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DEMAND-PULL VS. SUPPLY-AGGLOMERATION EFFECTS IN LOCATIONAL CHOICE OF INDUSTRY : PATTERNS WITH PRODUCT LIFE CYCLE

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In the literature of spatial economics it is stylized fact that weak economies of scale and high transportation costs induce supplies of goods and services to locate very close to their markets, and large economies of scale and low transportation costs provide an incentive to gather at one place. This paper first confirms this fact in a comparative static model and then attempts to find some empirical evidence in the industry level. We classify the applicable forces into "demand-pull"(centrifugal) and "supply-agglomeration" (centripetal). Using an observable estimator of relatively rapid growth before relocation and after relocation as an index of the weight of "history" versus "expectations", we would suggest that future growth(centrifugal forces) tends to dominate early stages of the PLC and supply-agglomeration(centripetal forces) tends to dominate later stages of the PLC, in a majority of industries studied.

JEL Classification: R3
Keywords: demand-pull(centrifugal) effects, supply agglomeration(centripetal) effects, product life cycle, economies of scale, trasportation cost

I. INTRODUCTION

When a firm makes a decision on location choice to enter or relocate an industry, it considers both demand side factors(demand-pull effects) and supply side factors (agglomeration effects). It concerns how much it could sell the products and how effectively it produces the products[1]. However, these two sets

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[1] The supply-agglomeration, according to Weber (Friedrich(1929)), defined as : an advantage including a cheapening of production or marketing which results from the fact that production is carried on to some considerable extent at one place. There are two kinds of agglomeration. One is the agglomeration from the concentration of industry through the simple enlargement of plant.

of factors are correlated. A firm prefers to locate its facilities at the place where market demand exists. Subseaquently lots of firms are likely to gather at that place, and this creates another market demand. A positive feedback of supply and demand exists in the market.

The scholars have built a consensus with this hypothesis even though some emphasize more on the demand-pull effects or the supply-agglomeration effects. The most salient question is the relative importance of "demand-pull" and "supply agglomeration" which parallels other issues such as the relative importance of "demand-pull" and "technology-push" in technological change in industrial organization. Hoover(1948) originally recognized the interdependence of supply and demand side factors, but emphasized more on the supply side factors. He classified the supply factors into two : procurement and processing. Procurement includes purchasing and bringing the necessary materials and supplies to the site of processing. And processing means transforming the material into more valuable forms. Regarding demand side factors, Hoover specified distribution, which includes selling and delivering the products. Market demand is determined by the geographic distribution of consumer income, which in turn depends primarily on the location of production.

In contrast to Hoover(1948), Krugman(1991a) put weight on the demand side factors. The geographic pattern of industry is determined by interaction between supply factors such as increasing returns to scale, transportation costs, and demand factors such as the number of consumers. However, he put more stress on the role of demand rather than supply in determining the location of production. In order to minimize transportation costs, a firm chooses the location where large local demand (demand externalities) exists. Local demand will be large where the majority of manufacturers choose to locate.

Arthur(1989, 1990) handled the feedback of supply and demand at a different angle. He explained the feedback of supply and demand relying on indeterministic factors such as "chance", which is called "self-reinforcing mechanism"[2]. Suppose that firms enter an industry one by one and choose their location so as to maximize profits. Also suppose that the firms' profits increase if they are near other firms. The first firm enters the industry and picks a location based on chance or geographic preference. The second firm decides based on preference modified by the benefits gained by locating near the first firm. The third firm is influenced by the position of the first two firms, and so on. If some location by good fortune attracts more firms than others in the early stages of this evolution, the probability that it will attract more firms increases.

The other is the agglomeration resulting from close local association of several plants. This paper focuses on the latter.

[2] Arthur introduces "Polya Process" to explain it ; the probability of a given color depends on the current proportions of colors on the table. If an increasing proportion of balls of a given color increases the probability of adding another balls of the same color, the system can demonstrate positive feedback.

Krugman(1991b) extended Krugman(1991a) to a refined model by using the two-product-two-region model. The paper's interesting and crucial results are that weak economies of scale and high transportation costs induce supplies of goods and services to locate very close to their markets and that demand side factors than supply side factors are more important. On the other hand, large economies of scale and low transportation costs provide the firms an incentive to gather at one place. Here, supply side factors are more attractive than demand side factors.

This paper confirms this argument in a comparative static model and at the same time incorporates product life cycle(PLC) concept in the empirical context of industry. It would be a stylized fact in the history of industry that at earlier stages of the PLC in which standards of technology as well as transportation means are not developed sufficiently, transportation costs are high and economies of scale are small, while at later stages of the PLC transportation costs are relatively low and economies of scale is large due to a high degree of standards of technology and well-developed transportation facilities. Encouraged by these facts, this paper attempts to find consistent results with empirical analysis of a sample of manufacturing industries.

This paper first reviews the relationship of "economies of scale" and "transportation cost" with product life cycle. In the next section a comparative static model is built to explain how "economies of scale" and "transportation cost" relate to the geographical divergence of industry. Lastly, the empirical analysis to support the result of the model is presented in the third section followed by the conclusions.

Ⅱ. ECONOMIES OF SCALE, TRASPORTATION COST, AND PRODUCT LIFE CYCLE

In the literature of spatial economics, the geographical concentration or dispersion of industry is explained largely on the input costs of production; labor, transportation, land cost, etc.. Particularly, the relative importance of labor cost and transportation cost have been major concerned (Weber (1929, translated by Friedrich), Hoover (1937, 1948)). However, relatively cheap transportation cost and expensive labor cost have made the labor cost be more important in locational choice of industry as its product life cycle proceeds. There are several contributing factors of less importance of transportation cost: (i) As the sector of high-value added light industries rather than the low-value added heavy industries has been increased, the relative importance of transportation cost out of total production costs has been decreased (Pred(1965)). (ii) By technological improvement, the more efficient use of material inputs has tended to reduce the influence of raw materials on plant location. (iii) Substitution of inputs has reduced the transportation cost : in generating electricity, pit head thermal power generation eliminates the necessity to transport coal and similar fuels (Caesar(1964)).

(iv) the development of transportation technology-containers, supertanks, pipelines, air cargo, expressways, etc.-has provided a cheap transportation.

It is presumable that there is relatively strong economies of scale in the industry facing later stages rather than earlier stages of its PLC. Technological change is more competitive and likely to occur at earlier stages of PLC, so that most product diversification occurs at these periods. Hence, the level of technological standards is not high. Rather "economies of scope" is dominant at the early stages. However, more people are gradually informed of the technology with the progress of time. Finally, one superior technology diffuses over the whole industry. This enhances the degree of standard in the industry. And simultaneously same time, stronger economies of scale are prevalent throughout the industry.

Stigler(1968) supports this fact in a different way. If a particular plant size is efficient, then eventually all plants in the industry should approach that size. This hypothesis would be feasible if all firms face similar cost conditions. If firms face different cost conditions, their efficiency scale will vary. In this case, the range of efficient plant sizes rather than exact efficient plant size is more suitable. Stigler analyzes the distribution of output in petroleum refining by plant size. This tells that as the portion of medium-size plants increases, those of the very small and very large plants decrease[3]. It concludes that in the petroleum industry the medium plant size is most efficient and economies of scale exists in that size. Industry adjusts itself to fit for economies of scale as its PLC goes on. It will be an evidence of the fact that economies of scale get stronger with the progree of PLC.

Ⅲ. COMPARATIVE STATIC MODEL

A monopolistic competition model focusing on the production side is built. A one-product economy, but product differentiation are assumed. There are n firms in the economy. Firm i produces y_i and its price p is affected by market production $\sum_{i \neq j}^{n} y_i$, i.e., $p\left(\sum_{i \neq j}^{n} y_i\right)$, which is a inverse demand function. Cost function is simply assumed y^{α}, $0 < \alpha < 1$; α represents the degree of economies of scale. If α is close to 0, then strong economies of scale exists, and if α is close to

[3] Summary of the investigation is

plant size (percent of industry total)	percent of industry capacity 1947	1950	1954
under 0.1	8.22	7.39	6.06
0.1 - 0.2	9.06	7.60	7.13
0.2 - 0.3	5.45	4.99	7.28
1.5 - 2.5	17.39	23.64	22.45
2.5 - 4.0	21.08	16.96	15.54

1, weak economies of scale exists. It is also assumed that a firm transports its output to another region to sell it with unit transportation cost, t. This assumption is somewhat strong in that the distance from firms to market is identical for all firms. Finally long-run equilibrium in which there are free entry and exit in the market, is assumed.

With these assumptions, the representative firm i is interested in maximizing its profit (π_i) in the market;

$$\pi_i = p\left(\sum_{i\neq j}^{n} y_i\right) y_i - y_i^{\alpha} - t y_i \tag{1}$$

The first order condition in (1) gives

$$y_i p'\left(\sum_{i\neq j}^{n} y_i\right) + p\left(\sum_{i\neq j}^{n} y_i\right) - \alpha y_i^{\alpha-1} - t = 0 \tag{2}$$

Since the long-run equilibrium is assumed, the profit of the firm realizes normal rate of returns;

$$\pi_i = p\left(\sum_{i\neq j}^{n} y_i\right) y_i - y_i^{\alpha} - t y_i = 0 \tag{3}$$

At the equilibrium the market is always cleared;

$$\sum_{i\neq j}^{n} y_i - D(p) = 0 \tag{4}$$

where $D(p)$ is defined as market demand ($D'(p)<0$).

Whether economies of scale lead to geographical divergence (concentration) or convergence (dispersion) is the major concern. If the former turns out, it is interpreted that there exists a strong relationship between "economies of scale" and "supply agglomeration". It is also investigated whether high transportation costs lead to the geographical convergence or divergence. Similarly, if the former occurs, "high transportation cost" relates positively to "demand-pull" force.

Let us assume a symmetric equilibrium for explict comparative static analysis. We are interested in $dn/d\alpha$ and dn/dt based on the purpose of this paper. At the symmetric equilibrium, $y_i = y_j = y$, $\pi_i = \pi_j = \pi$. We can rewrite (2), (4), and (3) as follows

$$ynp'(ny) + p(ny) - \alpha y^{\alpha-1} - t = 0 \tag{5}$$

$$ny - D(p) = 0 \tag{6}$$

$$\pi = p(ny)y - y^{\alpha} - ty = 0 \tag{7}$$

Total differentiating and manuplating (5), (6), and (7), and using $p''(ny)=0$ result in

$$2p'(ny)ydn+(2p'(ny)n-\alpha(\alpha-1)y^{\alpha-2})dy=(\alpha y^{\alpha-1}\ ln\ y+y^{\alpha-1})d\alpha+dt \quad (8)$$

$$ydn+ndy-D'(p)dp=0 \quad (9)$$

$$p'(ny)y^2dn+(p'(ny)yn+p(ny)-\alpha y^{\alpha-1}-t)dy=y^{\alpha}\ lnyd\alpha+ydt \quad (10)$$

With $dt=0$, solving (8), (9), and (10) with respect to $dn/d\alpha$ gives[4]

$$\frac{dn}{d\alpha}=\frac{-y^{\alpha}ln\ y(2p'(ny)n-\alpha(\alpha-1)y^{\alpha-2})D'(p)}{-p'(ny)y^2(2p'(ny)n-\alpha(\alpha-1)y^{\alpha-2})D'(p)}=\frac{-y^{\alpha}\ ln\ y}{-p'(ny)y^2}<0 \quad (11)$$

Since $p'(ny)$ is negative, the sign of $dn/d\alpha$ is obviously negative, which is consistent with our expectation ; the stronger economies of scale (lower value of α : close to 0) leads to the larger number of firms in that region(higher value of n).

Similarly, solving (8), (9), and (10) regarding dn/dt with $d\alpha=0$ gives[5]

$$\frac{dn}{dt}=\frac{-y(2p'(ny)n-\alpha(\alpha-1)y^{\alpha-2})D'(p)}{-p'(ny)y^2(2p'(ny)n-\alpha(\alpha-1)y^{\alpha-2})D'(p)}=\frac{-y}{-p'(ny)y^2}<0 \quad (12)$$

where dn/dt is negative. The higher transportation cost reduces the number of firms in the region, which means that the firms tend to move into other regions in which its market exists. This is a kind of firm adjustment behavior to higher transportation cost.

Figure 1 helps to understand these results. The larger α and t lead to the increase in the cost and in the equilibrium production y^*, and the new equilibrium is attained at $(y^{*'}, p^{*'})$ The larger amount of the

$$\frac{dy}{d\alpha}=\frac{D'(p)(2p'(ny)yy^{\alpha}\ ln\ y-p'(ny)y^2(\alpha y^{\alpha-1}\ ln\ y+y^{\alpha-1}))}{-p'(ny)y^2(2p'(ny)n-\alpha(\alpha-1)y^{\alpha-2})D'(p)}$$
$$=\frac{p'(ny)y^{\alpha-1}((2-\alpha)\ ln\ y-1)}{-2(p'(ny))^2y^2n+\alpha(\alpha-1)y^{\alpha}}>0 \quad \text{if} \quad ln\ y>1/(2-\alpha). \quad (13)$$

individual firm's production reduces the number of firms, n, in the market. In

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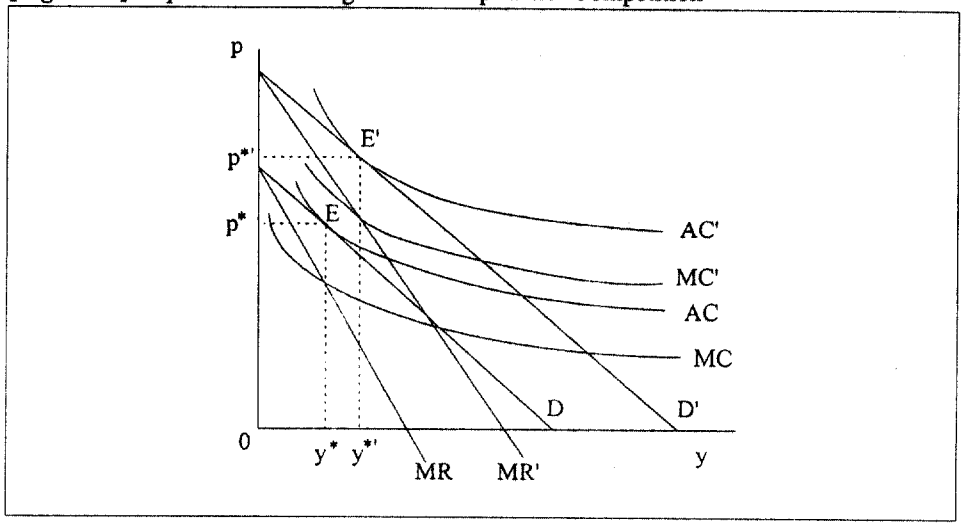
[4] Cramer's rule is applied to solve it ;

$$\begin{bmatrix} 2p'(ny)y & 2p'(ny)n-\alpha(\alpha-1)y^{\alpha-2} & 0 \\ y & n & -D'(p) \\ p'(ny)y^2 & 0 & 0 \end{bmatrix}\begin{bmatrix} dn/d\alpha \\ dy/d\alpha \\ dp/d\alpha \end{bmatrix}=\begin{bmatrix} y^{\alpha-1}+\alpha y^{\alpha-1}\ lny \\ 0 \\ y^{\alpha}\ lny \end{bmatrix}$$

[5] $$\begin{bmatrix} 2p'(ny)y & 2p'(ny)n-\alpha(\alpha-1)y^{\alpha-2} & 0 \\ y & n & -D'(p) \\ p'(ny)y^2 & 0 & 0 \end{bmatrix}\begin{bmatrix} dn/d\alpha \\ dy/d\alpha \\ dp/d\alpha \end{bmatrix}=\begin{bmatrix} 1 \\ 0 \\ y \end{bmatrix}$$

[Figure 1] Equilibrium Change in Monopolistic Competition



addition, $dy/d\alpha>0$ for the large y is verifiable in (13).

In conclusion, it is verified from the comparative static analysis that demand-pull effect at the earlier stage and supply-agglomeration effect at the later stage repectively are more critical in the locational choice of the industry.

Ⅳ. EMPIRICAL STUDIES

4.1. Method

In establishing its location, the firm should consider "history" or "future" of the demand side (supply side). A specific method is introduced to find an empirical evidence on the result of the comparative static analysis. When a firm makes a decision on location choice to enter an industry, it considers either how the location was in the past or how it will be in the future. How the location will be in the future is relavant to whether it will be bright in the future which represents the demand-pull effect. Pratically it is able to be measured by the growth rate of production or value added of the location after the firms' location choice. Reversely, how the location was in the past is relavant to the supply-agglomeration effect. A group of firms at certain locations facilitate exchanging the information among firms, sharing their input market and enhancing the technological development, further creating another output market, so that it results in lots of agglomeration effects among firms. How many firms already existed at the region will be a useful measurement. The followings are the method to determine how the demand-pull(demand side) or the supply-agglomeration(supply side) effects are more critical in choosing location with the progress of PLC.

First, in the demand side (i) when a firm enters(includes relocation) the industry in certain state, if the growth rate in value added of the state after entry is greater than national average, we determine the firm relies on "future" in locational choice. (ii) calculate the share of the firms relying on "future" among all entry firms at each stage of PLC. (iii) plot the patterns of the shares in accordance with PLC stages.

Second, in the supply side (i) when a firm enters the industry in a certain state, if the number of firms in that state before entry is greater than the average level(the number of firms divided by the number of states), we assume the firm relies on "history" for locational choice (ii) calculate the share of the firms relying on "history" among all entry firms at each stages of PLC stages. (iii) plot and analyze the pattern with PLC stages.

Third, we compare both demand and supply side (i) plot both supply and demand side patterns of each industry (ii) compare two patterns with their PLC stages (iii) classify the industries into several groups.

4.2. Variables and Data

The average growth rate of two or three years before or after entry is used for improving the significance level in the analysis. One of the reasons is that the growth rate of the state depends on various factors ; business cycle, unexpected exogenous shocks, etc.. To eliminate these factors, the average growth rate of several periods is used. On the supply side, because the number of firms, unlike the growth rate of value added, is likely to be unchangeable over the short periods, the number of competing firms of the period before entry is used. With respect to the PLC variable, we use Gort and Klepper's(1982) five stages classification[6].

31 U.S. manufacturing products(Table 1) were chosen for the analysis. The selection was made from data in *Thomas Register of American Manufactures.* The products were originally extracted from a list of products used by Gort and Klepper(1982). The products in the Gort and Klepper study were chosen on the basis of three criteria so as to include a broad range of type of products (consumer, industrial, and military) which were basic innovations and had adequate data on net entry.

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[6] Gort and Klepper(1982) suggested a five-stage classification based on the number of producers in a market during the life cycle. Stage I begins with the commercial introduction of a new product by its first producer and ends with a sharp increase in the rate of entry of new competitions into the industry. Stage II is the period of sharp increase in the number of producers. It is consistent with the period of rapid growth in the total output during its life cycle. Stage III is the period in which the number of entrants is roughly balanced by the number of exiting firms, so net entry is approximately zero. Stage IV is the period of negative net entry. The industry begins to decline. Stage V is the second period of approximately zero net entry. It continues until the eventual shrinkage of the market, induced by obsolescence of the product, or until fundamental changes in technology launch a new product cycle.

[Table 1] PLC Stages in 31 U.S. Manufacturing Industries

Product Name (No. of Firms)	PLC Stages				
	I	II	III	IV	V
Antibiotics (81)	1948-49	1950-59	1960-67	1968-80	1981-92
Artificial Christmas Tree(64)	1938-50	1951-65	1966-70	1971-85	1986-92
Ball-point Pens (255)	1948-56	1957-88	1989-92		
Betaray Gauges (28)	1955-62	1963-70	1971-74	1975-92	
Cathode Ray Tubes (150)	1935-43	1944-60		1961-67	1968-92
Combination Locks (108)	1912-28	1929-77	1978-92		
Contact Lenses (78)	1935-73	1974-88	1989-92		
Electric Blankets (55)	1915-22	1923-62	1963-66	1967-81	1982-92
Electric Shavers (65)		1937-39		1940-78	1979-92
Electrocardiographs (49)	1942-45	1946-57	1958-73	1974-85	1986-92
Freezers (160)		1946-55		1956-75	1976-92
Freon Compressors (102)	1935-41	1942-86		1987-92	
Gas Turbines (178)	1944-50	1951-92			
Gyroscopes (159)	1919-44	1945-67		1968-82	1983-92
Heat Pumps (158)	1954-59	1960-67	1968-72	1973-77	1978-92
Jet Engines (103)		1948-65		1966-81	1982-92
Microfilm Readers (119)	1940-61	1962-92			
Nuclear Reactors (105)	1955-57	1958-64	1965-66	1967-92	
Outboard Motors (138)		1913-17	1918-21	1922-40	1941-92
Oxygen Tents (55)	1932-39	1940-59	1960-62	1963-85	1986-92
Paints (279)	1934-38	1939-67		1968-83	1984-92
Photocopying Machines(115)	1940-43	1944-63	1964-68	1969-81	1982-92
Piezoelectric Crystals (124)	1941-43	1944-61	1962-65	1966-85	1986-92
Polariscopes (48)	1928-43	1944-57	1958-69	1970-78	1979-92
Radar Antenna Assemblies(135)	1952-55	1956-63		1964-81	1982-92
Radiant Heating Baseboards(64)	1947-52	1953-61	1962-68	1969-87	1988-92
Radiation Meters (88)	1949-54	1955-65		1966-87	1988-92
Recording Tapes (199)	1952-53	1954-85	1986-87	1988-92	
Rocket Engines (51)	1958-59	1960-65	1966-72	1973-80	1981-92
Styrene (110)	1938-55	1956-82	1983-92		
Video Cassette Recorders(54)	1974-80	1981-92			

Notes : Total Number of firms are 3,477 over 31 industries.

The growth rate of value added in the state level is available from the *Census of Manufactures*. However, these data are not consistent across periods. Large amount of data around World War I, II are not available. In that case, more than 3 years will be used in calculating the average growth rate of value

[Table 2] Comparison of Demand and Supply Side

Demand>Suppply → Demand<Supply	Demand<Supply → Demand>Supply	Demand<Supply	Demand>Supply
Artificial Christmas Trees (III) Combination Locks (II) Electric Blankets (III) Electric Shavers (IV) Freezers (IV) Freon Compressors (IV) Gas Turbines (II) Gyroscopes (II) Heat Pumps (IV) Jet engine (IV) Microfilm Readers (II) Nuclear Reactors (II) Piezoelectric Crystals (IV) Polariscopes (II) Radiation Meters (II) Rocket Engines (II) VCR (II)	Betaray Gauges (III)	Antibiotics Ball point Pens Cathode Ray Tubes Photocopying Machines Radar Antenna Assemblies Radiant Heating Baseboard Recording Tapes Styrene	Electrocardiographs Outboard Motors

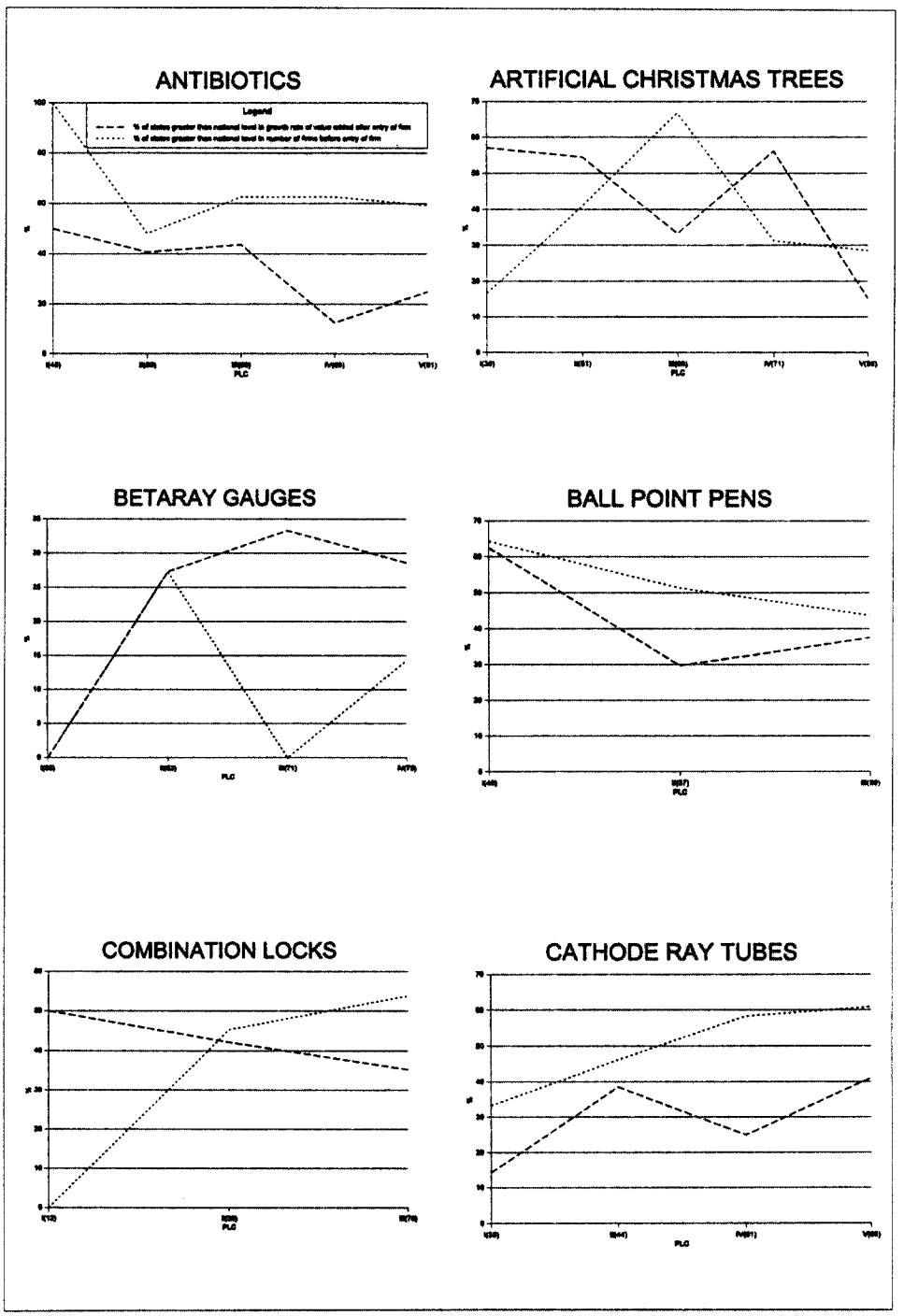
Notes : Contact Lenses and Oxygen tents are not classified into the categories.
The number inside parenthesis indicate the stage in which the pattern changes from demand> supply to demand<supply, or demand<supply to demand>supply.

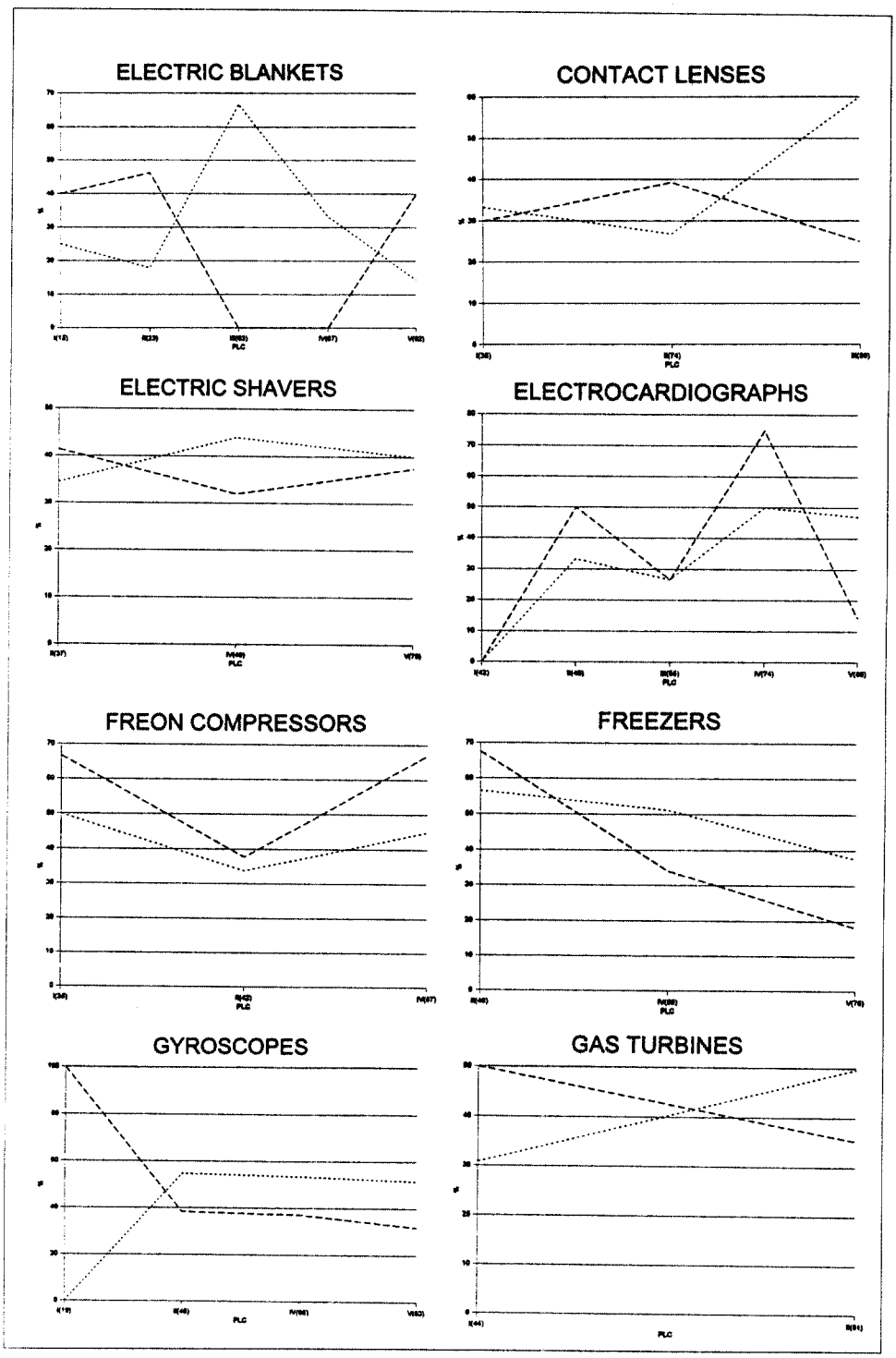
4.3. Results

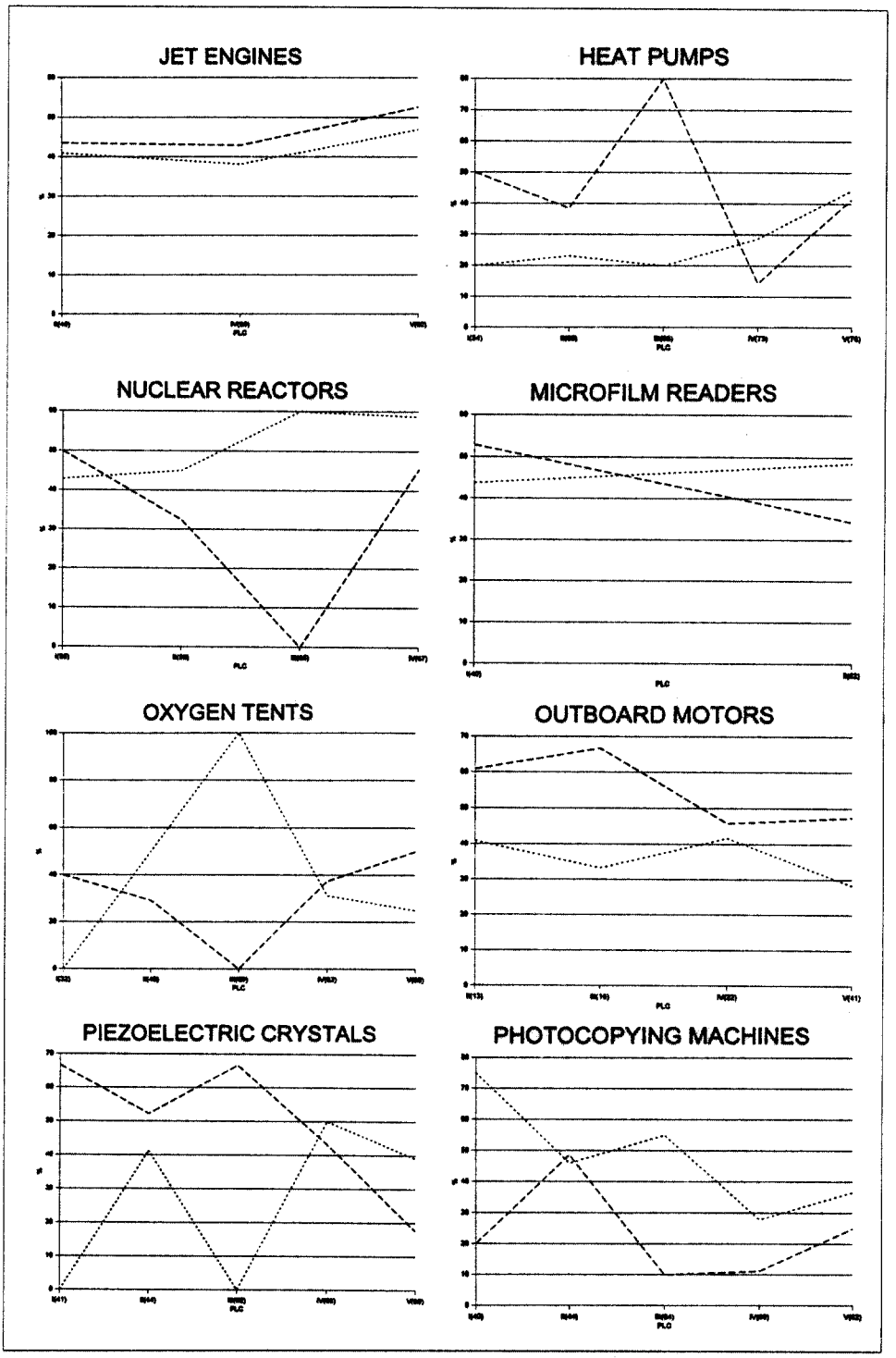
According to the empirical investigation (Figure 2 and Table 2), in the earlier stages (I, II), large portions of the firms emphasize demand-pull effects rather than supply-agglomeration effects : when the firms enter the industry facing earlier stages (I, II) of the PLC and decide the location, the firms consider more how the location will develop in the future rather than how many competitive firms exist in that location. In contrast, as the PLC goes on, the supply side effects than the demand side effects in locational choice are more concerned : when the firms enter the industry facing relatively later stages (II, III, IV, and V) of the PLC, they are more concerned about how many competitive firms exist in that location than how the location will develop in the future.

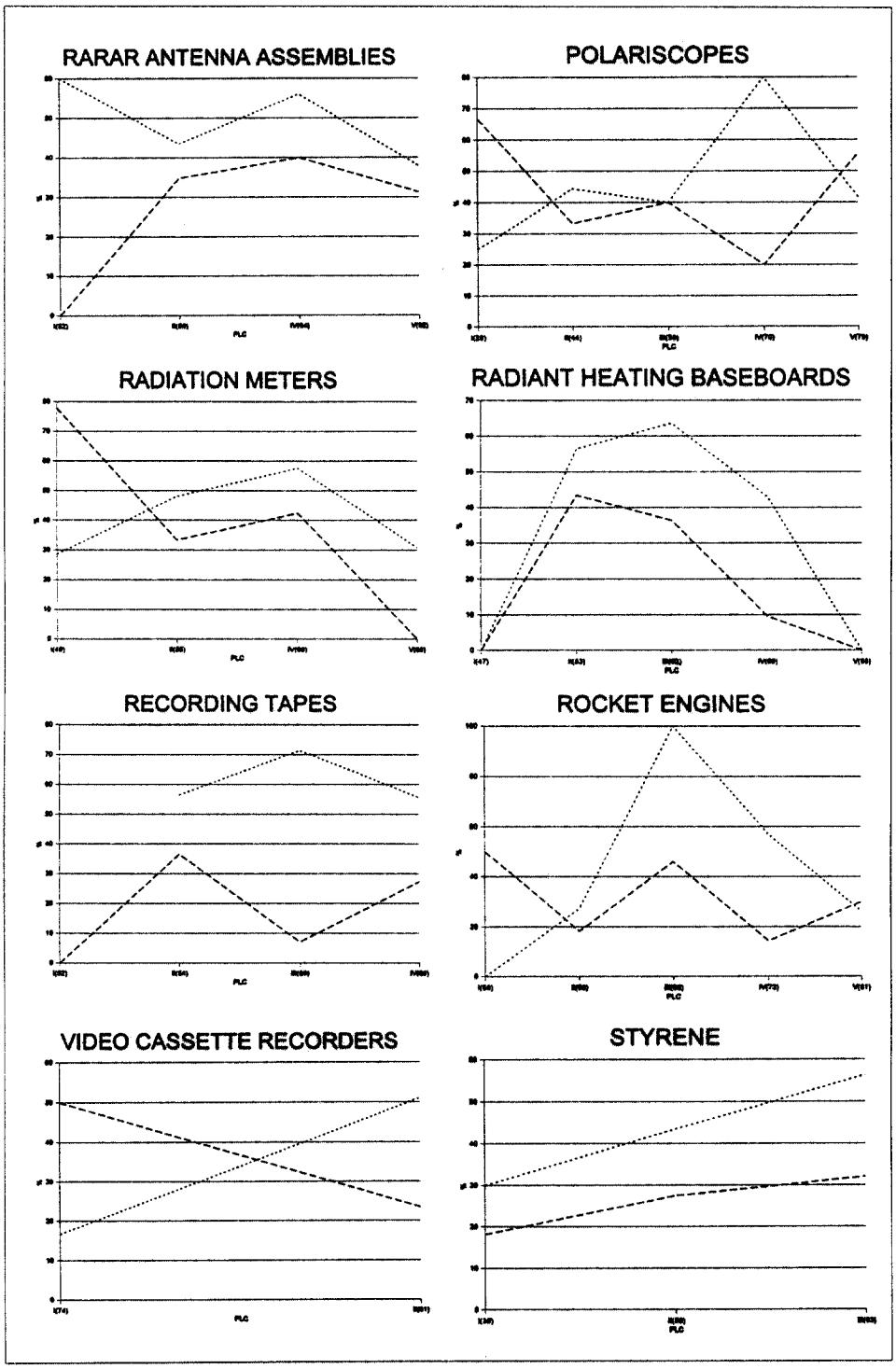
These empirical results are consistent with Krugman(1991b) and the results of the previous comparative static analysis. Krugman's results suggest that the

[Figure 2] Dmand-Pull vs. Supply-Agglomeration Effects in Locational Choice of Industries with the PLC




ELECTRIC BLANKETS
CONTACT LENSES
ELECTRIC SHAVERS
ELECTROCARDIOGRAPHS
FREON COMPRESSORS
FREEZERS
GYROSCOPES
GAS TURBINES


JET ENGINES
HEAT PUMPS
NUCLEAR REACTORS
MICROFILM READERS
OXYGEN TENTS
OUTBOARD MOTORS
PIEZOELECTRIC CRYSTALS
PHOTOCOPYING MACHINES


RARAR ANTENNA ASSEMBLIES
POLARISCOPES
RADIATION METERS
RADIANT HEATING BASEBOARDS
RECORDING TAPES
ROCKET ENGINES
VIDEO CASSETTE RECORDERS
STYRENE

stronger economies of scale and lower transportation cost induce "divergence" of firms into one region. This matches with the empirical result that firms emphasize "supply-agglomeration" effects at the later stages where transportation costs are relatively low and economies of scale are stronger compared to the earlier stages of the PLC. Likewise, another result is that weaker economies of scale and higher transportation costs stimulate the firms to get out of one region and close to the market. This is compatible with the empirical result that the firms stick to "demand-pull" effects at the earlier stage of the PLC.

Seventeen out of thirty sample industries studied show the pattern consistent results with the theory. Eight industries show that "supply agglomeration" effects dominate "demand-pull" effects across entire PLC stages. Only one industry indicates the opposite direction than predicted by the theory, and two industries are the case in which "demand-pull" effects entirely dominate "supply-agglomeration" effects. The remaining two industries are ambiguous. Considering the total relative importance of two effects over all stages of PLC, "supply-agglomeration" effects are superior to "demand-pull" effects in locational choice of industry.

V. CONCLUDING REMARKS

Theoretically and empirically, we examined that in the firms' locational choice facing the earlier stages of the PLC, the firms are more likely to emphasize the demand-pull effects than the supply-agglomeration effects. On the other hand, in the later stages of the PLC the firms are more likely to emphasize the latter than the former. 17 out of 30 sample industries showed results consistent with the theory. These findings confirm that the main conclusion of Krugman(1991b) be applicable in the PLC horizon of each industry, stronger economies of scale and lower transaction costs induce "concentration" of the firms into one region, and weaker economies of scale and high transportation costs favor "dispersion" of the firms to their markets.

If the demand-pull effects represent "future" and the supply-agglomeration effects "history", the result of this paper somewhat corresponds to the pattern of human life. In his or her young age, one adheres to his or her "future", and in his or her old age, one adheres to his or her "history". However, the prediction shall be apparent in industrial dynamism. The ongoing development of information technology will drastically reduce transaction costs and render the value of the physical distance less important than before. Thus the supply-agglomeration effects are expected to be less important in the future. On the other hand, transportation costs are also expected to be reduced continuously, which favor the supply-agglomeration effects. Therefore, the prediction will be dependent on the relative importance of both factors : the developing speed of information technologies compared to transportation technologies.

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