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PRACTICE ARTICLE

Are airline passengers ready for personalized dynamic pricing? A study of German consumers

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Abstract Today, dynamic pricing (DP) in most industries is an established form of pricing, and supported by the DP functionality of many revenue management (RM) systems and the general simplification of airline pricing driven by low-cost carriers. The technological changes (NDC, Big data, IoT, etc.) allow further steps for price differentiation culminating in either personalized or personalized dynamic pricing (PDP). PDP as we define it is not to be confused with the traditional DP of today's RM practices. Whether appropriate strategies for a 1:1 price setting can be successfully implemented in the market, depends on several factors: (1) technological advances in data mining and the ability to detect customer preferences (2) the ability to accurately determine customer's willingness-to-pay by predictive analytics; (3) the use of personal data by airlines and its acceptance by consumers as well as (4) the medium-term impact on customer loyalty and the associated risks for the sustainability of the whole airline business model.

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Dynamic pricing in a complex and volatile environment

Due to high global economic growth rates and increased competition among low-cost carriers (LCC) and legacy airlines, the demand for airline tickets has grown considerably in recent years. Growth opportunities for RM have increased simultaneously as airlines are able to increase load factors and at the same time yield per passenger. In this context, LCC play a pivotal role, since their business model includes opportunities and risks for the whole industry. The original low-cost operating model, established by Southwest Airlines, has been adapted by many other airlines worldwide. Simplifying the pricing model led both to a strong acceptance of LCC's pricing by customers and thus gave impetus for further growth in demand. At the same time a waiver or relaxation of ticket conditions decreased the ability of RM to implement fencing conditions and thus its ability to exploit the customers' willingness-to-pay (WTP). For RM this is counterproductive because consumer surplus increases. As Belobaba stated, "[…] although welcomed by consumers, simplified fares took from the airlines their most effective way of segmenting business and leisure demand" (Belobaba 2010). Moreover LCC still exert a significant price pressure on the airline industry worldwide. A prominent example is Ryanair in Europe. The market entry of Ryanair in Germany let airline fares decline on routes Ryanair started to operate.

Besides the goal of increased demand and utilization, yield improvement plays an essential role for RM managers. One component that has become increasingly important is selling ancillary products. In the last decade, there has been a "de-bundling" trend in the airline industry, where specific services that used to be included in a fare are now priced separately (Rosenstein 2013).

Revenues are generated by direct sales to passengers, or indirectly as a part of the travel itinerary. O'Connell and Warnock-Smith (2013) distinguish between three categories: à-la-carte, commission-based (also called "third-party") and frequent flyer activities. Unbundling or versioning reduced the risk of not explicitly knowing the price sensitivity of an individual customer. The customer always has the choice to select the product that best meets his needs. However, this kind of modular pricing has its limitations. One stark criticism of this approach is that the purchase process is becoming customer-unfriendly and the prices are perceived as unfair by customers (Friesen 2008). Southwest's 'Transfarency' campaign was started in 2015 to counter these customer concerns. There might also be a difference in the customer perception of ancillary pricing implemented by LCC in contrast to traditional carriers, as O'Connell and Warnock-Smith (2013) point out: "If the basic fare is truly competitive and cost leadership is consistently achieved as is the case with Ryanair then there will be a core of passengers who see the benefit of picking and choosing how many add-ons they want to arrive at a value based fare grounded on willingness to pay."

Improved technologies such as the new distribution capability (NDC) and enhanced insights into customers due to higher volumes of data and enhanced data quality improve the airline's ability to set personalized prices (PP) (Fig. 1). The WTP can be determined exactly at the moment of the customer's request based on the availability of real time data (i.e., days to departure, length of stay, booking behavior). At the same time the dramatic increase in companies' efforts to collect and use customer data have made customers more concerned about their privacy and the potential of data leakages and misuses (Martin et al. 2016). On the one hand, the prerequisite for identifying the WTP on an individual basis improves data about the search behavior of potential customers that can be used. This can be further extended by the purchase history and shopping for products as well as information on customer value (Krämer and Kalka 2016). On the other hand, customers' concerns about privacy and unfair price discrimination might effectively weaken customer loyalty (Office of Fair Trading 2013). Some of the facets of these new forms of price discrimination are:

- Browsing-based pricing: the customer's browsing history generates data and knowledge about his willingness-to-pay and his potential future travel interests.
- Past-behavior-pricing: the customer's transactions and hence his brand loyalty in the past (products bought, products rejected, price etc.) determine the current price.
- Devices-based-pricing: the use of the technical device (type of smart phone, PC, Laptop, Tablet), which generated the query, influences the price.
- Demographically-based-pricing: the customer's age, gender or income level or postal code allows an estimation of his willingness-to-pay.

The Executive Office of the President of the U.S. (2015) emphasizes, since "[…] it becomes easier to predict individual customers' willingness to pay and charge different prices for an identical product, versioning may be replaced by personalized pricing".
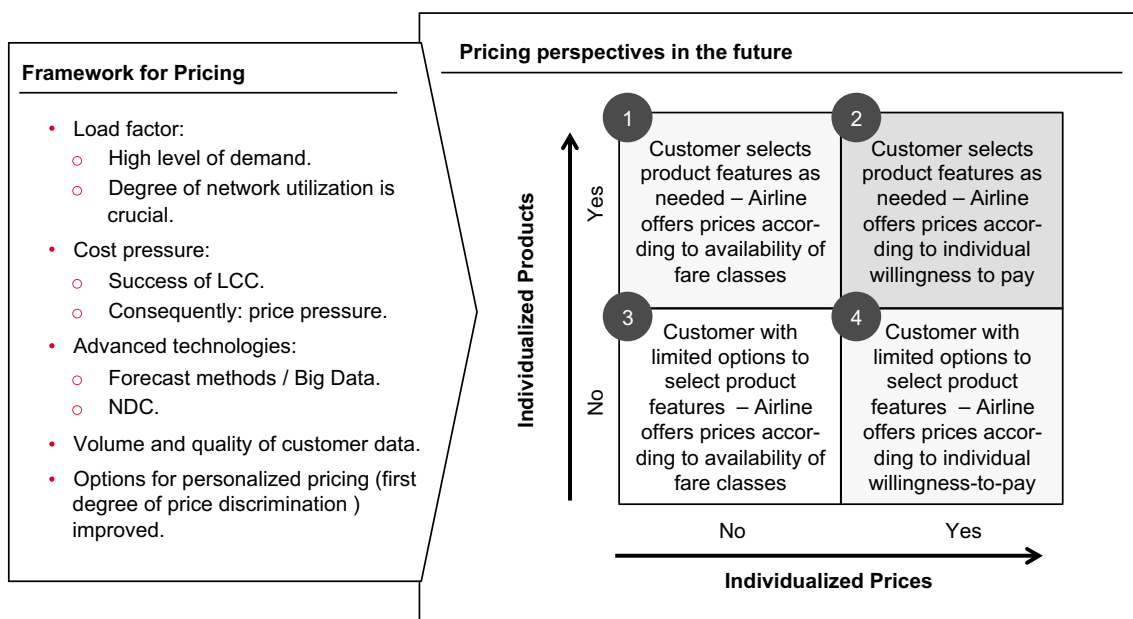
Fig. 1 Framework for pricing and future perspectives

Figure 1 depicts the opportunities to individualize products and prices from an airlines' perspective. The upper right quadrant (2) depicts the most advanced PP option. If two customers book an itinerary with identical conditions at the same time, they pay different prices, depending on their personal WTP. This form of price differentiation in theory comes close to perfect price discrimination, but at the same time has its limitation. First, there are major technical challenges. The amount of data required to predict individual price elasticity as well as the appropriate forecasting models will need to be explored and established. At this time those forecasting approaches have not been well documented. However, it is clear that with sufficient personal shopping (availability searches) and booking history available to analyze, developing individual customer price sensitivity profiles is feasible. There is a similarity in predicting the individual customer's price sensitivity to modeling potential customer turn down in RM. A future question will be how accurate those predictions of customers' WTP and demand for specific itineraries will be and how this knowledge can be incorporated into better network revenue optimization processes. In addition, a more complex and volatile environment may cause the WTP of individuals to become less robust (Krämer 2015). This creates a formidable challenge to the technology for automated pricing. Once technological challenges have been met, the question arises as to what extent this PP will be accepted and perceived as fair by airline customers (Friesen and Reinecke 2007).

Industry specific customer acceptance of dynamic pricing

Although technological and privacy issues are highly relevant (Lamberton and Stephen 2016), the focus of the paper is consumers' acceptance. Our conclusions are based on a representative survey of consumers in Germany (18+ years), which was conducted in June 2016 (online, $n = 968$). The subjects were recruited via two different online access panels. Age, income and mobility structures were examined and weighted. Since the frequency to use different means of transport has been recorded in an introductory part of the survey, it is possible to segment consumers. Main topics that have been included in the survey were the perception and evaluation of DP (as is currently practiced in RM) in various industries as well as the acceptance of different approaches to price discrimination from a customer's perspective. In this context, differentiating two segments - airline customers ($n = 300$) and airline non-customers ($n = 668$) is beneficial. Overall, the segment of airline customers shows a higher share for age group <30 years (28 vs. 17%) and a lower share for

age group 60+ years (27 vs. 34%) compared with airline non-customers. As expected, income level and total number of trips per year for airline customers are significantly higher. Among airline customers Lufthansa (83%), followed by Air Berlin (70%) and Eurowings (61%) are most frequently used.

Figure 2 shows (i) the past experience of consumers with flexible pricing and (ii) the level of acceptance according to different industries. Experiences with flexible pricing are particularly pronounced in the group of airline customers (63%). This corresponds with the finding of Kimes (1994; see also Wirtz and Kimes 2007) that by most consumers the practice of DP is more likely to be perceived as fair, once RM becomes used and accepted. After all, 28% of respondents, who have not flown in the last 12 months, state that they have previous experiences with flexible rates in the airline industry. Every second airline customer accepts DP, yet one-fifth of airline customers here still express strong reservations about the practice.
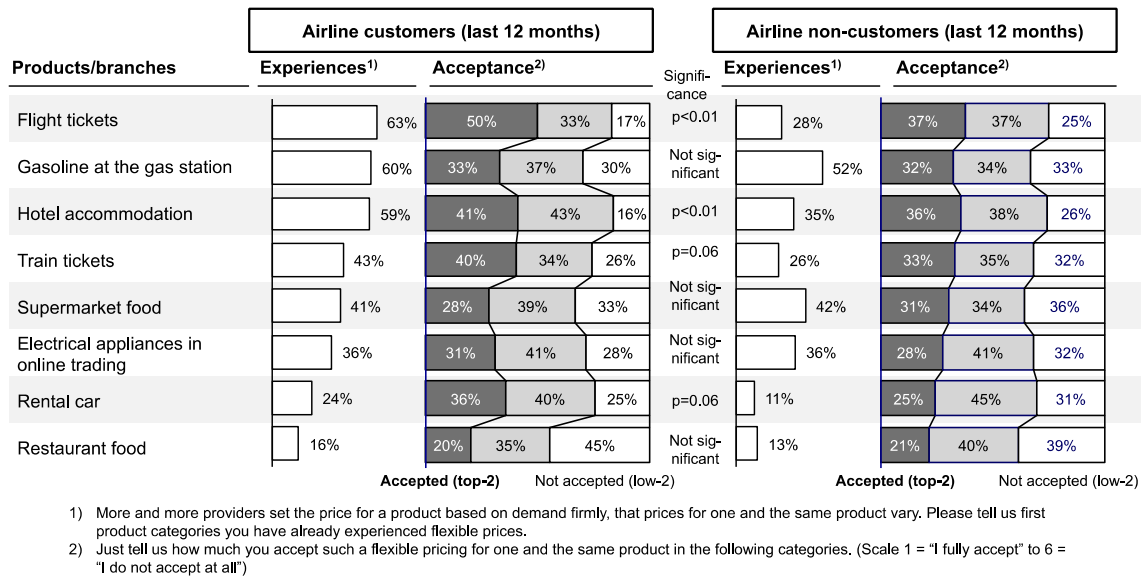
When comparing the different industries it can be shown that the acceptance level of DP has a large bandwidth. Especially, flexible prices at gas stations in Germany reach a low level of acceptance from a consumer's perspective while at the same time the level of experience with flexible prices is high. The group of supporters is about as large as the group of individuals who reject the approach. Despite the relatively high acceptance level in the airline industry one cannot conclude that a consistently positive attitude towards airline RM is present in the public. And this, even though the mechanism is established in the market for 30 years. As McMahon-Beattie (2011) stated, "[…] there still remains a sense that RM is something that is done to customers rather that something that is done for the customer."

The partial lack of conviction of the consumer as to the advantageous nature of DP is nourished by examples of excessive price changes that occur as part of the surge in pricing Uber rides. This was the case after a bomb attack in New York on Sep. 24, 2016. Uber nearly doubled its fares from normal rates. This led to complaints on social media as customers accused the company of price-gouging. Two years before, Uber created a controversy for introducing surge prices during a terror scare. The company said it was "truly sorry" for raising prices during a deadly hostage taking episode in Sydney.

Personalized dynamic pricing (PDP): consumer reluctance and reasons why

In this paper, we use the term PP as defined by Choudhary et al. (2005) to describe a situation in which a firm implements a pricing policy based on complete knowledge

Products/branches	Airline customers (last 12 months)				Signifi-cance	Airline non-customers (last 12 months)			
	Experiences[1]	Acceptance[2]				Experiences[1]	Acceptance[2]		
Flight tickets	63%	50%	33%	17%	p<0.01	28%	37%	37%	25%
Gasoline at the gas station	60%	33%	37%	30%	Not sig-nificant	52%	32%	34%	33%
Hotel accommodation	59%	41%	43%	16%	p<0.01	35%	36%	38%	26%
Train tickets	43%	40%	34%	26%	p=0.06	26%	33%	35%	32%
Supermarket food	41%	28%	39%	33%	Not sig-nificant	42%	31%	34%	36%
Electrical appliances in online trading	36%	31%	41%	28%	Not sig-nificant	36%	28%	41%	32%
Rental car	24%	36%	40%	25%	p=0.06	11%	25%	45%	31%
Restaurant food	16%	20%	35%	45%	Not sig-nificant	13%	21%	40%	39%
		Accepted (top-2)		Not accepted (low-2)			Accepted (top-2)		Not accepted (low-2)

1) More and more providers set the price for a product based on demand firmly, that prices for one and the same product vary. Please tell us first product categories you have already experienced flexible prices.

2) Just tell us how much you accept such a flexible pricing for one and the same product in the following categories. (Scale 1 = "I fully accept" to 6 = "I do not accept at all")

Fig. 2 Experience and acceptance of flexible prices of German consumers according to industry

of the WTP of each consumer. According to this understanding PP represents a very specific form of price discrimination and may not be used synonymously with the term DP. In general, DP is a method whereby the available price changes dynamically over time due to changes in demand, capacity, availability or competitive reactions. However, DP as it is currently practiced does not really consider price elasticity of each individual customer explicitly and therefore is not yet PDP. Therefore, we extend this definition to a point, where the seller sets a specific price for each customer determined at the precise moment when he wants to buy a product. In this case, it is personalized dynamic pricing (PDP) with various factors accounted for, e.g. available prices from RM, individual customer price sensitivity, loyalty affiliation, customer life time value, etc. determining the PDP. Thus, a differentiation from other dynamic forms of price setting is possible: couponing, auctions and forms of participatory pricing ("Name your own price" and "Pay-what-you want"). In this case, the customer has the ability to exert a certain influence on the price he is asked to pay (Kim et al. 2009). If the customer, for example, receives a personalized coupon (the provider has identified the customer as price-sensitive based on his previous purchasing behavior), it is the decision of the customer whether to redeem the coupon or to do nothing.

In our study, different forms and models for differentiating rates were examined, reaching a very different acceptance level from a consumer perspective. Price differentiation based on volume discounts is well established and accepted (Krämer and Burgartz 2016). Two-thirds of consumers fully accept such a form of price differentiation (Fig. 3). Lower acceptance levels arise for pricing models, where the
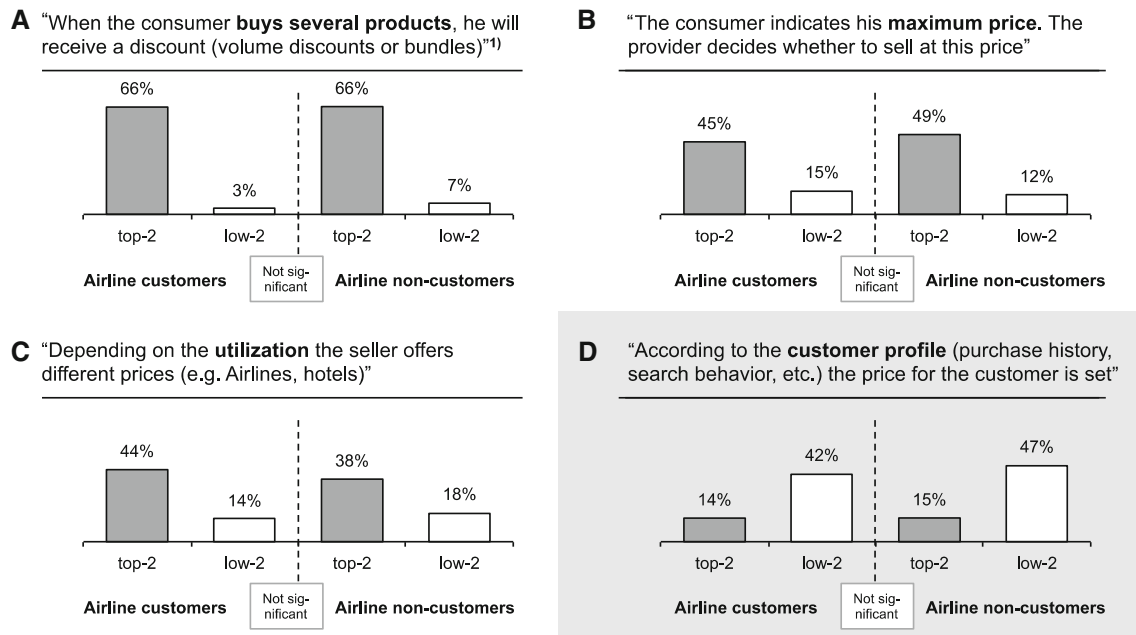
consumer indicates a maximum price and the seller either accepts or rejects the price ("Name your own price"). Price discrimination depending on capacity utilization is somewhat less accepted than coupons (44% top-2 evaluations among airline customers, 38% for non-airline customers). Consumers are particularly critical of price models where prices are determined based on the customer profile (shopping history, seeking behavior, etc.). Here, acceptance levels are only around 14–15% top-2 evaluations. About half of consumers reject this form of pricing categorically (CONPOLICY 2016). Barnasek and Mongan (2015) see information asymmetry as driver of a growing reluctance.

These results also confirm previous studies: Turow et al. (2005) find that 90% of customers disagree with the statement that "It's OK if a store charges me a price based on what it knows about me." However, there are also many instances where customers are not bothered by PP. In fact, it appears that customers have little objections with different people paying different prices for the same product, as long as the pricing scheme is perceived to be fair (Friesen 2008; Bayraksan et al. 2011).

While PDP is an intriguing area of DP with a rich potential, it comes also with some limitations in terms of risks of customer rejection, as the following examples demonstrate:

- In 2000, Amazon infuriated many customers when it sold DVDs to different people for different prices. Amazon called it merely a test and ultimately refunded the price difference to people who paid more. (Valentino-Devries et al. 2012).
- In 2012 CBS reported that Minnesota's largest airline (Delta) was making changes after a researcher uncovered frequent flyers were paying more for some plane

A "When the consumer **buys several products**, he will receive a discount (volume discounts or bundles)"[1)]

66%   3%   66%   7%
top-2   low-2   top-2   low-2
Airline customers   Not significant   **Airline non-customers**

B "The consumer indicates his **maximum price.** The provider decides whether to sell at this price"

45%   15%   49%   12%
top-2   low-2   top-2   low-2
Airline customers   Not significant   **Airline non-customers**

C "Depending on the **utilization** the seller offers different prices (e.g. Airlines, hotels)"

44%   14%   38%   18%
top-2   low-2   top-2   low-2
Airline customers   Not significant   **Airline non-customers**

D "According to the **customer profile** (purchase history, search behavior, etc.) the price for the customer is set"

14%   42%   15%   47%
top-2   low-2   top-2   low-2
Airline customers   Not significant   **Airline non-customers**

1) Lately different price models are discussed. How do you rate the following price models? (Scale 1 = "very good" to 6 = "very bad")

Fig. 3 Evaluation of price discrimination by German consumers

tickets (Sanburn 2012). It is not surprising that the issues of loyalty and reward are deeply rooted in the minds of consumers.

- In 2012 online travel agency (OTA) Orbitz confirmed that it was experimenting with showing different hotel offers to Mac and PC users since it was found out that on average users of Mac computers spend 20 USD to 30 USD more a night on hotels than their PC counterparts.

Outlook: the future of dynamic pricing in the airline industry

Research indicates that consumers care about the price other individuals pay for the same product. Both, the enhanced online environment and social media activities make it relatively easy to obtain such price information (Lamberton and Stephen 2016). Based on the concept of fairness there is an inherent risk that customers feel that they will be treated unfairly due to DP (Friesen 2008). In this context three aspects are crucial. First, how the customer accepts the rules of pricing ("the later you book the more expensive the ticket becomes"), second how the mechanism of DP works - according to Haws and Bearden (2006) the fairness perception is different for a scenario where the supplier sets prices based on an auction scenario - and third how the price discrimination is framed (Weisstein et al. 2013).

The individual consumer's level of knowledge in PP is the key to knowing whether a good deal has been made. There will be resistance to PP given some of the issues discussed above. In the short term, this could give airlines who do not practice PDP a competitive advantage if customers are unhappy with the sharing of private data or if they feel constantly being gouged by this approach. However, if all major airline carriers move to this approach the customer will have very little choice but to accept it. In the early stages of RM, even at the airlines, customers were not always enthusiastic about the advance purchase requirements but as most major carriers migrated to those and cancellation fees, customers had no real choice if they wanted to travel. Now only very few question this pricing approach. The uphill battle for the acceptance of PDP though will be tougher than implementing fencing and RM. Companies wishing to implement PP will have to understand how to effectively sell the concept properly to be perceived as fair by customers once the potential privacy and discriminatory issues become common knowledge (Darke and Chung 2005).

From our point of view there are two main risks to be further discussed and analyzed: First, even though the economic effect of PDP has theoretically been proven it has to be questioned whether PP is meaningful to customers or not. Second, provided that an estimation of the WTP in real-time would be technically possible it is still questionable if the short-term increase in revenue outweighs the long-term risk of deteriorating the customer

relationship. Therefore, customers' perceptions of fairness will play a pivotal role for PDP to become a success in the airline industry.

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