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Is Retail Service Productivity Really Low in Japan?

-- Numerical experiment based on Shepard's model --

by

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Is Retail Service Productivity Really Low in Japan?

- A Numerical experiment based on Shepard's model –[1]

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Abstract

The middle 1990s began a serious economic recession for Japan known as the "lost decade". Productivity appears to be a contributing factor to the recession with service sectors receiving an especially bad reputation for low productivity compared to the manufacturing industries. But this assumption has not been analyzed in terms of service output definition. This paper focuses on the relationship between the output definition and productivity for the retail trade service sector, both of which are often quite ambiguous.

Applying the theoretical model of Shepard (1991), we define the retail trade service output as the consumer's satisfaction with the service and try a numerical experiment on margins and productivity according to the scenario that describes the environmental changes in the Japanese retail trade service market. The simulation results show the substantial effect that deregulation has on lower retail trade service margins. In the case of retail trade service sectors, where production and consumption occur simultaneously, the productivity level depends highly on the definitions inherent in a consumer's evaluation and satisfaction. Hence, the simple productivity comparison across regions might be misleading and sometimes meaningless.

1 Introduction

The Japanese economic recovery since 2002 has initiated a search for contributors to the long term recession referred to as "the lost decade." Recently, one potential source was identified: productivity that has been hiding itself for a long time as a residual of economic growth. The search began with Hayashi and Prescott (2002) and their analysis by the calibration study of a dynamic macro model, which pointed out Total Factor Productivity (TFP) as a substantial cause for recession. Following their study, numerous academic papers have appeared explaining the macro TFP slowdown.[1]

The Japanese government is also interested in a productivity trend analysis for a more practical and urgent reason: the requirement for accelerating economic growth to construct a sustainable social security system with a decreasing contributing population. Ministry of Economy, Trade and Industry (2007) and Cabinet Office (2007) have explained that a primary source of the economic slowdown since 1990s is stagnant productivity in service industries that generate approximately a 70% share of GDP. This seems to be a common supposition in the government reports and papers that treat the U.S. service industries as the benchmark. Industrial Structure Council (2007), for example, reported that labor productivity in the Japanese service sectors is far behind that of the U.S., i.e., 40% below in hotels & restaurants and wholesale & retail services, and less than half in transportation services.

In the case of service sectors, the output definition is absolutely crucial for a reliable productivity measurement. Service output, different from manufacturing products, is uncountable and invisible. Can we say that a bank provides twice the service to a customer who has twice amount on deposit? Is transportation service of 100 miles twice as much as that of 50 miles? Secondly, service quality is difficult to measure. A gorgeous restaurant in a hotel certainly provides a higher quality service than a fast food shop, but how can we measure the quality difference? We can observe how much a consumer pays for service, but not consumer's evaluation, that is, real output.

The output definition issue for retail service has been contemplated for years. A contin-

[1] They can be roughly summarized according to the topic: inter-industry resource allocation by Miyagawa (2003), a firm's entry/exit effect by Nishimura, Nakajima, and Kiyota (2005), capital market malfunctioning by Caballero, Hoshi, and Kashyap (2006), IT capital by Jorgenson and Nomura (2005), organizational capital by Ministry of Economy, Trade and Industry (2004), capital utilization & labor hoarding effects by Miyagawa, Sakuragawa, and Takizawa (2005). For more details, see Miyagawa (2006), an excellent survey paper of recent productivity studies.

uing question is, which will be a better proxy of output, sales or margin? Oi (1992) prefers sales to gross margins for two reasons. First, if a store manager hires more employees to select sales items only suitable for customers, a factor substitution between labor and goods purchased for resale is observed. Second, gross margins could include monopoly rents and inefficiencies of production that are obviously not considered output. Triplett and Bosworth (2004), on the other hand, noted recent expansion of product movement that may lead to the overestimation of output. A retailer just transferring electric devices and appliances like PCs from manufacturers to consumers does not provide service output as much as sales amounts. Timmer, Inklaar, and van Ark (2005) derive "real margin" as output by utilizing the double deflation method: subtracting deflated purchase for resale from deflated sales.

The retail trade service output from a retailer is fundamentally what a consumer receives as an additional value to the merchandise. Betancourt and Gautschi (1993) classified retail trade services into five categories: accessibility of location, assortment, assurance of product delivery in the desired form and at the desired time, information, and ambiance. Consumers purchase "retail trade service," from the aggregated output of these five elements. In this sense, nominal output of retail trade service can be gross margin or value added. The problem is how to measure the price index for "retail trade service." The double deflation method is one alternative, although it has the shortcoming of leading to negative output values. Manser (2005) as well as BLS's PPI program, on the other hand, demonstrated a new method that directly measures service price as a difference between the sales price of a specific item and its acquisition cost.

One of the characteristics of service production is the simultaneous occurrence of supply and demand. The output definition only from the supply side is not sufficient, but demand side information, such as the consumer's utility maximization behavior, should be also considered.[2] In other words, we need an economic model of market equilibrium to define service output. In this paper, among a variety of retail firm models, we have chosen to utilize the model presented by Shepard (1991).[3] Shepard's model is based on a consumer's discrete choice between purchase of high quality service, purchase of low quality service and no

[2]The value of manufacturing products is also evaluated when consumers purchase and use them. Different from service, however, they can be stored and shipped to other regions and countries where manufacturers do not directly face consumer's evaluation.

[3]Ehrlich and Fisher (1982) presented a retail firm's optimal pricing model with a relationship to advertising behavior. Nakamura (1999) described a retail price discrimination model to explain price diversity of grocery stores in Canada. Maruyama (1991) analyzed Japan's trade system by utilizing a location model of retail shops.

purchase. Shepard (1991) focused on U.S. gas station service and tested if the market is competitive or not by using pricing information from full and self service stations. In the case of gas stations, it is common for service providers to supply both full and self services at the same place.

In retail trade service, however, each shop or firm may specialize in a certain level of service and tries to differentiate the service content from others. In this sense Shepard's model should be modified to apply to the retail trade service provision, especially in Japan. Traditionally, Japanese retail trade service has been quite regional. Small shops form a shopping arcade in the downtown and provide the regional market. There are not competitive, but cooperative, relationships between shops, which is welcomed by consumers because everyone is a member of the regional community.

According to economic growth and an expansion of the retail market size, regional shopping arcades are about to face competition with large superstores. Although the purpose of the Large-Scale Retail Store Law was to protect small shops from the competition, the law prevented large stores from opening in traditional store areas, and eventually led to less competitive and regionally monopolistic markets. Early in the 1990s, under the stream of deregulations, the law was relaxed for large stores to more easily enter the traditional market.[4] Considering the situation mentioned above, it might be reasonable to interpret that the Japanese retail trade service market has changed from a regionally monopolistic one to more competitive, but not perfectly competitive, where a large store and a group of small shops are conscious of each other and searching for suitable business strategies. We will write a scenario that illustrates the changes of Japanese retail trade service market conditions and attempts a simulation analysis to derive policy implications.

The rest of the paper is organized as follows. The next section introduces the Shepard model of the retail trade service market and explains the modified version for this paper's analysis. In Section 3 we try a numerical experiment using the model. In the following section we consider the policy implications based on the simulation results. The final section provides the conclusions.

[4]Early in 1990s researchers of economics published academic papers which protested regulated Japanese retail trade market. See Miwa and Nishimura (1991) and Krugman (1991) for more details.

2 Modified Shepard's Model

Suppose there are two kinds of retail trade service firms: one providing high quality service, h, and one providing low quality service, ℓ. We assume a consumer makes a choice of purchasing one unit of service from one of the two providers or no purchase. We also assume that the consumer's income m has a uniform distribution from $M-1$ to M. The consumer's choices can be described as follows:

$$U_h = V_h(m - P_h) \tag{1}$$

$$U_\ell = V_\ell(m - P_\ell) \tag{2}$$

$$U_0 = V_0 \cdot m, \tag{3}$$

where V_h and V_ℓ show the utility a consumer obtains from the purchase of high and low quality retail trade services respectively, and P_h and P_ℓ stand for the corresponding prices. V_0 is the reservation utility of retail trade service purchase.

2.1 Monopoly

In the case of a monopolistic market, each retail trade service provider faces its own customers' demand function. Following Shepard's model, a retail trade service provider maximizes profit equation defined as

$$\pi_h^M = (P_h - w - \alpha)\left(M - \frac{V_h P_h}{V_h - V_0}\right) \tag{4}$$

$$\pi_\ell^M = (P_\ell - w)\left(M - \frac{V_\ell P_\ell}{V_\ell - V_0}\right), \tag{5}$$

where w stands for the marginal cost of retail trade service common to low and high quality services and α for the additional marginal cost for high quality service. The superscript M symbolizes a monopolistic market situation. The profit maximizing prices are derived as follows:

$$P_h^M = \frac{V_h - V_0}{2V_h}M + \frac{w+\alpha}{2} \tag{6}$$

$$P_\ell^M = \frac{V_\ell - V_0}{2V_\ell}M + \frac{w}{2}. \tag{7}$$

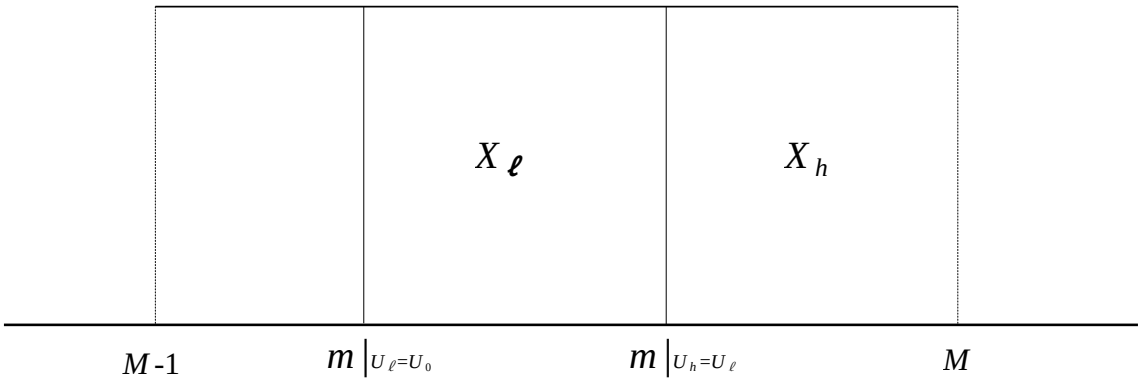

Figure 1: Thresholds and service demand

2.2 Bertrand equilibrium

Under the assumption of a consumer's rational choice among the three alternatives above, we can derive the following two threshold points that equalize U_h with U_ℓ, and U_ℓ with U_0:

$$m\big|_{U_h=U_\ell} = \frac{V_h P_h - V_\ell P_\ell}{V_h - V_\ell} \tag{8}$$

$$m\big|_{U_\ell=U_0} = \frac{V_\ell P_\ell}{V_\ell - V_0}. \tag{9}$$

The demand function for high quality and low quality services can be described as:

$$X_h = M - \frac{P_h V_h - P_\ell V_\ell}{V_h - V_\ell} \tag{10}$$

$$X_\ell = \frac{P_h V_h - P_\ell V_\ell}{V_h - V_\ell} - \frac{P_\ell V_\ell}{V_\ell - V_0}. \tag{11}$$

As Figure 1 shows, the demand for high and low quality services correspond to the areas between M and $m\big|_{U_h=U_\ell}$, and between $m\big|_{U_h=U_\ell}$ and $m\big|_{U_\ell=U_0}$ respectively.

Here we assume each provider maximizes profit under the given competitor's price, which leads to the Bertrand equilibrium. The reaction functions can be derived as follows:

$$P_h = \frac{w+\alpha}{2} + \frac{V_h - V_\ell}{2V_h} M + \frac{V_\ell}{2V_h} P_\ell \tag{12}$$

$$P_\ell = \frac{w}{2} + \frac{V_h(V_\ell - V_0)}{2V_\ell(V_h - V_0)} P_h. \tag{13}$$

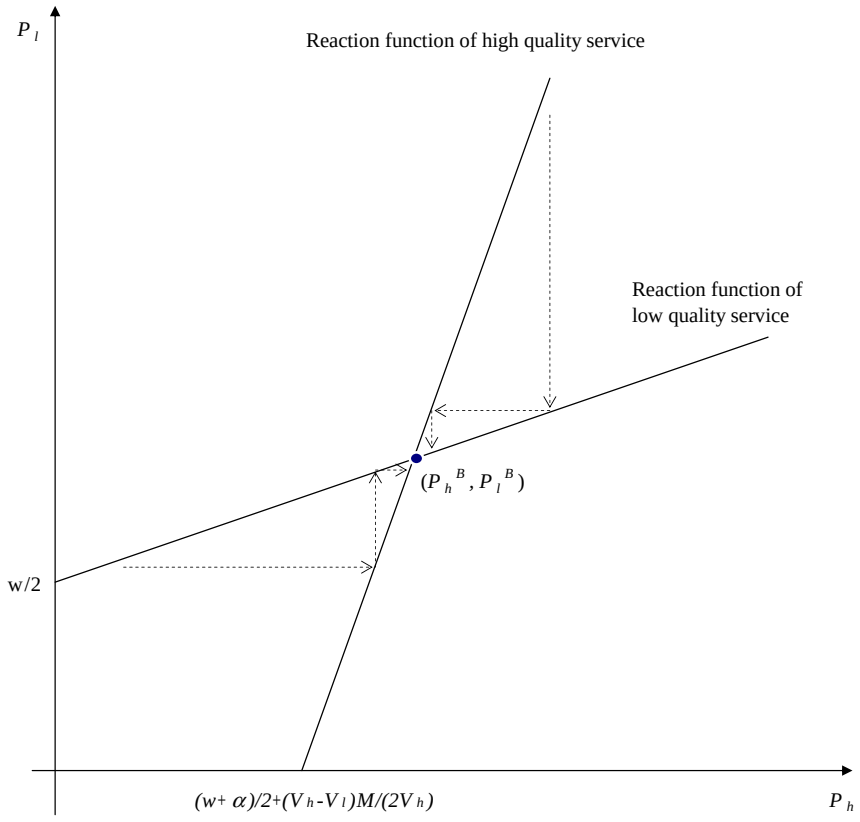

Figure 2: Reaction Functions

It can be shown that both the coefficient of P_ℓ in (12) and that of P_h are less than $1/2$. The reaction functions are illustrated in Figure 2. The intersection of the two lines corresponds to the Bertrand equilibrium prices, P_h^B and P_ℓ^B.

The results of comparative statics are summarized in Table 1.

We can make a comparison of retail trade service prices between monopolistic and Bertrand's cases. Subtracting RHS of (12) from that of (4) and RHS of (13) from that of (5), we get

$$\frac{V_\ell - V_0}{2V_h} - \frac{V_\ell}{2V_h}P_\ell = \frac{V_\ell(M - P_\ell) - V_0 M}{2V_h} > 0 \tag{14}$$

$$\frac{V_\ell - V_0}{2V_\ell}M - \frac{V_h(V_\ell - V_0)}{2V_\ell(V_h - V0)}P_h = \frac{V_\ell - V_0}{2V_\ell(V_h - V_0)}\Big[V_h(M - P_h) - V_0 M\Big] > 0. \tag{15}$$

	P_h	P_ℓ
w	$+$	$+$
α	$+$	$-$
M	$+$	$+$

Table 1: Comparative statics of Model 2

A move from pure monopoly to the Bertrand equilibrium lowers retail trade service prices.

The effects of the changes in M, α, and w differ between the monopoly and Bertrand situations. The simple calculation leads to the results that the effects of α and w are greater in the case of the Bertrand case, and that of M is greater in the monopoly case.

The total output of retail trade service Y is defined as:

$$Y = V_h X_h + V_\ell X_\ell. \tag{16}$$

The input for service production is evaluated in terms of cost: $w + \alpha$ for high quality and w for the low. Then, we have the total input X as

$$X = (w + \alpha) X_h + w X_\ell. \tag{17}$$

Therefore, the productivity ,ϕ, is

$$\phi = \frac{V_h X_h + V_\ell X_\ell}{(w + \alpha) X_h + w X_\ell}. \tag{18}$$

The nominal indicator of productivity can be mark-up rate (θ):

$$\theta = \frac{P_h X_h + P_\ell X_\ell}{(w + \alpha) X_h + w X_\ell}. \tag{19}$$

And finally consumer's welfare indicator in real term can be defined as

$$W = \frac{V_h X_h + V_\ell X_\ell}{P_h X_h + P_\ell X_\ell}. \tag{20}$$

3 Numerical Experiment

3.1 Scenario Writing

Based on the modified Shepard model, we make a numerical experiment giving certain values to the parameters: $w = 0.2, \alpha = 0.1, V_h = 0.75, V_\ell = 0.5, V_0 = 0.1, M = 1$ for the

Stage	Environmental change	Corresponding variables
0	Regional monopoly	
1	Bertrand equilibrium	
2	Change in consumer's evaluation	V_h 1% fall
3	Left shift of income distribution	M 1% fall
4	Wage rate reduction	w 1% fall
5	Labor quality reduction	w, V_h, and V_ℓ 1% fall

Table 2: Scenario

simulation A, $w = 0.1, \alpha = 0.2, V_h = 0.75, V_\ell = 0.5, V_0 = 0.1, M = 1$ for the simulation B, and $w = 0.2, \alpha = 0.05, V_h = 0.75, V_\ell = 0.5, V_0 = 0.1, M = 1$. We present a scenario that approximately depicts a recent environmental changes of a retail trade service market in Japan.

We begin with the "monopoly" situation where the market is divided into the two areas, one providing high quality service, another providing low quality service, and consumers have no choice among the two at purchase. The first move to the Stage 1 means the change from the monopolistic market to the Bertrand equilibrium. It corresponds to the deregulation of the Japanese retail trade service market after the amendment of the Large-Scale Retail Store Law. At the Stage 2, we assume consumers depreciate high quality service. According to the collapse of regional communities, traditional shopping arcades in downtown are losing customers. The Stage 3 shows the effect of economic recession and the shift of consumers' income distribution to the left. The deepening of the recession lowers the wage rate at Stage 4. The wage reduction makes the high quality labor force quit working in the retail trade services.[5] This is at the final stage. The scenario is summarized as in Table 2.

3.2 Results

The simulation results based on the scenario in Table 2 are summarized in Table 3, 4 and 5. In simulation A, we assume there is no productivity difference between low and high quality service providers. Simulation B considers a case where a low quality service provider gains higher productivity, and the simulation C proposes a case of high quality service that has

[5]The reduction of labor quality can have two effects: decrease in real labor input (eventually decrease in w) and depreciation of retail trade service by consumers (decrease in V_h and V_ℓ).

	Stage 0	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Total
P_h	0.583	0.532	0.529	0.527	0.525	0.523	
P_ℓ	0.500	0.345	0.345	0.344	0.342	0.339	
P	1.000	0.784	0.782	0.780	0.775	0.770	
X_h	0.663	0.191	0.180	0.168	0.175	0.186	
X_ℓ	0.375	0.945	0.958	0.953	0.951	0.944	
π_h	0.188	0.044	0.041	0.038	0.040	0.042	
π_ℓ	0.113	0.138	0.139	0.137	0.136	0.135	
ϕ_h	2.500	2.500	2.475	2.475	2.475	2.475	
ϕ_ℓ	2.500	2.500	2.500	2.500	2.500	2.500	
ϕ	2.500	2.500	2.495	2.495	2.495	2.494	
θ_h	1.944	1.773	1.765	1.758	1.761	1.766	
θ_ℓ	2.500	1.727	1.724	1.719	1.725	1.731	
θ	2.096	1.738	1.733	1.727	1.733	1.739	
W	1.192	1.439	1.440	1.444	1.453	1.448	
$\Delta P_h/P_h$		−8.8%	−0.5%	−0.4%	−0.5%	−0.4%	−10.6%
$\Delta P_\ell/P_\ell$		−30.9%	−0.2%	−0.3%	−0.7%	−0.7%	−32.7%
$\Delta P/P$		−21.6%	−0.3%	−0.3%	−0.6%	−0.6%	−23.4%
$\Delta X_h/X_h$		−71.2%	−5.8%	−6.6%	4.5%	6.1%	−73.1%
$\Delta X_\ell/X_\ell$		152.1%	1.4%	−0.6%	−0.2%	−0.7%	151.9%
$\Delta\pi_h/\pi_h$		−76.5%	−6.8%	−7.4%	4.1%	6.0%	−80.5%
$\Delta\pi_\ell/\pi_\ell$		22.2%	0.8%	−1.2%	−0.4%	−1.0%	20.5%
$\Delta\phi_h/\phi_h$		0.0%	−1.0%	0.0%	0.0%	0.0%	−1.0%
$\Delta\phi_\ell/\phi_\ell$		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
$\Delta\phi/\phi$		0.0%	−0.2%	0.0%	0.0%	0.0%	−0.2%
$\Delta\theta_h/\theta_h$		−8.8%	−0.5%	−0.4%	0.1%	0.3%	−9.2%
$\Delta\theta_\ell/\theta_\ell$		−30.9%	−0.2%	−0.3%	0.3%	0.3%	−30.7%
$\Delta\theta/\theta$		−17.1%	−0.3%	−0.3%	0.3%	0.4%	−17.1%
$\Delta W/W$		20.6%	0.1%	0.3%	0.6%	−0.4%	21.3%

P is the aggregated price of P_h and P_ℓ by Theil=Trönqvist index formula.

Table 3: Simulation A: Recent movement of Japanese retail market

	Stage 0	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Total
P_h	0.583	0.453	0.450	0.448	0.447	0.447	
P_ℓ	0.450	0.259	0.258	0.257	0.256	0.255	
P	1.000	0.670	0.667	0.664	0.662	0.661	
X_h	0.663	0.318	0.307	0.296	0.299	0.310	
X_ℓ	0.438	1.034	1.047	1.041	1.040	1.030	
π_h	0.188	0.049	0.046	0.044	0.044	0.046	
π_ℓ	0.153	0.165	0.166	0.164	0.163	0.162	
ϕ_h	2.500	2.500	2.475	2.475	2.475	2.475	
ϕ_ℓ	5.000	5.000	5.000	5.000	5.000	5.000	
ϕ	2.950	3.800	3.818	3.839	3.830	3.798	
θ_h	1.944	1.510	1.501	1.494	1.495	1.501	
θ_ℓ	4.500	2.591	2.581	2.572	2.587	2.606	
θ	2.405	2.072	2.075	2.076	2.079	2.078	
W	1.227	1.834	1.840	1.849	1.855	1.840	
$\Delta P_h/P_h$		−22.3%	−0.6%	−0.4%	−0.3%	0.1%	−23.6%
$\Delta P_\ell/P_\ell$		−42.4%	−0.4%	−0.3%	−0.4%	−0.3%	−43.9%
$\Delta P/P$		−33.0%	−0.5%	−0.4%	−0.4%	−0.2%	−34.4%
$\Delta X_h/X_h$		−52.0%	−3.4%	−3.9%	1.3%	3.5%	−54.5%
$\Delta X_\ell/X_\ell$		136.4%	1.3%	−0.6%	−0.1%	−1.0%	136.0%
$\Delta\pi_h/\pi_h$		−74.1%	−5.2%	−5.1%	1.0%	4.5%	−78.9%
$\Delta\pi_\ell/\pi_\ell$		7.4%	0.7%	−1.1%	−0.2%	−0.8%	6.0%
$\Delta\phi_h/\phi_h$		0.0%	−1.0%	0.0%	0.0%	0.0%	−1.0%
$\Delta\phi_\ell/\phi_\ell$		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
$\Delta\phi/\phi$		28.8%	0.5%	0.6%	−0.2%	−0.8%	28.7%
$\Delta\theta_h/\theta_h$		−22.3%	−0.6%	−0.4%	0.0%	0.4%	−22.9%
$\Delta\theta_\ell/\theta_\ell$		−42.4%	−0.4%	−0.3%	0.6%	0.7%	−41.9%
$\Delta\theta/\theta$		−13.8%	0.1%	0.1%	0.1%	0.0%	−13.6%
$\Delta W/W$		49.5%	0.3%	0.5%	0.4%	−0.8%	49.8%

P is the aggregated price of P_h and P_ℓ by Theil=Trönqvist index formula.

Table 4: Simulation B: Recent movement of Japanese retail market

	Stage 0	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Total
P_h	0.558	0.502	0.500	0.498	0.495	0.493	
P_ℓ	0.500	0.332	0.331	0.330	0.328	0.325	
P	1.000	0.776	0.773	0.771	0.766	0.761	
X_h	0.678	0.314	0.305	0.293	0.300	0.309	
X_ℓ	0.375	0.857	0.868	0.862	0.860	0.855	
π_h	0.209	0.079	0.076	0.073	0.074	0.076	
π_ℓ	0.113	0.113	0.114	0.112	0.112	0.111	
ϕ_h	3.000	3.000	2.970	2.970	2.970	2.970	
ϕ_ℓ	2.500	2.500	2.500	2.500	2.500	2.500	
ϕ	2.847	2.657	2.643	2.640	2.643	2.646	
θ_h	2.233	2.009	1.999	1.991	1.996	2.003	
θ_ℓ	2.500	1.659	1.655	1.651	1.656	1.661	
θ	2.315	1.769	1.760	1.752	1.759	1.767	
W	1.230	1.502	1.502	1.507	1.516	1.512	
$\Delta P_h/P_h$		-10.0%	-0.5%	-0.4%	-0.6%	-0.5%	-12.0%
$\Delta P_\ell/P_\ell$		-33.6%	-0.2%	-0.3%	-0.7%	-0.7%	-35.6%
$\Delta P/P$		-22.4%	-0.3%	-0.3%	-0.6%	-0.6%	-24.4%
$\Delta X_h/X_h$		-53.7%	-2.9%	-3.9%	2.6%	2.9%	-55.0%
$\Delta X_\ell/X_\ell$		128.5%	1.3%	-0.7%	-0.2%	-0.6%	128.3%
$\Delta\pi_h/\pi_h$		-62.1%	-3.8%	-4.6%	2.3%	2.8%	-65.6%
$\Delta\pi_\ell/\pi_\ell$		0.4%	0.7%	-1.4%	-0.4%	-0.9%	-1.6%
$\Delta\phi_h/\phi_h$		0.0%	-1.0%	0.0%	0.0%	0.0%	-1.0%
$\Delta\phi_\ell/\phi_\ell$		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
$\Delta\phi/\phi$		-6.7%	-0.5%	-0.1%	0.1%	0.1%	-7.1%
$\Delta\theta_h/\theta_h$		-10.0%	-0.5%	-0.4%	0.2%	0.3%	-10.4%
$\Delta\theta_\ell/\theta_\ell$		-33.6%	-0.2%	-0.3%	0.3%	0.3%	-33.5%
$\Delta\theta/\theta$		-23.6%	-0.5%	-0.4%	0.4%	0.5%	-23.7%
$\Delta W/W$		22.2%	0.0%	0.3%	0.6%	-0.3%	22.8%

P is the aggregated price of P_h and P_ℓ by Theil=Trönqvist index formula.

Table 5: Simulation C: Recent movement of Japanese retail trade service market

higher productivity.

In all cases, throughout the all stages, the service prices, P_h and P_ℓ, continue falling. Especially, the change in retail trade service market environment, from monopoly to the Bertrand equilibrium, has drastic and contrasting effects on high and low quality service providers. For a high quality service provider, market integration reduces sales by 50 to 70% and profit by nearly 80%. The low quality service provider, on the contrary, gains an expansion of sales and growth of profit. What looks interesting is that the largest fall in price, P, occurs in simulation B, from monopoly to Bertrand. The market share expansion of more productive service providers brings consumers more benefits because they have the potential power to allow price reductions.

In this paper we define retail trade service output in terms of a consumer's evaluation, utility level V. The productivity remains at the same level regardless the change in nominal variables such as wage, because the constant returns to scale technology for service production is assumed.[6] One essential factor affecting productivity is a change in the consumer's evaluation of retail trade service. In fact, to see the productivity indicator for each service provider, ϕ_h and ϕ_ℓ, the values stay at the same level except at Stage 2.[7] In Simulation A, no productivity difference is shown between the two services at Stage 0, the aggregated productivity shows a slight decline, only -0.2%. Simulations B and C, on the other hand, shows a quite different story. In the case of B, the aggregated productivity level rises nearly 30%, because of the low quality service, productivity level of which is twice as much as that of high quality service, and gains sales market share about 40% point. Simulation C shows a productivity fall in 7%.

The nominal productivity indicator, θ, on the contrary, receives a substantial negative effect from deregulation. A decline in consumers' service evaluations and their incomes also lower the mark-up rate. The consumer's welfare indicator, the utility level per expenditure, is drastically improved by deregulation. A fall in labor quality raises the mark-up rate, but

[6]It might be a common assumption that there exist economies of scale in retail trade service production. Certainly, it is more efficient to sell large numbers of products in huge superstores than to sell a single product in a little shop with a person-to-person transaction. Taking account of the retail trade service embodied in the sale of each product, however, the retail trade service per product of superstores can be much smaller than that of little shops. It might be ambiguous as to which productivity is greater.

[7]If retailers invent new retail trade service technology and dramatically improve a consumer's satisfaction, V will grow and eventually productivity will also rise. This scenario can illustrate productivity growth caused by "pure technical change" in this model.

lowers consumer's welfare.

If we use retail trade service price index P as a deflator of nominal productivity, the "real" productivity growth is 6.3% in Simulation A, 20.8% in B, and 0.7% in C. The overestimation is observed in A and C, and the underestimation in B.

4 Policy implications

The simulation results in Table 3, 4 and 5 clearly show the difference between nominal output (gross margin), P, and real output, V. Retail trade service is highly differentiated according to a variety of consumers' preferences. If the market is not perfectly competitive, the retail trade service margin may include the provider's rents and inefficiencies. We must be careful to discuss retail trade service productivity in a nominal term.

The three tables also explain that the deregulation policy in the retail trade service market obviously brings benefits to consumers through decreasing prices. In the simulation study, we assume that large-scaled superstores correspond to low quality service providers. As is shown in Simulation B, if they have higher productivity than traditional retail trade service stores, the effect of deregulation becomes much larger compared to other cases.

Nominal output is deflated by price index to obtain real output. This traditional procedure would have a problem when the price reflects the service quality. A change in the market share of high and low quality services would lead to a biased estimate of a real output measure even if service prices are constant.

If service output is evaluated by the consumer's utility level, the following two points should be considered. Firstly, a simple productivity comparison between different services is misleading. Small stores in local shopping arcades are not necessarily less productive than huge superstores in suburban areas. They provide different services. If a consumer's evaluation is of one of the service categories, ambiance, even a local small store would have high productivity. In this case, as Simulation C shows, macro productivity in retail sectors would decline as a result of the market competition.

Secondly, the international productivity comparison is almost meaningless. The same service would be appreciated in one country but not necessarily in others. What matters is whether a consumer's freedom to choose is guaranteed or not. Indicators of market conditions, such as the degree of competition and a variety of choices, are comparable among

nations. In fact the simulation results clearly explain how drastically prices fall as the market condition shifts from monopoly to the Bertrand equilibrium.

5 Conclusion

Measurement of productivity requires input and output definition. Different from manufactured products, service output is invisible and highly differentiated. Because production and consumption activities simultaneously occur, a consumer's purchase behavior should be taken into account to define output.

In this paper we have applied the theoretical model of Shepard (1991) to the Japanese retail trade service market. We assume that the market is composed of low and high quality service providers and investigate how retail margins and productivity move according to the change in market conditions. A numerical experiment is designed to illustrate recent environmental changes in the Japanese retail trade service market: deregulation, a change in life style, and an economic recession.

Since the early 1990s, the Japanese retail trade service market has been gradually deregulated. A symbolic event has been the moderation of the Large-Scale Retail Store Law, which previously had an effect of preventing huge superstores from competing in traditional shopping arcades in downtown areas. Not only the deregulation but also progress in personal transportation has integrated suburban and downtown retail trade service markets and led to competition between superstores and small shops. In the simulation study, we measure the deregulation effect by a shift from regional monopoly to the Bertrand equilibrium. As a result, retail margins drastically falls by 20 to 30%, and consumers' welfare is improved by 20 to 50%.

Shopping arcades in the downtown area are consistent with regional communities. Consumers in such communities not only go shopping there but also exchange information with neighbors, thus keeping their communities comfortable. Small shops play an important role in providing an area for communication and maintaining a peaceful environment. A recent drastic change in life style has depreciated the value of these services. Consumers now prefer a rich assortment of goods in superstores to local communications in small shops. In the simulation this trend shows the effect of lowering the retail margins.

The long term economic recession has caused less income, wage reduction, and, eventu-

ally, declining labor quality. The simulation results show that all these changes lead to a fall in retail margins. To summarize, environmental changes that occurred in the last ten years unexceptionably dropped retail margins.

Academic papers on the Japanese retail trade services published early in the 1990s mostly focused on the deregulation issues. Big margin were considered as evidence of imperfect competition and regulations. This view has completely changed. Raising retail trade service productivity seems to be a key to the recovery of the Japanese economy. This policy is quite misleading from the following two points. Firstly, if the service output is measured by retail margins, a shift from competition to monopoly would raise the productivity. Secondly, the causality could be reverse. Although it is ambiguous that productivity gains in the retail trade service sector cause economic growth, the business recovery would raise retail productivity through the expanding market share of productive retail trade service providers.

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