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The effects of individual internal versus external reference prices on consumer decisions for pay-what-you-want payments

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Abstract: We empirically investigate the interaction between internal and external reference prices on stated payments in a Pay-What-You-Want (PWYW) scheme. Using results of a vignette experiment with e-books, we show that when an external reference price provided is lower than respondents' internal reference prices, the average of PWYW payments significantly decreases compared with a situation in which the external reference price is not provided. *The relationship is the opposite when the external reference price provided to respondents is higher than their internal reference prices*. In such a case, upward pressure is created, thus the average of PWYW payments increases. These results remain true when we control for expected quality of e-books. Additionally, we find that when the external reference price is not provided, the size of PWYW payments depends positively on individual factors such as risk-taking propensity and perceived costs of e-book production.

Keywords: Pay-what-you-want, cultural goods, quality uncertainty, reference price, experience goods

JEL Codes: D12, Z19, M31

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1 Introduction

Books, movies, theater performances, and music are commercial, marketed for profit, cultural goods, for which consumers usually need to pay before experiencing them. Special features of such goods and consumer demand for them need to be handled by retailers appropriately. In general, taste for cultural goods changes over a lifetime and depends on the cultural experience the good provides. Individuals who had experienced a cultural good might have developed a perception of quality for similar goods they would potentially consume in the future. As a result, high heterogeneity in consumer valuation of cultural goods can be observed. Consumer demand in cultural sector is often binary, which means a particular cultural good is only bought and consumed once (think how often one buys and reads the same book, buys and watches the same movie, or again pays and downloads the same digital music he already paid for, because of reduced prices). Still, other cultural goods can be sold in bundles by subscription streaming services (e.g., Netflix or Spotify, with huge libraries of movies and songs), or consumed periodically in series (e.g., comic books or TV shows, that are also subject to taste and preference formation over time and consumption). Cultural goods can be classified as experience goods: individuals have to consume them in order to know what utility they derive.[3] Finally, many of these goods have a digital format or some digital substitute. In this paper, we use the example of e-books as commercial cultural goods characterized by variation in tastes, binary demand, experience character, and digital format. While this study focuses specifically on one cultural good, we believe that our findings can be applied by retailers in other markets as well.

To a retailer, the experience character of a good means coping with customers' uncertainty about the quality or value of a product before consumption. When uncertainty with respect to the quality of the good is high, a potential buyer who is risk-averse may abstain from purchasing it due to concerns of overpaying. Consumer uncertainty over quality has important implications for many cultural goods. In particular those offered digitally (like e-books), when a free unauthorized version of the product can be an available alternative. Sellers of cultural goods may consider the implementation of a voluntary pay-what-you-want pricing scheme (PWYW) as potential solution to the problem of quality uncertainty. In PWYW, each consumer voluntarily sets a price adequate to her expectations about quality of the good or, if payment is made after consumption, a price adequate to actual quality of the good.

The PWYW scheme has been around for a long time in the cultural sector: consider, for instance, street performers and buskers who can receive voluntary payments from passers-by. Recently, a growing number of real businesses started to use this model. Thus, it appeared that PWYW might be a profitable, alternative pricing policy. Examples of practical application of PWYW include restaurants and cafés, music albums, video-games, museums, concerts, and theatres (more can be found in Kim *et al*., 2009; Kim *et al*.,2014; Regner and Barria, 2009; or Mak *et al*., 2010). A growing body of scientific literature attempts to explain successful practical implementations of the PWYW pricing strategy.[4]

In the PWYW literature, two research streams can be found. One focuses on explaining why a buyer pays at all even if she could pay nothing (for the extensive discussion see León *et al*., 2012; or Greiff and Egbert, 2016). The other summarizes factors relevant to decisions about the size of their voluntary payments. Factors that play an important role in individuals' payment decisions under PWYW include: external and internal reference prices (the first one usually refers to the price suggested by the seller; the second one refers to individual price scales used to judge a particular offer), self-image concerns, expected quality, and anonymity or social distance relationship, which is defined by the degree of personal interaction made during the purchase (Andreoni and Bernheim 2009; Hoffman *et al*. 1994; Hoffman *et al*. 1996; Kim *et al*. 2009; Kim *et al*. 2014; Natter and

3 Nowadays, this uncertainty may be reduced (but not completely eliminated) for cultural goods purchased digitally. Availability of data on clients' past purchases, choices and sometimes also their satisfaction ratings, enables sellers to construct advanced algorithmic recommendation engines that suggest lists of products that consumers can potentially enjoy. This, however, does not always apply; for example, when a consumer alternately uses several services and platforms (for music - Spotify, Apple Music, Google Music, YouTube; for e-books in Poland - Merlin, Publio, Virtualo) or when he needs to create and self-update his account (for example, IMDb, goodreads and so on).

4 Name Your Own Price (NYOP) is another example of a voluntary pricing scheme. It is quite popular in the travel and tourism industry, but to the best of our knowledge, it has never been applied in the cultural sector. There are also different kinds of auctions, in particular Art Auctions, but those are not an alternative to the PWYW as they are not regular, direct-to-consumer strategies. Because of popularity of the PWYW in cultural sector, we decided to focus our study on this scheme.

Kaufman 2015).[5] Amongst these drivers, reference prices received remarkable attention.

We identified two gaps in the literature that we address in this paper. First, it remains uncertain whether the external reference price acts as a pure anchor (the *anchoring effect* means that the external reference price provided by a seller sets a standard "anchored" price for the consumer to consider) or as a signal associated with quality of the good. We show new empirical evidence of the *anchoring effect* of external reference prices, separated from the quality signal effect. In our study, the external reference price is defined as a readily available market price. Second, it is also unclear to what extent the individual internal reference price adjusts to the provided external reference price. We control for the relationship between external reference prices and internal reference prices on the size of the PWYW payments. We use the advantage of a proposed method – a survey with vignettes (brief scenario descriptions) – to analyse the effects of consumers' individual characteristics and beliefs about production costs on the magnitude of hypothetical voluntary payments. These problems, to the best of our knowledge, have not been empirically investigated before.

In the following section, we discuss the literature and present the research hypotheses. We test the hypotheses using the vignette technique, that is, an online survey with hypothetical scenarios described in Section 3. Section 4 provides results of the study. Sections 5 concludes and offers clues on practical implications of the findings.

2 Theoretical background and hypotheses

If the PWYW payment is made before consumption, a buyer can declare an inadequate price that negatively influences her utility and profits of the retailer. Consumers bear not only the risk of paying too much, but also the risk of not paying enough. For a consumer, potential costs of paying too little have psychological aspect of downgrading her self-image (resulting in guilt) and beliefs about own external, social image (resulting in shame). These psychological motives are commonly used to explain why a buyer pays something at all even if she could pay nothing (Gneezy *et al*. 2010; Gneezy *et al*. 2012; Kunter 2015; Regner and Riener 2012). Retailers can reduce consumers' risk either by allowing them to pay after consumption, or by provision of external reference prices (in different forms: average, suggested, market, minimum or maximum prices).

The PWYW research provides empirical evidence that external reference prices do in fact act as anchors. Consumers provided with price information reveal willingness to pay close to the external reference. They are also extremely important in the consumers' evaluation of the size of PWYW payments. Gautier and van der Klaauw (2012) tested the anchoring effects on PWYW payments for hotel stays. They varied external reference prices – posted prices of a room communicated to the guests – and found that higher external reference prices significantly increased PWYW payments, but only for consumers who learnt about the PWYW option (the promotional campaign) after they had already booked the room. Kim *et al*. (2014) found that provision of external reference prices overall increases PWYW payments, but the average proportion of PWYW payments to the external reference price becomes lower as the external reference price increases (the magnitude of decrease in PWYW payments to external reference proportion depends on the product type). Furthermore, existing evidence suggests that external reference prices should be provided to consumers especially when it is difficult for them to accurately assess the exact market price or value of a product or service. Johnson and Cui (2013) designed a lab experiment in which participants hypothetically purchased concert tickets. Their study showed the impacts of external reference prices in three forms: minimum, maximum, and suggested prices. They found that both minimum and maximum external reference prices negatively affected the average of declared PWYW payments compared with a control group without any external reference price. Participants informed about suggested external reference prices (formulated as "most people pay around $X") chose payments close to the suggested price, which reduced the variance of hypothetical PWYW payments. The authors conclude by noting that suggested external reference prices are an effective tool for firms willing to avoid low voluntary payments, but only when external reference prices are higher than or close to consumers'

5 There are various definitions of the internal reference price (see Kim *et al.* 2009; or Chandrashekaran and Jagpal, 1995 for extensive literature review). In our study, we follow the idea proposed by Kim *et al.* (2009) and define each respondent's individual internal reference price as an average of the price most recently paid for a given good and the price usually paid for products of the same category.

internal reference prices (the internal reference prices were calculated by the authors as the average price chosen in the control group, not at individual level). Such results suggest that in PWYW external reference prices enable firms to communicate the value of the product to customers. High external reference price can signal high value of the product and increase consumers' quality expectations for the good prior to consumption.

We expand this strand of literature by controlling for both the effect of the internal reference price using individual level data, and the effect of the expected quality of the good on the size of the PWYW payments. Vignette scenarios were used to create information conditions with low, medium, high and no external reference prices provided. The external reference price was in a form of regular market price. We propose that, for a given expected quality of the good, information about external reference price diminish the risk of not paying enough and a consumer may only bear the risk of paying too much. This risk can be limited by PWYW payment lower than the suggested external reference price. In other words, consumers adjust their willingness to pay for the product based on the anchor, but only up to the level that they perceive to be fair considering individual factors (e.g., their financial situation). The external reference price may also influence consumers' willingness to pay for a product through perceived savings, resulting in the voluntary payments lower than the external reference price (Chandrashekaran and Grewal 2006). Our first hypothesis states:

H1: Given the expected quality of a good, consumers not informed about an external reference price declare higher PWYW payments than consumers provided with the external reference price if, and only if, their internal reference prices exceed the external reference price.

Heyman and Ariely (2004) define two types of market that determine exchange relationships: a money market and a social market. In money markets, exchange relationships between at least two parties are regulated by market prices of products. In PWYW, prices are not set, so the buyer-seller relationship is not purely of money-market type. Social markets are characterized by social exchange norms (i.e., norms of cooperation, norms of reciprocity, and norms of distribution). People "feel bad" violating social norms. In PWYW, the social norm can be expressed as a "fair" price. The "fair" price in PWYW is a level of voluntarily payment that consumers choose in order to avoid a negative effect on their self-image (Gneezy *et al*. 2012). Similar conclusions come from the outcome-based theory of social preferences (Andreoni and Miller 2002; Bolton and Ockenfels 2000; Fehr and Schmidt 1999), which assumes that people are not purely driven by self-interest but they also care about the well-being of others. In PWYW, consumers potentially care about the seller and authors of the good they buy. In case of voluntary PWYW payments, this means that the larger the buyer's benefit from consuming the product and the higher the perceived cost of production, the higher the PWYW payment will be. Our second hypothesis is as follows:

H2: The PWYW payments increase with consumers' perception of costs of production expressed as the share of the product price.

H2a: The PWYW payments increase with consumers' perception of authors' reward expressed as the share of the product price.

Our stakeholders found the last two hypotheses interesting in the context of the Polish market for e-books. Prices of e-books in Poland are on average 20–30% lower than prices of paper books. Consumers see this as a minor price difference, and actually expect the price of a digital copy to be half the price of a paper book, and no more than 20 PLN (Gołąbiewski and Waszczyk, 2016). This can be due to easily imaginable argumentation that the costs of producing an e-book must be low or close to zero, because e-books do not have a physical form. Such likable and sound misconception might lead consumers to fall into the trap of fallacy and bias general public opinion. Therefore, in order to have consumers properly evaluate the price of an e-book, the costs associated with producing one may require clarification on the publishers' site.

3 Research description and method

To test the aforementioned hypotheses, we used an online survey with hypothetical scenarios (i.e., the vignette technique). This section describes sample, survey construction, and variables used to test the hypotheses in a model. Lastly, it provides a detailed description of scenarios used in the vignette experiment.

3.1 Subjects

The questionnaire was distributed through e-mail to all newsletter subscribed clients by one of the largest e-book retailers in Poland (Virtualo.pl). The Virtualo's website is visited by around half a million users every month. A total of 343 subjects participated in the survey. The data was collected between November 2015 and March 2016.

The cooperating e-book retailer sells 32 literary genres, including textbooks, guidebooks, scientific and academic literature, popular science readings, erotic literature, classic literature collection, religious books and so on. Genres identified as the most commonly read by clients of Virtualo.pl were fantasy and crime fiction. The survey was distributed solely amongst readers of these two genres. All the survey respondents not only bought, but also read either of the two genres shortly before filling out the survey.

We decided to collect responses from readers of the two selected literary genres, because we wanted to have comparable observations from a possibly uniform group of readers. Buyers of fantasy and crime fiction can be led by similar motivations; in this case, reading mainly for pleasure and entertainment.[6] Motivations to read a book can be personal and intrinsic, that is satisfaction or reward, or extrinsic and social (for a review of motivations see Becker *et al*., 2010; or Schaffner and Schiefele, 2016). Our intuition is that books from different literary categories are written, and then selected and bought by readers for various reasons – entertainment and pleasure, information and learning, obligation to read, social pressure, need of a gift – and that these different motivational contexts can impact readers' situational choices. By selection of the two genres, we tried to avoid the dispersion of choice situations and between genres variation. Therefore, we do not include additional genre-specific variables into our analysis. We also chose to avoid the commonly known required readings and classic titles, because respondents could have highly informed preferences about such books.

Survey participants were aged 18 to 70 years (73% between 25 and 45 years) with satisfactory level of income (95% of participants stated that they could afford everyday spending and only needed to save money for bigger expenses). 52% of the respondents were men.

6 Literary genres can be selected for a variety of reasons and we did not find any research that proves that fantasy and crime fiction are read just for pleasure and entertainment.

3.2 Survey design

The online survey was created on a survey development site. The questionnaire consisted of three sections. It started with a short introduction assuring confidentiality and anonymity to respondents. Then, respondents were asked about the title and the price of the most recently bought and read e-book from the Virtualo.pl online bookstore. We also wanted to know their perception of its production costs. We asked them to estimate the share of two kinds of costs − publishing costs and writer's honorarium − in the price of their most recently purchased e-book.

Next, the vignette experiment was presented (the exact translation of vignette scenarios is presented in the next subsection of this paper). It was followed by questions about the average price usually paid for an e-book, self-reported personal risk attitudes, measured on an 11-point scale on which the respondents declared their "willingness to take a risk, in general"[7], and questions regarding one's socio-demographic characteristics.

3.3 Vignette scenarios

The vignette technique was first introduced by Rossi in 1979. Nowadays, social scientists commonly apply this technique. This research method allows to elicit judgments, beliefs, attitudes, or intended behaviours without directly addressing the question to respondents, but rather by variation across vignettes (Wasson *et al*. 2002; Atzmüller and Steiner 2010; Stainer *et al*. 2016). Vignettes are descriptions of scenarios – hypothetical situations or persons – towards which respondents form their impressions. Although presented and asked about others' behaviour, hypothetical vignette questions are constructed to project choices of the respondents' themselves. The question over the effect of the hypothetical nature of vignettes on their reliability in predicting real life respondents' choices and behaviours was extensively studied by social scientists and showed the conditions necessary for validity of the results (see for example Hainmueller, 2015).

In our vignette experiment, Patricia is planning to buy an e-book. The context of the purchase varies by two factors related to the market price of the e-book and its perceived quality. Respondents were asked to guess

7 The general risk question was found to be a good predictor of other risky behaviours (Dohmen *et al*. 2005, 2011).

how much she would pay in each of the situations presented. Below is the translation of the introduction to the experiment and the vignettes:

Scenarios and treatments

Introduction:
In the "Pay What You Want" system, every buyer individually decides what price to pay for the given product. Below we present a few situations in which Patricia decides how much she will pay for an e-book in this system. Based on the described situations, please give the price Patricia will pay for the e-book.

Treatment 1:
Question 1. Patricia is planning to purchase an e-book in the "Pay What You Want" system. In traditional bookstores,[8] the e-book costs 9.90 PLN. Patricia read many reviews about the e-book and is convinced she will enjoy it. How much does she pay?
Question 2. Patricia is planning to purchase an e-book in the "Pay What You Want" system. In traditional bookstores, the e-book costs 9.90 PLN. Patricia read many reviews about the e-book and she has mixed feelings about whether she will enjoy it. How much does she pay?
Question 3. Patricia is planning to purchase an e-book in the "Pay What You Want" system. In traditional bookstores, the e-book costs 9.90 PLN. Patricia read many reviews about the e-book and is worried she will not enjoy it. How much does she pay?

Treatment 2:
Question 1. Patricia is planning to purchase an e-book in the "Pay What You Want" system. In traditional bookstores, the e-book costs 19.90 PLN. Patricia read many reviews about the e-book and is convinced she will enjoy it. How much does she pay?
Question 2. Patricia is planning to purchase an e-book in the "Pay What You Want" system. In traditional bookstores, the e-book costs 19.90 PLN. Patricia read many reviews about the e-book and she has mixed feelings about whether she will enjoy it. How much does she pay?

Question 3. Patricia is planning to purchase an e-book in the "Pay What You Want" system. In traditional bookstores, the e-book costs 19.90 PLN. Patricia read many reviews about the e-book and is worried she will not enjoy it. How much does she pay?

Treatment 3:
Question 1. Patricia is planning to purchase an e-book in the "Pay What You Want" system. In traditional bookstores, the e-book costs 39.90 PLN. Patricia read many reviews about the e-book and is convinced she will enjoy it. How much does she pay?
Question 2. Patricia is planning to purchase an e-book in the "Pay What You Want" system. In traditional bookstores, the e-book costs 39.90 PLN. Patricia read many reviews about the e-book and she has mixed feelings about whether she will enjoy it. How much does she pay?
Question 3. Patricia is planning to purchase an e-book in the "Pay What You Want" system. In traditional bookstores, the e-book costs 39.90 PLN. Patricia read many reviews about the e-book and is worried she will not enjoy it. How much does she pay?

Control group:
Question 1. Patricia is planning to purchase an e-book in the "Pay What You Want" system. Patricia read many reviews about the e-book and she is convinced she will enjoy it. How much does she pay?
Question 2. Patricia is planning to purchase an e-book in the "Pay What You Want" system. Patricia read many reviews about the e-book and she has mixed feelings about whether she will enjoy it. How much does she pay?
Question 3. Patricia is planning to purchase an e-book in the "Pay What You Want" system. Patricia read many reviews about the e-book and she is worried she will not enjoy it. How much does she pay?

In our study, we apply the mixed design according to the categorization of vignette experiments by Atzmüller and Steiner (2010). Respondents were randomly assigned to one of the three treatments or the control group presented above. In the control group, market price was not presented – there was no external reference price. The three treatments varied with respect to the marked conditions, which in this case meant the external reference price of the e-book that Patricia was planning to buy; the price could be "low" (9.90 PLN), "medium" (19.90 PLN) or "high" (39.90 PLN). Suggested external

reference prices were cautiously chosen from a range of actual retailers' market prices: 19.90 PLN (around 4.75 EUR) is the dominant, medium price, 9.90 PLN (2.35 EUR) is a low, discount price and 39.90 PLN (9.50 EUR) is a high price. Each respondent was only assigned to one treatment, but presented with three choice situations (scenarios). These three scenarios differed with respect to the degree of hypothetical consumer's certainty about the e-book quality. This gives a design with 4 × 3 = 12 scenarios. In each choice situation, survey respondents had to declare how much they believe Patricia (hypothetical consumer) paid for an e-book available in PWYW. In the results section, Patricia's voluntary payments declared by respondents are referred to as the "estimated PWYW".

Even well designed experiment might fail to predict absolute levels of real payments, because of the hypothetical nature of survey questions that might lead to upward hypothetical bias. The absolute levels of payments declared by respondents need to be taken with some caution. For example, according to Gołąbiewski and Waszczyk (2016) Polish readers are unwilling to pay more than 20 PLN for an e-book. We have more confidence in the effects of treatments and the role of explanatory variables than in levels of payments declared by respondents.

4 Results

The estimated PWYW values discussed below follow characteristics of real PWYW payments, which increases the reliability of our results. The proportion of the estimated PWYW values to the external reference price decreases for higher external reference prices, which is consistent with the results of a field experiment by Kim *et al*. (2014). The data also shows that 86% of the respondents chose a round amount (.00 price ending) confirming Lynn *et al*. (2013) observation of consumer preference for round over non-round prices.

Kim *et al*. (2009) summarize different approaches to how the internal reference price can be defined. They give examples of internal reference prices derived from consumers' previous purchases, either as a weighted average of prices paid for products from the same category, or as the price recently paid for the same brand product. We mix these two approaches and calculate individual internal reference price for each respondent as an average of the price most recently paid by her for an e-book and of the average price usually paid for e-books. The average of respondents' internal prices is 19.53 PLN, i.e. slightly lower than the dominant market price of 19.90 PLN.

Tab. 1 presents the average of estimated PWYW values in all scenarios – treatments that informed respondents' about external reference prices, and the control group. The average of estimated PWYW values increases not only with the expected quality of the e-book but also with the external reference price for a given quality of the e-book. Therefore, we observe a significant pure anchoring effect, which is independent from the expected quality of the good.

In Tab. 2, we additionally divide respondents into two groups depending on their internal reference prices (9.90 to 19.90 and 19.90 to 39.90). Some respondents were informed about the external reference price lower or close to their internal reference prices. For them, the average of estimated PWYW payments were significantly lower than in the control group, independent of the expected quality of the e-book. The opposite is true in scenarios with the external reference price greatly above the internal reference prices; there the estimated PWYW payments were on average significantly higher than in the control group. The results presented in Tab. 2 support Hypothesis 1: when individual internal reference prices were higher than a given external reference price, the average of estimated PWYW payments were in most cases significantly higher amongst respondents from the control group than amongst consumers who were provided with the relatively low external reference price.

Fig. 1 shows the relationships between internal reference prices and estimated PWYW values for each treatment separately when the e-book quality is unknown (in scenarios with certainly low and high e-book quality, such graphs look analogously). For uncertain quality, internal reference prices are significantly and positively correlated with estimated PWYW values only in the control group.[9]

To investigate if the internal reference price and other individual factors affect decisions about the size of PWYW payments when the external reference price

9 We identified outlying observations within the range of internal reference prices. The outlaying internal reference prices are likely a consequence of the definition of this variable, which is the average of the price most recently paid for an e-book and the average price usually paid. Outliers do not affect the results. Robustness check results without the outlying observations are available upon request from the authors.

Tab. 1. The average of estimated PWYW payments for e-books with perceived low, unknown and high quality – results in PLN presented separately for treatments with different external reference prices and the control group without the external reference price

	Low quality				**Unknown quality**				**High quality**			
	Control group	**Low price treatment 9.90**	**Medium price treatment 19.90**	**High price treatment 39.90**	**Control group**	**Low price treatment 9.90**	**Medium price treatment 19.90**	**High price treatment 39.90**	**Control group**	**Low price treatment 9.90**	**Medium price treatment 19.90**	**High price treatment 39.90**
Min	0	0	0	0	0	0	0	8	1	1	5	15
Max	36.7	10	20	29	36.7	15	20	30	50	20	25	39.9
Mean	8.902	4.115	8.476	11.481	14.151	6.449	12.361	17.736	21.260	9.065	17.310	25.703
p-value [(1)]	-	0.000	0.309	0.996	-	0.000	0.013	1.000	-	0.000	0.000	1.000
p-value [(2)]	-	0.000	0.807	0.048	-	0.000	0.127	0.000	-	0.000	0.000	0.001
p-value [(3)]	-	0.000	0.977	0.003	-	0.000	0.157	0.000	-	0.000	0.000	0.000
Standard deviation	5.972	3.168	4.551	6. 046	6.032	2.738	3.5125	5.188	8.497	2.733	3.314	5.941
Observations	77	78	78	84	77	78	78	84	77	78	78	84

[(1)] Ha: mean from control group > mean from treatment 9.90, 19.90 and 39.90, respectively. Two-sample t-test on the equality of means.

[(2)] Ha: independent samples in control group and in treatment 9.90, 19.90 and 39.90, respectively, were drawn from populations with the same median. Nonparametric two-sample test on the equality of medians with unmatched data.

[(3)] Ha: independent samples in control group and in treatment 9.90, 19.90 and 39.90, respectively, are from populations with the same distribution. Wilcoxon rank-sum (Mann-Whitney) test.

Tab. 2. The average of estimated PWYW payments for e-books with perceived low, unknown and high quality – results in PLN presented separately for all treatments and the control group, and different levels of individual internal reference prices

	Low quality				**Unknown quality**				**High quality**			
	Control group	**Low price treatment 9.90**	**Medium price treatment 19.90**	**High price treatment 39.90**	**Control group**	**Low price treatment 9.90**	**Medium price treatment 19.90**	**High price treatment 39.90**	**Control group**	**Low price treatment 9.90**	**Medium price treatment 19.90**	**High price treatment 39.90**
Internal reference price between <9.90, 19.90)	**7.54**	**3.48**	8.73	11.61	**11.95**	**5.85**	11.72	18.05	**17.50**	**8.29**	16.38	24.66
p-value (1)		0.001				0.000				0.000		
Observations with internal reference price <19.90, 39.90)	22	24	15	18	22	24	15	18	22	24	15	18
Internal reference price between <19.90, 39.90)	**14.34**	5.86	**11.22**	12.55	**19.7**	8.61	**14.40**	18.43	**27.82**	10.78	**18.89**	27.48
p-value [(1)]			0.186				0.050				0.014	
Observations with internal reference price <19.90, 39.90)	11	16	12	16	11	16	12	16	11	16	12	16
Observations with revealed internal reference prices*	34	40	28	36	34	40	28	36	34	40	28	36
All observations per treatment	77	78	78	84	77	78	78	84	77	78	78	84

Notes: All respondents received three vignettes (low, unknown, high quality), so the number of observations is the same in all quality-scenarios for control group and treatments with respective external reference prices.

*Some respondents did not provide information on neither the price most recently paid for an e-book nor the average price they usually pay for e-books. Additionally, the extreme internal reference price intervals < 0, 9.90) and < 39.90, max) were omitted since we had only few observations that fit into these, and they might be considered outliers. Therefore, we could calculate individual reference prices for only 136 respondents, and divide them amongst all treatments.

[(1)] Ha: mean from control group > mean from treatment 9.90 and 19.90, respectively, for a given interval of internal reference price. Two-sample t-test on the equality of means.

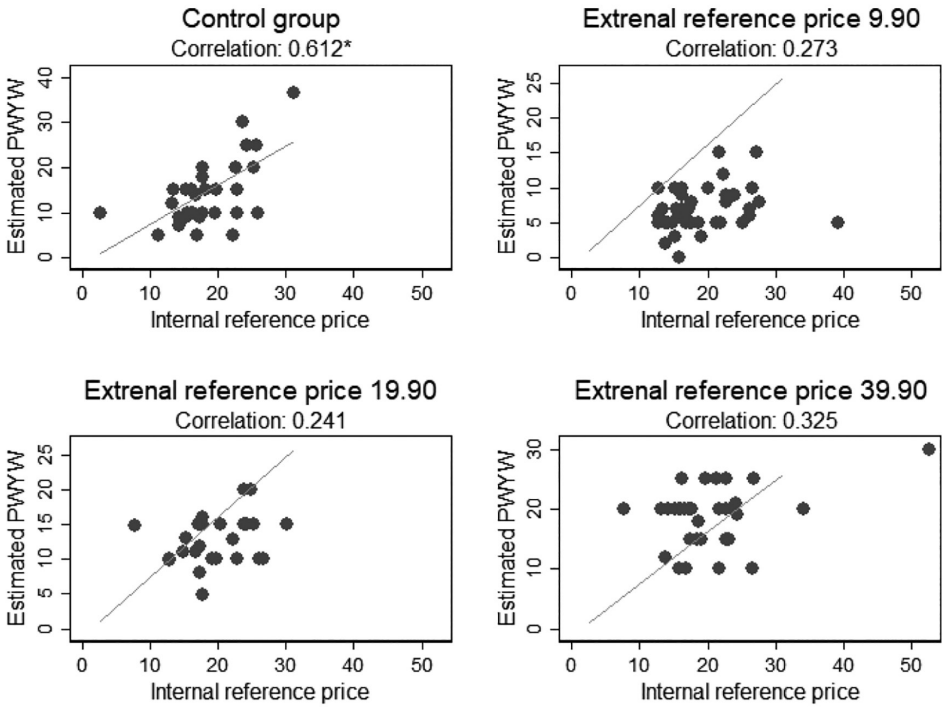

Fig. 1. The effects of external and internal reference prices on estimated PWYW measured for unknown quality of the e-book.

Tab. 3. Results of random-effects GLS regression, with estimated PWYW payments as dependent variable, and internal reference price as an individual-specific independent variable

	Control group	**Low price treatment 9.90**	**Medium price treatment 19.90**	**High price treatment 39.90**
Internal reference price	0.535**	0.182**	0.217	0.388***
	(0.216)	(0.079)	(0.150)	(0.116)
Author reward	0.103**	0.019	0.011	0.057
	(0.046)	(0.024)	(0.043)	(0.046)
Publication costs	0.112*	0.035	0.050	-0.055
	(0.061)	(0.028)	(0.046)	(0.065)
Distribution costs	0.009	-0.017	0.002	0.026
	(0.068)	(0.027)	(0.057)	(0.051)
Risk loving	0.726	0.381*	-0.106	0.092
	(0.501)	(0.210)	(0.306)	(0.327)
Age	0.138	-0.005	-0.023	-0.115
	(0.147)	(0.035)	(0.082)	(0.075)
Sex	3.396	2.772***	0.678	2.413
	(2.391)	(0.975)	(1.466)	(1.570)
Unknown quality	4.591***	2.520***	3.140***	6.114***
	(0.929)	(0.405)	(0.658)	(0.849)
High quality	10.806***	4.850***	7.669***	13.847***
	(0.929)	(0.405)	(0.658)	(0.849)
Constant	-21.293***	-5.634*	4.203	4.227
	(7.670)	(3.037)	(4.454)	(5.012)
Observations	102	120	84	108
Number of respondents	34	40	28	36

Standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Tab. 4. Results of random-effects GLS regression, with estimated PWYW payments as dependent variable, without internal reference price as independent variable

	Control group	**Low price treatment 9.90**	**Medium price treatment 19.90**	**High price treatment 39.90**
Author reward	0.108***	0.010	0.005	0.057*
	(0.030)	(0.015)	(0.020)	(0.031)
Publication costs	0.104***	0.017	0.019	0.014
	(0.035)	(0.017)	(0.020)	(0.034)
Distribution costs	0.042	-0.002	-0.021	0.034
	(0.041)	(0.017)	(0.028)	(0.039)
Risk loving	0.851***	0.207	0.259	0.368*
	(0.249)	(0.135)	(0.174)	(0.210)
Age	-0.007	0.014	-0.012	-0.019
	(0.066)	(0.027)	(0.037)	(0.053)
Sex	2.999**	1.190**	1.074	1.410
	(1.309)	(0.568)	(0.711)	(1.054)
Unknown quality	5.248***	2.333***	3.871***	6.255***
	(0.622)	(0.287)	(0.459)	(0.586)
High quality	12.357***	4.950***	8.755***	14.222***
	(0.622)	(0.287)	(0.459)	(0.586)
Constant	-6.807	0.021	5.632**	5.508
	(4.218)	(1.764)	(2.229)	(3.846)
Observations	231	234	231	252
Number of respondents	77	78	77	84

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

is provided, we run separate random effect models for each treatment (Tab. 3). In the regressions, we include factors discussed in the theory section – the perceived share of price that covers the author's reward (*Author reward*), the perceived share of price that covers the publication costs (*Publication costs*) and the internal reference price (*Internal reference price*). Additionally, we control the effects of the expected quality of the e-book and individual risk-taking propensity (*Risk loving*). We find these factors relevant because of the experience character of cultural goods – whenever quality uncertainty is involved in an economic decision, risk-taking attitudes can play an important role.

Internal reference price was found significant in two treatments (low and high external reference price treatments) and in the control group. Once again, the internal reference price proves to be significant in subjects' decisions about the size of the voluntary PWYW payments when the external reference price is not provided.

Internal reference prices could not be calculated for all respondents, as not all of them remembered the price of the e-book they had most recently bought. To increase the number of observations, we run additional regressions without the internal reference price as explanatory variable (Tab. 4).

When the external reference prices are not provided to the respondents, the estimated PWYW values depend on individual factors such as risk-taking propensity, perceptions of publication costs and authors' reward. It seems that without external reference prices, the declared voluntary PWYW payments depend on consumers' individual experiences and beliefs. Positive effect of the risk-taking propensity means that without external reference prices, risk-averse buyers might be willing to pay less in the PWYW payment scheme because they could be afraid of paying an inadequately high price. Provision of the moderate – 9.90 or 19.90 – external reference price reduces the risk of overpaying (in Tab. 4 *Risk loving* is significant only in control group and the treatment with high external reference price; in Appendix, Tab. 1–3, *Risk loving* variable is significant only in three out of eighteen scenarios with external reference prices). Interestingly, in the control group and in the low external reference price treatment, we observe

significantly higher estimated PWYW values amongst female respondents. This might be due to the fact that our hypothetical consumer (Patricia) was a woman. Finally, the expected quality of the e-book has a positive effect on the estimated PWYW payments.

We run additional OLS regressions separately for each scenario (Appendix, Tab. 1–3). Overall, we observe that signs and significance of the individual factors, that potentially affect voluntary PWYW payments, do not change with the expected quality of the e-book (there are some exceptions, but we did not identify any specific pattern). This suggests that the impact of the analysed individual factors and beliefs, in particular the perception of authors' reward as the share of the product price, on the decision about the size of the voluntary PWYW payments is independent of the expected quality of the product.

5 Conclusions

Using hypothetical vignette scenarios, we show that the size of the PWYW payments may increase with external reference prices (in a form of market price), even if the expected quality of the product remains unchanged. However, when individual internal reference prices are higher than the external reference price, the average of PWYW payments decreases compared with the control group (without the external reference price). Otherwise, the relation is the opposite; the external reference price higher than consumers' internal reference prices creates upward pressure, increasing the PWYW payments.

When consumers are not informed about the external reference price, PWYW payments depend positively on individual factors such as internal reference prices, the part of the e-book price that they believe goes to authors and covers the publication costs. This suggests that, if the external reference price is not provided, voluntary payments in PWYW might be enhanced by informing consumers about costs needed to produce e-books or reminding them about the need to reward authors' work. Market examples of such practice include Humble Bundle and Polish Artrage (former Bookrage), which enable their clients to choose the share of PWYW payments that goes to the authors, distributors, and charity. Further studies could examine if the size of the PWYW payments increases with the share of payment allocated to authors or charity.

The results of our study can be applied by retailers of commercial cultural goods, such as e-books, music, and performances, who are willing to make their goods accessible and attractive to potential buyers by implementing the PWYW scheme. The most important managerial lesson for them is that the external reference price can increase PWYW payments when it is higher than internal reference prices, even if the expected quality of the product remains unchanged. When setting up the external reference price, retailers must consider internal reference prices of potential consumers. In this context, it should be mentioned that in a number of countries (but not in Poland), book prices are fixed by law or business agreements, which can significantly influence the internal reference prices amongst buyers of e-books.

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Appendix:

Tab. 1. OLS regressions, with estimated PWYW payments as dependent variable. Regressions for e-book with low quality, estimated separately for each treatment and control group, with and without internal reference price as explanatory variable.

	With internal reference price				**Without internal reference price**			
	Control group	**Low price treatment 9.90**	**Medium price treatment 19.90**	**High price treatment 39.90**	**Control group**	**Low price treatment 9.90**	**Medium price treatment 19.90**	**High price treatment 39.90**
Publication costs	0.187***	0.056	0.054	-0.132*	0.109***	0.037*	-0.000	0.010
	(0.051)	(0.036)	(0.065)	(0.076)	(0.032)	(0.021)	(0.030)	(0.044)
Author reward	0.110**	0.052*	0.023	0.051	0.089***	0.033*	-0.014	0.034
	(0.044)	(0.030)	(0.060)	(0.050)	(0.029)	(0.018)	(0.029)	(0.040)
Risk loving	0.624	0.328	-0.343	-0.217	0.901***	0.210	-0.001	0.279
	(0.481)	(0.266)	(0.379)	(0.365)	(0.242)	(0.171)	(0.238)	(0.268)
Internal reference price	0.367*	0.166	0.296	0.529***				
	(0.206)	(0.102)	(0.210)	(0.134)				
Age	0.255*	-0.015	-0.019	-0.142	0.015	-0.002	0.034	-0.051
	(0.136)	(0.045)	(0.116)	(0.084)	(0.063)	(0.034)	(0.055)	(0.068)
Sex	3.419	2.022	0.350	2.277	2.265*	0.472	1.700	0.255
	(2.210)	(1.198)	(2.055)	(1.780)	(1.262)	(0.712)	(1.068)	(1.363)
Constant	-20.977***	-3.451	4.315	9.759*	-3.261	0.916	6.826**	10.824**
	(6.124)	(3.265)	(5.790)	(5.327)	(3.261)	(1.951)	(2.936)	(4.274)
Observations	34	40	28	36	77	78	77	84
R-squared	0.609	0.240	0.145	0.415	0.309	0.104	0.044	0.042

Standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Tab. 2. OLS regressions, with estimated PWYW payments as dependent variable. Regressions for e-book with unknown quality, estimated separately for each treatment and control group, with and without internal reference price as explanatory variable.

	With internal reference price				**Without internal reference price**			
	Control group	**Low price treatment 9.90**	**Medium price treatment 19.90**	**High price treatment 39.90**	**Control group**	**Low price treatment 9.90**	**Medium price treatment 19.90**	**High price treatment 39.90**
Publication costs	0.126**	0.025	0.042	-0.103	0.115***	0.015	0.019	-0.001
	(0.051)	(0.031)	(0.047)	(0.070)	(0.032)	(0.018)	(0.022)	(0.036)
Author reward	0.120**	0.011	0.014	0.011	0.113***	0.010	0.018	0.037
	(0.045)	(0.026)	(0.043)	(0.046)	(0.030)	(0.016)	(0.022)	(0.033)
Risk loving	0.732	0.407*	0.022	0.131	0.683***	0.221	0.288	0.567**
	(0.484)	(0.228)	(0.274)	(0.334)	(0.246)	(0.146)	(0.181)	(0.221)
Internal reference price	0.472**	0.178*	0.166	0.396***				
	(0.208)	(0.087)	(0.152)	(0.123)				
Age	0.124	0.038	-0.018	-0.125	-0.027	0.040	0.021	0.008
	(0.137)	(0.039)	(0.084)	(0.077)	(0.064)	(0.029)	(0.042)	(0.056)
Sex	3.451	2.765**	1.129	2.618	2.890**	1.437**	0.923	1.522
	(2.227)	(1.028)	(1.487)	(1.631)	(1.281)	(0.607)	(0.813)	(1.122)
Constant	-12.434*	-2.045	8.092*	16.063***	3.532	2.312	8.433***	12.665***
	(6.171)	(2.800)	(4.190)	(4.879)	(3.310)	(1.665)	(2.236)	(3.516)
Observations	34	40	28	36	77	78	77	84
R-squared	0.592	0.307	0.136	0.346	0.302	0.126	0.071	0.119

Standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Tab. 3. OLS regressions, with estimated PWYW payments as dependent variable. Regressions for e-book with high quality, estimated separately for each treatment and control group, with and without internal reference price as explanatory variable.

	With internal reference price				**Without internal reference price**			
	Control group	**Low price treatment 9.90**	**Medium price treatment 19.90**	**High price treatment 39.90**	**Control group**	**Low price treatment 9.90**	**Medium price treatment 19.90**	**High price treatment 39.90**
Publication costs	0.035	0.028	0.042	0.061	0.125**	0.001	0.037*	0.036
	(0.074)	(0.029)	(0.047)	(0.093)	(0.048)	(0.018)	(0.020)	(0.041)
Author reward	0.082	-0.003	0.014	0.085	0.114**	-0.013	0.014	0.082**
	(0.064)	(0.024)	(0.043)	(0.061)	(0.044)	(0.016)	(0.020)	(0.037)
Risk loving	0.848	0.329	0.022	0.512	1.011***	0.187	0.325*	0.380
	(0.695)	(0.212)	(0.274)	(0.444)	(0.366)	(0.146)	(0.163)	(0.246)
Internal reference price	0.752**	0.205**	0.166	0.268				
	(0.298)	(0.081)	(0.152)	(0.163)				
Age	0.017	-0.028	-0.018	-0.110	-0.050	0.002	-0.076**	-0.039
	(0.196)	(0.036)	(0.084)	(0.102)	(0.095)	(0.029)	(0.038)	(0.062)
Sex	3.601	2.929***	1.129	2.921	4.432**	1.638***	0.674	2.878**
	(3.193)	(0.954)	(1.487)	(2.166)	(1.907)	(0.610)	(0.732)	(1.252)
Constant	-4.123	2.974	8.092*	16.319**	8.790*	7.582***	16.442***	20.595***
	(8.850)	(2.600)	(4.190)	(6.480)	(4.926)	(1.671)	(2.014)	(3.924)
Observations	34	40	28	36	77	78	77	84
R-squared	0.457	0.336	0.136	0.274	0.221	0.117	0.151	0.164

Standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$