on non-higher education are homogeneous, but that higher education consists of several differentiated varieties. The preferences of these consumers, the prospective students, can be expressed in terms of the following utility function U

$$\mathrm{U} = M^{\mu}A^{1-\mu},\ \ 0<\mu<1 \qquad (1)$$

$$\mathrm{M}=\left[\int_0^n q(i)^{\rho}di\right]^{\frac{1}{\rho}},\ \ 0<\rho<1 \qquad (2)$$

A is the consumption of non-higher education, q(i) is the consumption of variety i of the university, and M is the partial utility determined from the variety of the university. Equation (1) is a Cobb-Douglas type function, which is the upper level function specifying utility. Equation (2), which defines the partial utility, is a CES function with constant elasticity of substitution. Since we assume that $0<\rho<1$ (i.e. $1<\sigma<\infty$), the Cobb-Douglas function is not completely alternative, although the elasticity of substitution between the two varieties is stronger than when expressed as On the other hand, the market share of each variety is zero because it corresponds to a point on the interval [0,n]. In other words, universities produce a large number of similar but to some extent differentiated varieties, representing the monopolistically competitive market envisaged by Chamberlin (1933). Given income y, the price of non-university education p^a, and the cost of each university education, i.e., tuition $p(i)$, a prospective student maximizes the utility function equation (1) subject to the following budget constraint

$$p^a A + \int_0^n p(i)q(i)di = y$$

The derivation of the demand function can be divided into two stages as follows. In the first stage, given a partial utility M, we solve a cost minimization problem for it.

$$\min \int_0^n p(i)q(i)di$$

$$s.t.\ \left[\int_0^n q(i)^\rho di\right]^{\frac{1}{\rho}} = M \qquad (3)$$

The first-order condition of the cost minimization problem is that the marginal rate of substitution and the price ratio is equal for any variety *i*,*j*, i.e.

$$\frac{q(i)^{\rho-1}}{q(j)^{\rho-1}} = \frac{p(i)}{p(j)}$$ and from this condition

$$q(i) = q(j)\left[\frac{p(j)}{p(i)}\right]^{\frac{1}{1-\rho}}$$

is obtained. Substituting this expression into the constraint equation (3) and solving for q (j), we obtain

$$q(j) = \frac{p(j)^{\frac{1}{\rho-1}}}{\left[\int_0^n q(i)^\rho di\right]^{\frac{1}{\rho}}} M \qquad (4)$$

This is the compensating demand function for variety j. The minimized cost can be obtained by substituting equation (4) into the equation for the cost as follows。

$$\int_0^n p(j)q(j)dj = \left[\int_0^n p(i)^{\frac{\rho}{\rho-1}} di\right]^{\frac{\rho-1}{\rho}} M$$

The terms in [] on the right-hand side of the above equation are、

$$P = \left[\int_0^n p(i)^{\frac{\rho}{\rho-1}} di\right]^{\frac{\rho-1}{\rho}} = \left[\int_0^n p(i)^{1-\sigma} di\right]^{\frac{1}{1-\sigma}} \qquad (5)$$

Then, P is the minimum cost of obtaining one unit of partial utility. Therefore, P can be regarded as the price index of the university industry. Substituting equation (5) into equation (4), the compensation demand q(j) becomes

$$q(j) = \left[\frac{p(j)}{P}\right]^{\frac{1}{\rho-1}} M \qquad (6)$$

The second step is to determine the amount of consumption A and partial utility M other than higher education that maximises utility under the constraint, given income y.

$$\max\ U = M^\mu A^{1-\mu}$$

$$s.t. PM + p^a A = y$$

The first-order condition of this utility maximisation problem is that

$$M = \mu \frac{y}{P}$$

$$A = (1-\mu)\frac{y}{p^a}$$

Substituting equation (6), the demand function for variety j is

$$q(j) = \frac{p(j)^{-\sigma}}{P^{1-\sigma}} \mu y \qquad (7)$$

From these results, the indirect utility function for prospective students is From these, the indirect utility function for a prospective student is

$$V = \mu^\mu (1-\mu)^{1-\mu} y P^{-\mu} (p^a)^{-(1-\mu)} \qquad (8)$$

The demand function, equation (7), shows that when the elasticity of substitution σ is 1, the CES function coincides with the Cobb-Douglas function. Substituting σ = 1 into equation (7) gives q(j) = y/(p(j)) μ, which is a demand function with constant expenditure share: as σ increases, the price elasticity of demand increases above 1 and substitutability between varieties increases. Furthermore, the lower the price index, the smaller the demand for a variety becomes, which implies a competition effect where the demand for each variety decreases as competition in the industry increases, such as university entry and price competition. Assuming that the prices of all varieties are the same at p_i, the price index from equation (5) would be

$$P = (np^{1-\sigma})^{\frac{1}{1-\sigma}} = n^{\frac{1}{1-\sigma}} p$$

In other words, it can be confirmed that a decrease in the price index (increased competition) is brought about by a decrease in the price *p* of each variety and an increase in the number of varieties *n*.

There are two regions, and prospective students attach importance to deviation value when choosing a university, and to price (tuition) and inter-regional travel costs when looking for a job if the deviation value is at the same level. When they look for a job in their region, they do not pay inter-regional travel costs when looking job, but when they look for a job in another region, they pay inter-regional travel costs when looking for a job since τ is the cost of goods required for one unit of goods (students) to move, if a graduate of a university in region i is offered a job in region i at price p_i, the tuition fee of this good in region j is $p_{ij}=p_i\tau$. According to equation (5), the price index for each region is

$$P_1 = [n_1 p_1^{1-\sigma} + n_2(p_2\tau)^{1-\sigma}]^{\frac{1}{1-\sigma}}$$

$$P_2 = [n_2 p_2^{1-\sigma} + n_1(p_1\tau)^{1-\sigma}]^{\frac{1}{1-\sigma}} \qquad (9)$$

n_1 and n_2 are the types of university variety produced in regions 1 and 2 respectively. From equation (7), the total demand for employment of university graduates in region j for the goods produced in region i, including the cost of inter-regional travel during job hunting, is

$$q_i = q_{ii} + \tau q_{ij} = \mu p_i^{-\sigma}\left(\frac{Y_i}{P_i^{1-\sigma}} + \frac{\varphi Y_j}{P_j^{1-\sigma}}\right) \qquad (10)$$

Y_i is the total income of region i. Also, $\varphi = \tau^{1-\sigma}$, where φ is the freedom of movement. The freedom of movement takes the range from 0 to 1, and the larger the value, the lower the inter-regional movement cost in job hunting. Given the assumption of interregional mobility costs at the time of job search, an enrollment of τ times the amount of demand is required to meet the demand in other regions. The higher the interregional transfer cost at the time of job hunting, the fewer students are willing to move from one region to another to find a job, and the number of students enrolled decreases.

3.2. A Model for Choosing a University Location

Identifying the universities located in region i, university production is a technology of increasing returns. The technology required to develop the skills of students at all universities is the same, with fixed costs C^f and marginal costs C^m as constants. If the tuition fee is p_i, the profit of the university is。

$$\Pi_i = p_i q_i - (C^f + C^m q_i) \qquad (11)$$

Since each university produces a differentiated good, it sets its tuition fee p_i to maximize its profit (11), given its aggregate demand (10). In addition, the tuition fee p_i of his university does not affect the market price index. The derivative of the demand for tuition is therefore

$$\frac{dq_i}{dp_i} = -\sigma\mu p_i^{-\sigma-1}\frac{Y_i}{P_i^{1-\sigma}} - \sigma\mu p_i^{-\sigma-1}\frac{\varphi Y_j}{P_j^{1-\sigma}} = -\sigma\frac{q_i}{p_i}$$

Then, from the first-order condition of profit maximisation, the equilibrium price (tuition fee)

is$p_i = \frac{\sigma}{\sigma-1}C^m = \frac{1}{\rho}C^m$ (12)

It means that the ratio of tuition fee to marginal cost *σ/(σ-1)=1/ρ* is constant. If the mark-up rate of universities is $(p_i - C^m)/p_i$, the mark-up rate is generally equal to the inverse of the price elasticity of demand if university i have monopolistic pricing. Since the price elasticity of demand is constant at σ, the mark-up rate is constant at σ/1. Normally, the mark-up rate decreases as the number of universities entering the market increases, but in the CES utility function, it remains constant, which simplifies the analysis. Substituting this into the utility function (3-11), we obtain

$$\Pi_i = \frac{C^m}{\sigma-1}q_i - C^f \qquad (13)$$

This means that on the other hand, since universities are free to enter the market, the profit equation (13) is zero. The free entry condition is this means that the university's fixed input is *1/σ* of its turnover.

$$C^f = \frac{C^m q_i}{\sigma-1} = \frac{1}{\sigma}p_i q_i \qquad (14)$$

That is, in the Dixit and Stiglitz (1977) model of monopolistic competition, which assumes a fixed mark-up rate and free entry, the fixed cost of a university is 1/σ of sales and the variable cost is (σ-1)/σ of sales. If the only factor of production is labour, with wage *w*, fixed labour input F and marginal labour input m, then $C^f = Fw, C^m = mw$. Substituting in equation (14) and solving for the number of graduates q_i, we obtain

$$q_i = \frac{F(\sigma-1)}{m}$$

This means that as long as positive profits exist, new universities will enter the industry and eventually each entering university will produce a certain amount of graduates, with each entering university providing a labour input of *F+mq=Fσ*. If the total labour supply in the university industry is *L*, then the number of participating universities is

$$\text{n} = \frac{L}{F\sigma}$$

When the substitutability between the variety of universities is weak, the number of universities increases because prospective students need a large variety, and the number of students per university decreases. When the fixed input *F* is small, e.g. when the fixed cost of a university is small due to online etc., the number of universities increases because it is easier to establish new universities and the number of enrolments and graduates per university decreases.

4. A Model Consisting of Two Symmetrical Universities (Assuming Two Types of Students within the Same University Who Want to Work in Their Region and another Region)

Assume that there are two regions: students who do not have to pay inter-regional travel costs to find a job in their region (the region they live in when they choose university) and students who want to find a job in another region. There are two regions: one in which students do not have to pay inter-regional travel costs to find a job in their region, and one in which students have to pay inter-regional travel costs to find a job in the other region. There are two universities (x, y), both of which produce using the same technology of increasing returns. There are two types of prospective students (x-loving and y-loving) in the economy, with equal numbers of *L*. The x-loving students consume only the variety of the x-sector, and the y-loving students consume only the variety of the y-sector. The utility functions of both types of consumers can be expressed as CES functions.

$$U^x = \int_0^n q^\rho(i^x)di^x \, , U^y = \int_0^n q^\rho(i^y)di^y$$

We also assume that these types of prospective students are distributed in both regions and that the populations of both regions are identical, but that $\theta \in (1/2,1)$, and that there are more x-types in region 1 and more y-types in region 2. Although the composition of prospective student types differs across regions, the population of the two regions is identical and the technology of the two universities is identical, so the wages in the two regions are also identical. The wages in both regions are denoted by *w*. The fixed labour input of each university is *F* and the marginal labour input is ρ. The demand q_{ii}^x per prospective student of type *x* in region j for the variety of universities in sector *x* in region *i* can be shown to be。

$$q_{ii}^x = \frac{(p_i^x)^{-\sigma}}{(P_i^x)^{1-\sigma}} w$$

$$q_{ij}^x = \frac{(\tau p_i^x)^{-\sigma}}{\left(P_j^x\right)^{1-\sigma}} w = \frac{\varphi}{\tau} \frac{(p_i^x)^{-\sigma}}{\left(P_j^x\right)^{1-\sigma}} w \qquad (15)$$

p_i^x is the tuition fee of the variety and $\tau \in (1, \infty)$ is the interregional travel cost of finding a job. P_i^x is also the price index of sector *x* in region *i*. If n_i^x is the number of universities in sector *x* in region *i*, it is given by

$$P_i^x = \left[\int_0^{n_i^x} (p_i^x)^{1-\sigma} ds + \varphi \int_0^{n_j^x} \left(p_j^x\right)^{1-\sigma} ds\right]^{\frac{1}{1-\sigma}} = p_i^x\left(n_i^x + \varphi n_j^x\right)^{\frac{1}{1-\sigma}} \qquad (16)$$

Since wages are the same in both regions, equation (11) implies that $p_i^x = p_j^x$, and we use this relationship in the last equality equation; similarly for sector *Y*, the equilibrium price and the equilibrium enrolment for a university located in region *i* are

$$p_i^x = p_i^y = w, \; q_i^x = q_i^y = F\sigma \qquad (17)$$

From equations (15), (16) and (17), the market equilibrium conditions for the x-sector variety entering in region 1 and the x-sector variety produced in region 2 are respectively

$$\frac{\theta L}{n_1^x+\varphi n_2^x} + \varphi \frac{(1-\theta)L}{\varphi n_1^x+n_2^x} = q_1^x \qquad (18)$$

$$\varphi \frac{\theta L}{n_1^x+\varphi n_2^x} + \frac{(1-\theta)L}{\varphi n_1^x+n_2^x} = q_2^x = q_1^x \qquad (19)$$

Subtracting Eq. (19) from Eq. (18) and dividing by $1\text{-}\varphi$, we obtain

$$\frac{\theta L}{n_1^x+\varphi n_2^x} + \frac{(1-\theta)L}{\varphi n_1^x+n_2^x} \qquad (20)$$

Therefore, it follows that。

$$\frac{n_1^x}{n_1^x+n_2^x} = \theta + (2\theta - 1)\frac{\varphi}{1-\varphi} > \theta \qquad (21)$$

The left-hand side of the above equation represents the share of universities in region 1 in sector x. This equation only holds if the right-hand side is less than or equal to 1. If the right-hand side is greater than 1, then $\frac{n_1^x}{n_1^x+n_2^x} = 1$, which means that x sectors are completely concentrated in region 1. The conditions for the above situation are

$\varphi \geq (1\text{-}\theta)/\theta$ *or* $\theta \geq 1/(1+\varphi)$. In other words, perfect agglomeration is more likely to occur when inter-regional mobility is very high, or when the composition of the types of prospective students is very skewed. In region 1, where there is a large number of people of type X, there will be universities with a market share of more than x in the sector. Region 2 will have more universities than its market share in sector y.

Check the income and expenditure. The income and expenditure is the number of inter-regional transfers x tuition fees for x departments in region 1. If we consider working in the region where the university is located as regional development, the greater this income and expenditure, the greater the impact on the region.

$$B^x = n_1^x\varphi \frac{w(1-\theta)L}{\varphi n_1^x+n_2^x} - n_2^x\varphi \frac{w\theta L}{n_1^x+\varphi n_2^x} = \frac{\varphi w(1-\theta)L}{\varphi n_1^x+n_2^x}\left(n_1^x - n_2^x\right) \qquad (22)$$

The second equality can be derived from equation (20). From equations (21) and (22), region 1 for sector x is the university where all enrolments leave the local area, and y is the university where all enrolments in region 2 leave the region where the university is located after graduation. Therefore, university 1, which has a large number of people of type x, is the university where all enrolments in sector x leave the local area, and a home market effect occurs, which is equivalent to a region with a large market having more universities than its market share. The location of each sector is determined by the balance between the size of the market and the level of competition. Students tend to avoid leaving the region where their university is located when looking for a job, as there are greater job opportunities in urban areas with a larger number of jobs and employers than in regions where regional universities are located. They try to locate in the largest markets possible to save on the costs of inter-regional transfers during the job hunt, while many universities congregate in large markets. Profits are reduced in more competitive regions that offer lower tuition fees. The numerator of equation (20) represents the size of the market in each region and the denominator the inverse of the price index (degree of competition) in each region, meaning that these relative forces are equalised in both regions.

In the situation where the cost of inter-regional travel in job hunting is infinite and job hunting outside the region where the university is located is not possible ($\varphi \to 0$), equation (20) becomes

$$\frac{\theta L}{n_1^x + 0} = \frac{(1-\theta)L}{0 + n_2^x}$$

Thus, to maintain balance, the university share must equal the population share θ. This is why the home market effect does not occur when $\varphi \to 0$. In a situation where the cost of inter-regional mobility in a job search is finite and mobility is possible, it follows that if the university share remains equal to the population share

$$\frac{\theta L}{\theta + \varphi(1-\theta)} > \frac{(1-\theta)L}{\varphi\theta + (1-\theta)}$$

The left-hand side shows the degree of competition in Region 1 relative to the market size of Region 1, and the right-hand side shows that of Region 2. When inter-regional mobility occurs through job hunting, competitors also appear in the other region, and the effect of new competition is weak in Region 1, where there are many universities, but strong in Region 2, where there are few universities. Therefore, region 1 has a larger market relative to the level of competition, which results in an increase in the share of universities in region 1 and the location of more universities than its share of the population.

5. A Model with Homogeneous Goods (Introducing Industries Other Than Universities)

Helpman and Krugman (1985), considered a model with an industrial sector and an agricultural sector with a constant yield technology and assumed that the only difference between the two countries is the size of their population. They found that if the home market effect is a phenomenon specific to the industrial sector, then countries with large populations attract more industry and become net exporters of industry.

Let the population of region 1 be θL and the population of region 2 be $(1-\theta)L$. Assume that region 1 is large region, i.e. an urban area, and that $\theta \in (1/2,1)$. Enrollees, who are consumers, have the same utility function equation (1) and consume both goods produced by higher education and goods outside higher education. Outside higher education, one unit of the good is produced by one worker under perfect competition. The demand for non-higher education goods is assumed to be large and non-higher education production occurs in both regions. Under the above assumptions, the prices of non-higher education in both regions and the wages in both regions are all equal. Therefore, if goods other than higher education are value-standard goods, the wages in both regions are also equal to one. University enrolments continue as before, with F the fixed labour input and ρ the marginal labour input. The labour input refers to the cost of running the university, not to the labour input of the students. As before, the equilibrium producer prices are $p_1 = p_2 = 1$ and $q_1 = q_2 = F\sigma$. The price indices for the university industry in both regions are respectively as follows

$$P_1 = (n_1 + \varphi n_2)^{\frac{1}{1-\sigma}}, P_2 = (\varphi n_1 + n_2)^{\frac{1}{1-\sigma}}$$

The demand q_{ij} per enrollee in region j for the variety of universities produced in region i is

$$q_{11} = \frac{\mu}{n_1 + \varphi n_2}, q_{12} = \frac{\varphi}{\tau}\frac{\mu}{\varphi n_1 + n_2}$$

$$q_{22} = \frac{\mu}{\varphi n_1 + n_2}, q_{21} = \frac{\varphi}{\tau}\frac{\mu}{n_1 + \varphi n_2}$$

It follows that From the market equilibrium conditions for universities, we obtain the same equations as in equations (18) and (19) as follows

$$\frac{\mu}{n_1 + \varphi n_2}\theta L + \frac{\varphi\mu}{\varphi n_1 + n_2}(1-\theta)L = F\sigma$$

$$\frac{\varphi\mu}{n_1 + \varphi n_2}\theta L + \frac{\mu}{\varphi n_1 + n_2}(1-\theta)L = F\sigma$$

As in equation (21), balance between market size and degree of competition

$$\frac{\theta}{n_1+\varphi n_2} = \frac{1-\theta}{\varphi n_1 + n_2} \quad (23)$$

and the formula for determining the company share in Region 1

$$\frac{n_1}{n_1+n_2} = \theta + (2\theta - 1)\frac{\varphi}{1-\varphi} > \theta \quad (24)$$

Is satisfied. The above equation implies that in a model with two regions, one with universities as higher education and the other with homogeneous goods producing non-university goods, region 1 with a large population will have a larger share of university enrolments than its share of the population. This means that region 1 with a large population will attract more applicants and produce more graduates who are enrolled, i.e. the home market effect. Equation (24) implies that the share of university enrolments in region 1 is an increasing function of the degree of freedom of movement φ of universities. This can be seen as a quadratic expansion effect of the home market effect. This means that the progressive merger of universities (and the decline in the cost of inter-regional mobility when seeking employment) will lead to the withdrawal of universities from the regions. It means that even if the level of skills and resources available in both regions is the same, a reduction in enrolments will occur simply because of the small size of the population. Smaller universities in rural areas will experience a negative spiral of declining enrolments.

6. Conclusion

This study applies the state of the Japanese university industry to a theoretical model of monopolistic competition. The analysis leads to the following conclusions

The higher the cost of inter-regional travel during the job search, the fewer students are willing to move from one region to another to find a job, and the lower the number of students enrolled. When the substitutability between university varieties is weak, the number of universities increases because prospective students need more variety, and the number of students per university decreases. When fixed inputs are low, e.g. when the fixed costs of universities are low due to online etc., the number of universities increases because it is easier to establish new universities, and the number of students and graduates per university decreases.

In a model that assumes two types of students within the same university who want to work in their region or another region, there will be many students who move between regions. Alternatively, complete clustering of universities is more likely to occur when the types of prospective students are very unevenly distributed. The location of universities is determined by the balance between market size and the level of competition. Students tend not to leave the area where their university is located when looking for a job because they have better job opportunities in urban areas with a higher number of jobs and employers than in areas where local universities are located. They try to locate in the largest markets possible to save on the costs of inter-regional transfers during the job hunt, while many universities congregate in large markets. Profits are reduced in more competitive regions offering lower tuition fees.

As people move from one region to another through the job market, there will be competitors in the other region. The impact of new competition will be weaker in regions where there are more universities, but stronger in regions where there are fewer. Thus, regions with more universities will have a larger market relative to the level of competition, and more universities than their share of the population will be located there.

In a model with two regions, one with higher education universities and one with homogeneous goods producing non-university goods, the region with the largest population has a larger share of university enrolments than its share of the population.

This means that regions with large populations attract more applicants and produce more graduates who are enrolled, i.e. the home market effect is the same.

The progressive merging of universities (and the lowering of inter-regional mobility costs when seeking employment) means that there will be a withdrawal of universities from the regions. It means that a contraction in enrolments will occur simply because of the small size of the population, even if the level of skills and resources available in both regions are identical. Smaller universities in rural areas will experience a negative spiral of declining enrolments. Declining enrolments mean that investments cannot be made to improve the quality of education. Rather, the quality of education is likely to decline as the number of teachers and courses decreases to reduce costs, and remuneration for teachers decreases, leading to an exodus of talented teachers from the universities.

The MEXT policy change allows students to choose their university from a more diverse range of options than before. The results of the analysis show that the balance between the size of the rural market and the level of competition between universities is important for the survival of small rural universities. As competition between universities increases, the probability of university survival increases as urban universities increase their enrolment more than the urban to rural population ratio. On the other hand, small rural universities will experience a decline in the quality of their teaching. MEXT, together with deregulation, has focused on universities with a high quality of education through the distribution of grants and subsidies. In recent years, there has been a shift from a trend of increasing and diversifying the number of universities to a policy of reducing the number of universities. The theoretical conclusions are that the influx of university students to urban areas or the expansion of employment in urban areas encourages the establishment of new universities in rural areas, which in the long term will lead to bankruptcy and have a little positive effect on rural areas in the medium to long term. Companies tend to locate in urban areas where there is a high concentration of universities with a high degree of difficulty in gaining admission to university in order to secure excellent human resources, but for students the disadvantage of choosing an urban university is that the cost of living in urban areas, including housing and food, is higher than that in rural areas. This study does not take this into account, which is an issue. The results of this study are consistent with those of Ishii (2022), whose empirical analysis showed that the number of universities in Japan has increased in urban areas as a result of policies, while the number of students per institution has decreased in rural areas. In addition, the competitive environment differs among large, medium and small universities. This study's model is consistent with

Ishii (2022) results, given that small universities have weaker substitutability of variety; Ishii (2022) found that the higher the deviation of high school students before entering university, the more they are inclined to enrol in large universities in urban areas, while the lower the deviation of high school students, the more they are inclined to enrol in their own rural area showed that they were more inclined to enrol in smaller universities. The results of this study show that the balance between market size and level of competition determines the location of universities. In other words, for high school students, the higher their deviation, the more likely it is that the university they wish to enrol in will cover the whole country and the larger the market size may tend to be. Urban areas are highly competitive as universities enter more than their share of the population. Students with a lower deviation of their own will target their local area and thus the market size will be smaller. Also, with smaller regional universities, the quality of education is likely to be lower due to lower university income.

Measures to ensure the survival of small rural universities include having a system whereby universities pay for inter-regional travel during job-hunting, and reducing the cost of job-hunting for students by locating in areas relatively close to urban areas.

References

Becker, G. S. (1964). *human capital: A theoretical and empirical analysis, with special reference to education.* University of Chicago Press: Chicago.

Chamberlin, E. (1933). *The theory of monopolistic competition.* Harvard University Press: Cambridge, MA.

Dixit, A. K. and Stiglitz, J. E. (1977). Monopolistic competition and optimum product diversity. *American Economic Review,* 67(3): 297-308.

Epple, D. and Romano, R. E. (1998). Competition between private and public schools, vouchers, and group effects. *American Economic Review,* 88(1): 33-62.

Hanushek, E. and Welch, F. (2006). *Handbook of the economics of education.* Elsevier.

Hanushek, E. and Woessmann, L. (2011). *Handbook of the economics of education.* Elsevier.

Hanushek, E., Machin, S. J. and Woessmann, L. (2016). *Handbook of the economics of education.* Elsevier.

Helpman, E. and Krugman, P. R. (1985). *Market structure and foreign trade: Increasing returns, imperfect competition, and the international economy.* MA: MIT Press: Cambridge University Press.

Ishii, T. (2022). Inter-university competition in different competitive envirfonments, ssrn working paper.