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THE APPROACHES TO ESTIMATION OF INFLUENCE OF PRICE DISCRIMINATION ON COMPETITION LEVEL OF AIRLINE INDUSTRY

The article is devoted to the methodological approaches of estimation of changes in the level of market competitiveness caused by price discrimination in the airline industry.

Keywords: airline industry, price discrimination, price elasticity of demand.

Стаття спрямована на пошук підходів до оцінки впливу цінової дискримінації на конкурентний стан авіатранспортної галузі.

Ключові слова: авіатранспортна галузь, цінова дискримінація, цінова еластичність попиту.

Статья направлена на поиск методик оценки влияния ценовой дискриминации на состояние конкурентной среды в авиатранспортной отрасли

Ключевые слова: авиатранспортная отрасль, ценовая дискриминация, ценовая эластичность спроса.

Introduction. The article is founded on the theoretical work by Borenstein [1] and the follow-on work by Holmes [2]. Borenstein shows that price discrimination could exist in a monopolistically competitive market. This important result suggests that traditional models, which prior to his work focused only on price discrimination in monopoly markets, are seriously incomplete. Holmes expands on Borenstein's results by building on the fundamental result that price discrimination is rooted in differences among consumers in their reservation prices and brand preferences. Holmes contribution is to show that one can conceptually separate the price elasticity of demand for an individual firm into an industry elasticity and cross-price elasticity in relation to other firms. When a firm unilaterally raises the price of its good, the industry elasticity measures the tendency of consumers not to buy the good at all, whereas the cross-price elasticity measures the tendency of consumers to buy from a rival firm selling imperfect (or heterogeneous) substitute.

Analysis of research and publications. Price discrimination on the basis of consumers' diverse industry elasticity is referred to "monopoly type" price discrimination by Borenstein and Rose [3], while "competitive type" price discrimination is based on consumers' diverse cross-price elasticity. The most important investigation testing between these types of price discrimination is carried out by Borenstein and Rose. The model of price dispersion in the airline industry shows that price dispersion is positively correlated with the level of market competitiveness. This empirical finding is suggestive of competitive-type price discrimination, and indirectly shows that heterogeneity in the tendency of consumers to switch airlines is the sole or dominant determinant of price dispersion

in the airline industry. On the other hand, it can be viewed as incomplete because they only indirectly examine the relationship between price discrimination and the two components of price elasticity. In addition, they are unable to separate the industry elasticity and cross-price elasticity as the sources of price discrimination in the model.

Goal of article. The goal of article is define approaches to estimation influence of price discrimination factor on conditions of competition in airline industry.

Primary part. The model of demand for air travel we consider is a three-stage budgeting model based on multi-stage budgeting approach developed by Gorman [4]. We assume that travelers can allocate total expenditure in stages so that their choice in each stage is made conditional only on the expenditures allocated in the upper stage and prices of goods in that stage. The decision tree in Figure 1 illustrates the structure of travelers' choice: (1) at the top stage, travelers decide whether or not to travel and expenditure is allocated to overall travel; (2) at the middle stage, given total travel expenditure, travelers determine modes of transportation; and (3) at the bottom stage, travelers' preference on airlines is revealed conditional on total expenditure on air travel.

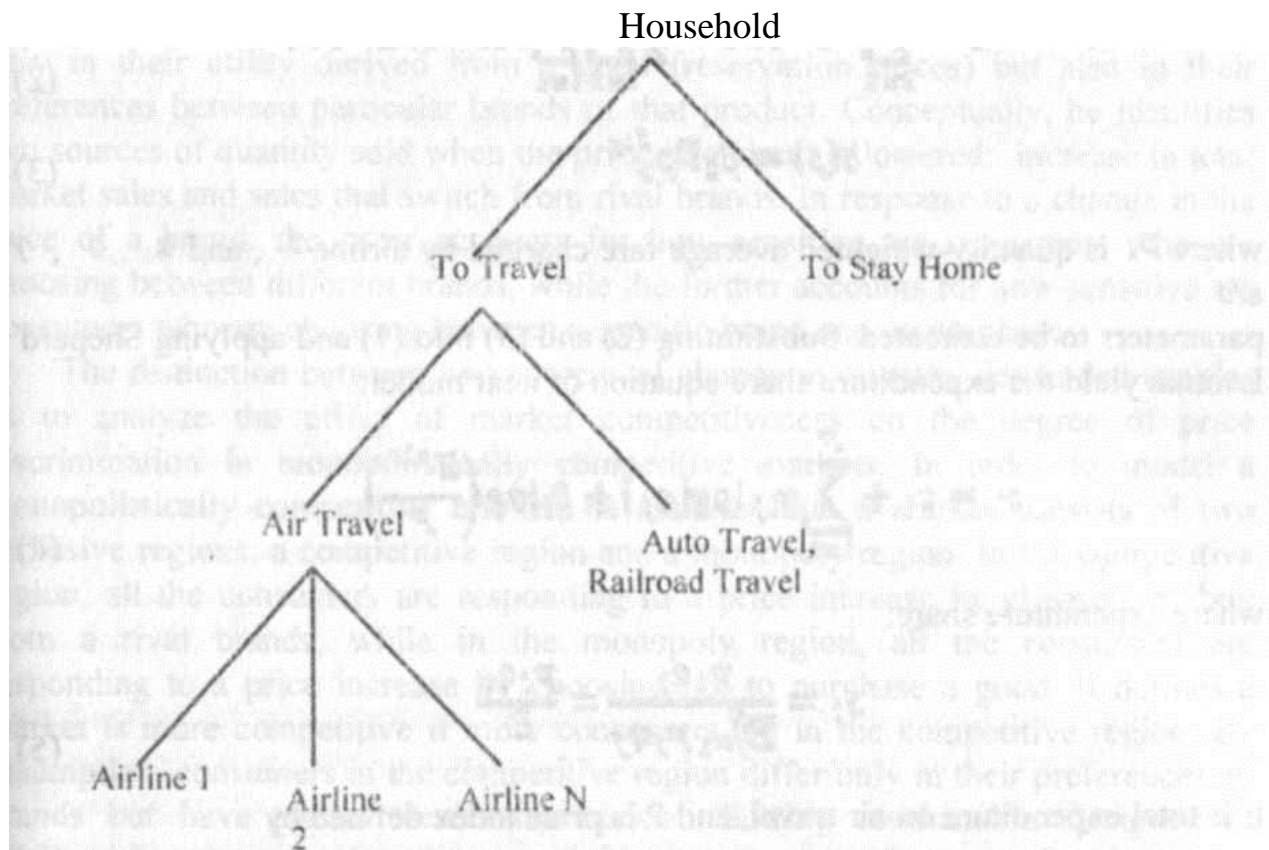


Figure I. The Consumer Decision Tree Regarding Travel

The multi-stage budgeting model allows us to empirically decompose an airline's own or firm level price elasticity' into cross-price elasticity other airlines

and an industry elasticity. Conceptually, cross-price elasticity measures the responsiveness of quantity demanded of a good to a unilateral change in the firm's own price with total expenditures given, whereas the industry elasticity measures the responsiveness of total quantity of airline travel demanded to a change in the overall price of air travel. Price elasticity measured at the bottom level in Figure 1 represents the cross-price elasticity, whereas at the top two levels, we observe the industry price elasticity of air travel. In this article, the focus is on measuring the cross-price elasticity among airlines at the bottom level of Figure 1.

Let the expenditure function for air travel on a route where N airlines are competing be defined as

$$\log u(p, y) = a(p) + u + b(y) \quad (1)$$

where u is the utility travelers derive from air travel and P is the air fare. This expenditure function allows exact aggregation over travelers such that demand for an airline can be represented as an outcome of decisions made by a rational representative traveler. We then take the following functional forms for $a(p)$ and

$$a(p) = a_0 + \sum_{i=1}^N \alpha_i \log p_i + \frac{1}{2} \sum_{i=1}^N \sum_{j=1}^N \gamma_{ij} \log p_i \log p_j \quad (2)$$

$$b(y) = \beta_0 \prod p_i^{\beta_i} \quad (3)$$

where β_i is quantity-weighted average fare charged by airline i , and $a_0, \alpha_i, \gamma_{ij}, \beta_0, \beta_i$ are parameters to be estimated. Substituting (2) and (3) into (1) and applying Shepard's Lemma yield the expenditure share equation of next model:

$$s_i = \alpha_i + \sum_{j=1}^N \gamma_{ij} \log(p_j) + \beta_i \log\left(\frac{E}{P}\right) \quad (4)$$

where expenditure share:

$$s_i = \frac{P_i Q_i}{\sum_{j=1}^N P_j Q_j} = \frac{P_i Q_i}{E} \quad (5)$$

E is total expenditure on air travel, and P is price index defined by

$$\log P = a_0 + \sum_{i=1}^N \alpha_i \log p_i + \frac{1}{2} \sum_{i=1}^N \sum_{j=1}^N \gamma_{ij} \log p_i \log p_j \quad (6)$$

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Let consider price elasticity. Price elasticity derived from non-linear expenditure share equation are:

$$\epsilon_{ij} = -\beta_{ij} + \frac{P_{ij}}{S_i} - \frac{\beta_i}{S_i} \left(\alpha_j + \sum_{k=1}^n \alpha_k p_k^* \right) \quad (7)$$

In the standard model of market structures, a monopoly firm may charge different prices to consumers with different price elasticity of demand, provided it is able to segment the market into different sub-groups of consumers and to prevent resale by consumers who pay the lower price to those who pay the higher price. In a perfectly competitive market, firms have no market power to price discrimination—there exists only one price. From these two extreme cases, one could infer that in an imperfectly competitive market, the degree of price discrimination of a firm would increase as a market becomes more concentrated. Contrary to our intuition, theoretical works by Borenstein and Holmes provide formal models in which price discrimination may increase with market competition.

Using a spatial model of monopolistic competition, Borenstein [1] shows that the effect of market competition on the level of price discrimination by firms depends on the sources of price discrimination. He allows consumers to differ not only in their utility derived from a good (reservation prices) but also in their preferences between particular brands of that product. Conceptually, he identifies two sources of quantity sold when the price of a brand is lowered: increase in total market sales and sales that switch from rival brands. In response to a change in the price of a brand, the latter accounts for how sensitive are consumers who are choosing between different brands, while the former accounts for how sensitive are consumers who are choosing between a specific brand and no purchase.

The distinction between two sources of change in quantity demanded enables us to analyze the effect of market competitiveness on the degree of price discrimination in monopolistically competitive markets. In order to model a monopolistically competitive market, he assumes that a market consists of two exclusive regions: a competitive region and a monopoly region. In the competitive region, all the consumers are responding to a price increase by choosing to buy from a rival brand, while in the monopoly region, all the consumers are responding to a price increase by choosing not to purchase a good. It defines a market is more competitive if more consumers are in the competitive region. By assumption, consumers in the competitive region differ only in their preferences on brands but have similar reservation prices. Sorting mechanisms designed to distinguish consumers by their reservation prices are of no use in identifying consumers in the competitive region with different brand preferences. Therefore, one could predict that, if consumers are sorted by their preferences on brands, the level of price discrimination is expected to increase as a market becomes more

competitive due to increased inter-brand competition. The distinction between discrimination based on the tendency to switch brands from one based on the tendency to leave the market is first analytically formulated by Holmes. Using a symmetric duopoly model of differentiated products, he shows that in an oligopoly model, price elasticity (ϵ^p) consists of cross-price elasticity (ϵ^{cross}) and industry elasticity ($\epsilon^{industry}$) such that

$$\epsilon_{price} = \epsilon_{cross} + \epsilon_{industry} \quad (8)$$

and the price-cost markup formula is

$$\frac{p-c}{p} = \frac{1}{\epsilon_{price}} = \frac{1}{\epsilon_{cross} + \epsilon_{industry}}$$

When a firm unilaterally increases its price of a good, the cross-price elasticity measures the tendency of consumers to move on to a competing firm or brand, while the industry elasticity captures the tendency of consumers to drop out of the market. Price discrimination is defined as "monopoly type" if discrimination between consumers is due to their differences in industry elasticity; price discrimination is defined as "competitive type" if discrimination between consumers is due to their differences in cross-price elasticity.

In an example described in Table 1, type A consumers are more sensitive to price changes than type B consumers and therefore, if price discrimination is allowed, they will be charged a lower price in equilibrium.

Table 1.- An Example of Monopoly- and Competitive-Type Price Discrimination

		Cross-Price Elasticity	Industry Elasticity	Price Elasticity
Case 1	Type A	1	1.5	2,5
	Type B	1	0,5	1,5
Case 2	Type A	1.5	1	2.5
	Type B	0,5	1	1,5

Under the traditional price discrimination model (price discrimination based on the differences in price elasticity), each consumer type will pay identical equilibrium prices in both case 1 and 2. Even though each type of consumers has same aggregate price elasticity in both cases, the source of differences in price elasticity between each type is not alike. For example, consumers' heterogeneity in the industry elasticity in case 1 yields distinction between different types of consumers, while heterogeneity in the cross-price elasticity in case 2 causes

distinction between different types of consumers. Under monopoly type price discrimination, consumers are sorted by their industry elasticity such that type B consumers will be charged a higher price only in case 1. Meanwhile, under competitive type price discrimination, price discrimination will only be observed in case 2 in response to differences in the cross-price elasticity. Borenstein and Rose [3] carry out an investigation empirically testing which type of price discrimination is practiced in the U.S. airline industry. Using a reduced form model of price dispersion in airline markets, they find price dispersion is correlated with more competitive structures. In their study, price dispersion refers to the variation in prices charged to different passengers by an airline on a route. The dispersion of fares in the airline industry results both from the variation in the costs of serving different types of consumers and from self-selective discriminatory pricing. Due to data limitations and possible correlation between costs of serving different consumers and discriminatory prices charged on heterogeneous consumers, it is difficult to empirically discern discriminatory pricing from cost variation as a source of price dispersion. This result confirms the theoretical prediction of competitive type price discrimination, and indirectly shows that heterogeneity in the tendency of consumers to switch airlines is the sole or dominant determinant of price dispersion in airline markets.

Conclusions. Using of the model of price discrimination in modern conditions of airline: industry in Ukraine can help better understand consumers behavior and conduct forecasting more precisely.

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ПІДХОДИ ДО ОЦІНКИ ВПЛИВУ ЦІНОВОЇ ДИСКРИМІНАЦІЇ НА КОНКУРЕНТНИЙ СТАН АВІАТРАНСПОРТНОЇ ГАЛУЗІ

Однією з ознак, що характеризують авіатранспортну галузь є припущення про тісний кореляційний зв'язок між розсіюванням цін на авіап перевезення та загальним рівнем конкуренції на ринку. Моделі, що дозволяють розраховувати щільність зв'язку між цими параметрами повинні враховувати не тільки еластичність попиту на послуги окремих суб'єктів ринку, але також еластичність попиту на послуги окремої галузі загалом та перехресної еластичності між продуктами гравців ринку та субститутами, тобто перевезеннями іншими видами транспорту, що вишивають на рівень попиту. Спостереження за поведінкою споживачів, що підтверджуються досвідом стверджують, що цінова детермінанта є домінуючою при прийнятті рішення щодо вибору чи зміни того чи іншого продукту галузі. Теоретичні моделі, побудовані дослідниками Боренштейном та Холмсом [3] дозволили кількісно отримати результати, що підтвердили вищезазначені припущення для умов монополістичної конкуренції американського ринку авіап перевезень. Моделювання прецесії, що відбуваються на ринках з різними рівнями конкуренції виявили тенденції до зміни споживачами продуктів в межах однієї галузі за критерієм ціни в умовах монополістичної конкуренції. Достатньо високий рівень перехресної еластичності між продуктами окремих галузей, особливо за умов олігополістичної конкуренції однієї з них спонукають споживачів до переключення на продукти-субститути іншої.

Використання моделей спрямованих на отримання кількісної оцінки зв'язку між факторами цінової дискримінації і рівнями конкуренції у окремих галузях дозволять краще розуміти поведінку суб'єктів ринку та підвищити точність прогнозування.

Ключові слова: авіатранспортна галузь, цінова дискримінація, цінова еластичність попиту.