



CRR DISCUSSION PAPER SERIES A

Discussion Paper No. A-6

**Information and Distribution:
The Role of Merchants in the Market Economy with Demand Risk**

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July 2013

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Information and Distribution:
The Role of Merchants in the Market Economy with Demand Risk*

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Abstract

This paper discusses the relationship between information and distribution, with special reference to the role of the merchant in the market economy. By working with simple equilibrium models of the industry and doing a sequence of comparative economic analyses, we intend to shed a new light on an important yet rather neglected area in the economics profession.

Let us suppose that the demand side is subject to many changes and may be represented by a simple uniform distribution function with two parameters, i.e. mean μ and variations σ^2 . Then we can show that the entry of the informed distributor between the producer and the consumer would cause two opposing welfare effects: A negative intermediation effect and a positive information effect. If the degree of relative risk is large enough in the sense that the $\sigma^2 - \mu^2$ ratio exceeds a certain threshold value, then the information effect becomes a dominant force. Therefore, the introduction of the distributor into the economy will increase both producer and consumer surpluses: It will make all the parties better-off.

In a historical perspective, the *Ohmi* merchant is known to have a good faith in the principle of *sampo yoshi* or all-round advantages of trading. Hopefully, the result obtained in the paper will give some theoretical ground for such an old and new principle.

Key words: Information, distribution, merchant, risk

1. Introduction

This paper deals with the relationship between information and distribution, with a focus on the role of the merchant in the market economy. Since the consumer and the producer act as two main players on the stage of economics profession, the intermediate role of the distributor has been undervalued as a minor supporting actor, or even completely ignored. The purpose of this paper aims to more or less mend such unfair

* This work was partly supported by the Grand-in-Aid for Science Research (C) No. 25512010 from the Japanese Ministry of Education, Science, Sport Culture and Technology. Editorial assistance by Mr. Masashi Tajima and staff members of the Center for Risk Research, Shiga University, was gratefully acknowledged.

treatment in economic science, thus shedding a new light on the informational role of a variety of merchants in a right perspective.

Konosuke Matsushita (1894-1989), the famous founder of the powerful Matsushita group of manufacturers and a legendary figure who made his business career from rags to riches, once observed:

When I put my full energy into business, an unlimited amount of wisdom springs out of my mind. This is really a very important point. Many governmental officers and university professors, however, tend to forget such a plain truth in the business world. Even someone some might say that wholesale merchants are useless entities engaging in intermediate exploitation. Being a practical man myself, I am sure that this is no more than a utterly nonsense story, regrettably being shared by naive men of no business experience. ¹

Isamu Nakauchi (1922-2005), the founder of the giant Daiei group of supermarkets, may be regarded as a noted champion of the Japanese distribution system. In his well-sold book, he remarked:

It is information that constitutes the origin of everything. The person who acquires the information is the consumer. In my opinion, the distributor should be regarded as an indispensable entity in collecting the information from the consumer. ²

As Nakauchi has rightly noticed, it seems that everything comes from information. The person who controls information may control the market economy. In a real world, the distributor is in the best position to collect the consumer data which is in turn transmitted to the producer, whence the market economy may smoothly work. This is the crux of our research, and will repeatedly be pointed out throughout this paper.

The content of this paper is as follows. The next session will verbally illuminate the three vital functions of merchants as active intermediaries in the economy, with a special focus on some historical examples. The third session will model the world without uncertainty as a reference point. Comparisons between the case of direct trade between the producer and the consumer and the case of the entry of the distributor as a "third man" will be done through the use of equilibrium analysis.

¹ See Matsushita (1974), p. 126.

² See Nakauchi (1982), p. 140.

The fourth session will introduce demand uncertainty and analyze its effects on equilibrium values. The non-symmetric situation in which the distributor collects the demand data but the producer is not so informed is worthy of intensive investigation. There will be two different kinds of effects working in opposite directions. They are: the negative intermediation effect and the positive information effect. As far as the positive effect considerably overpowers the negative one, it will be likely that the presence of the distributor will rather enhance the welfare of all the parties of the society. Some final remarks will be made in the final session.

2. The role of merchants as vital intermediaries

2-1. Merchants really matter: Some historical examples

It would be no exaggeration to say that the history of merchants is almost as old as the history of civilization. In what follows, several examples will be picked up in order to demonstrate the historical fact that merchants really matter.

Example 1. The first historical example is recorded in Volume 69 (*The Success Stories of Wealthy Persons*) in *Shi ji or Records of the Grand Historian* (109BC-91BC), a famous history book of ancient China written by Sima Qian, Ancient China. Remarkably enough, this chapter begins with the following sentence.

Any common man with no government position is nevertheless able to find good opportunities to sell and buy goods so that he can increase his wealth. To be sure, this should not harm politics whatever, nor to people's daily activities. A wise man of greater knowledge will gain much more from the trade of goods. This is precisely the reason why we have thus decided to write Volume 69, namely *The Success Story of Wealthy Persons*.³

As the reader can see easily from this historical example, Adam Smith (1723–90), presumably claimed the Father of Economic Science, may not be the historically first person to discuss the wealth of persons and/or nations. Well back in the period before Jesus Christ was born, the concept of wealth or moneymaking was already utilized by Chinese people. The distributive role of merchants between sellers and buyers was clearly recognized by Sima Qian:

³ See Sima Qian, Japanese translation (1975), p.150.

We can eat food thanks to the labor of farmers. Timbers are first supplied by wood cutters, then transformed into finished items by craftsmen, which in turn will be distributed by merchants into any other place where the items are demanded. The circulation of goods in the country are brought about by the combination of the powers of these ordinary people, not by the order of the government upon the private sectors. Each person who wants the good can really acquire it by means of his greatest possible talent and effort. The price of a cheap good might rise later whereas an expensive good might be cheaper tomorrow. As the water is naturally running down to a lower place, so each man is willing to do hard work day and night. People may gladly come to working places before they are ordered to do so, and trade goods among themselves without any kind of enforcement. No doubt, these acts accord with reason, showing the natural consequences of people's free will. ⁴

Example 2. J.R. Hicks (1904-1991) was among the greatest economists of the 20th century, having had a long-standing influence on economic thought. As his age gradually advanced, he had underwent the massive transformation from first-rate theoretician to outstanding historian.

His later work on economics was well-presented in *A Theory of Economic History* (1969) in which the role of the merchant was singled out as a key concept for understanding the working and performance of the market economy. He remarked:

The mere fact that one trading centre has a different geographical location from another gives it come 'comparative advantage' in the collection of information; by trading between centers these advantages can be utilized and risks on both sides can be reduced. ⁵

According to Hicks, the merchant is making a profit by buying a commodity at a low price and selling it at a high price. There should be an advantage to the sellers of one commodity; and its buyers for just the same reason. Thus there is a profit to the merchants, and a gain to each of the parties with whom they trade. In technical language, the latter gain is called a consumer's surplus. So long as the trade is carried out voluntary, it must confer what Hicks names an "All-round Advantage." ⁶

As the following example will show, the way how Hicks characterizes the working of the Merchantile Economy is quite similar to the way by which the *Ohmi* merchant of

⁴ See Sima Qian, Japanese translation (1975), p.152.

⁵ See Hicks (1969), p.49.

⁶ For a more detailed discussion, see Hicks (1969), pp.43-44.

modern Japan has circulated many goods by land and/or by sea between different regions.

Example 3. Eiichiro Ogura (1924-1992) was a leading scholar for the study of the *Ohmi* merchant who served as early pioneers of the Japanese capitalist economy. Ogura was known as the inventor of the catchy phrase *Sampo Yoshi*, or the principle of three way advantages. In his well-read book (1991), he characterized *Sampo Yoshi* as the behavioral principle of the *Ohmi* merchant in the following way:

Any trade of goods between sellers and buyers could be advantages to both parties. We would also say that customers should be regarded as kings, not as subordinates. Certainly this would be rather common sense shared by all the merchants. What *Ohmi* merchants distinguish themselves from other merchants is the adoption of additional advantage, which may be named the advantage to the society. What is good for the seller and for the buyer is also good for the whole society. ⁷

The *Ohmi* merchant took advantage of every transportation means to reach almost every place in Japan including Hokkaido. The merchant's style of carrying a shouldering pole named *Tenbinbo* symbolized his dedication to hard work day and night. In order to carry goods and items between Kyoto and Hokkaido, he periodically showed his courage to take the risky Sea of Japan route in stormy weather. His innovative power of economic development in remote regions was well-documented in history, thus contributing a great deal to making a solid foundation of modern Japan. ⁸

2-2. Three vital functions of merchants: Theoretical argument

Any national economy contains three types of players. They are: the producer, the consumer and the distributor. In daily language, the last player is called the merchant or the trader who puts himself between the producer and the consumer, thus playing a part of intermediation.

If the size of the economy is so small and the trade of goods between the supplier and the demander can be carried out with no frictions and/or with no time lags, then there should be no real reasons whatever to justify the presence of intermediating merchants: They would be thought of as mere spoilers or even as the players of

⁷ See Ogura (1991), p.9.

⁸ For a detailed discussion of this point, see Ogura (1989).

intermediate exploitation. Of course, the reality is entirely different! The economy in question is not so small and face-to-face matching of the supplier and demander becomes very hard and time-consuming, indicating for the necessity of go-betweens. We have to establish a realistic theory of the trade on the basis of the interactions of the supplier, the demander, and intermediary.

In order to understand the proper functions of the merchant, it is quite important to recognize the existence of possible three gaps between the supplier and the demander. Let us discuss what these gaps are all about.⁹

The first gap stands for a location gap, which may be shown by a horizontal sequence of dots in Chart (A) of Figure 1. For instance, good quality apples are produced in Aomori, the northern end of Honshu, Japan, whereas they are consumed in Tokyo or Osaka, central Japan. Many merchants are necessary to fill the location gap between the production and consumption of apples. Transportation by trains and trucks may also be carried out by intermediaries.

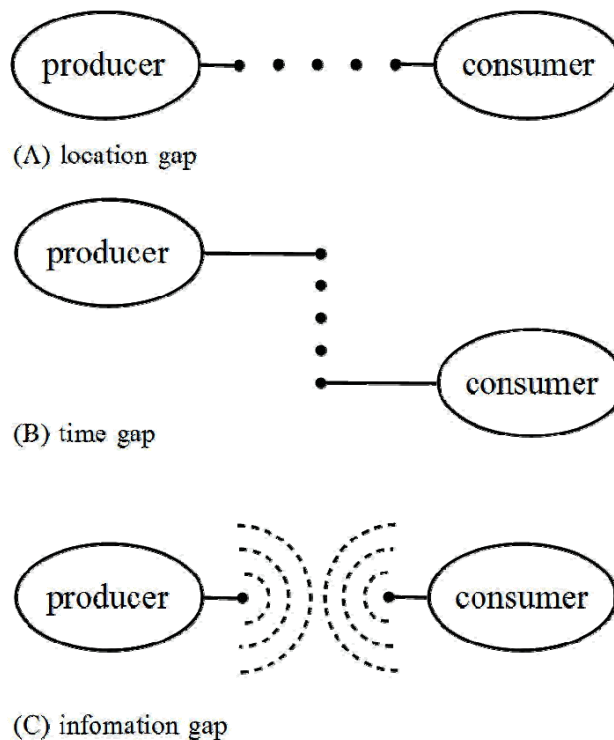


Figure 1. Three Different Kinds of Gaps: The Role of the Distributor

⁹ In May 2012, I had a chance to talk to Professor Katuhito Iwai (University of Tokyo) about the functions of merchants in the market economy. I then found that the three possible "gaps" between the producer and the consumer which I pointed out in this paper were closely related to his own concept of "differences" as an indispensable part of the capitalist system. Gaps and differences seem to be both sides of the same coin. See Iwai (1985).

The second gap indicates for a time gap, as can be seen by a vertical sequence of dots in Chart (B). Although rice is perhaps the most preferred food in Japan and is eaten almost everyday by most people, its harvest time is quite limited to September or October. The vital function of rice merchants is to fill such time gap by the means of storage and inventory operations. Whether factors such as temperature, rain and typhoons should not be ignored. Therefore insurance operations must be needed to take care of probable damages caused by whether, and also by accompanying price fluctuations.

The third gap is related to information. As is seen in Chart (C), the information gap is demonstrated by the wide spread of dotted half circles from both the producer and consumer sides. which correspond to a certain degree of non-perfect transmission of information between both parties. We live in the world of uncertainty in which customers' tastes and fashions may change drastically and even unpredictably. The argument that convenient stores near main train stations are best located for collecting the demand data quickly and exactly might be quite convincing. It would be safe to say that the company president sitting in a comfortable chair at Tokyo office would be in no position to know what is happening in remote areas in Japan or foreign countries. This is because manufacturers and customers may be different not only geometrically but also culturally. In such a situation, only the presence of the intermediate merchant would be helpful for gathering the necessary demand data.

In short, the merchant is supposed to perform those three vital functions which correspond to filling location, time and information gaps. This paper will pay a special attention to the third information gap, a rather neglected area in the existing literature.

3. The working of the market economy without uncertainty

3-1. Face-to-face trade between the producer and the consumer: Case *O*

Let us begin our discussion with a simple market economy under full certainty. It is supposed here that the producer and the consumer in an industry under question may trade face-to-face without causing any frictions, and that a "third man" called the distributive intermediary is not needed for trading. This simple case is named Case *O*.

Concerning the demand side, let us assume that the market demand function is described by the following linear function:

$$p = a - \beta x, \quad (1)$$

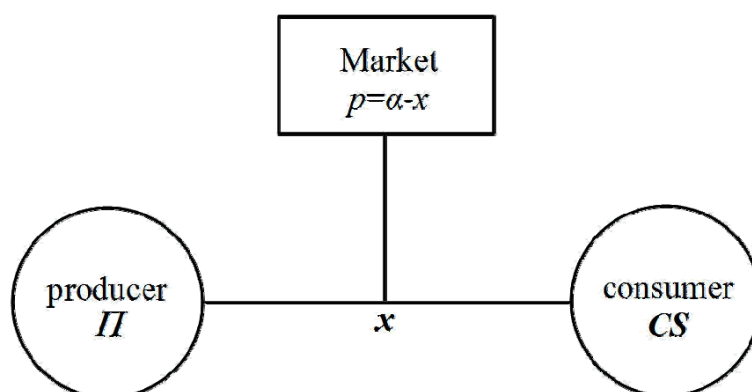
where x and p respectively denote the amount of trade and the unit price. The

parameter α is a positive constant. Without loss of generality, we may assume that β is just equal to one, so that the demand function is simply written as $p = \alpha - x$.

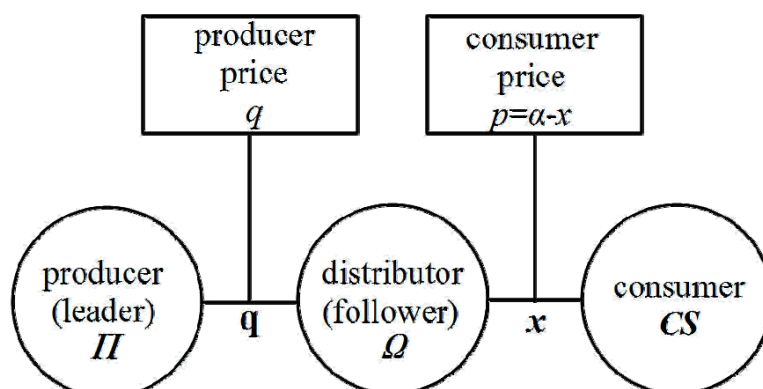
Regarding the supply side, let us consider the monopoly firm in which its marginal cost c is just constant. Then we may regard the unit price p as a "net price," namely a "gross price" minus the unit cost c . The producer's profit is then given by

$$\Pi = px = (\alpha - x)x \quad (2)$$

In Figure 2, Chart (A) represents our "direct distribution model" under consideration. It is noted here that the producer and the consumer meet each other, literally face to face and without troubles or frictions. This means that any kind of distributive intermediary or middleman is conspicuously absent in trading. .



(A) Face-to-face trade between the producer and the consumer



(B) The entry of the distributor

Figure 2. The World without Uncertainty

The producer aims to maximize its profit. If we maximize Π with respect to x , we obtain $\alpha - 2x = 0$. This yields $\alpha - x^0 = x^0$ at equilibrium, so that the equilibrium

profit is calculated as $x^0 = a/2$. It is easy to obtain the equilibrium price and the equilibrium profit:

$$p^0 = a - x^0 = a/2. \quad (3)$$

$$\Pi^0 = (a - x^0)x^0 = (x^0)^2 = a^2/4. \quad (4)$$

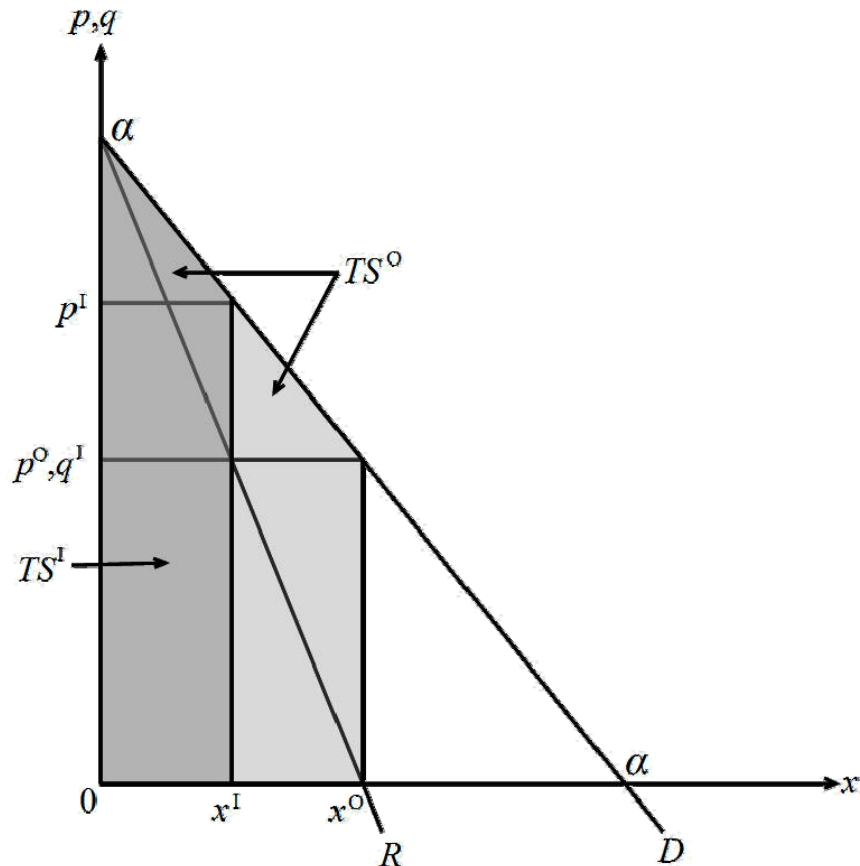


Figure 3. Producer and Consumer Surpluses: Case *O* versus Case *I*

We assume that the consumer's welfare by trading can be well-measured by the amount of the consumer's surplus. It is easy to see in Figure 3 that such surplus is shown by the area of triangle to be formed by the demand line D over p^0 . More exactly, by means of (3), we obtain

$$CS^0 = (a - p^0)x^0/2 = (x^0)^2/2 = a^2/8. \quad (5)$$

Since the total surplus is the sum of the producer's profit and the consumer's surplus, it follows from (4) and (5) that

$$TS^0 = \Pi^0 + CS^0 = 3a^2/8. \quad (6)$$

For the summary of these calculation results, see the second column of Table 1.

Table 1 : The World without Uncertainty: Case *O* versus Case *I*

Equilibrium Values	Case <i>O</i>	Case <i>I</i>
x	$a/2$	$a/4$
p	$a/2$	$3 a/4$
q	-	$a/2$
Π	$a^2/4$	$a^2/8$
Ω	-	$a^2/16$
PS	$a^2/4$	$3 a^2/16$
CS	$a^2/8$	$a^2/32$
TS	$3 a^2/8$	$7 a^2/32$

3-2 The Entry of the Distributive Intermediary: Case *I*

We are now in a position to introduce a "third man" on the trade stage: The distributive intermediary is supposed to enter between the producer and the consumer. Then the structure of the present case (Case *D*) must become more complicated than the previous case (Case *O*), as is indicated by Chart (B) of Figure 2.

Let us further assume that the trading structure is the one of Stackelberg- type, with the producer serving as a leader and the distributor as a follower. As is seen in Chart (B), the producer takes an initiative to set up the producer price q , and then the distributor who takes account of the demand schedule ($p = a - x$) determines the amount of trade x for any given q .¹⁰

When the distributor is present in the economy, it is important to distinguish two different kinds of prices. They are: the producer price q and the consumer price p . The difference between these two prices ($p - q$) stands for what we usually call the "distribution margin." If we completely ignore distribution costs for the sake of analytical simplicity, we can calculate the distributor's profit in the following way:

$$\Omega = (p - q)x = (a - q - x)x. \quad (7)$$

As mentioned above, the distributor as a follower takes the producer price q as a given and determines the amount of trade x to maximize its profit Ω . By using (7), the first order condition for such maximization is provided by

$$a - q - 2x = 0. \quad (8)$$

¹⁰ In the present situation, the producer plays a leading actor and the distributor as a supporting actor on the Stackelberg trading theater. In other situations, however, the parts of both players can be interchanged: The distributor may have greater power than the producer, thus acting as a leader rather than as a follower. This equally important case will be discussed in a separate paper.

From this equation, the distributor's reaction function is derived by

$$x = (\alpha - q)/2. \quad (9)$$

If we employ (9) as well as the demand equation (1) (note $\beta = 1$), we may find the relationship between the consumer price p and the producer price q :

$$p = \alpha - x = \alpha - (\alpha - q)/2 = (\alpha + q)/2. \quad (10)$$

The producer as a Stackelberg-type leader, taking account of the distributor's reaction function (9), determines the producer price q so as to maximize its profit:

$$\Pi = qx = q(\alpha - q)/2. \quad (11)$$

The 1st order condition of such maximization is given by

$$(\alpha - 2q)/2 = 0, \quad (12),$$

from which immediately follows the producer price at equilibrium:

$$q^I = \alpha/2. \quad (13)$$

The amount of trade and the consumer price at equilibrium are provided by:

$$x^I = \alpha/4 \quad (14).$$

$$p^I = \alpha - x^I = 3\alpha/4. \quad (15)$$

On the one hand, it follows from (11), (13) and (14) that the producer's profit at equilibrium is derived by

$$\Pi^I = q^I x^I = \alpha^2/8. \quad (16)$$

On the other hand, by virtue of (7), (13), (14) and (15), the distributor's profit at equilibrium can be calculated by

$$\Omega^I = (p^I - q^I) x^I = ((3\alpha/4) - (\alpha/2)) (\alpha/4) = \alpha^2/16. \quad (17)$$

If we make use of equilibrium values mentioned above, it would be a rather easy job to find the values of the producer surplus PS , the consumer surplus CS and the total surplus TS :

$$PS^I = \Pi^I + \Omega^I = 3\alpha^2/16. \quad (18)$$

$$CS^I = (x^I - p^I)x^I/2 = \alpha^2/32. \quad (19)$$

$$TS^I = PS^I + CS^I = 7\alpha^2/32. \quad (20)$$

The computation results of Case I will be summarized in the third column of Table1.

3-3 Comparison between Cases O and I : The Effects of Distributive Intermediaries

We are dealing with the world without uncertainty. The question of interest is whether and to what extent the entry of the distributor between the producer and the consumer influences the working and performance of the market economy. We can find a definite answer by simply comparing the equilibrium values of the two cases: Case O without distributive intermediation and Case I in which the distributor is present.

More specifically, making a series of comparisons of equilibrium between the second and third columns in Table 1 enables us to straightforwardly establish the following proposition:

PROPOSITION 1 (Case O versus Case I)

- (1) $x^I < x^O$, $p^I > p^O$.
- (2) $PS^I < PS^O$, $CS^I < CS^O$, $TS^I < TS^O$.

The messages of this proposition are quite clear. Property (1) shows that in the world without uncertainty, the entry of the distributor between the producer and the consumer makes the "product circulation pipe" more complicated than otherwise, thus yielding a rise in consumption price p and a decline in the amount of good x . As a result, as Property (2) indicates, the distributive intermediation makes both the producer and the consumer worse-off, whence causing a decrease in the total welfare of the society.

As you can see, Figure 3 drawn above gives a good illustration of Proposition 1. There are two different kinds of trapezoids which are partially overlapping each other: The smaller dark-shadowed trapezoid, and the larger trapezoid that consists of the dark-shadowed area plus the light-shadowed area. This clearly shows that the total surplus TS is shrunk by the extent of the difference of these two areas through the entry of the distributor. It is also noted that the distance between p^I and q^I represents what we may call the "distribution margin," an extra cost caused by the trade distribution.

4. Demand Risk and Non-symmetric Information

We are now in a position to introduce the new factor "demand risk" into the industry structure. Needless to say, we live in the world of risk and uncertainty. Main-stream economists, however, have had a tendency to underestimate or even neglect the risk factors. One of the main purposes of this paper is to do our best to somehow mend such "bad tendency" so that we may make our economics get back to the "right track." ¹¹

¹¹ It is in the 1980s and the 1990s that the theory of information and oligopoly was intensively discussed in the economics profession for the first time. Active researchers included Gal-Or (1985,86), Sakai (1982,84,85,87), and Vives (1984,87). While an interest in the theory had been on wane since then, I believe that a unifying work of imperfect competition and imperfect information remains unfinished, and its applications to distribution and regional problems will be left for further research. This paper may be regarded as one of my recent attempts to go forward in that direction.

Let us suppose that the consumer's taste is flexible and unpredictable, depending upon a change of his/her own preference and the fashion of the times where he/she lives. In the presence of such demand risk, the producer who live in a long distance from the consumer may not be in the best position to collect the reliable demand data. There exist some situations in which the producer need to get a help from a "third man" serving as the distributive intermediary between the producer and the consumer, thus filling the gap of demand information. The market economy without the distribution channel would look like Hamlet without prince.

4-1 Demand Risk and the Ignorant Producer: Case N

Let us suppose that the demand side is subject to many changes and may be well-represented by a simple uniform distribution $\Phi(\alpha)$ (see Figure 4):

$$\Phi(\alpha) = 1/2 \text{ for } \alpha = H, L; \quad \Phi(\alpha) = 0 \text{ otherwise.}$$

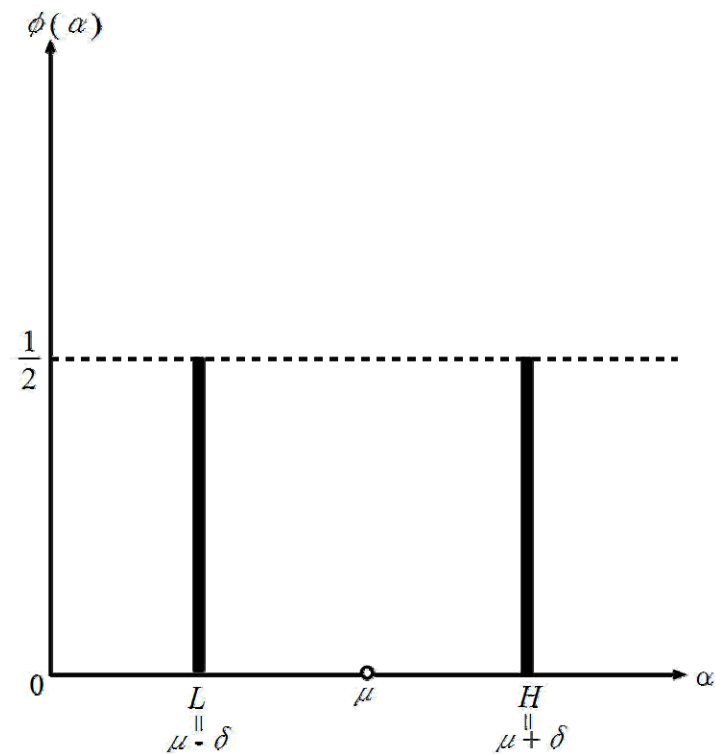


Figure 4 The Uniform Distribution of α

For example, the state of business may be either good (namely, α takes on a higher value H) or bad (a lower value L), with the probability of each state being a half.

If we put $H = \mu + \sigma$ and $L = \mu - \sigma$ then it is easy to see that α and μ respectively represent the mean and the standard deviation of the demand intercept α .

We are concerned with two opposite cases. They are: Case N in which the distributor is not informed of the true value of α , and Case F where the distributor is fully informed.

Let us begin our inquiry with the first case N . It should be noticed that the production strategy of the ignorant distributor must be the "routine action" in the sense that he/she takes on the same strategy regardless to a good or bad state of the economy.

The ignorant distributor aims to maximize its expected or average profit:

$$E\Pi = Epx = E(\alpha - x)x = x(\mu - x). \quad (21)$$

The first-order condition for such maximization yields

$$x(\mu - 2x) = 0, \quad (22)$$

from which follows the equilibrium amount of traded good:

$$x^N = \mu / 2. \quad (23)$$

As long as the demand parameter α is a stochastic variable, the market price p is also subject to demand fluctuations. In the light of (23), the expected price at equilibrium is given by

$$Ep^N = E(\alpha - x^N) = \mu / 2. \quad (24)$$

If we continue to adopt a calculation technique similar to the one used for Case O , we can find the expected profit and the expected consumer surplus at equilibrium:

$$E\Pi^N = (x^N)^2 = \mu^2 / 4. \quad (25)$$

$$ECS^N = (\mu - Ep^N)x^N / 2 = \mu^2 / 8. \quad (26)$$

These computation results may be summarized in the second column in Table 2.

Table 2 : Demand Risk and Equilibrium Values: Case N versus Case F

Equilibrium Values	Case N	Case F
x	$\mu / 2$	$(2\alpha - \mu) / 4$
p	$(2\alpha - \mu) / 2$	$(2\alpha + \mu) / 4$
q	-	$\mu / 2$
$E\Pi$	$\mu^2 / 4$	$\mu^2 / 8$
$E\Omega$	-	$\mu^2 / 16 + \sigma^2 / 4$
EPS	$\mu^2 / 4$	$3\mu^2 / 16 + \sigma^2 / 4$
ECS	$\mu^2 / 8$	$\mu^2 / 32 + \sigma^2 / 8$
ETS	$3\mu^2 / 8$	$7\mu^2 / 32 + 3\sigma^2 / 8$

Clearly, there exist close similarities between Case O and Case N , the only yet important difference being that α is now replaced by μ , and equilibrium values by *expected* equilibrium values.

4-2 The Effective Entry of the Informed Distributor: Case F

In the world with demand risk, let us consider the entry of the distributor who acquires the demand information. As in case I , let us suppose that the producer plays as a Stackelberg-leader to set up the production price q whereas the distributor acts as a follower to determine the amount of traded good x .

Once the distributor is in a position to obtain the demand data of which the producer is ignorant, the distributor's trade strategy has to undergo a drastic change. It is no longer the "routine action" but the "contingent action" in the sense that its trade volume should be flexible in response to the state of the economy: It increases or decreases the amount of trade x according to whether the prospect of its demand is good or bad. In contrast, the ignorant producer has to stick to the routine strategy as before.

To begin with, let us consider the behavior of the informed distributor as a follower. Since the distributor acquires the demand information, it aims to determine the best contingent strategy x in response to the value of α so as to maximize its profit

$$\Omega = px - qx = (\alpha - q - x)x \quad (27)$$

for a given the production price q set up by the producer as a leader.

The first-order condition for profit maximization leads to

$$\alpha - q - 2x = 0, \quad (28)$$

from which follows the reaction function of the distributor:

$$x = (\alpha - q)/2. \quad (29)$$

It is worthy of attention to see that the reaction function is now dependent on the value of α . This is clearly because the informed distributor can acquire the demand information.

Let us turn to the behavior of the ignorant producer. The producer as a leader, taking account of the distributor's reaction (29), aims to set up the production price q so as to maximize its expected profit:

$$E\Pi = Eqx = Eq(\alpha - q)/2 = q(\mu - q)/2. \quad (30)$$

The first-order condition for maximization yields

$$(\mu - 2q)/2 = 0, \quad (31)$$

from which follows the production price at equilibrium:

$$q^F = \mu/2. \quad (32)$$

In the light of (29), we find the amount of traded good at equilibrium:

$$x^F = (\alpha - q^F)/2 = (\alpha - \mu/2)/2 = (2\alpha - \mu)/4, \quad (33)$$

whose expectation leads to

$$E x^F = (2\mu - \mu)/4 = \mu/4. \quad (34)$$

By making use of (33), we can obtain the consumption price at equilibrium:

$$p^F = \alpha - x^F = \alpha - (2\alpha - \mu)/4 = (2\alpha + \mu)/4, \quad (35)$$

whose expectation results in

$$E p^F = (2\mu + \mu)/4 = 3\mu/4. \quad (36)$$

Let us find a series of expected surpluses at equilibrium for Case F . First of all, since by means of (32) and (33), we have

$$\Pi^F = q^F x^F = (\mu/2)((2\alpha - \mu)/4) = \mu(2\alpha - \mu)/8, \quad (37)$$

we obtain the expected producer's surplus at equilibrium:

$$E \Pi^F = \mu(2\mu - \mu)/8 = \mu^2/8. \quad (38)$$

Note that the distribution margin at equilibrium can be calculated by

$$p^F - q^F = (2\alpha + \mu)/4 - (\mu/2) = (2\alpha - \mu)/4. \quad (39)$$

Therefore we obtain

$$\Omega^F = (p^F - q^F)x^F = (2\alpha - \mu)^2/16 = (4\alpha^2 - 4\alpha\mu + \mu^2)/16, \quad (40)$$

whose expectation leads to

$$E \Omega^F = (4E\alpha^2 - 4\mu^2 + \mu^2)/16 = (4E\alpha^2 - 3\mu^2)/16. \quad (41)$$

Let us recall the convenient formula:

$$E \alpha^2 = \mu^2 + \sigma^2, \quad (42)$$

Then we can derive the expected distributor's surplus at equilibrium:

$$E \Omega^F = (4(\mu^2 + \sigma^2) - 3\mu^2)/16 = \mu^2/16 + \sigma^2/4. \quad (43)$$

Since the expected producer surplus is simply the sum of the expected producer's surplus and the expected consumer's surplus, it follows that

$$E \Pi^F + E \Omega^F = \mu^2/8 + (\mu^2/16 + \sigma^2/4) = 3\mu^2/16 + \sigma^2/4. \quad (44)$$

As said before, the consumer's surplus is measured by the area of triangle formed by the demand line over the consumer price. Hence the expected consumer surplus at equilibrium is provided by

$$E CS^F = E(\alpha - p^F)x^F/2, \quad (45)$$

which in view of (33) and (35), may be transformed to

$$E CS^F = E(2\alpha - \mu)^2/32.$$

Since we have $E(2\alpha - \mu)^2 = \mu^2 + 4\sigma^2$ by means of (42), it follows that

$$E CS^F = \mu^2/32 + \sigma^2/8. \quad (46)$$

Hence the expected total surplus is computed as

$$\begin{aligned}
ETS^F &= EPS^F + ECS^F \\
&= (3\mu^2/16 + \sigma^2/4) + (\mu^2/32 + \sigma^2/8) = 7\mu^2/32 + 3\sigma^2/8.
\end{aligned} \tag{47}$$

These computation results for Case F may be summarized in the third column of Table 2 . In contrast to Case N where the distributor is ignorant of the demand parameter α and only the value of mean μ is relevant, the value of variance σ^2 is newly added in Case F with the informed distributor being present, presumably playing a critical role in the assessment of our equilibrium values.

4-3 The Intermediation Effect versus the Information Effect

We are interested in asking how and to what extent the entry of the distributor influences the whole picture of the market economy. As I discussed before, if the distributor is ignorant of the demand data, mere presence of the distributor between the producer and the consumer will make the distribution channel unnecessarily more complicated than otherwise, thus badly affecting the working of the economy: The producer, the consumer and the society will be all worse-off. This is really a Pareto-inferior situation.

When the distributor acquires the demand information, however, the whole picture is expected to change. Presumably, there would be two different effects working in opposing directions. They are: the negative effect of complication caused by distributive intermediation and the positive effect of caused by collection of the demand information. The first and second effects may respectively be called the intermediation and information effects. The key question would be which one of the two effects becomes stronger. The answer should be like this. It depends! In some probable situations, a kind of Pareto-improving situation could emerge by the introduction of the informed distributor into the economy. What we need to do is a more detailed analysis based on exact calculations.

If we compare corresponding equilibrium values on Case N and Case F , we can establish the following proposition:

PROPOSITION 2 (Case F versus Case N)

- (1) $Ex^F < Ex^N, Ep^F > Ep^N$.
- (2) $EPS^F \gtrless EPS^N \Leftrightarrow \sigma^2/\mu^2 \gtrless 1/4$.
 $ECS^F \gtrless ECS^N \Leftrightarrow \sigma^2/\mu^2 \gtrless 3/4$.
 $ETS^F \gtrless ETS^N \Leftrightarrow \sigma^2/\mu^2 \gtrless 5/12$.

In the light of Table 2, the proof of this proposition is rather straightforward. .

First of all, comparing equilibrium values of x for the two cases, we find

$$Ex^F - Ex^N = \mu/4 - \mu/2 = -\mu/4, \quad (48)$$

which is negative. In a similar fashion, we obtain

$$Ep^F - Ep^N = 3\mu/4 - \mu/2 = \mu/4, \quad (49)$$

which is positive. This completes Property (1).

The meaning of this property is very clear. The introduction of the informed distributor causes a decline in the expected amount of good, and a rise in the expected consumer price. Interestingly enough, the mean μ is present, but the variance σ^2 is not, in (48) and (49). This implies that only the negative intermediation effect is working and thus yields Property (1),

Next, if we compare corresponding equilibrium values in Table 2, it is a rather easy job to derive

$$EPS^F - EPS^N = (3\mu^2/16 + \sigma^2/4) - \mu^2/4 = -\mu^2/16 + \sigma^2/4. \quad (50)$$

It is noted that the most right hand side of the above equation consists of the two terms. They are: the negative intermediation effect associated with μ , and the positive information effect related to σ^2 . The relative strength of these two effects are not one-sidedly determined, depending on the values of μ and σ^2 . In a similar fashion, we can also obtain

$$ECS^F - ECS^N = (\mu^2/32 + \sigma^2/8) - \mu^2/8 = -3\mu^2/32 + \sigma^2/8. \quad (51)$$

$$ETS^F - ETS^N = (7\mu^2/32 + 3\sigma^2/8) - 3\mu^2/8 = -5\mu^2/32 + 3\sigma^2/8. \quad (52)$$

As is clear enough, the most right-hand sides of (51) and (52) contain the negative intermediation term and the positive information term. Here again, which effect is dominating is very critical, depending on the values of μ and σ^2 . In the light of (50), (51) and (52), it is a rather easy work to obtain Property (2).

In my opinion, Property 2 of the above proposition is very important, perhaps representing the best result in this paper. In order to understand it in a wider and deeper perspective, I feel it useful to construct Table 3.

Table 3 : The entry of the informed distributor: Its welfare implications

The Value of σ^2/μ^2	ΔEPS	ΔECS	ΔETS
(1) $\sigma^2/\mu^2 > 3/4$	+	+	+
(2) $5/12 < \sigma^2/\mu^2 < 3/4$	+	-	+
(3) $1/4 < \sigma^2/\mu^2 < 5/12$	+	-	-
(4) $\sigma^2/\mu^2 < 1/4$	-	-	-

A close look at Table 3 teaches us a very important lesson. The value of the ratio σ^2/μ^2 plays a critical role in determining the welfare effects of the entry of the informed distributor. More precisely, this is the ratio of the variance of the demand parameter to its mean square, relatively measuring the state of spread of α around μ . The greater the ratio, the greater is the degree of demand risk.

On the one hand, when the degree of the demand risk is large enough in the sense that the ratio (σ^2/μ^2) exceeds $3/4$, acquisition by the distributor of the demand information is so important. In this case, the positive information effect is expected to overpower the negative intermediation effect, whence the entry of the informed distributor makes all the parties involved better-off: *ECS*, *MPS* and *ETS* are all expected to rise. On the other, if the degree of the risk is small enough in that the ratio is less than $1/4$, just the opposite results would happen: the intermediation effect overtakes the information effect. The presence of the informed distributor makes all the parties worse-off.

Between these opposite cases, there exists an intermediate range. If the variance-mean square ratio is smaller than $3/4$ but larger than $1/4$, the producer is better-off, but the consumer is worse-off. This is neither a Pareto-superior situation nor a Pareto-inferior one, but something between. Even in that range, if the ratio is large enough to exceed $5/12$ (yet less than $3/4$), the distributor's entry contribute to an increase in *ETS*, so that a possible side payment from the producer to the consumer would make all the parties better-off.

To sum up, in the world with demand risk, the introduction of the informed distributor into the economy would produce two mutually opposing effects: the negative intermediation and the positive information effects. If the degree of the risk is large enough, then the information effect would become a dominant force, so that all the parties would be better-off. Presumably, such a situation would do justice to the existence of the distributive intermediary. This is like an arranged marriage. The entry of a good match maker with good experience could bring happiness to a hesitant couple.

5. Concluding Remarks

As the saying goes, old memories die hard. In my long academic career, 1972 stood up as a very special year when I was teaching economic theory at the University of Pittsburgh, U.S.A. Personally speaking, in that year, I finally received a Ph.D. degree of economics from my alma mater, the University of Rochester, the Empire State. It seemed really a great accomplishment to me. More than 40 years from then, I still

remain to be grateful to a lot of American and Japanese colleagues and friends for kindly coming to see me at a private celebration party.

I should to add to say, however, that 1972 meant a special year not only because of the personal reason aforementioned. A very significant Nobel Economic Prize ceremony took place in Sweden, one of the prize winners being John R. Hicks, a towering economist in the 20th century. Academically speaking, Hicks was a sort of my grandfather in two ways: Hicks was the teacher of Lionel W. McKenzie, my mentor at Rochester, and also the guru of Michio Morishima whom I admired very much as an inspiring idol.¹²

In later years when I happened to read Hicks' later essays *Economic Perspectives* (1977), I was really shocked like a thunder out of blue sky to see the following sentence in its Preface:

They gave me [J.R. Hicks] a Nobel prize (in 1972) for my work on 'general equilibrium and welfare economics', no doubt referring to *Value and Capital* (1939) and on the papers on Consumers' Surplus which I wrote soon after that date. But it was done a long time ago, and it was with mixed feelings that I myself felt myself to have outgrown."¹³

The mixed feelings Hicks felt at that time was also recorded by Morishima on his later booklet *Modern Economic as a Thought* (1993):

Hicks' research area is very wide, covering so much topics. Among so many writings of Hicks, I myself [Morishima] like *A Theory of Economic History* and *A Market Theory of Money* so much. When I read the former book, I asked him, "Would you like to switch your work to write books *a la* Max Weber? He then replied, "I would not think so." A bit later on, however, he told me, "I would have felt much happier if I was awarded a Nobel Prize for *A Theory of Economic History*. It really implies that his own evaluation that *History* work was greater than his *Theory* work *Value and Capital*.

It seems to me that whereas Hicks' contributions to economic science is wide and deep, the link between theory and history nevertheless remains a missing link to be

¹² My personal memories of Morishima and Hicks, see the recent work by Sakai (2011). In this paper, I did an intensive discussion on what I called the Hicks-Morishima approach to the interdependence of several markets.

¹³ See Hicks (1969), p.6.

filled. It is remarkable to see that he wrote the following sentence:

Where shall we start? There is a transformation which is antecedent to Marx's Rise of Capitalism, and which, in terms of more recent economics, looks like being more fundamental. This is the Rise of the Market, the Rise of the Exchange Economy. It takes us back to a much earlier stage of history, at least for its beginnings: so far back indeed that on those beginnings (or first beginnings) we have little direct information. But there are several ways in which we can deduce, fairly reliably, what must be occurred." ¹⁴

In my opinion, one of several ways to discuss the Rise of the Market is the way in which in this paper, I intensively discussed the informational role of the distributive intermediary in the economy. In standard economics textbooks, the role of the distributor or the merchant has been overly underestimated or completely ignored. It would be high time to correct such an unfair treatment in economic science. Needless to say, there would remain so much problems to be left over for future research. Hopefully, this paper would show us a right direction towards the New Economic Science unifying history and theory.

¹⁴ See Morishima (1993), p.123.

References

- Gal-Or (1985) "Information Sharing in Oligopoly," *Econometrica*, Vol.53, pp.329-343.
- Gal-Or (1986) Information Transmission: Cournot and Bertrand Equilibria, *Review of Economic Studies*, Vol.53., pp.85-92.
- Hicks, J.R. (1969) *A Theory of Economic History*, Oxford University Press.
- Hicks, J.R. (1977) *Economic Perspectives: Further Essays on Money and Growth*, Oxford University Press.
- Iwai, K. (1985) *The Venice Merchant's Theory of Capital*, Chikuma Publishing Co.
- Matsushita, K. (1974), Ishiyama, S. and Koyanagi, M. eds., *Konosuke Matsushita Remembers: The Secret of Business*, Diamond Publishing Co.
- Morishima (1993) *Modern Economics as a Thought*, NHK publications.
- Nakauchi, I. (1982), Ishida, S. ed., *Inspiring Speeches of Isao Nakauchi*, Chuo Keizai Publishing Co.
- Ogura, E. (1989) *The Innovative Power of Development by the Ohmi Merchant* Chuo Keizaisha.
- Ogura, E. (1991) *The Ohmi Merchant: New Ideas from Old Teachings*, Sunrise Publishing Co.
- Sakai, Y. (1982) *Economics of Uncertainty*, Yuhikaku Publishing Co.
- Sakai, Y. (1984) "The Role of Information in a Stackelberg-Type Duopolistic Market," Mimeo. University of Tsukuba.
- Sakai, Y. (1985) "The Value of Information in a Simple Duopoly Model," *Journal of Economic Theory*, Vol.36.
- Sakai, Y. (1987) "Cournot and Bertrand Equilibria under Imperfect Information," *Journal of Economics*, Vol.46, pp.213-232.
- Sakai, Y. (1990) *Theory of Oligopoly and Information*, Toyo Keizai Publishing Co.
- Sakai, Y. (2012) *Economic Thought of Risk and Uncertainty*, Minerva Publishing Co.
- Sima Qian (109BC-91BC) , *Shi ji, The Records of the Grand Historian*, Ancient China.
- Ogawa, K., Imataka M., and Hukushima Y. (1975), Iwanami Publishing Co.
- Vives, X. (1984) "Information Equilibrium: Cournot and Bertrand," *Journal of Economic Theory*, Vol.34.71-94.
- Vives, X. (1987) "Trade Association, Disclosure Rules., Incentives to Share Information and Welfare, " Mimeo. University of Pennsylvania.