

Global Logistics Planning: how a location criterion affects a new plant setting ---An empirical study on the motorcycle industry

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ABSTRACT

Taiwan's geographically close to China, created other unique circumstances for direct interactions between Taiwanese and Chinese businesses. Obviously, in the view of cost savings and higher business efficiencies, the first step is to improve the competitiveness and understand the nature of market globalization. From the view of global logistic, internationalization is one way in which can help Taiwanese firms promote their competitiveness. Ideal site selection is definitely a critical factor for setting up a new plant decision. According to literature review, there are eight criteria affecting the location setting: cost, infrastructure, business service, labor, government, customer to market, supplier to source, and competitor. The main purpose of this study is to identify the impact of these different criteria on setting

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1.0 Introduction

1.1 Factors in Plant Location

Businesses setting up shop face such factors as basic material cost, infrastructure setup, business services, labor, government, customer/market, supplier/resources, and competition. The success of internationalizing a business is undeniably tied to the setup of the manufacturing plant. Many traditional industries in Taiwan have moved towards setting up plants in China to take advantage of and gain a competitive edge using its availability of cheap labor and raw material, but many of these businesses have not seen the profit margins they originally expected. Why is this so? This is a question worth investigating. The goal of this study is to discuss the factors that should be considered when businesses are looking to setup plants in either Taiwan or China so to provide a reference for them in this process.

1.2 Factors in Plant Location

When a manager decides to setup shop in a different country, how should he evaluate quality and quantity? When a company sets the main production plant in a country that lacks a basic utilities infrastructure, the frequent and unexpected power outages caused by an inadequate power system may frequently shut down the production line. This ultimately harms the company's productivity, lead time, inventory quality, production cycles, etc. Since the establishment of a basic utilities infrastructure is crucial to the operation of a plant, companies will look for this when considering locations. Bhatnagar, Jayaram, and Yue [2003] came up with eight main variables in plant location determination: basic material cost, infrastructure setup, business services, labor, government, customer (market), supplier (resources), and competition. This study uses these eight factors as the foundation in formulating hypotheses.

1.3 The Study's Hypotheses

The factor of initial plant location will ultimately influence the decision of which country the plant ultimately resides in; specifically, it determines whether the plant will be located in Taiwan or China. Generally, if company policy leans toward low manufacturing costs or being close to stable markets, then the company will prefer to setup shop in China. On the other hand, if the company stresses labor quality, infrastructure setup, and business services, then the company will prefer Taiwan. Similarly, if the

company wishes to participate in government policy on financial and tax issues, then it will prefer to be in Taiwan. Lastly, if the company is sensitive to its competitive status, then it will prefer to be Taiwan in order to closely monitor and learn from its neighboring competitors.

The following hypothesizes:

- H1: Companies that emphasize factors in basic material cost prefer to locate a plant in China rather than in Taiwan.
- H2: Companies that emphasize the existence of an infrastructure setup prefer to locate a plant in Taiwan rather than in China.
- H3: Companies that emphasize business services will prefer to locate a plant in Taiwan rather than in China.
- H4: Companies that emphasize labor factors will prefer to locate a plant in Taiwan rather than in China.
- H5: Companies that emphasize stability of government will prefer to locate a plant in Taiwan rather than in China.
- H6: Companies that emphasize customer/market-related factors will prefer to locate a plant in China rather than in Taiwan.
- H7: Companies that emphasize the proximity of suppliers will prefer to locate a plant in Taiwan rather than in China.
- H8: Companies that emphasize their competitive status will prefer to locate a plant in Taiwan rather than in China.

This study aims to achieve the following: 1) Discuss the types of overseas plants and how they increase competitiveness and 2) Investigate the factors that should be considered when setting up a plant, since the decision will ultimately affect the company's operational results.

2.0 Literature Review

2.1 Global Logistics

The world economy has shifted from nation-based economies to region-based economies and is moving towards a global economic system. Under this development, management of production of goods is no longer confined to one area, and now leaps across the boundaries of countries and continents. The life cycle of a product, starting from the purchase of materials, to manufacturing, storage, delivery, sales, and even post-sales service and management of the product at the end of its useful life now necessitates support in the form of business logistics, supply chain management (SCM), and, more broadly, global logistics management (GLM). A global logistics management system is basically any product distribution or supply chain which crosses country boundaries.

2.2 Logistics Management

D. J. Bowersox and D. J. Closs [1996] believed that logistics management included support unit strategies and systems design for control of materials and storage and transport of finished products. D. M. Lambert, J. R. Stock, and L. M. Ellram[1998] pointed out that "logistics" is the part of the supply chain process that involves planning, execution, and control of product and services from the start to the point of consumption including the effective exchange and storage of related data in order satisfy the customers' needs. P. Dornier, R. Ricardo, F. Michel, and K. Panos[1998] additionally added that "logistics" is the management process between the two points of sales and production. Function-oriented business unit structures involve dividing a company into separate departments, and logistics processes are important interfaces which exist within all the different business units.

2.3 The Criterion of Plant Location

Per actual observations, the most widely-employed method in displaying location quality is a tradeoff table which displays the different important variables. The motives and supporting factors of proximity to customers, climate, legal environment, and taxation are all assigned tradeoff levels and totaled using composite scores. Specific and general applications in industry can be found within the following texts: Ballou[1999], Bowersox and Closs[1996], Brucs[1985], and several others. This method is relatively objective and the outcome often aligns with the user's preferences. Schmenner[1979] emphasized location strategy and cautioned that relying too heavily on financial analysis leads to reset the location and undesirable answers when setting up additional production facilities. MacCormack, Newmann, and Rossenfield[1994] previously reviewed the global trade environment, new product systems, and the impact of new methods on the evaluation of plant locations. These scholars suggested that the current literature on the determination of plant location is too much limited to quantitative figures such as

transport costs, foreign exchange rates, rent and labor rates, and ignores such qualitative factors as basic infrastructure, labor skill level, the legal environment of the local government, and proximity to suppliers.

3.0 Research Method

Research Target and Questionnaire Design

The selected company in this study is a leader in the Taiwanese motorcycle manufacturing industry, which is considered a traditional industry. This study targeted the selected company's suppliers and other chosen companies who had recently established manufacturing plants in either Taiwan or China. The Likert 5-point scale was employed in soliciting the manufacturers' objective knowledge.

Collection Method and Basic Information

The questionnaires for this study were mailed to the suppliers of the selected company. A total of 142 copies were sent out, 51 was received back, and after additional contact 34 more copies were received for a total of 85 (60%). Out of the questionnaires returned, 19 were deemed invalid, so a grand total of 66 valid questionnaires were used. The sampling for this study consisted mainly of the suppliers for our selected motorcycle manufacturer.

4.0 Calculation Analysis and Discussion

Logistic regression and the more commonly used multiple regression both assume an existing cause and effect relationship between the independent and dependent variables and uses the various parameter calculations in the model to determine their correlation (positive or negative relationship). This study's analysis employs a dummy variable, with 1 representing a high relative model of entry (51%.100%) and 0 representing a low relative model of entry (0%.50%), which is very suitable for use in logistic regression. Additionally, in multiple regression, the independent variable's regression coefficient can be used to directly represent an independent variable's marginal effect on a dependent variable, but because the logistic regression model is not first order function, its independent variable coefficient (regression coefficient) can only be used to determine the direction of influence and not the marginal effects that an independent variable has on a dependent variable. In order to determine the marginal effect (probability), it is necessary to substitute the independent variable coefficient in the equation.

$$P(Y_i=1) = 1/[1+\exp(-a-bX_i)]$$

Y_i is the dependent variable, X_i is the i^{th} vector of the independent variable

a is the intercept parameter, b is the regression coefficient vector

Since the probability value increases with the value of the independent variable in the equation $P(Y_i=1) = 1/[1+\exp(-a-bX_i)]$, when the independent variable's parameter estimate value (regression coefficient) is positive it means that the factor in question has a negative impact on a company's decision to establish a plant in Taiwan. Conversely, a negative parameter estimate value represents a positive impact on the decision. In our model all variables are basically measuring the total impact of all variables.

Table 2: Logistic Regression Analysis Results

		B	S.E.	Wald	Degrees of Freedom	Significance	Exp(B)	EXP(B)'s 95.0% Confidence Interval	
								Lower boundary	Upper boundary
Geographic Location Factors	Basic material cost factors	-.017	.183	.009	1	.924	.983	.687	1.406
	Infrastructure setup	-.076	.189	.163	1	.686	.926	.639	1.342
	Business services	.255	.183	1.933	1	.164	1.291	.901	1.849
	Labor	-.238	.118	4.021	1	.045**	.788	.625	.995
	Government	.040	.135	.089	1	.765	1.041	.799	1.357
	Supplier	-.683	.343	3.957	1	.047**	.505	.258	.990
	Customer/Market	.358	.199	3.234	1	.072*	1.431	.968	2.114
	Competitor	-.056	.216	.066	1	.797	.946	.619	1.446
	Number of employees below 300	.147	.926	.025	1	.874	1.159	.189	7.123
	Constant	3.199	4.888	.428	1	.513	24.501		

Data source: Current study

Note: *P<0.1, **P<0.05, ***P<0.01

The table above displays the importance of the individual variables in the model. Three experience factors – labor, supplier, and customer/market – have been found to be significant predictability factors regardless of where the plant is located. The value of B in the table represents the logit equation's coefficient. A factor with a negative value is one which is emphasized by a manager who chooses to locate a plant in Taiwan, and those who choose China for a plant location will place emphasis on those factors with a positive B value. From this analysis we can see that companies which prefer a Taiwan location placed emphasis on labor ($p=0.045$) and supplier/resources ($p=0.047$).

5.0 Conclusion and Recommendation

5.1 This study concludes the following:

In conclusion, H4 and H7 are supported by this data. This discovery also validates the maturity of the motorcycle manufacturing industry in Taiwan and the fact that suppliers tend to group together in close proximity. Taiwan is already in a state of development; the electronics and machinery industries have especially achieved the highest level of effective development of its supply chain. Because of this, establishing a plant in Taiwan will allow a company to quickly reap the benefits from its various suppliers. This discovery supports Kim's (1998) and Singh and Yip's (1998) belief that close proximity to local suppliers is an important factor for multinational companies in Taiwan. Similarly, companies which stress customer/market factors ($p=0.072$) seem to prefer setting up shop in China, thus supporting H6. This conclusion makes clear that managers who locate plants in China have, as their main targets, local customers as opposed to regional or global customers. In summary, per Table 2, our hypotheses H4, H6 and H7 were supported, and the remaining hypotheses do not have sufficient data to be either supported or rejected. The main contribution of this study is its attempt to analyze the factors affecting the location of a plant in either Taiwan or China, since actual studies of this kind, on a large scale, are rare. Plant size is another control variable that is perceptibly different when comparing Taiwanese and Chinese plants.

5.2 Discoveries from the Study and Discussion

In the future, regardless of a Taiwanese or Chinese location in setting up plants, labor, suppliers, and customers and markets will be the ultimate drivers in the determination of location. This study provides concrete contributions in the area of operational strategy for managers of multinational corporations. While the world's businessmen are focusing their attention on China–tomorrow's "factory for the world," it is necessary to first understand its advantages, and when considering establishing operations there

evaluate the aforementioned labor, supplier, and customer/market issues. Additionally, before establishing shop overseas, first have a clear plan of action. If it is just an initial exploratory investment, then an overseas plant is best, and the monetary investment should be moderate as to not bring down the parent business in case the investment does not bear fruit. As for environmental factors, plant size and the type of industry and product are considered to be important controlling factors in the establishment of a plant.

5.3 *Suggestions for Future Study*

Future study in this area should consider a dynamic systems approach, since China is obviously a rapidly developing market and to study it using a passive method is risking the data quickly becoming obsolete. In order for companies to obtain a continuous competitive advantage, a dynamic approach to research is necessary, but the considerations involve higher costs and the necessity of greater resources.

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