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Willingness-to-Pay for Privacy: A Study on IPhone

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Abstract: This research employs the iPhone as a case study and conducts a survey to investigate consumers' willingness-to-pay (WTP) for privacy. We discover that consumers not only value their privacy in the digital realm but are also willing to invest considerably in privacy-protection services. What makes our findings particularly intriguing is the relationship between consumers' privacy habits and their willingness-to-pay. Surprisingly, individuals who may exhibit lower vigilance in safeguarding their privacy online paradoxically demonstrate a higher willingness-to-pay for services that ensure their data protection. Our research not only sheds light on consumer behavior but also provides invaluable strategic implications for businesses, especially tech giants like Apple. By leveraging privacy protection as a key selling point, firms can not only cater to the increasing concerns of privacy-conscious consumers but also elevate their products to a new level of desirability. Effectively communicating the robust privacy features of products like the iPhone empowers companies to justify premium pricing, enhancing their revenue streams while simultaneously fostering a safer digital environment for their users. This study stands as a testament to the symbiotic relationship between consumer demand for privacy and businesses' strategic innovation, driving the evolution of both technology and user protection in the digital age.

Keywords: Willingness-to-pay (WTP), consumer privacy, big data

1. Introduction

Currently, a significant volume of data is being used. On one hand, this improves the quality of products, such as better recommendation algorithms. On the other hand, it increases the adverse impact of privacy disclosure on consumers, leading to issues like harassing calls and spam messages. The protection of consumer privacy draws more and more attention. There are numerous laws that protect personal information from being leaked One such notable regulation is the General Data Protection Regulation (GDPR), implemented in Europe on May 25, 2018. GDPR restricts firms' exploitation of consumer data. At the same time, companies like Apple have integrated privacy protection into their product design, capitalizing on it as a selling point. Notably, Apple's iPhones allow users to control app tracking, exemplifying their commitment to privacy.

Such a scenario causes some discussions: if the usage of consumer data can increase the value of products and sell for a higher price, can the protection of consumer privacy also increase the value of products and attract consumers to pay more? In other words, do consumers have the willingness to

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pay for privacy protection and can the willingness-to-pay (WTP) of privacy increase products' advantages in the competition therefore the firm can charge a higher price?

Therefore, this study aims to explore consumers' attitudes toward privacy protection and whether different attitudes will lead to differences in their willingness to pay for privacy protection. However, how to measure willingness to pay for privacy protection is a difficult question to resolve. In this study, we innovatively combine the willingness to pay for privacy protection with specific products to measure whether the consumers are willing to pay more for products with better privacy protection services so that consumers can more vividly perceive the impact of privacy protection on their lives.

In this article, we target iPhone as products with better privacy protection while cellphones with Android systems as the products with worse privacy protection. Although both brands have some privacy protection services, the iPhone's closed system architecture makes privacy protection easier to conduct, and such ideas can be widely found in Apple's marketing and advertisement.

Thus, to answer the research question, this article conducts a survey on consumer attitudes to privacy protection and willingness to pay for privacy protection and corresponding products. We then compile data to compare the effects of each factor on the WTP. In addition, we use a comparison of iPhone and Android phones to further measure privacy WTP.

This research provides a new way to measure the WTP for privacy. At the same time, from the perspective of the company, whether privacy protection can be taken as a part of the selling point, and if so, which part of people should be targeted. At the same time, this paper combines the discuss.

2. Literature review

This research is mainly related to the paper regarding Willingness-to-pay (WTP) and the paper about consumer privacy.

First, this research is correlated to the literature on Willingness-to-pay (WTP) and willingness-to-accept (WTA). For the research about WTP/WTA, Breidert et al., summarized the methods of measuring WTP, and we refer to this paper when we design the questionnaire [1]. Then Horowitz and McConnell discussed the difference between WTP and WTA empirically [2]. It is shown that WTA is usually higher than WTP, such a conclusion is also found in our data.

Second, this research talks about consumer privacy, which is discussed in a lot of literature [3-5]. They discussed how consumer privacy affects pricing. Particularly, Chen et al., proposed privacy can help in personalized pricing and increase consumer surplus [6]. When information about consumers becomes known to companies, it undermines many companies' practices of price discrimination, and that information instead promotes lower prices and better deals. A more relative paper is Tsai et al., which used an experiment to show that consumers prefer to purchase from online retailers who protect their privacy better and some consumers are willing to pay a premium for privacy-protective websites [7]. We have different methods from this paper, but we have a similar conclusion that privacy protection can be used as a selling point for firms.

Last, there are some researchers working on the comparison of iPhone and Android. The most relative one is Keith et al., [8]. In this paper, the authors focused on the assurance of local information privacy on iPhone and the willingness to pay for the app and they found that the location privacy assurance is of great concern.

3. Questionnaire

3.1. Main Variables

The main variables we use can be found in Table 1. We use the questionnaire to measure whether consumers are aware of the role that data privacy plays in daily life. All these variables work as potential independent variables in our model. Privacy awareness means whether people have the

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concept of privacy disclosure or protection and whether they are aware of the importance of privacy. Privacy protection means whether people will take action to protect privacy in daily life. Apple policy-awareness means whether respondents are aware of Apple's privacy policies. Apple policy agreement means whether respondents agree that Apple has better privacy protection than Android. privacy protection- Apple means Apple's privacy protection measures themselves.

Table 1: Main variables.

Independent variables(X)	Privacy awareness Privacy protection, Apple policy-awareness Apple policy-agreement
Dependent variables(Y)	WTP for privacy(general) WTP for privacy(positive) WTA for privacy(general) WTA for privacy(positive) WTP for Apple

Then we are interested in whether the potential independent variables can affect the willingness to pay or willingness to accept data privacy, which work as dependent variables in our model. WTP for privacy means how much people are willing to pay for privacy protection. WTA for privacy means how much people are willing to accept for losing their privacy. Still, we measure in a general way (WTP general and WTA general) by generally describing consumer privacy in and positive way by stressing the positive effect of data privacy such as it can be used for better recommendation (WTP positive and WTA positive). Specifically, WTP for Apple means how much people are willing to pay for Apple.

The correspondent questions for the main variables can be found in Table 2 and Table 3.

Table 2: Questions about independent variables.

Variable	Variable Code	Content	Answer
Privacy awareness	A1	I agree that the leakage of personal information troubles me.	Not agree to agree, 1-5
	A2	I think the government or mobile phone companies should be more protective of users' privacy.	Not agree to agree, 1-5
privacy protection	B1 (positive)	Whether you will blot out the personal information on the tracking number.	Never to always, 1-5
	B2(negative)	Whether you will participate in the mobile phone number to receive small gifts and other activities	Never to always, 1-5
Apple policy-agreement	D	Compared with Android phones, Apple products provide better privacy protection for users, do you agree or disagree	Yes or no, 1 or 0

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Table 3: Questions about dependent variables.

Variable	Variable Code	Content	Answer
WTP for privacy(general)	WTP1	If you could pay for a privacy protection service to hide your online purchases, software use, and other private information from all third parties, what is the most you would be willing to pay per month for the service?	Choose from CNY 0-100
WTP for privacy(positive)	WTP2	If you could pay for a privacy protection service that hides your online purchases, software usage, and other private information but still opens it up to selected platforms to provide better services (such as personalized recommendations, etc.), what is the most you would be willing to pay per month for the service?	Choose from CNY 0-100
WTA for privacy(general)	WTA1	If you could sell your online shopping habits, software usage, and other personal information to a third-party platform every month, but did not know what it was used for, how much would you be willing to accept?	Choose from CNY 0-100
WTA for privacy(positive)	WTA2	If you can sell your personal information such as online shopping habits and software use to third-party platforms such as Taobao every month for providing better services (personalized recommendations, etc.), what is the minimum price you are willing to accept?	Choose from CNY 0-100
WTP for Apple	WTP5	Suppose you need to replace a new phone currently, regardless of the actual market price of the phone in reality and the possibility of resale. For an iPhone and an Android phone with basically the same hardware performance and appearance, the value of the Android phone is 1000 RMB, what is the most you are willing to spend on the iPhone?	Choose from CNY 0-100

3.2. Questionnaire design

The main questionnaire questions and corresponding variables are shown in Tables 2 and 3. The questions about demographic variables can be found in Table 4.

First of all, we investigated people's awareness of privacy. Through these two questions, we can simply see people's views on privacy protection. Then we set up three questions in the privacy protection section, which start from the daily aspects of life. From this, we can see whether people have a preliminary privacy protection behavior. The next part is Apple Policy-Awareness, we use a picture of Apple’s advertisement with privacy protection and ask for awareness, which investigates whether consumers have noticed this privacy protection policy. It is the basis of our research about

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the comparison of Apple and Android: only when consumers are aware of the difference between Apple and Android on privacy protection can we use WTP for privacy to explain the price gap.

With similar logic, we designed questions to ask about Apple's policy agreement. By asking whether you agree that Apple provides better privacy protection than Android, you can judge whether users agree with this policy. If consumers are willing to pay Apple more for privacy, they should agree that Apple does better in privacy protection.

Then for the variable "Privacy protection- Apple", this question is for Apple users only to check whether these respondents will take action to protect their privacy when Apple offers this option. Similar questions are asked for Android users as "Privacy protection- Android".

As for dependent variables, WTP1 asks people in general terms how much extra money they would be willing to pay for a service that protects their privacy, and WTP2 asks how much extra money they would be willing to pay to protect their privacy and still be offered a personalized service. WTA1 asked the respondent, from their point of view, how much money they can accept to sell their privacy for unknown usage. WTA2 asked them how much they would accept to sell their privacy in exchange for a more personalized service. Compared with WTP1 and WTA1, WTP2 and WTA2 are more advanced services to enable the data to only be used in the "right" way. We have WTP2 and WTA2 because nowadays personalized services play an important role in our daily lives, and the strict restriction of data usage is nearly impossible. Based on updated laws such as GDPR, the government also focuses on the controlled usage of consumers' data rather than the usage of such data. Thus, the analysis of WTP2 and WTA2 is also meaningful. However, the way we asked the questions may lead the respondents to certain answers, and the results are less reliable than WTP1 and WTA1, we mainly use WTP1 and WTA1 in our main analysis. Last, WTP5 asked people the premium they would be willing to pay for Apple compared to Android with the same qualities.

We also asked some questions about demographic information. The most important control variable is consumption level. Different from the traditional questions by asking the income level, we measure the consumption level by asking about their consumption of online services. We suppose the respondents who pay more for online services may have the tendency to pay more for privacy-protective services. Thus, we can use consumption level (code is F) as a good control variable.

4. Analysis and Results

We completed a survey with 54 participants. Based on the survey, we analyzed consumers' willingness to pay for privacy protection. We show the results of summary statistics in table 4, which summarizes the statistics of the respondents' demographic information and the key variables.

Table 4: Summary Statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
Gender (Female=1, Male=0)	54	.481	.504	0	1
Income	54	2.111	1.383	1	5
Age	54	2.056	1.338	1	5
Edu	54	1.667	1.116	1	5
City	54	1.593	1.221	1	5
Privacy awareness	54	3.167	1.526	1	5
Privacy protection-positive	54	3.389	1.571	1	5
Privacy protection-negative	54	1.778	1.355	1	5
Apple policy-agreement	54	.593	.496	0	1
Consumption Level	54	53.741	40.695	0	100
WTP1	54	41.685	40.411	0	100

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Table 4: (continued).

WTP2	54	42.741	39.349	0	100
WTA1	54	54.63	43.789	0	100
WTA2	54	49.333	42.853	0	100
WTP5	54	1124.796	730.173	0	2000

Overall, the selection of respondents is random, and the sample is reliable to analyze. Respondents' cognition of privacy protection, habits of privacy protection, and key variables such as willingness to pay show significant differences, which indicates that it is meaningful to study willingness to pay for privacy with this sample to a certain extent.

However, there are some potential biases regarding education and age, since half of the respondents are young and from high school. It may be considered in our analysis later.

The first analysis we have is how privacy protection awareness affects WTP. And the results of linear regression are shown in Table 5, We choose WTP1 since WTP1 measures the general case. As for independent variables, Privacy awareness measures the positive idea of data usage, a higher score of Privacy awareness means people agree more that data usage is convenient the daily life.

Privacy protection stands for respondents' daily habits of privacy protection. Higher Privacy protection-positive shows the respondents are sensitive about privacy protection and will take action while higher Privacy protection-negative shows the respondents cannot protect their privacy very well by themselves. Last, higher consumption level shows the respondents pay more for online services and we use consumption level as a control variables.

From Table 5, we can see that WTP1 is negatively correlated with privacy awareness and privacy protection-positive, and WTP1 is positively correlated with privacy protection-negative and consumption level. All the results are significant at the 10% level.

To understand the results, it makes sense that privacy awareness is negatively correlated with WTP, the respondents who believe data usage is important may have less incentive to pay for privacy protection. Similarly, it makes sense that consumption level is significantly positively correlated with WTP since the respondents who have higher consumption levels especially higher consumption levels on online services may have the tendency to pay high for another service. However, the direction of privacy protection may seem to be counterintuitive. My understanding of the mechanism is that the two variables of privacy protection show how the respondents can protect their privacy by themselves. If the respondents are careful and can take action by themselves, they may feel less necessary to be protected by the third party. Thus, higher scores on protection-positive and lower scores on protection-negative (the careful respondents) may have lower WTP for protection services, while lower scores on protection-positive and higher scores on protection-negative (the careless respondents) may have higher WTP for protection services. Thus, privacy protection-positive is negatively correlated with WTP while privacy protection-negative is positively correlated with WTP. It is a very interesting finding that can help the firm target the groups who need the privacy protection services most.

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Table 5: Effects on Willingness-to-pay for Privacy Protection.

WTP1	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Privacy awareness	-5.056	2.581	-1.96	.056	-10.243	.13	*
Privacy protection-positive	-6.089	2.503	-2.43	.019	-11.118	-1.06	**
Privacy protection-negative	9.055	3.768	2.40	.02	1.484	16.627	**
consumption level	.552	.106	5.22	0	.339	.765	***
Constant	32.569	13.883	2.35	.023	4.671	60.467	**
Mean dependent var		41.685	SD dependent var			40.411	
R-squared		0.451	Number of obs			54	
F-test		11.759	Prob > F			0.000	
Akaike crit. (AIC)		529.307	Bayesian crit. (BIC)			539.252	

*** p<.01, ** p<.05, * p<.1

The second analysis is about how the WTP can be transferred into the premium of Apple. This part is the highlight of our research since we have innovatively internalized WTP for privacy into the willingness to pay for a brand that provides privacy services. We use the premium payment for iPhone compared with Android as dependent variables and we assume the two types of cell phones have the same qualities. The regression results are shown in Table 6.

Table 6: Regression results for WTP of iPhone.

WTP5	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
WTP1	4.438	2.451	1.81	.076	-.482	9.358	*
Apple policy-agreement	442.629	194.021	2.28	.027	53.116	832.142	**
Constant	677.501	148.284	4.57	0	379.807	975.194	***
Mean dependent var		1124.796	SD dependent var			730.173	
R-squared		0.187	Number of obs			54	
F-test		6.144	Prob > F			0.004	
Akaike crit. (AIC)		859.102	Bayesian crit. (BIC)			865.069	

*** p<.01, ** p<.05, * p<.1

First, we can see that WTP5 (WTP for iPhone) and WTP1 (WTP for general privacy protection) are positively correlated, which tells us that the willingness to pay for privacy can be transferred into the premium of the product with better privacy protection. Second, the premium for Apple is positively correlated which is the agreement for Apple's privacy-protective policy. This is important evidence showing that the respondents do pay the premium for privacy. Thus, the firm can use privacy protection as a selling point to increase the advantages as well as the price. This conclusion is consistent with Tsai et al., [7].

Last, we also do some comparison between WTA and WTP and check for framing effects by comparing WTP1 and WTP2. The comparison between WTA and WTP is shown in Table 7.

Table 7: Comparison between WTA and WTP.

Paired t test: WTP1 WTA1

	obs	Mean1	Mean2	dif	St Err	t value	p value
WTP1 - WTA1	54	41.685	54.630	-12.944	5.355	-2.4	.019

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Paired t test: WTP2 WTA2

	obs	Mean1	Mean2	dif	St Err	t value	p value
WTP2 - WTA2	54	42.741	49.334	-6.593	4.787	-1.4	.174

We know from historical literature that, WTP and WTA are always discussed together and can show people's preferences from different perspectives. In our research, we measure the people's WTP and WTA for privacy at the same time. The key difference between WTA and WTP is well discussed, and the general idea is that WTA is usually slightly higher than WTP [2].

Consistent with the previous paper, our WTA is significantly higher than WTP, which means when people consider privacy as something they already own and want to sell it for money, the money they accept is higher than the money they are going to pay to protect their privacy. Consider the scenario that the phone brand would provide privacy protection services, which is closer to the idea of WTP here, that's why we consider WTP as our main dependent variable.

5. Conclusion

A questionnaire was conducted to study how consumers' privacy cognition and protection habits affect their willingness to pay for privacy. First, as for willingness-to-pay for privacy, the consumers' agreements on the advantage of data usage are negatively correlated with WTP, which means the consumers who prefer the firms to use their data to improve the qualities have less tendency to pay for privacy protection. More importantly, the careful consumers who can protect their privacy by themselves have lower WTP, while the careless consumers who cannot protect their privacy by themselves may pay more for privacy protection services.

Then the premium payment for Apple is positively correlated with WTP for privacy, which means the firms can benefit from a privacy-protective policy and charge a higher price for it. The positive correlation between the WTP for Apple and the agreement for Apple's privacy-protective policy also supports the idea.

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