

# A Study of the Relationship between the Automotive Third-Party Logistics Providers and Corporate Demanders

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**Abstract:** Managing the supply base is an important but complex issue for automotive manufacturers. This study, based on a model of Game Analysis to examine the relationships among manufacturers and third-party logistics suppliers. Results show that from the overall consideration, vehicle manufacturers outsourcing logistics business has become the direction of development.

**Keywords:** automotive industry; automobile logistics; automobile third-party logistics; relationship; Game Analysis

The industry is the representation of industrialization level for a country, which has a very large degree of industrial linkage. With the rapid development of China's automobile industry, automotive logistics market has ushered in tremendous business opportunities

## I. The connotation of an automobile logistics

Automotive Logistics refers to how to minimize the cost, in accordance with the needs of users, in the procession of transforming of auto parts, spare parts, vehicle from the supplier to the It mainly includes transportation, storage, packing, loading and unloading, distribution, circulation, information processing and other activities. Automotive Logistics may be divided into four parts by means of business process: the supply of logistics, production logistics, vehicle and spare parts sales, storage and transport, logistics and industrial waste recycling logistics. Supply logistics is the procession that upstream suppliers provide OEMs auto parts, raw materials, supplies, entrance to the vehicle factory's warehouses, etc. Production Logistics occurred mainly in the internal of a enterprise. It starts at the entrance from the warehouse to the production line consumption point, then finishes before the entrance of the garage. Vehicle and spare parts sales logistics refers to the logistics from product garage to the spare parts dealer's entrance between .

Automotive Logistics is a communication among materials suppliers, manufacturers, wholesalers, spare parts, logistics companies and end-user satisfaction, to achieve a organic integration from production to consumption.

## II. the concept and status of automobile third-party logistics

### Concept

Automotive industry supply chain is a whole chain of value and functionality, which focus on core automotive business, through the control of information flow, logistics, capital flow and other parts of the control during the procession of accessories, package assembly, the formation of vehicle product, and the delivery to consumers at the hands of suppliers, manufacturers, distributors.

With the globalization and specialization of automobile production, the automotive outsourcing industry chain gradually formed and developed, with the outsourcing of auto parts procurement, transportation, vehicle sales of transportation, recall, recycling and other sectors to a third party, not only the enterprise's core business can be assured, but also the logistics costs can be reduced. What's more, the whole supply chain operational efficiency can be improved. At present, the auto industry's competition has expanded from a single vehicle manufacturers to the entire supply chain. Competition , through third-party businesses, connect the entire supply chain participants effectively to share resources and improve overall competitiveness.

### Status

Automotive Logistics Distribution is recognized as the most complex and specialized area by the whole international logistics industry. The rapid development of China's automotive industry on the automotive logistics industry poses a severe challenge. It mainly includes: Firstly, the globalization of automobile production led to the global sourcing of automotive components, which has placed enormous demands to parts logistics. China has become the world's spare parts production base with a increasing demand for automotive parts; secondly, as the rapid expansion of China's automotive consumer market, demand in automobile logistics will rapidly increase; thirdly, the fact of the original asymmetric distribution of China's auto sales, increases the demand for automotive logistics.

Automotive Logistics in China is still part of a sunrise industry in its infancy. Europe and the United States automobile manufacturing enterprise's logistics costs accounted for 8% of sales, the Japanese auto makers are up to 5%, while car manufacturers in China's logistics costs have accounted for 15% of sales, which in one hand shows

the backwardness of China's auto industry logistics, in the other hand demonstrated its huge space for development.

#### the relationship between manufacturers and third-party logistics suppliers

In the early stages of the development of China's auto industry, as demand is greater than supply, there was room for considerable profit. The capacity of car manufacturers to pay the cost was strong. Also the most reliable protection for production was needed, which led to a redundancy of major components and high logistics costs in exchange for a reliable profit guarantee. In addition, due to historical reasons, China's largest bus companies have their own warehousing and transportation resources. Thus in the selection of logistics providers, they will give priority to the use of internal resources, and under certain circumstances, they will also use this as a way of transferring of cost and profit. Therefore, the domestic logistics costs was much higher than Europe, the United States and Japan's. With the competition of Chinese auto market and automotive logistics market continues to mature, this situation is changing.

Automobile manufacturers and logistics providers come to increasingly close interdependence and cooperation. Through the use of advanced information technology, automotive manufacturers and third-party logistics companies share information more extensively and intensively. Vehicle manufacturers and third-party logistics companies share information through information systems and data base. With checking third-party logistics company's system, car manufacturers can take the initiative to order parts directly and query the state. Third-party logistics providers may also enter the vehicle manufacturer's ERP system, the material subsystem, in accordance with authority, check vehicle manufacturer's parts inventory, vehicle order situation, orders from car manufacturers to parts suppliers and the like. Such information sharing can increase visibility, shorten response time, lower error rate and so on.

Another reflects of the close co-operation is the close co-operation between companies and logistics in procession of car manufacturers' decision-making process in the establishment of a new factory or the establishment of new purchasing center. Manufactures consulting their views and suggestions. Before the completion of the procurement center, the associated logistics solution had been identified. The simultaneous construction of logistics facilities and factories, fully embodies the car manufacturers and logistics companies to work closely together.

#### manufacturers and third party logistics providers Game Analysis

The amount of the manufacturer's distribution function of  $D$  depends on the quality cost of third-party logistics providers  $\alpha$  and manufacturers  $\beta$ , through their joint efforts, the retailer's optimal order quantity can reach the saturation

state order, then the manufacturer's distribution amount of function is as follows:

$$D = Q - \gamma \alpha^{-m} \beta^{-n}$$

Where  $Q$  is saturated order,  $\gamma$ ,  $m$ ,  $n$  for the cost-to-order effects of factors, both are normal numbers, The greater  $m$  value is that, the greater the cost of third-party logistics providers impact on the order. And thus the amount of access to distribution is bigger, and vice versa;  $n$  also has the same meaning.

Each delivery unit of a product, the manufacturer's marginal profit is  $\lambda$ , the marginal profit of third-party logistics providers is  $\mu$ , both of them are constant. The manufacturer's expected profit  $\pi_1$  is as follows:

$$\pi_1 = \lambda (Q - \gamma \alpha^{-m} \beta^{-n}) - \beta$$

The third-party logistics providers' expected profit  $\pi_2$  is as follows:

$$\pi_2 = \mu (Q - \gamma \alpha^{-m} \beta^{-n}) - \alpha$$

In the third-party logistics, the demanders have the priority in decision-making power as compared to third-party logistics providers. Of the two sides in the game, the third-party logistics demanders' needs are dominant, while providers are in a subordinate position. The two sides is in a kind of master-slave game relationship. Then the third-party logistics demanders need to think in an overall point of view, collaborating with logistics providers, control logistics service quality well, rather than merely see themselves as equal partners. They need to manage, monitor logistics service providers' service quality, and guide to enhance its quality of service standards.

Assume that the burden of third-party logistics demand side is not only the cost of its own, but also for the logistics service providers to provide quality guidance, investment in training, service or service provider in logistics facilities and logistics software, its input costs is  $t\alpha$ , the logistics service providers' input costs is  $1-t\alpha$ ,  $t$  means the proportion of the demand side's investment costs for the logistics provider account for the proportion of the total cost of inputs,  $0 \leq t \leq 1$ .

In the master and slave game, the third-party logistics demand side would be the first to give the logistics service providers input costs  $t\alpha$ . Providers, make their own input costs policy, the optimal  $\alpha^*$ , according to its response to determine their own optimal input costs  $\beta^*$ .

The first thing to consider about is the logistics service providers optimization model:

$$\begin{aligned} \text{Max } \pi_2^* &= \mu (Q - \gamma \alpha^{-m} \beta^{-n}) - (1-t) \alpha \\ \text{s.t. } m, n, \gamma &> 0 \quad 0 \leq t \leq 1 \quad \alpha \geq 0 \end{aligned}$$

The optimal solution to meet:

$$\frac{\partial \pi_2^*}{\partial \alpha} = m\mu\gamma\alpha^{-(m+1)}\beta^{-n} - (1-t) = 0$$

Solution was:

$$\alpha = \frac{m\mu\gamma}{(1-t)\beta^n} \quad (1)$$

The manufacturer's optimization model is as follows:

$$\text{Max } \pi_1^* = \lambda (Q - \gamma \alpha^{-m} \beta^{-n}) - t \alpha - \beta \quad (2)$$

substitute (1) into the equation (2), then the optimization model becomes:

$$\text{Max } \pi_1^* = \lambda \left( Q - \gamma(m\mu\gamma)^{\frac{m}{m-1}} (1-t)^{\frac{m}{m-1}} \beta^{\frac{n}{m-1}} \right) - t(m\mu\gamma)^{\frac{1}{m-1}} (1-t)^{\frac{1}{m-1}} \beta^{\frac{n}{m-1}} - \beta$$

The optimal solution to meet:

$$\frac{\partial \pi_1^*}{\partial \beta} = 0 \quad \frac{\partial \pi_1^*}{\partial t} = 0$$

Solution was:

$$\beta = \left( n^{m-1} \gamma n^{-m} (\lambda - m\mu) \right)^{\frac{1}{m+n+1}} \quad (3)$$

substitute (3) into the equation (1), Solution was:

$$\alpha = \left( n^n \gamma n^{n+1} (\lambda - m\mu) \right)^{\frac{1}{m+n+1}}$$

$$t = \begin{cases} \frac{\lambda - (m+1)\mu}{\lambda - m\mu} \dots \frac{\lambda}{\mu} \geq m+1 \\ 0 \dots \text{其他} \end{cases}$$

At present, domestic enterprises are mainly engaged in automotive logistics, including traditional transport companies, and automotive logistics company that are established by automobile manufacturing group. The former is mainly engaged in low-end automobile logistics, while the latter provides professional services for the management of vendor-based automotive logistics company. As China's auto market competition becoming increasingly fierce, car manufacturers continue to concern about the cost of logistics. Price competition in the current market is still the most important tool, forcing the car manufacturers continue to reduce costs. There is a huge compression space for logistics costs. Although the internal logistics is easier to command and control, it is difficult to reduce logistics costs considerably, considering the volume, management, technology and other aspects of reasons. In the course of competition, from the overall consideration, vehicle manufacturers outsourcing logistics business has become the direction of development.

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