A Logic of Industrial Policy and Regulation*

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Introduction

Both Industrial policy and regulation have important effects on budget constraints of producer and consumer by changing relative prices among industrial sectors. I discussed some of the effects of budget constraint problem on my another paper before. Experiences in some countries including Japan and U. S. tell us some important industries including semi-conductor industry have typical and interesting industrial characters.

In this paper I dare to study some theoretical thinking. I use my several ideas and microeconomic tools necessary for analysis of industrial policy and regulation. Particularly I would like to pay attention to two problems. They are information problem and interface problem. I called them so. Their problems affect an innovational technology and a barrier of entry for enterprises and industries concerned. I am discussing some fatal meanings using my new word “rivalry”. This is the word surpassing the classical and well-known one “competition”.

*This is submitted to summing up my recent article published abroad.
Entry problem and value of producer’s information

In general rational producer is used to get his own subjective estimation about market demand adding brought by the governmental policy whether it is regulation including deregulation or industrial policy. We introduce four terms adopted by producer, that is, situation ($s_i$), action ($a$), result ($r$) and utility ($u$). In term $s_i (i = 1, 2)$ $s_1$ explains that he can produce by himself and $s_2$ does that he can not by himself. Term $a$ explains that he coordinates amount of investment for R & D and equipment. Term $r$ explains he decides amount of his profit. $u$ explains volume of utility gotten by $r$. Formulating the above,

\[ r(a, s_i) \]
\[ u(r(a, s_i)) = ur(a, s_i) = f(a, s_i) \]

we introduce prior probability $p(s_i)$ meaning producer’s subjective probability about $s_i$. Expected value of utility is

\[ E(a) = \sum f(a, s_i)p(s_i) \]

Maximizing $E(a)$,

\[ E_0 = \text{Max} \sum f(a, s_i)p(s_i) \]

Writing $p(G/s_i)$ conditional probability meaning credibility of the information ($G$), that is, likelihood of the information and the posterior information $p(s_i/G)$, we get the next Bayesian formula
Here likelihood means probability for getting the information $G$ when the situation $s_i$ occurs actually and the posterior information means that probability the situation $s_i$ occurs when the information $G$ are gotten.

In the above formula $P(G)$ is probability getting the information $G$. Then we get

$$E_I = \text{Max} \sum f(a, s_i)p(s_i/G)$$

Therefore value of the information ($V_I$) is

$$V_I = E_I - E_0$$

When $V_I$ is positive, rational producer dares to pay price to get the information $G$. We call this cost for getting information transaction cost. Transaction cost is indispensable with his production cost for producer.

In a certain industry each of incumbent and entrant has to decide whether he can produce all or the part of demand increasing by himself. $s_1$ means to be able to produce by himself and $s_2$ does not. In this case $a$ means that he prepares to invest for R & D and equipment rationally. Next $r$ means that he plans to increase his profit as large as possible. At last $f$ means amount of his utility gotten from his profit. Therefore we see the information $G$ depends on his own thinking of the content indicated from governmental policy whether he is able to produce by himself or not, when market demand increases. If additional market demand is null, he does not need the above estimation at all. Here market demand adding
means shifting of market demand curve to the right.

In Figure 1–b DD is market demand curve before shifting and D’ D’ is that after shifting. SS is market supply curve and moves to the right as a new next entrant enters into the industry. They are SS, S’ S’, S” S” in order from the left side. In Figure 1–a LAC and LMC are long–run average cost curve and long–run marginal cost curve. As a new next entrant enters into the industry they move upward gradually. They are LAC’, LAC” and LMC’, LMC”. The initial equilibrium point is point E. After shifting it is point E1.

Market price is determined at the intersection of DD curve and a series of SS curves. Points E, E1, E2 and E3 are equilibrium points after shifting. Soon after DD curve shifts to the right at first, the market price is the highest and profit of incumbent is the biggest. But the process of entry of new entrants induces the market prices to fall gradually. There are P”, P’’ and P’ in order from the upper level. It is interesting that price falling and cost rising occur simultaneously. Probably final market price will be determined somewhere between upper price P” and bottom price

Figure 1 Prototypic Process of Entry between Incumbent and Entrant
P'. The final equilibrium price is $P^{''}$ in this diagram. The output of market is $Q$ and that of individual producer is $q \left( \sum q = Q \right)$. By shifting of DD and SS curves $Q$ moves in order $Q', Q''$ and $Q'''$. In rivalry the output of market increases necessarily. But that of individual producer may increase or may not ($q'' \geq q'$). When LAC and LMC curves shifts diagonally to the right, $q'''$ may be larger than $q'$. That is dubious. At that time profits of incumbents and entrants may be null or positive. We can understand that if the profit is null, the present market is very competitive in the long-run. If the profit is positive, we can call it rivalry as is discussed in the latter part. In rivalry the amount of profit is a rectangle with shadow in this diagram. We can call curve S'S* market supply curve in the long run.

**Characteristics approach of production and consumption -interface problem-**

We can draw a model concerning the interrelation among extent of efficiency and that of entry. In according to new demand theory by Lancaster we introduce two characteristics, that is, cost falling or price falling and competition promoting or entry promoting. The former is technological factor and the latter is institutional factor. An amount of industrial funds are allocated on the strength of above two factors. Here there are four industries producing four different kinds of products. These are bank, electric communication, automobile and transportation. Figure 2 depicts some of combination of these two kinds of industrial funds. We can call the boundary line ABCD with four corners characteristic frontier. Every point on this frontier is efficient. But every point on such three
partial lines as AC, BD and AD is not efficient. Because these three partial lines locate inside of characteristic frontier concerned. The points on these three lines are never chosen. The enterprise and industry would not like to invest for R & D and equipment by using the amount of industrial funds. Ceteris paribus, only when price of product of electric communication industry falls, point B have to move in the direction of the north–east. If the extent of price falling is considerably large, the characteristic frontier must be drawn as new frontier AB'D. Now point C is inside this new frontier. Next we can expect the industry of automobile will realize more cost falling and / or more competition promoting. But here I dare to call two things cost falling factor and rivalry promotion factor. Rivalry is new word as I will mention soon after. In this case we can expect that price falling in the sector of electric communication will induce the prices of bank and transportation industries to fall, owing to the effect of Marshallian pecuniary externality. In fact price falling of products increases surely consumers' demand and producer's profit. The enterprise which fails to carry out price falling, that is, fails to interface consumer's rational behavior with producer's rational behavior, is given up by most of consumers and is compelled to exit from his market. This is an interface problem between production and consumption. The first change of price of individual industrial effectuates a chain reaction of change of prices in several other industries. Here we can see change of relative prices among several industries. Each rational producer has to follow this chain reaction in order to schedule his efficient production. In this diagram there are two social indifference curves $I_1$ and $I_2$. $I_2$ has higher utility than $I_1$. Here we can regard this social indifference curve as a kind of national taste related with policy decision line. An optimal point
is not that of intersection between the line $B'D$ and $I_1$ but a tangent point between the line $B'D$ and higher indifference curve $I_2$.

**Industrial climate and socio-economic complexity**

The international war in the main industries seems to be endless. Many economic researchers explain efficiency of industrial organization depend on the extent of competition in main and international industries. They believe the larger extent of competition in market becomes, the larger extent of efficiency in organization of industries concerned becomes. Is this significant postulate true? It is stupid of us not to notice the difference of perfect competition and excessive competition. To be honest this problem appears in discussing significance of competition all the time. Meaning of two words Perfect and excessive looks similar at a glance. It is true that the former means competition is excessive but the

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**Figure 2** Two Characteristics Approach in Production and Consumption

- Characteristic (cost falling factor)
- Characteristic (rivalry promotion factor)
- Bank
- Electric communication
- Automobile
- Transportation

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latter means rivalry is excessive. So what do we mean by the word of competitive oligopoly for instance? In this paper new word rivalry means more differential and less excessive among products. In rivalry the producers produce differential goods but have many competitors. Here I should like to adopt a concept of rivalry with a familiar concept of competition. In fact there are many industrial situations saying that economic competition is too little and economic rivalry is too much. We need to remember that extent of rivalry isn't equivalent to extent of monopoly. Many outstanding economists have taught us definition of competition only as concept preceding to that of monopoly. The things conditioning this new concept of rivalry are as follows. The first is that price is not always distant from marginal cost. So-called excessive competition occurs often in the situation of perfect competitive industry. This fact doesn't mean too little competition but does too rivalry. The second is that differentiation of products exists surely in the market with a rather unsymmetrical information among producers. Although for instance we seem to be no differentiation among typical parts of semiconductor by different makers, being subject to mass-productive method, the difference of nation and name of each maker name, that is, brand name forms a vital differentiation of product. The third is that barriers of entry exist surely but is entirely dependent on the extent of production cost performance and amount of R & D and equipment investment in one year. As the actions of entry take place frequently both in the industry of semiconductor products and the installation industry of the same products, we can call the above situation action of conditional free entry.

In semiconductor industry most of the characteristic and specific points of industrial organization are kept without reserve, I believe. Could
we explain the industrial situations of competition and rivalry? It is safe to say that the helpful hints for the problem exist rightly in the technological characteristics. As a general rule technology has a dense relation with three vital economic and managerial sites. I should like to relate the above context with three performance marks of cost, demand and market mainly in the case of two countries, U. S. and Japan. We can see the difference of socio-economic structure of technology in two countries. In microscopic sense, most of economists look like thinking that the entrepreneur's innovational technology need rational entrepreneurship in production and competitive entrepreneurship in market in order to give his own advantage coming from more large extent of competition to entrepreneurs. Speaking from a view of economic aspect technology is not always dependent on interaction of demand and supply in competitive market, and it has also little mutual relation with economic rationality and productive efficiency. Here we can see some of roots of socio-economic complexity.

In economic competition any entrepreneur can't yet survive unless he uses his weapon named his new business opportunity of advantage coming from new innovational technology. in his own economic and managerial world, as professor Hayek taught us. Also although by invisible Goddess' Hand the merit of every entrepreneur's economic opportunity disappears sooner or later, any entrepreneur has yet strong incentive to create new innovational technology. Even if an equilibrium has come, he can break its equilibrium and readjust the market by using his own strong incentive sooner or later. He can always endeavor to decrease total production cost by falling labor cost and the other production cost including transaction cost, only when he can do it by his
own strong incentive coming from expectation of additional advantage for new technological innovation. We can research mainly innovational technology contributing to performance of cost and market. Generally speaking the advantage of technological innovation leads necessarily to performance of cost and market through falling of cost and readjusting of market. Technology itself doesn't always fall cost, but entrepreneurs' effort to adapt his own technological innovation to the basic R & D research, production process and product differentiation necessarily decrease his total cost. Those are because investment for R & D and equipment are very important and feasible strategies in entrepreneurs and industries concerned. Compared to entrepreneurs and industries of U. S. and Japan, we can see some plain points of difference in socio-economic factors of two countries. Which of them is the most critical?

A pre-history of semi-conductor industries tells us the truth in part. For instance, the market share of Japanese industry in this business world has changed considerably in each past ten-years-period, especially in 1970's, 1980's and 1990's. I'm afraid most of economists use the term, that is, competition without knowing well the term, that is rivalry. As rivalry isn't mere economic phenomena, it has surely socio-economic and even political facets. To put it shortly, rivalry has close relation with the phenomena of socio-economic and even cultural complexity. A certain scientist knowing the production spot tells us the following that if Japanese entrepreneur has a definite target and does it in the long-run, his innovational creativeness must be revealed at the best. On the contrary U. S. and the other countries including Europeans and Asians don't always hate losing their sales share in the market and dislike to behave according to the tacit consent with other enterprises in the same
industry. In Japanese society people don’t always hate the same kind of opinion as the other’s. So they don’t be worried about troublesome things between the others’ opinions. In this society there is a basic structure of one strong lope tied up into a bundle, with their standing side by side. But in the other countries’ societies each member looks like a massive and heavy stone bound loosely by a thin lope. When one of them starts to move, the other doesn’t move and is standing still with no influence each other. Probably this is something of democracy, I think. However things are rightly different in Japan. Speaking in the same way, when one stone stars to move, every stone starts to move all together. This is notorious complexity of consensus in Japanese customs. In other words this way is the above tacit consent. But we can not assert that this custom is quite unlikely to be a kind of democracy.

Professor. Morishima, in his book, showed his unique view regarding Japanese case as M. Weber had analyzed socio-economic relations between capitalism and rational spirits in 19 th century’s European society. Of course his work is merely one tried essay, but his opinion is stimulating very much for researchers of comparative analysis between Japanese enterprises and industries and the other countries’ ones. But no matter how eagerly he endeavored to search the role of Confucianism in Japanese history. I wonder yet whether that the Confucian spiritual climate of Japanese is able to explain economic success of Japan in industrial developed economy. But speaking as a general rule ethical and religious spiritual climate factors are not always useful for giving a final answer of the problem, that is, “Why any country, for instance, U. S. succeeded in economic competition once more in the second half of the 1990’s?” Though we must know there is any vital relation between
something of ethical factor and industrial success of the country, we should not to expect a persuasive and useful interpretation for the above respectable and controversial matter yet.

Though many economists used to understand that iron industry is plainly different from semiconductor industry from the viewpoint of competitive oligopoly. Though competitive oligopoly is one type of homogeneous oligopoly, its concept includes many important parts which can't be explained by only help of orthodox economic theory. By examining semiconductor industry here are both price falling and investment for R & D and equipment. Some economists believe that essence of oligopoly consists in non-price competition. Strictly speaking this postulate is not correct. The core of this problem doesn't insist in price falling but cost falling. So we had better consider an interrelation between cost falling and investment for R & D and equipment. Which is the first thing to do among the two? Many people must think that suitable success of investment for R & D and equipment comes to realizing cost falling. Saying paradoxically, I dare to say success of cost falling leads to investment for R & D and equipment with a powerful guide. We need to notice that specially in the semiconductor industry we cannot tell rightly the difference between price falling induced by cost falling and by mismatch in economic relation of demand and supply in the market. Rate of price change depends on that of cost change. Formulating this context, mark-up principle is

\[
dP/dt = dLMC/dt(1+m)
\]

Here \(P, LMC, m\) and \(t\) are price, marginal cost in the long-run, mark-up and time. Indeed in the case of the latter mentioned above the price is apt
to fall more rapidly than in that of the former. Because the rate of cost change in the latter is larger than that in the former. We can say mark-up changes with height of return of investment. Most of technological analysts say the larger pieces of chip engineers can get from a piece of wafer, the better technological precision they have on a piece of chip. In this industry degree of precision of high technology depends just on how many pieces of chips they can cut off. An efficient cost falling enables them to sell at lower price and to increase their own share of sales by the other root. This fact induces them to implement larger investment for R & D and equipment surely and swiftly. Then the return of this investment determines mark-up. Especially in the 1980's Japanese enterprises have implemented an enormous amount of investment even in the midst of depression. In this case hesitating timely investment is not forgiven for entrepreneur's own survival. This used to be rule patterned by Japanese enterprises. But I guess this is not a rule peculiar to Japanese enterprises. We can observe that in the period of low growth of the country there is an excessive competition not only in the textile industries and the like in chronic depression but also in the industries of semiconductors, automobiles and home-electronics which their growth of demand is rather high. The characteristic in point was that we could see falling price in the long-run with the rise of efficiency or productivity. This type of oligopoly which I dare to call competitive oligopoly rivalry here, is apt to have considerably high extent of concentration of sellers, but to change frequently their order of ranking in the percentage of share in the global market. When each producer has continued to win large merits coming from economy of scale and technological innovation, he faces to a kind of market structure, rivalry by name in a phase of
investment for R&D and equipment. Speaking from specific cycle in semi-conductor industry and the relatives, the price of product falls periodically in the long run or often radically in the short run. Even if the price falls sharply, it can't be under the competitive lowest level with null profit. I guess there must be plain economic reason for its mechanism. An existence of this mechanism forms an important technological barrier for entry coming from peculiar product differentiation proper. That is reason why a change in the rate of share is rather small in this industry and the producer concerned are able to keep up more large rate of profit on more large mark-up $m$.

Now the basement of economic behavior is no doubt market economy. Market economy means typical mode of economic transaction using mainly market mechanism. We have two problems here. One is whether several countries in international trade can offer any open opportunity for free market transaction to his partners or not. This triggers a clear friction of GDP incomes between several countries. In the case of two countries it brings unusual trade friction between them. The other is how government can discriminate trading products in her own system through market mechanism. These problems relate with constructing specific firm system in carrying out the feasible governmental policy, industrial policy or deregulation. Many foreign researchers have thought that Japan has developed her strength by means of protectionism in the international trade in the help of her governmental policy, U. S. has implemented it by means of free trade in the help of free enterprises. But this symmetric relation is not always true. In other words in the 1990's the tables of economic influence has turned in the economic development of two countries. The above has taught us very interesting contrast between two
main capitalist states. Saying more ironically though we could see some phases of typical economic trade between Japan and U. S. in the past times, we can merely balance of power in each trading area in the world, without seeing the same phases between Japan and Asian countries in these days. I cannot help guessing that this curious fact was caused by admirable trick of an economic history and world-wide diffusion of socio-economic complexity.

Let's go back to our main subject, that is, rivalry in oligopoly. The following are about characters of rivalry of the industries concerned. The main difference between competition and rivalry consists in the degree of discretion of price and non-price strategies. Rivalry holds good to make clear discretion of non-price strategy. In this kind of rivalry a considerably high growth rate of demand lead up necessarily efficient technological innovation whether the intermediate products are subject to captive method of production or not. The advantage by the height of rivalry can induce the entrepreneur concerned to realize such an experience rule of cost, that is, learning by doing. Besides he is able to get a large economic advantage from economy of scale and efficient technological innovation. Efficient technological innovation means innovation of process of production, products itself and new market for sales including an additive investment for R & D and equipment. Sooner or later a drastic price falling is realized in the market of rivalry through cost falling. In practice every semiconductor enterprise is an imperfectly integrated organization unlike usual big steel enterprise with a perfectly integrated one. Generally speaking an enterprise which the vertical integration is highly organized has surely more technological innovational efficiency. Actually organizations in most of Japanese
semiconductor enterprises are not only integrated at the highest level but also general electronic appliances makers. This is noticeable feature of Japanese semiconductor enterprises. Japanese makers often buy many specific apparatuses and parts needed in their own process of production from the other makers than their family partners. Even organizational scientists cannot afford to understand rightly mechanism of comparative advantage in the highly integrated organizations. For instance typical enterprise producing both whisky and beer can always invest a large amount of money earned at whisky business branch into beer business branch. In the above same way many enterprises whose main products are home–electronic ones can invest a lot of money earned at the same branch into the semiconductor branch. This is an effective method investment without economic risk in his market. What is the theoretical framework explaining the industrial context of these features? As we have seen that there are three vital features. The first is existence of organizational vertical integration. The second is possibility of additive investment for R & D and equipment induced by advantage of cost falling. The third is height of rivalry raising own larger share of sales in the market. All of three features belong to supply side factors. Now it is safe to say that there are more three factors from the view of industrial policy and deregulation as I mentioned before. The first is effectiveness of change of relative prices among several products. The second is effectiveness of controlling barriers of entry and the like through the industrial policy concerned. The third is effectiveness of deregulatory policies characterized by adjusting own budget constraint and that of partnership or union.

As the other socio–economic aspect we should like to advise that a
notorious second rule of thermodynamics has told us that entropy travels straight to thermal death leaving the situations alone. Human beings are able to use their wisdom organizationally and effectively by creating, accumulating, processing and storing own scare resources and own innovational knowledge of opportunities for survival. So they can put increase of entropy back skillfully. Public interest means total of social surplus being supported and created by individual interest. Properly speaking the government used to implement a series of new regulations under the slogan of priority of public interest in order to maximize social surplus artificially. But the government will fail in the end. Although in a human society the portion of total social surplus was shared among private producers and consumers, private producers get larger portion of it after all. The producer has been the only economic unit who shares larger gain from additive investment for R & D and equipment. So-called government failure has been caused by the fact that government herself is not only an experimenter who experiments on creating public interest but also an experimental testee suffering such a test.

In Japan there was a notable historical and industrial event. Many people can never forget it. That happened from 1976 to 1979. Several excellent researchers were delegated from famous five microelectronic enterprises, that is, Hitachi, Toshiba, Mitubishi, NEC and Fujitu. They worked in the same laboratory house and succeeded in their working research of semi-conductor branch. It is important that the event occurred under strong leadership of Japanese government MITI (Ministry of International Trade and Industry). Japan has won an industrial success and has increased her output and export of products of semi-conductor. Some analysts believe that Japanese socio-economic system
had justly brought such an industrial success as the above event fortunately. We can call this fact a typical industrial policy in Japan. But in modern protectionism we can observe the same kind of facts in the other countries whether they win or lose in the end. As a recent case study we have a remarkable instance of European aircraft company Airbus as a modern version of industrial policy in an international sense. Of course international industrial policy has a dense relation with another barrier of entry, that is, tariff barrier. Even though it looks like that a strong leadership by bureau of government has achieved fortunate success, the result may bring an unexpected friction between the countries or areas concerned. Saying from my theoretical view some principles of industrial policy or regulation teaches us the following. Whether it is industrial policy or regulation the character of public policy scheduled by bureau of government is inclined to change from content regulated and planned to one stressed on market mechanism under some assumptions. Some institutional economists call this tendency a complementary deviation of institutional system. Bureau of government falls into a certain of difficult dilemma. This is not fail of government but success of government. In short industrial policy and regulation show rightly artificial deviation from given and well-defined equilibrium point. In this implication deregulation is revival of deviated equilibrium point through changing relative prices among industrial sectors.

References
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