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MODELING THE IMPACT OF E-COMMERCE ON THE INTERNATIONAL DIVISION OF LABOR

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Abstract

The development of the Internet and modern technologies has transformed wholesale trade to such an extent that most transnational flows of goods cover online platforms, reaching a situation where e-commerce has become a function of transnational B2B trade.

Keywords: e-commerce, B2B, labor.

Introduction

E-commerce is defined as a business model in which business is conducted through the Internet and electronic networks. E-commerce can be carried out in different forms and forms (Anjali Gupta, (2016)):

- in different types of business. There are players who only sell online.
- different involvement of the parties in e-commerce. Example: B2C, B2B, C2C, B2A, etc.

Strong market players such as Amazon, Alibaba, eBay, etc., dominate the e-commerce market segment, where net players participate (Nuray Terzi`a (2011)). Although these players have achieved a global presence, they do not dominate all markets. The "clean" e-commerce market is approaching maturity in many segments, and large companies have reached its dominant and monopolistic position in the market. Dominant companies are prone to unfair commercial practices that prevent small players from entering the market.

Literature review

By modeling product and information flows on separate but connected subnet domains, it is possible to demonstrate the nature of the relationship between logistics in geographic space and e-logistics in cyberspace. This is exactly what Yuko A., Samuel J. R. and Guido S. did in their work (Yuko Aoyama, Samuel J. Ratick, Guido Schwarz (2005)). Their results suggest that competitive transport costs can still play an important role in the logistics industry even after the introduction of B2B e-commerce. However, B2B ecommerce intermediaries have been adopted in all scenario decisions, which demonstrates the sustainability of the benefits that such intermediaries can provide and is a good predictor for the further growth of e-logistics.

Purpose

The single-purpose static optimization model presented by the authors minimizes the total cost of the supply chain in one case. Modern production processes, which rely on timely delivery and lean production strategy, usually require a couple of goals. First, the time needed to manage the supply chain based on demand should be minimized. Secondly, to minimize the number of goods in transit or storage in the system at any given time. The model can be extended to include numerous real-world goals by clearly including time and allowing goods to be stored at intermediate nodes between one period and the next. This paper introduces a special production order form according to transactional services.

Methodological approach and discussion

The work of arbitrators is very important and the efficiency of transactions has an impact on this. With the efficient operation of the transaction system, the distribution of the work of arbitrators is improved. This could include the cost of products and services and the level of financial literacy.

E-commerce today has become more used in the international financial system. Today there are many modifications of the concept of "e-commerce". It is now just as important to include in the e-commerce system and logistics service providers, and payment intermediaries and others. It is these transaction concepts that are formalized by many arbitrators. (Figure 1).

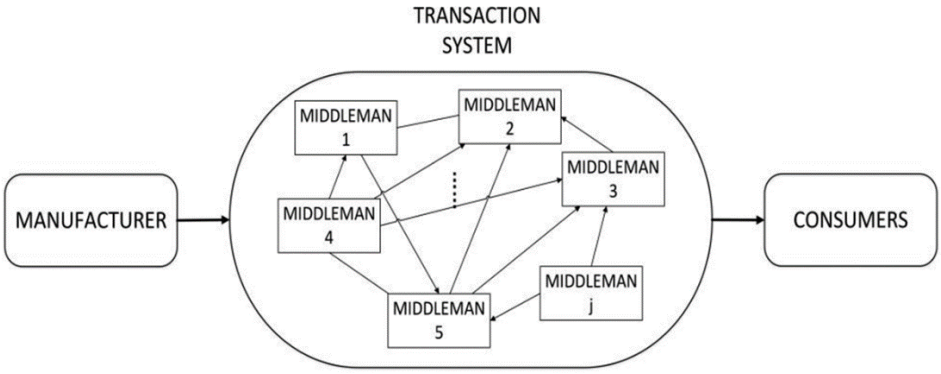

Figure 1. The structure of transaction systems

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By improving the efficiency of transactions, the cost of transactional services can be reduced. This will allow all intermediaries to better allocate their investments. This paper will demonstrate the issue of creating and trading supply of intermediaries. For the implementation of transactions, four types of transactional services are required: an enterprise of transactional industries, information work, logistics services and payment services. The size of the demand for the above services in the transaction is similar, i.e. 1:1:1:1 ratio.

One of the participants chooses from 1 to 4 types of transactional services. If he wants to start selling goods that belong to the middleman who manages the distribution, then there must be someone who is obliged to provide services in accordance with the agreement. Moreover, the number of goods that the intermediary trades depends only on the number of services that he provides to the given company.

The author constructed the following model (Li Wang, Yueting Chai and Yi Liu (2017)). Let *w, x, y* and *z* be the production of transaction management services, information services, logistics services, and payment services, respectively. The production functions of transactional services are as follows:

$$w = l_w^a \; x = l_w^b \; y = l_w^c \; z = l_w^d \tag{1}$$

where *a, b, c* and *d* are the degree of specialization economy of 4 types of services. We believe that there are increasing returns to scale in the production of transaction services. Thus, we have:

$$a > 1 \; b > 1 \; c > 1 \; d > 1 \tag{2}$$

Let $l_i \in [0,1](i = w, x, y, z)$ be the resource used to produce the service *i*. We think the total resource of a middleman is constant, and we let it be 10, so we have:

$$l_w + l_x + l_y + l_z \leq 10 \tag{3}$$

Let *N* be the quantity of commodity sold by a middleman, then:

$$N = \frac{w}{s} = wk \tag{4}$$

where s is essential services quantity and k is transaction efficiency.

If *i* > *w (i = x, y, z)*, the middleman has *i – w* units of transaction services to sell. If *i* < *w (i = x, y, z)*, the middleman has to buy *w – i* units of transaction services. The profit function is:

$$P = p_g N + p_x(x - w) + p_y(y - w) + p_z(z - w) \tag{5}$$

where p_c, p_x, p_y and p_z are the prices of commodity, information services, logistics services and payment services, respectively.

The optimal specialized production mode decision problems of a middleman are as follows:

$$\max P = p_g N + p_x(x - w) + p_y(y - w) + p_z(z - w) \tag{6}$$

$$s.t. \begin{cases} x = l_x^a,\ y = l_y^b \\ z = l_z^c,\ w = l_w^d \\ l_x + l_y + l_z + l_w \leq 10 \\ N = wk \\ 0 \leq k \leq 1 \end{cases} \tag{7}$$

To simplify the model, we think that the degree of specialization economy of information service, payment service and logistics service economy are the same, i.e.:

$$a = b = c = d \tag{8}$$

Thus, the decision problem could be rewritten as follows:

$$\max P = p_g N + p_x(x - w) + p_y(y - w) + p_z(z - w) \tag{9}$$

$$s.t. \begin{cases} x = l_x^a,\ y = l_y^a \\ z = l_z^a,\ w = l_w^a \\ l_x + l_y + l_z + l_w \leq 10 \\ N = wk \\ 0 \leq k \leq 1 \end{cases} \tag{10}$$

Now consider a system in which transactions are conducted with 100 intermediaries. Everyone must decide how many resources are required to be implemented in each of the 4 types of services. Prices are determined only by the ratio of supply and demand. The price drops when the supply rises. Conversely, when the supply falls, then the price falls. Then the price function looks like this:

$$P_g = g_g - hN_t \tag{11}$$

The price functions of transaction services are as follows:

$$P_i = g_i - h_i(i_{ts} - i_{td}), i = x, y, z \tag{12}$$

where N_t is the total quantity of commodities sold in the system, i_{ts} (i = x, y, z) is the total supply of service i in the system and i_{td} (i = x, y, z) is the total demand of service *i* in the system.

To simplify the model itself, we can assume that the price functions for these 4 types of services are the same. Then there will be the same gradients of price functions, that is:

$$g_x = g_y = g_z \tag{13}$$

$$h_x = h_y = h_z = h_w \tag{14}$$

The rules of simulation: If the total supply i_{ts} (*i = x, y, z*) of service *i* is less than the total demand i_{td} (*i = x, y, z*), then every demander can get $i_{ts}i_{md}/i_{td}$, where i_{md} (i = x, y, z) is the demand of the middleman. If the total supply i_{ts} (*i = x, y, z*) of service *i* is more than the total demand i_{td} (i = x, y, z), then every supplier can sell $i_{td}i_{ms}/i_{ts}$, where i_{ms} (*i = x, y, z*) is the supply of the middleman.

Results

If we talk about equilibrium prices, then they refer to the ratio of the equilibrium price of goods and transactional services (e/g). We change only the price of goods, while fixing the equilibrium price of services in order to change the relative equilibrium price:

- Economics specialization degree a = 3.
- Price gradient h = 2.
- Equilibrium price of transactional services g = 500.

The effect of different relative equilibrium prices on the distribution of intermediaries' resources is shown in Figures 2-4.

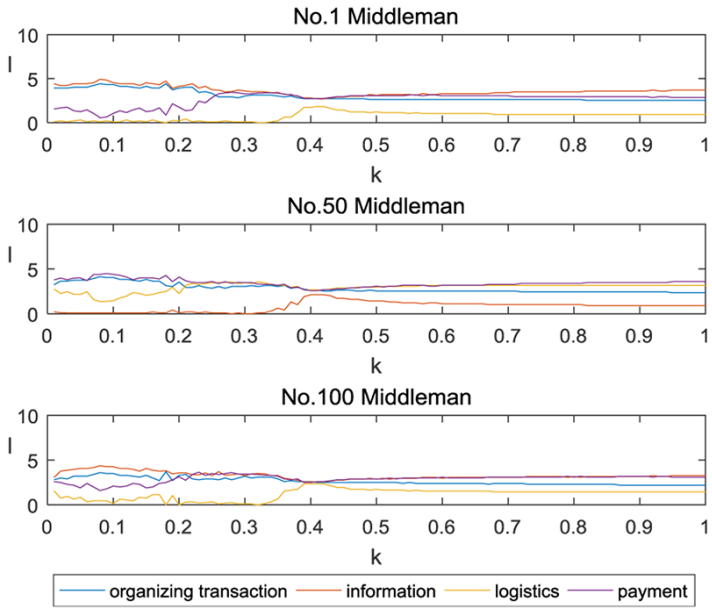

Figure 2. Commodity equilibrium price e = 1,000.

Source: modelling results

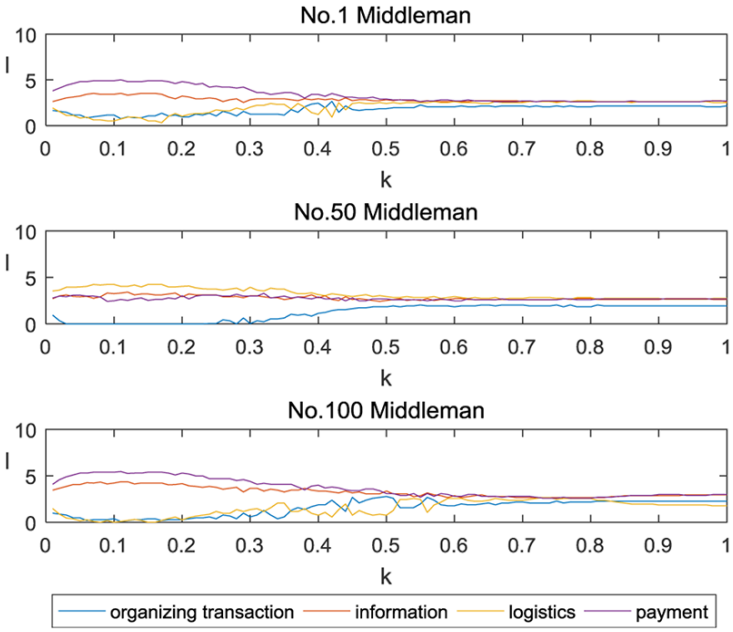

Figure 3. Commodity equilibrium price e = 2,000.

Source: modelling results

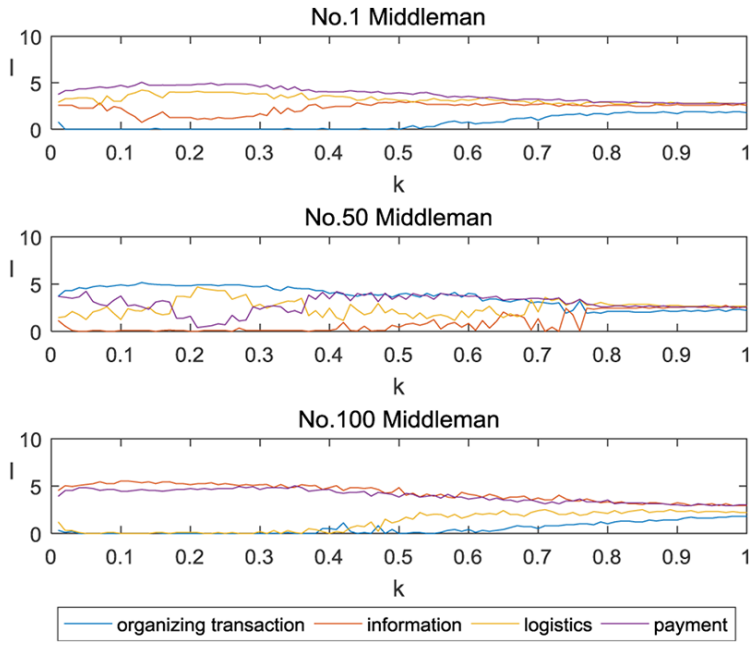

Figure 4. Commodity equilibrium price e = 3,000.

Source: modelling results

From the above results, we can see that with the increase in the efficiency of transactions, the level of division of labor first began to increase, then followed a decline, and then again increased. As the efficiency of transactions increases, the cost of purchasing transactional services decreases, which increases the investment of intermediaries' resources. The higher the price relative to equilibrium leads to an increase in profits from the sale of goods than from the sale of transactional services.

Conclusions

This paper has demonstrated the form of division of labor when using transactional services. If the market has a general demand for transactional services, then it is possible to create patterns of behavior of intermediaries and their solutions. In addition, this will allow us to investigate their impact on the efficiency of transactions.

A decision making model was developed to serve intermediary transactions. You should also consider the impact of the overall supply of services and market demand on prices. The results show that as the efficiency of transactions increases, the division of labor first increases, then decreases, and finally may rise again. Improving transaction efficiency lowers the cost of purchasing transactional services.

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