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THE EFFECT OF INDIVIDUAL PERCEPTIONS OF INTERNET CONNECTION QUALITY AND DIGITAL FINANCIAL SERVICES' PLATFORM CREDIBILITY ON THE USAGE OF DIGITAL FINANCIAL SERVICES

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ABSTRACT
Digital Financial Services (DFS) present an opportunity to expand financial access within society; however, DFS adoption remains relatively low in Indonesia. This study aims to assess how individual perceptions of internet connection quality and the credibility of DFS platforms influence their adoption in Indonesia. Utilizing data from the 2020 Digital Economy Household Survey (DEHS) and employing the probit and ordered probit estimation models, the research demonstrates a positive and significant relationship between perceptions of internet connection quality, DFS platform credibility, and the likelihood and frequency of DFS usage. Notably, a majority of DFS users fall under the "occasionally used" category, indicating usage ranging from 3 to 30 minutes per day. The study underscores the need for collaborative efforts to establish a well-distributed, trusted, and secure DFS ecosystem. This necessitates addressing regulatory frameworks, enhancing infrastructure, and improving public financial literacy to enhance user acceptance and utilization of DFS platforms.

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Introduction.

Financial inclusion is currently a concern for governments in various countries due to its significant impact on the bottom-of-the-pyramid population, which generally has a high level of unbanked individuals. Financial inclusion aims to provide access to financial services for people who lack the means to engage in financial activities. Equalizing access to financial services can have multiplier effects on the economy, such as reducing poverty, stimulating economic growth, narrowing regional disparities, and promoting financial stability (Ljumović et al., 2021; Sastiono & Nuryakin, 2019; Zins & Weill, 2016). The level of financial inclusion in Indonesia has been continuously growing, reaching 83.6% in 2021, which represents a 2.2% increase compared to 2020. One of the efforts to enhance access to financial services for the population is through the utilization of digital technology, particularly Digital Financial Services (DFS) like internet banking, mobile banking, and server-based electronic money (Yasmin & Dirbawanto, 2022).

Based on data from the Central Statistics Agency (BPS), the percentage of Indonesian society utilizing the internet for financial facilities remains relatively low, ranging from 6.46% in 2019 to 7.78% in 2021. The Indonesian Internet Service Providers Association (APJII) reported that the number of Indonesians connected to the internet in 2021-2022 reached 210,026,769 people, accounting for 77.02% of the total population, marking a 3.32% increase from the 2019-2020 period (APJII, 2022). There is an opportunity to foster financial inclusion by expanding the use of financial services through the advancement of Information and Communication Technology (ICT), particularly internet access.

As the availability of internet access services grows among the population, the quality of internet services in Indonesia becomes a crucial factor. The success of DFS relies on external factors such as reliable digital devices and a stable internet connection (Ozili, 2018). Robust and widespread financial and Information and Communication Technology (ICT) infrastructure, which ensures security, efficiency, and accessibility, is essential for providing DFS to the entire population. According to Ookla's Speedtest Global Index data, Indonesia's internet quality has been improving overall, but the fixed broadband and mobile speeds in Indonesia are among the lowest in the ASEAN region.

The information provided by APJII, Ookla, and BPS suggests that despite the growth in internet users and improvements in internet connectivity, the utilization of the internet for financial services in Indonesia remains relatively low. Apart from external factors, the success of DFS also hinges on internal factors, particularly individual perceptions of digital technology. Several studies indicate that individual perceptions, such as lack of trust, security concerns, and consumer protection on DFS platforms, hinder adoption (Kim et al., 2009; Luarn & Lin, 2005; Yousafzai et al., 2010).

Based on the aforementioned explanations, individual perceptions of internet quality and the credibility of DFS platforms are factors that the government should consider in boosting acceptance. If individual perceptions of internet quality and DFS platform credibility are indeed significantly influential in increasing DFS usage, this study will provide additional information about factors affecting DFS acceptance from the user's perspective. The objective of this research is to analyze the influence of individual perceptions of internet quality and DFS platform credibility on enhancing DFS usage, especially in mobile/internet banking and server-based electronic money in Indonesia. Thus, the research question raised is: Do individual perceptions of internet quality and DFS platform credibility affect the probability and frequency of DFS usage in Indonesia?

Literature Review.

Theoretical Review.

Various theories have attempted to explain and predict the relationship between behavioral intention and technology usage, including The Theory of Reasoned Action (TRA), The Theory of Planned Behavior (TPB), and the Technology Acceptance Model (TAM). TRA was developed by Hill, Fishbein & Ajzen (1977). This theory implies that effective use of Information Technology (IT) depends on positive behavioral intentions formed by attitudes and subjective norms. Ajzen (1991) further developed TRA into TPB. According to TPB, in addition to attitude and subjective norm, a third element influencing behavioral intention and actual behavior is perceived behavioral control (PBC), which represents an individual's perception of the availability of resources or skills required to perform a behavior. Fred Davis (1989) introduced the TAM, adapted from TRA, to explain individual acceptance of using information technology systems. This model indicates that a person's behavior when using IT is triggered by perceived benefits (perceived usefulness) and perceived ease of use. Several studies have aimed to expand the TAM concept by involving other aspects. Wang, Wang, Lin, and Tang (2003) as well as Luarn and Lin (2005) extended the TAM concept by adding the aspect of perceived credibility to explore user acceptance of mobile banking.

Meanwhile, the study by Gruber and Koutroumpis (2011) observed that the diffusion of mobile telecommunications significantly impacts the economy through GDP growth and productivity

growth. This research highlights the positive and significant contribution of mobile telecommunications infrastructure to economic and productivity growth.

Empirical Review.

The Impact of Internet Connection Quality on DFS Usage.

Specifically, DFS requires a strong and high-quality cellular network with adequate capacity. The quality of service can be assessed from the user's perspective, based on the perceived experience in using the service (Quality of Experience) (Ruth, 2015). Quality of Experience is a subjective assessment in the telecommunications field, focusing on the user's perspective on the overall value of the provided service (ITU, 2016). Roostika (2011) concluded that no one else can evaluate service quality except the customers themselves. The study by Trinugroho, Sawitri, Toro, Khoiriyah, and Santoso (Trinugroho et al., 2017) found a significant positive relationship between the perception of the quality of supporting infrastructure and the readiness of the community in implementing non-cash systems.

The Role of Perceived Platform Credibility in DFS Usage.

User acceptance of adopting DFS is crucial in the effort to expand financial access. The study by Kim et al. (2009) states that consumer trust in DFS can significantly and positively influence service usage. Another crucial aspect in DFS implementation is related to risk. Pavlou (2003) mentions economic risks in conducting online financial transactions, involving the potential for financial loss due to money loss. Consumer concerns about security and privacy protection significantly influence the acceptance of online shopping and banking (Luarn & Lin, 2005).

Socioeconomic and Demographic Factors in DFS Usage.

Several previous studies have indicated that the use of DFS is influenced by various social, economic, and demographic aspects. Research by Zins and Weill (2016) and Mouna and Jarboui (2022) found that women are less likely to have access to financial services compared to men. The study by Ljumović et al. (2021) suggests that individuals in the productive age group tend to access financial services more than those who are not productive. The research by Sastiono and Nuryakin (2019) discovered that individuals with higher education are more likely to use DFS.

Marumbwa (2014) found that employment status is a key sociodemographic characteristic predicting the frequency of mobile money transfer usage and acceptance. The study by Soumaré, Tchana Tchana, and Kengne (Soumaré et al., 2016) indicates that respondents who are divorced or single tend to use their accounts less frequently than married individuals. Moreover, the study suggests that individuals in larger households tend to use their accounts less frequently. Chamboko (2022) stated that urban residents are more likely to make digital payments compared to those living in rural areas.

A study by Lenka and Barik (2018) discovered a positive and significant correlation between increased DFS usage and increased internet and mobile phone usage in SAARC countries. The research by Maulana and Nuryakin (2021) found that account ownership significantly affects the probability of using financial services. The study by Caron (2022) found that the presence of mobile phone towers significantly influences DFS usage in the Philippines, Senegal, and Tanzania.

Conceptual Framework

After identifying the variables influencing DFS usage and frequency and considering data availability, the conceptual framework used in this study is as follows:

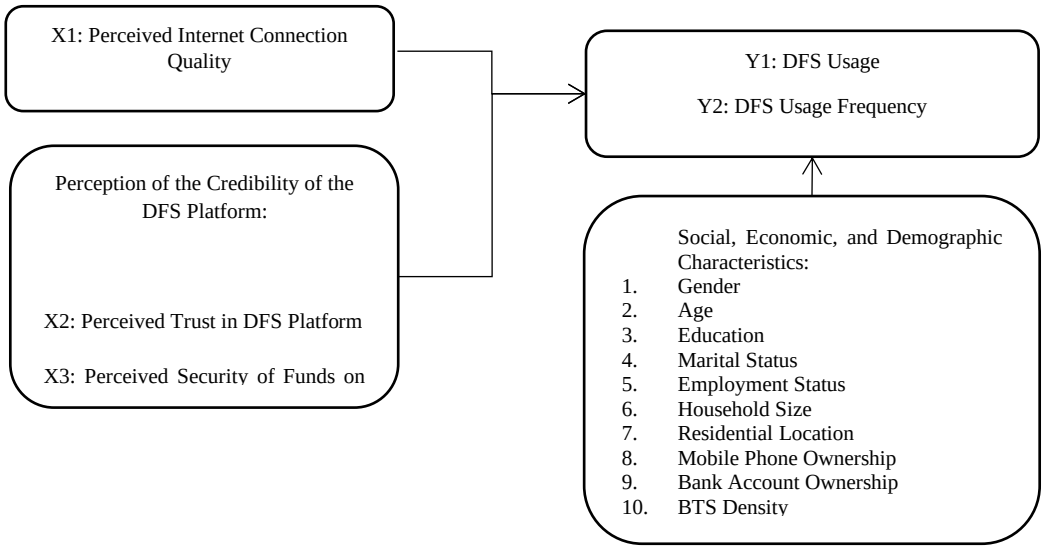

Figure 1. Research Analysis Framework.

Research Design.

The research conducted can be classified as confirmatory and explanatory, aiming to determine the factors that potentially influence a variable in hypothesis testing. This approach provides a foundational solution to address the issue of problematic financial reporting practices in Indonesia. The study focuses on accounting and finance employees from various organizations in Indonesia, with a sample size of 100 respondents.

For data collection, snowball sampling was employed, where initial respondents who completed the questionnaire were encouraged to share it with colleagues in the accounting or finance department of their respective companies or organizations. Structural equation modeling (SEM) was utilized for data analysis, primarily due to two reasons. Firstly, the variables in this study are latent, meaning they cannot be directly measured and need to be inferred from items. Secondly, SEM is well-suited for small sample sizes, typically ranging from 30 to 100 respondents (Ghozali, 2014).

This research utilizes data from the 2020 Digital Economy Households Survey (DEHS) and 2020 data on the number of BTS (Base Transceiver Stations) from the Ministry of Communication and Informatics. The analytical unit used in this study consists of individuals who were sampled in the DFS (Digital Financial Services) usage survey. The sample selection involved excluding analytical units that were identified as outliers, resulting in 3,053 observations.

The dependent variable targeted in this research is the usage of DFS by individuals. Furthermore, this study also measures the frequency of DFS usage by individuals. The DFS usage variables encompass mobile banking, internet banking, and server-based electronic money usage within the past year. The frequency of DFS usage will be measured based on the time interval of usage in minutes per day. The observations are categorized ordinally into 4 (four) groups as follows:

Table 1. Classification of DFS Usage Frequency.

Classification	Frequency of DFS Usage	Usage Interval of DFS
Fourth Category	Frequently Used	More than 30 minutes per day
Third Category	Occasionally Used	Between 3-30 minutes per day
Second Category	Rarely Used	Less than 3 minutes per day
First Category	Never Used	0 minutes per day

The main independent variable in this study is the perception of internet connection quality. Another primary independent variable is the perception of trust in the DFS platform, along with the perception of financial security on the DFS platform and the perception of usage protection on the DFS platform. This research also incorporates other variables as controls, where the use of these control variables considers data availability and is based on previous research studies. The control variables used are socio-economic and demographic conditions.

Table 2. Research Variable Specifications.

Variable	Description	Measurement
DFS_usage$_i$	DFS Usage	Usage Dummy Variable: Takes the value 1 if the respondent uses DFS and 0 if not.
DFS_frequency$_i$	Frequency of DFS Usage	Categorical Variable: Takes the value 1 for "Never," 2 for "Rare," 3 for "Occasionally," and 4 for "Often" usage categories.
Internet_quality$_i$	Perceived quality of internet connection	Internet Connection Quality Dummy Variable: Takes the value 1 if the perception of internet connection quality is good and 0 if poor.
trust$_i$	Perception of trust in DFS platform	Trust in DFS Platform Dummy Variable: Takes the value 1 if the respondent trusts the DFS platform and 0 otherwise.
security$_i$	Perceived security of funds on the DFS platform	Security of Funds Dummy Variable: Takes the value 1 if the respondent feels their funds are secure and 0 otherwise.
protection$_i$	Perceived protection of DFS platform usage	Protection Perception Dummy Variable: Takes the value 1 if the respondent feels protected while using DFS and 0 otherwise.
gender$_i$	Gender	Gender Dummy Variable: Takes the value 1 if the respondent is male and 0 otherwise.
age$_i$	Age	Respondent Age Variable: Measured in years.
	Education	Educational Level Dummy Variables: - Primary Education: Takes the value 1 if the respondent's highest education is elementary school or lower and 0 otherwise. - Secondary Education: Takes the value 1 if the respondent's highest education is junior high school or high school equivalent and 0 otherwise. - Higher Education: Takes the value 1 if the respondent's highest education is diploma or higher and 0 otherwise.
employed$_i$	Working Status	Employment Dummy Variable: Takes the value 1 if the respondent indicates being employed and 0 otherwise.
marital_status$_i$	Marital Status	Marital Status Dummy Variable: Takes the value 1 if the respondent is married or has been married and 0 otherwise.
household_size$_i$	Household Size	Household Members Variable: Measured in number of people, including the head of the household.
location$_i$	Location of residence	Urban Residence Dummy Variable: Takes the value 1 if the respondent lives in an urban area and 0 otherwise.
mobile_phone$_i$	Mobile Phone Ownership	Smartphone Ownership Dummy Variable: Takes the value 1 if the respondent owns a smartphone and 0 otherwise.
account$_i$	Account Ownership	Bank Account Ownership Dummy Variable: Takes the value 1 if the respondent has a bank account and 0 otherwise.
lnbts_density$_i$	BTS Density	Comparison of BTS per Province and Population per Province: This is a log-function comparison between the number of BTS (Base Transceiver Stations) per province and the population per province.

This study employs a quantitative method with descriptive and inferential analyses. Descriptive analysis is conducted using descriptive statistical data and cross-tabulation among all

independent variables against the dependent variable. Inferential analysis conducted in this research utilizes the probit and ordinal probit models. Both of these models are estimated using maximum likelihood and interpreted using marginal effects.

To evaluate the determinants of DFS adoption in Indonesia, probit and ordinal probit estimations are employed using the following equations:

For DFS usage:

$DFS\_usage_i = \beta_0 + \beta_1$ internet_ quality$_i + \beta_2$ trust$_i + \beta_3$ security$_i + \beta_4$ protection$_i + \beta_5$ gender$_i + \beta_6$ age$_i + \beta_7$ secondary_education$_i + \beta_8$ higher_education$_i + \beta_9$ employed$_i + \beta_{10}$ marital_status$_i + \beta_{11}$ household_size$_i + \beta_{12}$ location$_i + \beta_{13}$ mobilephone$_i + \beta_{14}$ account$_i + \beta_{15}$ lnbts_density$_i + \varepsilon_i$ …… (1)

For DFS frequency:

$DFS\_frequency_i = \beta_0 + \beta_1$ internet_ quality$_i + \beta_2$ trust$_i + \beta_3$ security$_i + \beta_4$ protection$_i + \beta_5$ gender$_i + \beta_6$ age$_i + \beta_7$ secondary_education$_i + \beta_8$ higher_education$_i + \beta_9$ employed$_i + \beta_{10}$ marital_status$_i + \beta_{11}$ household_size$_i + \beta_{12}$ location$_i + \beta_{13}$ mobilephone$_i + \beta_{14}$ account$_i + \beta_{15}$ lnbts_density$_i + \varepsilon_i$ …… (2)

Research Results.

Descriptive Analysis.

Statistically, the data of the variables used in this study are presented in Table 3. It can be seen that the total number of analysis units is 3,053 individuals. Out of this total number of observations, 13.9% used DFS during the observation period. Around 91.5% of the respondents assessed the quality of their internet connection as good. Moving on to the perception of DFS platform credibility, 78.2% of the respondents trust DFS, 35.7% consider their money to be safe on the DFS platform, and 36.3% of the respondents feel protected when using the DFS platform. In terms of socio-economic demographics, the average respondent is male, 35.2 years old, has a secondary education equivalent to junior high school or high school, is employed, is married or has been married, has 4 family members in the household, resides in an urban area, owns a mobile phone, has an account with a financial institution, and lives in an area with a BTS density of 0.002.

Table 3. Descriptive Statistics of Research Data.

Variable	Obs	Mean	Std. Dev.	Min	Max
DFS Usage	3053	.139	.346	0	1
DFS Frequency	3053	1.246	.668	1	4
Internet Quality	3053	.915	.278	0	1
Trust	3053	.782	.413	0	1
Security	3053	.357	.479	0	1
Protection	3053	.363	.481	0	1
Gender	3053	.512	.5	0	1
Age	3053	35.231	12.585	15	83
Primary Education	3053	.11	.313	0	1
Secondary Education	3053	.634	.482	0	1
Higher Education	3053	.256	.436	0	1
Employment	3053	.651	.477	0	1
Marital Status	3053	.766	.423	0	1
Household Size	3053	4.182	1.619	1	10
Location	3053	.731	.443	0	1
Mobile Phone	3053	.891	.312	0	1
Account	3053	.598	.49	0	1
BTS Density	3053	.002	.001	.001	.003

Source: DEHS 2020 and Ministry of Communication and Information (reprocessed)

Table 4. Cross-tabulation of all independent variables on the dependent variable (in %)

Independent Variable	DFS Usage		Total	Frequency of DFS Usage			
	Yest	NO		Never	Rare	Occasional	Often
1	2	3	4	5	6	7	8
Perception of Internet Connection Quality							
Good	14,42	85,58	100	85,58	5,65	6,3	2,47
Bad	8,53	91,47	100	91,47	4,65	3,1	0,78
Perception of Trust							
Trust DFS	16,01	83,99	100	83,99	6,41	6,92	2,68
Distrust DFS	6,45	93,55	100	93,55	2,55	2,85	1,05
Perception of Money Security							
Feeling the money is secured	19,56	80,44	100	80,44	7,16	8,72	3,67
Feels their money is not secured	10,79	89,21	100	89,21	4,68	4,53	1,58
Perception of Use Protection							
Feeling the DFS platform is protected	20,13	79,87	100	79,87	8,12	8,3	3,7
Feel the DFS platform is not protected	10,39	89,61	100	89,61	4,11	4,73	1,54
Gender							
Male	15,03	84,97	100	84,97	6,27	6,27	2,49
Female	12,76	87,24	100	87,24	4,84	5,78	2,15
Age Group							
Gen Z (1997 – 2012)	13,57	86,43	100	86,43	5,36	6,37	1,84
Millennials (1981 – 1996)	16,69	83,31	100	83,31	6,85	6,85	3
Gen X (1965 – 1980)	11,29	88,71	100	88,71	4,15	5,32	1,81
Boomers (1946-1964)	10	90	100	90	4,76	3,33	1,9
Post War (1928 – 1945)	0	100	100	100	0	0	0
Education							
Primary Education	2,37	97,63	100	97,63	1,48	0,89	0
Secondary Education	9,97	90,03	100	90,03	4,24	4,13	1,6
Higher Education	28,68	71,32	100	71,32	10,63	12,93	5,12
Daily activities: Work							
Working	15,11	84,89	100	84,89	5,89	6,5	2,72
Not Working	11,72	88,28	100	88,28	4,97	5,15	1,59
Marital Status							
Married / Ever Married	13,08	86,92	100	86,92	5,43	5,47	2,18
Never Married	16,69	83,31	100	83,31	6,03	7,85	2,81
Household Size							
≤ 5 People	13,85	86,15	100	86,15	5,8	5,76	2,28
> 5 People	14,23	85,77	100	85,77	4,5	7,21	2,52
Location of Residence							
Urban	15,76	84,24	100	84,24	6,27	6,99	2,51
Rural	8,9	91,1	100	91,1	3,66	3,41	1,83
Mobile Phone Ownership							
Have	15,51	84,49	100	84,49	6,21	6,73	2,57
Do not have	0,9	99,1	100	99,1	0,3	0,3	0,3
Account Ownership							
Have	19,28	80,72	100	80,72	7,94	8,32	3,01
Do not have	5,95	94,05	100	94,05	2,04	2,61	1,3

Table 4. (Continuation)

Independent Variable	DFS Usage		Total	Frequency of DFS Usage			
	Yest	NO		Never	Rare	Occasional	Often
1	2	3	4	5	6	7	8
BTS Density							
< 0,002	13,25	86,75	100	86,75	5,28	5,61	2,37
> 0,002	16,41	83,59	100	83,59	6,66	7,59	2,17
TOTAL	13,92	86,08	100	86,08	5,57	6,03	2,33

Source: DEHS 2020 and Ministry of Communication and Information (reprocessed)

Based on the table provided, it is evident that out of 3,053 respondents, only 13.92% use DFS, with the majority utilizing DFS on an occasional basis (6.03%). Moreover, a higher proportion of DFS usage is noted among individuals who rate their internet connection quality as good (14.42%), with the majority of DFS usage falling within the occasional category (6.3%). Shifting to the perception aspect regarding DFS platform credibility, a larger proportion of DFS usage is observed among individuals who express trust in the DFS platform (16.01%), feel that their money is secure on the DFS platform (19.56%), and consider the DFS platform safe to use (20.13%). In terms of usage frequency, most users who find the DFS platform credible use it occasionally.

There are more male users of DFS compared to females. The majority of DFS users belong to the Millennial generation, born between 1981 and 1996 (16.69%). A significant number of DFS users possess higher education levels (Diploma to Doctoral) (28.68%). The proportion of DFS users is higher among those who indicate they are employed (15.11%). A larger number of individuals who have never been married use DFS. DFS usage is more prevalent in households consisting of more than 5 people, at 13.85%. Individuals residing in urban areas use DFS more frequently (15.76%). Approximately 15.51% of individuals who own a mobile phone use DFS. A total of 19.28% of respondents with accounts use DFS. Individuals living in areas with a higher BTS density use DFS more frequently (16.41%). Regarding usage frequency with respect to socio-economic demographic aspects, the majority of DFS users spend between 3-30 minutes per day, categorizing their usage as occasional.

Inferential Analysis.

In the first model, this study estimates the probability of DFS usage using Probit Regression. The chi-square test results (Prob>chi2) for all specifications indicate a value of 0.0000, signifying that all independent variables used in the model collectively influence the dependent variable. The Pseudo-R2 value in the full model (specification 4) is 0.1811, suggesting that in the employed model, around 18.11% of the variation in DFS usage can be explained by the variation in the independent variables. The results of the probit regression model can be observed in Table 5.

The estimation results through stepwise regression demonstrate that both the independent and control variables utilized yield estimations and significances that remain relatively consistent across all specifications. The estimation outcomes reveal that when individuals perceive their internet connection quality as favorable, their probability of using DFS increases by 4.63% compared to individuals who consider their internet connection quality to be poor.

Table 5. Estimation Results of Probit Regression on DFS Usage.

Variables	Specification 1	Specification 2	Specification 3	Specification 4
internet_ quality	0.0601**	0.0590**	0.0486**	0.0463*
	(0.0252)	(0.0241)	(0.0240)	(0.0237)
trust	0.0813***	0.0614***	0.0633***	0.0419**
	(0.0183)	(0.0179)	(0.0178)	(0.0174)
security	0.0377**	0.0407***	0.0411***	0.0426***
	(0.0146)	(0.0141)	(0.0140)	(0.0137)
protection	0.0528***	0.0458***	0.0416***	0.0379***
	(0.0147)	(0.0141)	(0.0140)	(0.0138)
gender		0.0323**	0.0358***	0.0310**

Table 5. Continuation.

		(0.0126)	(0.0125)	(0.0123)
age		-0.00214***	-0.00239***	-0.00285***
		(0.000637)	(0.000634)	(0.000624)
secondary_education		0.126***	0.122***	0.110***
		(0.0308)	(0.0306)	(0.0311)
higher_education		0.271***	0.267***	0.232***
		(0.0311)	(0.0308)	(0.0314)
work		0.0353**	0.0345**	0.0303**
		(0.0139)	(0.0138)	(0.0136)
marital_status		-0.00709	-3.46e-05	0.00347
		(0.0173)	(0.0174)	(0.0170)
household_size			-0.00320	-0.000795
			(0.00366)	(0.00363)
location			0.0694***	0.0586***
			(0.0145)	(0.0142)
mobile_phone				0.198***
				(0.0408)
account				0.102***
				(0.0136)
lnbts_density				0.0540***
				(0.0157)
Constant	-1.835***	-2.463***	-2.608***	-1.880***
	(0.135)	(0.224)	(0.244)	(0.654)
Observations	3,053	3,053	3,053	3,053
Prob > chi2	0,0000	0,0000	0,0000	0,0000
Pseudo R2	0,037	0,1223	0,1324	0,1811
Standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

Source: DEHS 2020 and Ministry of Communication and Information (reprocessed).

Individuals who have trust in the DFS platform have a higher probability of DFS usage by 4.19% compared to individuals who do not trust the DFS platform. Individuals who feel their funds are secure on the DFS platform have a higher probability of using DFS by 4.26% compared to individuals who feel their funds are not secure on the DFS platform. The estimation results indicate that when individuals feel protected while using the DFS platform, their probability of using DFS increases by 3.79% compared to if they feel unprotected while using the DFS platform.

The estimation results also indicate that males have a higher probability of using DFS by 3.10% compared to females. There is a negative relationship between age and DFS usage; for every increase of 1 year in age, the probability of using DFS decreases by 0.29%. Individuals with secondary and higher education increase the probability of using DFS by 11% and 23.2%, respectively, compared to those with a primary education. Individuals who indicate that they are employed have a higher probability of using DFS by 3.03% compared to individuals who are not employed. Individuals living in urban areas have a greater probability of using DFS by 6.60% than those living in rural areas. Individuals who own a mobile phone have a higher probability of using DFS by 19.8% compared to individuals who do not own a mobile phone. Individuals with an account have a higher probability of using DFS by 10.2%. For every 1% increase in BTS density, the probability of individual DFS usage increases by 5.4%.

In the second model, this study estimates the influence of the probability of DFS usage frequency using the Probit Ordinal model. The chi-square test results (Prob>chi2) indicate a value of 0.0000, which means that all independent variables used in the model collectively influence the dependent variable. The Pseudo-R2 value is 0.1287, indicating that in the employed model, around 12.87% of the variation in DFS usage frequency can be explained by the variation in the independent variables.

The estimation results of the ordinal probit model find that individuals who rate their internet connection quality as good have a 5.12% lower probability of Never using DFS. Individuals who rate their internet connection quality as good have a higher probability of using DFS in the Rare category by 1.56%, in the Occasionally category by 2.23%, and in the Often category by 1.33% compared to individuals who rate their internet connection quality as poor.

The research findings also reveal that individuals who trust the DFS platform have a 3.9% lower probability of being in the Never-used category for DFS. Conversely, the probability of using DFS in the Rare category increases by 1.19%, the probability of being in the Occasionally category is greater by 1.7%, and the probability of using DFS in the Often category is greater by 1.01% compared to individuals who do not trust the DFS platform.

Table 6. Estimation Results of Ordinal Probit on DFS Usage Frequency.

VARIABLES	Probit Ordinal Estimation	Marginal Effects Probit Ordinal "Never"	Marginal Effects Probit Ordinal "Rare"	Marginal Effects Probit Ordinal "Occasional"	Marginal Effects Probit Ordinal "Often"
internet_ quality	0.276**	-0.0512**	0.0156**	0.0223**	0.0133**
	(0.126)	(0.0233)	(0.00718)	(0.0102)	(0.00617)
trust	0.210**	-0.0390**	0.0119**	0.0170**	0.0101**
	(0.0916)	(0.0170)	(0.00523)	(0.00744)	(0.00450)
security	0.240***	-0.0445***	0.0136***	0.0194***	0.0115***
	(0.0717)	(0.0133)	(0.00413)	(0.00587)	(0.00360)
protection	0.178**	-0.0330**	0.0101**	0.0144**	0.00856**
	(0.0722)	(0.0133)	(0.00412)	(0.00585)	(0.00356)
gender	0.143**	-0.0265**	0.00810**	0.0115**	0.00687**
	(0.0640)	(0.0118)	(0.00364)	(0.00518)	(0.00314)
age	-0.0138***	0.00256***	-0.000782***	-0.00111***	-0.000664***
	(0.00328)	(0.000605)	(0.000190)	(0.000269)	(0.000170)
secondary_education	0.632***	-0.117***	0.0358***	0.0510***	0.0304***
	(0.168)	(0.0311)	(0.00967)	(0.0139)	(0.00858)
higher_education	1.257***	-0.233***	0.0711***	0.101***	0.0603***
	(0.171)	(0.0315)	(0.0104)	(0.0148)	(0.0100)
work	0.179**	-0.0332**	0.0101**	0.0144**	0.00860**
	(0.0708)	(0.0131)	(0.00405)	(0.00576)	(0.00349)
marital_status	-0.00592	0.00110	-0.000335	-0.000477	-0.000284
	(0.0880)	(0.0163)	(0.00498)	(0.00710)	(0.00423)
household_size	-0.00320	0.000592	-0.000181	-0.000258	-0.000153
	(0.0189)	(0.00350)	(0.00107)	(0.00152)	(0.000908)
location	0.285***	-0.0528***	0.0161***	0.0230***	0.0137***
	(0.0749)	(0.0138)	(0.00433)	(0.00613)	(0.00383)
mobile_phone	1.032***	-0.191***	0.0584***	0.0832***	0.0495***
	(0.213)	(0.0395)	(0.0124)	(0.0178)	(0.0113)
account	0.500***	-0.0927***	0.0283***	0.0403***	0.0240***
	(0.0722)	(0.0132)	(0.00433)	(0.00613)	(0.00418)
lnbts_density	0.252***	-0.0467***	0.0143***	0.0203***	0.0121***
	(0.0819)	(0.0151)	(0.00470)	(0.00665)	(0.00410)
/cut1	2.104***				
	(0.626)				
/cut2	2.460***				
	(0.626)				
/cut3	3.153***				
	(0.628)				
Observations	3,053	3,053	3,053	3,053	3,053
Prob > chi2	0,000				
Pseudo R2	0,1287				

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

Source: DEHS 2020 and Ministry of Communication and Information (reprocessed)

This research states that when individuals feel their funds are secure on the DFS platform, the likelihood of falling into the category of Never using DFS decreases by 4.45%. Furthermore, individuals who feel their funds are secure on the DFS platform have a greater probability of using DFS in the Rare category by 1.36%, in the Occasionally category by 1.94%, and in the Often category by 1.15% compared to individuals who do not feel their funds are secure on the DFS platform. When individuals feel protected while using the DFS platform, the likelihood of Never using DFS becomes smaller by 3.3%. Moreover, the probability of those individuals using DFS in the Rare category increases by 1.01%, the probability of using DFS in the Occasionally category also rises by 1.44%, and the probability of using DFS in the Often category increases by 0.86% compared to individuals who do not feel protected.

In terms of gender, males have the highest probability of using DFS in the Occasionally category at 1.15%. Additionally, an increase of 1 year in age will reduce the probability of DFS usage frequency, particularly in the Occasionally category, by a maximum of 0.11%. Education at the secondary and higher levels contributes to an increase in the probability of DFS usage frequency in the Rare, Occasionally, and Often categories. Employed individuals have the highest probability of using DFS in the Occasionally category, at 1.44%. Residing in urban areas also presents a higher chance of using DFS in the Occasionally category by 2.3% compared to individuals living in rural areas. Individuals with a mobile phone have the highest probability of using DFS in the Occasionally category, at 8.32%. Those with accounts in financial institutions have a higher probability of using DFS in the Occasionally category, at 4.03%. An increase of 1% in BTS density will also contribute to a 2.03% increase in the likelihood of individuals using DFS in the Occasionally category.

This study also explores the relationship between perceptions of internet connection quality and the credibility of the DFS platform on the probability and frequency of DFS usage based on generations. The sample is divided into two broad groups: the younger generation consisting of Millennials and Gen Z, and the older generation comprising Gen X, Boomers, and Post War individuals. The estimation results of the influence of perceptions of internet connection quality and the credibility of the DFS platform on DFS usage probability among generations based on the probit model can be seen in Appendix 1. Meanwhile, the complete estimation results of the probit ordinal model on the probability of DFS usage frequency among generations can be found in Appendix 2. Based on the estimation results of the probit and probit ordinal models among generations, there are some differences among the three groups.

The variables of perceptions of internet connection quality, trust, and protection in DFS usage among the older generation do not prove to significantly influence the probability and frequency of DFS usage. This could be due to differences in digital literacy levels (Kominfo, 2022) and low financial literacy (Suleiman et al., 2022).

Table 7. Comparison I Intergenerational Ordinal Probit Estimation Results.

VARIABLES	**Ordered Probit Marginal Effects of All Observations**				**Ordered Probit Marginal Effects Older Generation**			
	"Never"	**"Rare"**	**"Occasional"**	**"Often"**	**"Never"**	**"Rare"**	**"Occasional"**	**"Often"**
internet_quality	-0.0512**	0.0156**	0.0223**	0.0133**	-0.0225	0.00681	0.0100	0.00559
	(0.0233)	(0.00718)	(0.0102)	(0.00617)	(0.0314)	(0.00956)	(0.0141)	(0.00788)
trust	-0.0390**	0.0119**	0.0170**	0.0101**	-0.0337	0.0102	0.0151	0.00840
	(0.0170)	(0.00523)	(0.00744)	(0.00450)	(0.0288)	(0.00882)	(0.0130)	(0.00735)
protection	-0.0330**	0.0101**	0.0144**	0.00856**	-0.0304	0.00922	0.0136	0.00756
	(0.0133)	(0.00412)	(0.00585)	(0.00356)	(0.0203)	(0.00626)	(0.00918)	(0.00523)
Standard errors in parentheses								
*** p<0.01, ** p<0.05, * p<0.1								

Furthermore, the estimation results of the probit ordinal model among the younger generation indicate that the protection variable does not prove to have a significant impact on the probability of DFS usage frequency. This once again underscores the fact that financial literacy rates in Indonesia are

still relatively low (Suleiman et al., 2022). Additionally, the variables of gender and age among the younger generation do not demonstrate a significant influence on the probability and frequency of DFS usage. The generation classified as the younger generation is considered digital natives, possessing distinct technological skills from those of preceding generations (Palfrey & Gasser, 2011).

Table 8. Comparison II Intergenerational Ordinal Probit Estimation Results.

VARIABLES	Ordered Probit Marginal Effects of All Observations				Ordered Probit Marginal Effects Younger Generation			
	"Never"	"Rare"	"Occasional"	"Often"	"Never"	"Rare"	"Occasional"	"Often"
protection	-0.0330**	0.0101**	0.0144**	0.00856**	-0.0271	0.00822	0.0116	0.00725
	(0.0133)	(0.00412)	(0.00585)	(0.00356)	(0.0175)	(0.00535)	(0.00756)	(0.00476)
gender	-0.0265**	0.00810**	0.0115**	0.00687**	-0.0122	0.00368	0.00522	0.00325
	(0.0118)	(0.00364)	(0.00518)	(0.00314)	(0.0156)	(0.00474)	(0.00672)	(0.00420)
age	0.00256***	-0.000782***	-0.00111***	-0.000664***	-0.00005	0.00002	0.00002	0.00001
	(0.000605)	(0.000190)	(0.000269)	(0.000170)	(0.00161)	(0.000487)	(0.000689)	(0.000429)
Standard errors in parentheses								
*** p<0.01, ** p<0.05, * p<0.1								

Furthermore, the variables of work and location of residence in the older generation group are not proven to have a significant effect on the probability of use and frequency of DFS usage. This could be due to lifestyle factors (Zeng & Li, 2023) and peer influence (Ravikumar et al., 2022).

Table 9. Comparison III Intergenerational Ordinal Probit Estimation Results.

VARIABLES	Ordered Probit Marginal Effects of All Observations				Ordered Probit Marginal Effects Older Generation			
	"Never"	"Rare"	"Occasional"	"Often"	"Never"	"Rare"	"Occasional"	"Often"
employed	-0.0332**	0.0101**	0.0144**	0.00860**	0.0206	-0.00625	-0.00922	-0.00513
	(0.0131)	(0.00405)	(0.00576)	(0.00349)	(0.0210)	(0.00642)	(0.00943)	(0.00534)
location	-0.0528***	0.0161***	0.0230***	0.0137***	0.00289	-0.000878	-0.00129	-0.000720
	(0.0138)	(0.00433)	(0.00613)	(0.00383)	(0.0204)	(0.00618)	(0.00912)	(0.00508)
Standard errors in parentheses								
*** p<0.01, ** p<0.05, * p<0.1								

Estimation results from the probit model indicate that the variable of secondary education among the older generation does not have a significant influence on DFS usage. This could be due to the differentiation in knowledge and skills required for digital financial activities within the older generation, which is more prominent among individuals with higher education. Individuals with higher education (bachelor's degree or higher) tend to have better digital literacy compared to those with lower education (high school diploma or lower) (Kominfo, 2022).

Discussion.

The results of the probit and ordinal probit model estimations show a significant and positive relationship between individual perceptions of internet connection quality and the probability of DFS usage as well as the frequency of DFS usage. Individuals who assess the quality of their internet connection as good have a higher probability of using DFS and using it more frequently (ceteris paribus). These findings are consistent with the study by Trinugroho et al. (2017). Thus, the provision of quality and equitable internet is considered essential in efforts to enhance the use of digital financial

facilities. The individual perception of the credibility of the DFS platform generally has a positive and significant impact on individuals' decisions to adopt DFS. These results confirm several previous research findings that customer trust in DFS (Kaur et al., 2021), security aspects (Wang et al., 2003), and user privacy protection (Luarn & Lin, 2005) are crucial in increasing community acceptance of DFS usage.

Expanding financial access through DFS requires solid collaboration among the government as a regulator, DFS providers, and telecommunication providers to build an equitable, trustworthy, secure, and protective DFS ecosystem. Therefore, efforts to expand DFS access include equitably improving internet connectivity by developing telecommunication infrastructure, particularly in non-commercial areas, establishing regulations to enhance trust, ensuring fund security and user protection on DFS platforms, and evaluating DFS products tailored to societal needs.

The estimation results reveal that socioeconomic and demographic factors affecting the probability and frequency of DFS usage include gender, age, education, employment status, residential location, mobile phone ownership, account ownership, and BTS Density. These findings are consistent with several previous studies that found gender (Zins & Weill, 2016), age (Ljumović et al., 2021), education (Maulana & Nuryakin, 2021), employment status (Marumbwa, 2014), urban location (Chamboko, 2022), mobile phone ownership (Lenka & Barik, 2018), ownership of accounts in financial institutions (Maulana & Nuryakin, 2021), and mobile phone towers (Caron, 2022) influence DFS adoption. Efforts to increase DFS demand can be stimulated by providing education to the public regarding digital literacy (through the Ministry of Communication and Information Technology) and financial literacy (through the Central Bank and Financial Services Authority), aligning to provide comprehensive information about the benefits and risks of digital financial access, especially to vulnerable populations excluded from financial services, such as women, the elderly, individuals with low education, the unemployed, rural residents, those without mobile phones, and those without accounts.

Conclusions.

This study aimed to determine how individual perceptions of internet connection quality and DFS platform credibility affect DFS adoption in Indonesia. The estimation results show a significant and positive relationship between individual perceptions of internet connection quality and DFS platform credibility and the probability and frequency of DFS usage. These findings confirm that individual perceptions contribute to shaping the decision to use DFS. These findings have implications for regulators, DFS providers, and telecommunication providers to formulate appropriate strategies and regulations, considering user acceptance aspects projected with positive perceptions of internet connection quality and DFS platform credibility.

Recommendations.

For future research, a longitudinal design could be employed to explore the dynamics, causality, and complexity among variables. Furthermore, considering the limitations of the data in this study, future research is expected to provide a more comprehensive explanation of digital financial services by capturing digital literacy and financial literacy aspects that may influence community adoption of DFS. Further studies may also consider the impact of socioeconomic and demographic aspects in shaping individual perceptions that contribute to individual decisions to use DFS.

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Appendix 1: Comparison of Probit Regression Estimation Results between generations.

VARIABELS	All Observations	*Younger Generation*	*Older Generation*
Internet_quality	0.0463*	0.0797**	0.0140
	(0.0237)	(0.0334)	(0.0319)
trust	0.0419**	0.0445**	0.0407
	(0.0174)	(0.0219)	(0.0297)
security	0.0426***	0.0410**	0.0559***
	(0.0137)	(0.0181)	(0.0206)
protection	0.0379***	0.0320*	0.0334
	(0.0138)	(0.0182)	(0.0208)
gender	0.0310**	0.0174	0.0499***
	(0.0123)	(0.0163)	(0.0189)
age	-0.00285***	-0.000463	-0.00353***
	(0.000624)	(0.00165)	(0.00132)
secondary_education	0.110***	0.167***	0.0570
	(0.0311)	(0.0499)	(0.0371)
higher_education	0.232***	0.302***	0.144***
	(0.0314)	(0.0501)	(0.0380)
employed	0.0303**	0.0477***	-0.0306
	(0.0136)	(0.0181)	(0.0215)
marital_status	0.00347	-0.0163	-0.0337
	(0.0170)	(0.0224)	(0.0451)
household_size	-0.000795	-0.00216	0.000396
	(0.00363)	(0.00478)	(0.00567)
location	0.0586***	0.0954***	-0.00286
	(0.0142)	(0.0190)	(0.0210)
mobile_phone	0.198***	0.216***	0.170***
	(0.0408)	(0.0546)	(0.0611)
account	0.102***	0.105***	0.101***
	(0.0136)	(0.0167)	(0.0240)
lnbts_density	0.0540***	0.0647***	0.0402*
	(0.0157)	(0.0215)	(0.0222)
Observations	3053	1897	1156
Prob > chi2	0,0000	0,0000	0,0000
Pseudo R2	0,1811	0,1977	0,1726

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

Source: DEHS 2020 and Ministry of Communication and Information (reprocessed)

Appendix 2: Comparison of Marginal Effect Probit Ordinal Estimation Results between Generations.

VARIABLES	Ordered Probit Marginal Effects of All Observations				Ordered Probit Marginal Effects Younger Generation				Ordered Probit Marginal Effects Older Generation			
	"Never"	"Rare"	"Occasional"	"Often"	"Never"	"Rare"	"Occasional"	"Often"	"Never"	"Rare"	"Occasional"	"Often"
internet_ quality	-0.0512**	0.0156**	0.0223**	0.0133**	-0.0818**	0.0248**	0.0351**	0.0219**	-0.0225	0.00681	0.0100	0.00559
	(0.0233)	(0.00718)	(0.0102)	(0.00617)	(0.0329)	(0.0101)	(0.0143)	(0.00915)	(0.0314)	(0.00956)	(0.0141)	(0.00788)
trust	-0.0390**	0.0119**	0.0170**	0.0101**	-0.0424**	0.0129**	0.0182**	0.0113*	-0.0337	0.0102	0.0151	0.00840
	(0.0170)	(0.00523)	(0.00744)	(0.00450)	(0.0214)	(0.00653)	(0.00926)	(0.00585)	(0.0288)	(0.00882)	(0.0130)	(0.00735)
security	-0.0445***	0.0136***	0.0194***	0.0115***	-0.0455***	0.0138**	0.0196***	0.0122**	-0.0521***	0.0158**	0.0233**	0.0130**
	(0.0133)	(0.00413)	(0.00587)	(0.00360)	(0.0174)	(0.00537)	(0.00759)	(0.00483)	(0.0201)	(0.00636)	(0.00926)	(0.00553)
protection	-0.0330**	0.0101**	0.0144**	0.00856**	-0.0271	0.00822	0.0116	0.00725	-0.0304	0.00922	0.0136	0.00756
	(0.0133)	(0.00412)	(0.00585)	(0.00356)	(0.0175)	(0.00535)	(0.00756)	(0.00476)	(0.0203)	(0.00626)	(0.00918)	(0.00523)
gender	-0.0265**	0.00810**	0.0115**	0.00687**	-0.0122	0.00368	0.00522	0.00325	-0.0448**	0.0136**	0.0200**	0.0111**
	(0.0118)	(0.00364)	(0.00518)	(0.00314)	(0.0156)	(0.00474)	(0.00672)	(0.00420)	(0.0184)	(0.00579)	(0.00843)	(0.00499)
age	0.00256***	-0.000782***	-0.00111***	-0.000664***	-0.00005	0.00002	0.00002	0.00001	0.00342***	-0.00104**	-0.00153***	-0.000853**
	(0.000605)	(0.000190)	(0.000269)	(0.000170)	(0.00161)	(0.000487)	(0.000689)	(0.000429)	(0.00128)	(0.000405)	(0.000591)	(0.000354)
secondary_ education	-0.117***	0.0358***	0.0510***	0.0304***	-0.175***	0.0531***	0.0752***	0.0468***	-0.0655*	0.0199*	0.0293*	0.0163*
	(0.0311)	(0.00967)	(0.0139)	(0.00858)	(0.0503)	(0.0156)	(0.0223)	(0.0145)	(0.0371)	(0.0114)	(0.0169)	(0.00968)
higher_ education	-0.233***	0.0711***	0.101***	0.0603***	-0.299***	0.0908***	0.129***	0.0800***	-0.150***	0.0456***	0.0673***	0.0375***
	(0.0315)	(0.0104)	(0.0148)	(0.0100)	(0.0506)	(0.0164)	(0.0234)	(0.0163)	(0.0380)	(0.0125)	(0.0182)	(0.0116)
employed	-0.0332**	0.0101**	0.0144**	0.00860**	-0.0473***	0.0144***	0.0203***	0.0127***	0.0206	-0.00625	-0.00922	-0.00513
	(0.0131)	(0.00405)	(0.00576)	(0.00349)	(0.0175)	(0.00541)	(0.00764)	(0.00490)	(0.0210)	(0.00642)	(0.00943)	(0.00534)
marital_status	0.00110	-0.000335	-0.000477	-0.000284	0.0251	-0.00759	-0.0108	-0.00670	0.0159	-0.00483	-0.00713	-0.00397
	(0.0163)	(0.00498)	(0.00710)	(0.00423)	(0.0216)	(0.00655)	(0.00929)	(0.00580)	(0.0441)	(0.0134)	(0.0197)	(0.0110)
household_size	0.000592	-0.000181	-0.000258	-0.000153	0.00224	-0.000679	-0.000963	-0.000599	-0.000542	0.000165	0.000243	0.000135
	(0.00350)	(0.00107)	(0.00152)	(0.000908)	(0.00460)	(0.00139)	(0.00197)	(0.00123)	(0.00547)	(0.00166)	(0.00245)	(0.00136)
location	-0.0528***	0.0161***	0.0230***	0.0137***	-0.0874***	0.0265***	0.0375***	0.0234***	0.00289	-0.000878	-0.00129	-0.000720
	(0.0138)	(0.00433)	(0.00613)	(0.00383)	(0.0184)	(0.00587)	(0.00827)	(0.00563)	(0.0204)	(0.00618)	(0.00912)	(0.00508)
mobile phone	-0.191***	0.0584***	0.0832***	0.0495***	-0.218***	0.0661***	0.0937***	0.0583***	-0.152***	0.0461***	0.0679***	0.0378**
	(0.0395)	(0.0124)	(0.0178)	(0.0113)	(0.0544)	(0.0170)	(0.0243)	(0.0160)	(0.0559)	(0.0176)	(0.0258)	(0.0156)
account	-0.0927***	0.0283***	0.0403***	0.0240***	-0.0941***	0.0285***	0.0404***	0.0252***	-0.0937***	0.0284***	0.0419***	0.0233***
	(0.0132)	(0.00433)	(0.00613)	(0.00418)	(0.0163)	(0.00530)	(0.00745)	(0.00528)	(0.0234)	(0.00766)	(0.0112)	(0.00721)
lnbts_density	-0.0467***	0.0143***	0.0203***	0.0121***	-0.0533***	0.0162**	0.0229**	0.0142**	-0.0389*	0.0118*	0.0174*	0.00969*
Observations	2628	170	184	71	1599	121	127	50	1029	49	57	21
Pseudo R2	0,1287				0,1384				0,1242			
Standard errors in parentheses												
*** p<0.01, ** p<0.05, * p<0.1												