

# THE IMPACT OF INTERNET USAGE ON ENTREPRENEURSHIP IN INDONESIA

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## Abstract

This study aims to determine the effect of internet usage on entrepreneurship in Indonesia. Probit regression is used in this study because the dependent variable is a binary category that indicates a family's involvement in entrepreneurial activities. The data used in this study is secondary data sourced from the Survei Sosial Ekonomi Nasional (Susenas) in 2020 and 2021. The results show that internet usage increases the probability of entrepreneurship in Indonesia by 7.4 percentage points and is statistically significant. Further analysis shows that the effect of the internet is greater for necessity-based entrepreneurship and only affects rural areas in Indonesia. This research may have implications to add to the literature for entrepreneurship development in Indonesia to compete globally.

**Keywords:** internet, entrepreneurship, probit, susenas, Indonesia.

**JEL Classification:** D1, J1, M2, O1

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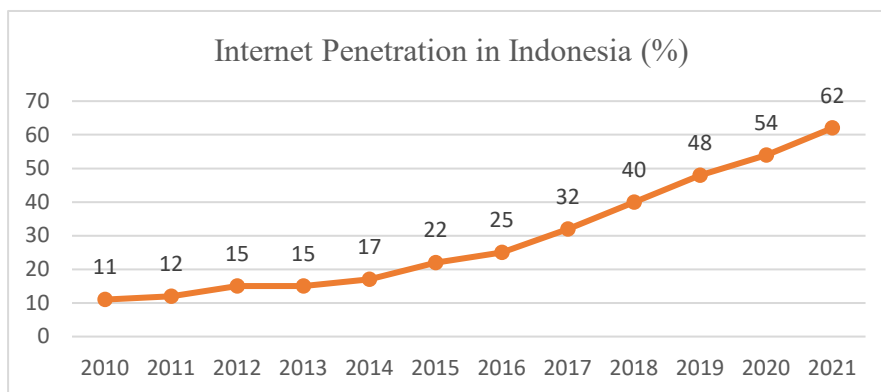
# THE IMPACT OF INTERNET USAGE ON ENTREPRENEURSHIP IN INDONESIA

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## I. Background

In the digital era, the internet has a role that can facilitate every activity with the facilities provided. The role of the internet in the digital era can be utilized in various activities for the needs of work, education, entrepreneurship, and other economic activities for every individual who has access to the internet. This research will focus on the impact of the internet on entrepreneurship.

Based on data from the report of the Indonesian Internet Service Providers Association (APJII) in 2022 the number of people in Indonesia who already have internet access is more than 210 people or reaches 77.02 percent of the total 272 million population in Indonesia. Based on the island, the highest internet penetration rate is the island of Kalimantan which reaches 79.09 percent while the lowest is the island of Papua with a penetration rate in 2021 reaching only 68.03 percent. Internet penetration is the percentage ratio of internet users to the population in a particular region (APJII, 2022). Figure 1.1 shows the increase in internet penetration in Indonesia from 2010 to 2021. So, we can conclude that most of the Indonesian population can access the internet and the number is increasing quite significantly every year as shown in Figure 1.1.



**Grafik 1.** Internet penetration in Indonesia (2010-2021)

**Source:** World Bank (2021)

In terms of internet access among Micro, Small and Medium Enterprises (MSMEs), the results of the Internet Use Survey by MSMEs conducted by APJII in 2022 stated that the use of the internet by MSMEs reached 87.43 percent of a total of 525 respondents spread across 34 provinces in Indonesia, with the respondent criteria being the owner or manager of MSMEs. Based on classification, MSMEs with the highest internet usage are

medium-sized businesses with a percentage of 72.04 percent, then small businesses 65.04 percent, and micro businesses 63.59 percent.

Most of the respondent MSMEs use the internet for promotional purposes of the businesses they run by utilizing marketplaces, social media, or their own websites. It was recorded that 82.14 percent of respondent MSMEs utilized the internet as a means of promoting their products or services (APJII, 2022). In 2022, 16.56 percent of respondents experienced an increase in sales of more than 2 times with the use of the internet in running a business, then 44.88 percent experienced an increase but less than 2 times and 38.56 percent were still fixed (APJII, 2022). So it can be concluded that the internet can help to increase sales by utilizing it mostly for promotional means.

In using the internet, there are five frameworks related to the skills needed to develop entrepreneurship: operational skills (technical skills to navigate digital media), formal skills (browsing and navigation), information skills (searching, selecting, evaluating information in digital media), communication skills (ability to communicate on the internet), and content creation skills (ability to produce content) (Van Deursen, Courtois, and Van Dijk, 2014). Then, there are other skills that support business activities, namely in the form of internet marketing skills, for example, such as search engine optimization (SEO), interactive advertising, customer service, and maintaining customer relationships via the internet (Yuldinawati, Deursen, and Dijk, 2018).

There are several previous studies in various regions that explain that the effect of the internet on entrepreneurship has a positive effect and a more significant effect on rural areas (Forman, Goldfarb, and Greenstein, 2012; Liu, Ren, and Mei, 2022; OECD, 2017; Tan and Li, 2022).

Although the internet has many benefits in entrepreneurship, these benefits will only be obtained for areas with adequate facilities. Currently, Indonesia is still sub-optimal in internet access performance. Based on data from the Speedtest Global Index, Indonesia's internet speed position with mobile networks in March 2023 is ranked 101 out of 140 countries, while for fixed broadband networks it is ranked 120 out of 180 countries (Ookla, 2023). Download speed using mobile networks only reached 21.35 Mbps below the global performance which reached 41.54 Mbps, while for fixed broadband networks the download speed in Indonesia reached 25.59 Mbps below the global performance which reached 79.00 Mbps (Ookla, 2023). This condition makes Indonesia lag behind surrounding countries, such as Malaysia which is ranked 45th for mobile networks and 37th for fixed broadband networks. When compared to countries in the Southeast Asia region, Indonesia is at the bottom of the list in download speed for mobile and fixed broadband networks (Ookla, 2023).

This condition is an obstacle for MSME businesses in the current digital era, especially related to information technology infrastructure in Indonesia. Other challenges faced are financial financing, business skills and low information technology knowledge. Then globalization that occurs can also potentially be a new opportunity or even a challenge in the form of international competition that makes the use of the internet not optimal (Yuldinawati, Deursen, and Dijk, 2018).

This challenge must be addressed immediately by Indonesia because based on the results of research in Indonesia, the use of the internet in running a business has great benefits for developing and maintaining a business, especially when there is a shock such as an outbreak. By combining online and offline systems, businesses can utilize the internet to accelerate their digital transformation (Kurniawati et al., 2021). This not only helps entrepreneurs survive difficult conditions, but also allows them to continuously adapt to market changes more efficiently.

In this study, the authors attempt to examine the effect of internet usage on the probability of entrepreneurship with data from the country of Indonesia. The data will illustrate the magnitude of the impact of the internet on the probability of households engaging in entrepreneurial activities in Indonesia. In Indonesia itself, there are still few studies that discuss this topic, so the author wants to study further with data from Indonesia.

This study was conducted to determine the effect of internet usage on the probability of entrepreneurship in Indonesia. The model used in the study refers to the research model used by Ying Tan and Xiaoying Li (2022) in China with the title "The Impact of Internet on Entrepreneurship". Respondents in this study were limited to individuals aged 18-65 years to avoid the impact of school age and retirement. In addition, the age group is included in the labor force and uses the internet in daily activities. This research will be conducted using secondary data obtained from the results of Survei Sosial Ekonomi Nasional (Susenas) in 2020 and 2021.

## **II. Literature Review**

Currently, the internet has been commonly used by people in Indonesia for various needs. According to Varian (2001) the internet is an information technology infrastructure that provides global connectivity and enables efficient information exchange, communication, and economic transactions. The internet provides a variety of benefits to further facilitate the activities of each individual. For example, the internet is a source of open information channels, learning channels, communication channels to become transaction channels that can be easily accessed by every community.

In the study of information economics conducted by Stiglitz (2002), it discusses how imperfect information affects markets and the economy as a whole. In the context of information economics, the discussion presented can be applied to aspects of information management for decision-making. Here are some basic concepts in the study conducted by Joseph E. Stiglitz related to information economics.

1) Asymmetric information

Asymmetric information refers to a situation where one party in a transaction has more information or knowledge than the other party. In economic terms, this means that one party involved in the transaction process has a different level of information about the quality, value or risk associated with a product or service. This information asymmetry can lead to market failures and inefficiencies.

2) Adverse selection

Adverse selection is a condition where one of the parties involved in the transaction has more information than the other party so that it will cause information imbalance. As a result of this condition, the party who has better information will utilize it for the benefit of one party, while the other party does not fully understand the information which results in the transaction becoming unfair and can harm one party.

3) Moral hazard

When parties are protected or guaranteed by a transaction or contract, they will tend to change their behavior to be more risky because they know that the negative consequences will not be fully borne by them. Moral hazard occurs when individuals or entities are encouraged to act against the interests of others because of insurance or protection.

4) Signal

A signal is an action or information used by one party to communicate certain qualities or characteristics to another party. Signals can help reduce information asymmetry and affect trust in transactions.

The discussion of Information economics explains important insights into market analysis, contracting, decision-making, and policy design in a variety of economic fields, including finance, insurance, healthcare, marketing, and corporate organization. In some previous literature, the internet is explained that the internet has an abundance of information that is useful for businesses to innovate in the development of the businesses they run. Innovation is the process of developing and implementing new ideas, products, or processes that bring added value to customers or create higher efficiency (Christensen, 1997, 15). Innovation can be incremental (gradual improvement) or radical innovation (drastic change). The innovations created may result in changes that distort the existing market. It can disrupt established business models as it often comes about through technological

innovation or new business models that are different to pre-existing systems. When disruption occurs, affected industries must adjust to survive or thrive. This can be done by business model transformation, investment in internal innovation, or partnerships with innovative companies. As MSME players in Indonesia did, they combined offline and online business models so that they could survive during the Covid-19 pandemic (Kurniawati et al., 2021).

In his book, *Diffusion of Innovations* (Rogers, 2010, 41), Rogers explains the diffusion of innovations theory which focuses on how new innovations, such as technologies, ideas, or practices can occur. Rogers identified five stages of innovation diffusion, namely knowledge, persuasion, decision, implementation, and confirmation. Rogers proposed the concept of innovation characteristics that influence the rate of adoption, including relative advantage, simplicity, compatibility, trialability, and observability. In technology diffusion theory Rogers highlighted the role of communication in influencing innovation adoption. Rogers identified communication channels that play a role in disseminating information about innovations, such as interpersonal communication, mass channels, and interactive channels. Interpersonal communication, including recommendations from family members, friends or colleagues, has a strong influence in the innovation adoption process.

From the consumer side, the internet affects the consumption patterns made by the community. Internet use in daily activities increases spending on online shopping for sports products, computers and cellphones, learning services and food delivery services in Canada (AbdulHussein, Cozzarin, and Dimitrov, 2022). This can be an opportunity for businesses to reach consumers through digital platforms that have been developed.

The *Entrepreneurship at a Glance* report issued by the Organisation for Economic Co-operation and Development (OECD) (2017) explains that digital tools and broadband access have a role in encouraging the creation and dissemination of knowledge in entrepreneurship development to open up opportunities for micro and small entrepreneurs to reach global markets (OECD, 2017).

Various internet-based transformations in the digital era have various benefits in entrepreneurship and economic development. First, in the field of entrepreneurship, the internet can reduce entry barriers and facilitate start-ups with innovation and introduce change management in organizations and businesses (Fossen and Sorgner, 2021; Matthes and Kunkel, 2020; Yunis, Tarhini, and Kassar, 2018).

Second, the internet also provides faster and more accurate information facilities to help businesses find business models so as to minimize the risk due to asymmetric information (Tan and Li, 2022). Information is important for business actors to be utilized as an opportunity in running a business, so that it greatly affects the

development of the business being run (Shane and Venkataraman, 2000). For example, information needed to start a business can be more easily obtained through the internet, either through an easier communication process or by independent exploration.

Third, the internet can reduce transaction costs and remove distance and time barriers that hinder potential buyers in urban and rural areas (Khanal, Mishra, and Koirala, 2015; Tan and Li, 2022). Thus, the internet can catalyze transformation in production and stimulate product demand (Wang, Hu, and Xiong, 2022).

Fourth, when viewed from the financial sector, the internet makes it easier for business actors to get financial assistance to run a business. The digital financial sector, which is also experiencing developments, makes financial access easier to reach by the community. The digital financial sector can improve the pre-existing banking system which can then be utilized by the community while encouraging entrepreneurial activities (Aghion, Fally, and Scarpetta, 2007). In the digital financial sector, the internet plays an important role in encouraging entrepreneurship by facilitating businesses in obtaining information about financing outside the banking sector to conduct research and development (Ding, Gu, and Peng, 2022; Tan and Li, 2022). In addition, crowdfunding systems can also help businesses to obtain business financing at a lower cost (Tan and Li, 2022). For financial transaction needs, banking services encourage the creation of fast transactions through mobile devices known as mobile banking services. The existence of mobile banking services makes banking transactions more effective and efficient (Veijalainen, Terziyan, and Tirri, 2002). Mobile banking services make it easier for someone to conduct banking transactions anywhere and anytime without having to come to the bank to make transactions ((Yuldinawati, Deursen, and Dijk, 2018); Zusryn and Hashfi, 2020). So, it can be concluded that there are many benefits of using the internet in running a business that makes business actors motivated and start using the internet in their business activities, such as the use of e-commerce (Yuldinawati, Deursen, and Dijk, 2018).

There are several studies that have discussed how the internet affects entrepreneurial activities before. Tan and Li (2022) conducted research using China Family Panel Study (CFPD) data related to internet usage on the probability of households engaging in entrepreneurial activities in China. The results of their research show that the use of the internet can positively encourage households to engage in entrepreneurial activities by up to 5 p.p. Furthermore, Tan and Li's (2022) research also shows that internet usage also positively affects the growth of new entrepreneurs by 3 p.p. Based on the regional analysis conducted, the impact of internet usage on entrepreneurial activity is more significant for rural areas. According to Tan and Li (2022), this is due to the improvement of infrastructure in rural areas by the government, which makes entrepreneurial activity grow more rapidly. Based on the type of business, namely opportunity-based entrepreneurship and necessity-based

entrepreneurship, it shows that the use of the internet is greater in encouraging opportunity-based entrepreneurship by 7.5 percent than necessity-based entrepreneurship, which is only 5.4 p.p.

Similar research was also conducted by (Liu, Ren, and Mei, 2022) for agricultural households in rural China. The results of the study are also in line with the research of Tan and Li (2022) that usage has a positive impact on encouraging agricultural households to engage in entrepreneurial activities up to 6.3 percent. Based on the type of entrepreneurship, this study shows that the use of the internet by farm households has a greater impact on necessity entrepreneurship of up to 5.8 p.p compared to opportunity-based entrepreneurship of only 0.9 p.p. The study further shows that the internet has a positive impact on farm households engaging in entrepreneurial activities. The study further shows that the internet enhances digitalization in rural areas, increases the propensity of farmers to engage in entrepreneurial activities, and boosts regional economic income.

In a study conducted by Cumming and Johan (2010) on the effect of government-provided internet to rural communities in the Canadian province of Alberta on regional entrepreneurship, it showed an increase in entrepreneurship for regions with more internet users. The provision of internet by the government of Alberta Canada known as SuperNet shows that the internet spurs entrepreneurial activity by allowing agglomeration for areas covered by SuperNet. However, for remote areas that are not covered by SuperNet and have small internet users, the results show a decline in entrepreneurial activity.

Another study conducted by Gomes and Lopes (2022) showed that Information and Communication Technology (ICT) facilities positively affect the growth of total early-stage entrepreneurial activity (TEA) in OECD countries. There are 3 ICT facilities used in this measurement, namely cellular phones, internet, and fixed broadband networks. As a result, the use of cellular phones has the highest impact on the formation of new businesses in OECD countries, which is 9 p.p. According to the research conducted, the evolution of cellular phone technology for various purposes has increased its use, which has also influenced the formation of new businesses. The next ICT facility is fixed broadband, which has a positive effect of up to 5.5 p.p on new business formation in the OECD region. Fixed broadband networks are fundamental in business environments but access is more limited for the entire population. As such, its usage has not increased dramatically due to the high cost for a household. Last but not least is the internet, which positively influences new business formation in OECD countries by 3.6 p.p. Currently, the internet is not able to replace fixed broadband, but it can be accessed at a lower cost. The study shows that ICT facilities contribute to fostering the development and accelerated growth of entrepreneurial activity among countries in the OECD region.



In the African continent, the presence of high-speed internet has a positive impact on entrepreneurial activities for people connected to the internet. The results of a study conducted by Hounghonon, Mensah, and Traore (2022) showed that access to high-speed internet increased by 17.4 p.p the probability of households running agricultural businesses in the African region. The study classified businesses into several sectors namely agribusiness, manufacturing, and services. The results for the agribusiness and manufacturing sectors showed insignificant results, but for the services sector the internet had a significant positive effect on the involvement of households running service-oriented businesses.

However, different results were shown in research conducted by (Fairlie, 2006). Using the probit regression method with Current Population Survey (CPS) data from 1997-2001 in the United States at the individual level. Internet access at home has no effect on entrepreneurship for women, but the internet has an effect on businesses that are already running.

### III. Data and Methods

This research was conducted using data sourced from Survei Sosial Ekonomi Nasional (Susenas) taken in March 2020 and 2021 conducted by the Central Statistics Agency (BPS). Susenas is a survey designed to collect socio-population data in Indonesia at a relatively very broad national level. Susenas contains data related to education, health, housing, consumption, employment and other socioeconomic fields. This survey contains data at the individual and household level from 33 provinces in Indonesia, so research using Susenas data can represent analysis at the national level in Indonesia.

The model used in this study is based on the model used by Tan and Li (2022) who conducted research on the effect of internet usage on the probability of households engaging in entrepreneurial activities in China with the following model specifications:

$$\begin{aligned} Prob(wirausaha_{it} = 1) = & \alpha + \beta_1 internet_{it} + \beta_2 age_{it} + \beta_3 agesq_{it} \\ & + \beta_4 male_i + \beta_5 married_{it} + \beta_6 educ_{it} + \beta_7 rural_{it} + \beta_8 hh\_size_{it} \\ & + \beta_9 health_{it} + \beta_{10} signal_{it} + \lambda_i + \theta_t + u_{it} \end{aligned}$$

In the analysis to determine the effect of household internet use on household involvement in entrepreneurial activities, many aspects are needed. Therefore, comprehensive control variables related to

individual home characteristics and household characteristics that influence households to engage in entrepreneurial activities are needed.

This research was conducted using the probit model method. Wooldridge (2016, 525) explains that the probit method is used when the dependent variable is discrete and the value is small. The probit method was chosen because the outcome in this study is a binary category that indicates a family's involvement in entrepreneurial activities. The use of the probit method is useful for determining the likelihood of an event occurring to one of the categories by estimating the probability that an observation with certain characteristics.

The model used in this study has the potential to cause endogeneity problems. The endogeneity problem is due to reverse causality where internet use will affect household involvement in entrepreneurial activities, but people involved in entrepreneurial activities may use the internet more because of entrepreneurial activities. To identify the reverse causality, this study creates a new entrepreneur variable based on Susenas data in 2020 and 2021 as in the research conducted by Tan and Li (2022). New entrepreneurs refer to households that are not engaged in entrepreneurial activities in 2020 but are registered in entrepreneurial activities in 2021 Susenas data. Based on this strategy, the model is changed as follows.

$$\begin{aligned} \text{Prob}(\text{wirausaha Baru}_{it} = 1) = & \alpha + \beta_1 \text{internet}_{it} + \beta_2 \text{age}_{it} \\ & + \beta_3 \text{agesq}_{it} + \beta_4 \text{male}_i + \beta_5 \text{married}_{it} + \beta_6 \text{educ}_{it} \\ & + \beta_7 \text{rural}_{it} + \beta_8 \text{hh\_size}_{it} + \beta_9 \text{health}_{it} + \beta \text{signal}_{it} + \lambda_i + \theta_t + u_{it} \end{aligned}$$

To find out that the internet has different effects on different types of businesses or different regions, this study will divide the sample into several samples to analyze the heterogeneous effects of the internet on entrepreneurial activities. Based on the type of entrepreneurship, this study divides entrepreneurial activities into 2 types: necessity-based entrepreneurship and opportunity-based entrepreneurship. Necessity-based entrepreneurship is starting an entrepreneurial activity due to limited alternative opportunities, often due to unemployment or low income. Opportunity-based entrepreneurship refers to the creation of a business or venture that arises from identifying and capitalizing on opportunities in the market. It is driven by an unmet need in the market and a desire to capitalize on it. Motivated opportunity-based entrepreneurs actively seek opportunities to create and grow new businesses (Fairlie and Fossen, 2018). Opportunity-based entrepreneurs generally have a larger scale and create more employment opportunities.

In dividing the needs-based and opportunity-based entrepreneurial sub-samples, this research uses the total food expenditure per capita in a month. The total food expenditure per capita was compared with the food poverty line according to BPS in 2020 and 2021. In 2020, the food poverty line was IDR339,004 (73.87 percent) and in 2021 it was IDR360,007 (74.05 percent). Individuals who have total expenditure below the food poverty line will fall into the needs-based entrepreneurial group while those who have total food expenditure above the food poverty line are opportunity-based entrepreneurs. Based on region, this study divides rural and urban sub-samples to test for differences between the impact of the internet on entrepreneurial decision-making in urban and rural areas.

To see the impact of the internet as a source of information for business actors, this study adds the interaction variable of internet use with internet use behavior such as information sources, learning, social media, and entertainment. To analyze the impact of the internet on household involvement in entrepreneurial activities in terms of financing, both formal and informal financing. This study adds an interaction analysis of internet usage variables and financing from banking and non-banking financing separately.

## **IV. Result**

### **4.1. Descriptive statistics**

This study was conducted to show how internet usage affects the probability of households engaging in entrepreneurial activities in Indonesia. Table 1 shows the summary statistics of the variables used in the study. The summary statistics were obtained by combining Susenas data in 2020 and Susenas data in 2021, which had previously been weighted with the same household head in each year. Based on the combination of Susenas data in 2020 and 2021, the total sample is 1,271,913 individual household heads. The statistical summary results show that 49.4 percent of the sample is involved in entrepreneurial activities and there are 51.8 percent of households that use the internet in this research observation.

Based on existing research, this study uses demographic characteristics including age, gender, marital status, years of education, health, household size and regional classification as covariates. Regional classification shows the difference in household residence based on rural and urban areas. Based on the characteristics of the respondents, the average age of the respondents was around 45 years old, 76.2 percent of the sample were male household heads and 94.8 percent were married.

Variable	<i>Obs</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Min</i>	<i>Max</i>	<i>Mode</i>
= 1 if entrepreneurship	1,271,913	0.494	0.499	0	1	0
=1 if using the internet	1,271,913	0.518	0.499	0	1	1
Age	1,271,913	45.148	9.724	18	65	-
Age squared	1,271,913	2,132.964	878.602	324	4225	-
= 1 if male gender	1,271,913	0.762	0.426	0	1	1
= 1 if marital status is married	1,271,913	0.948	0.222	0	1	1
education level	1,222,121	8.62	3.892	1	21	-
= 1 if no health problems	1,258,895	0.937	0.242	0	1	1
household size	1,271,913	4.004	1.481	0	16	-
= 1 if the classification is rural	1,271,913	0.497	0.499	0	1	0
Signal	1,271,913	6,789.605	3,540.153	343	11520	-

**Table 1.** Descriptive statistics

Furthermore, Table 2 compares the subgroups of households that use the internet and those that do not. Among the 1,271,913 samples, 51.8 percent belong to the internet user group. The comparison results show that household status and characteristics are significantly different in the two sub-samples. The t-statistic test results show that there are differences between the two subgroups of internet-using households and households that do not use the internet.

	Internet = 1		Internet = 0		t-test for difference in means
	mean	Std.	mean	Std.	
entrepreneur	0.667	0.007	0.397	0.009	23.207***
Age	40.396	0.166	47.011	0.153	28.833***
Age squared	0.736	0.006	0.772	0.007	3.404***
Binary marriage	0.921	0.004	0.893	0.005	-4.098***
Education level	10.693	0.065	7.222	0.055	40.594***
Rural binary	0.752	0.010	0.467	0.006	25.347***
Binary health	0.941	0.004	0.862	0.005	10.154***
Household size	3.98	0.029	4.13	0.027	-3.430***
Internet signal	5,295.461	55.726	4,294.917	55,726	11,4538***

**Table 2.** Sub-groups of internet users and non-users

## 4.2. Regression Results

This research analysis was conducted using internet usage as the main variable. The internet variable is a dummy variable that takes the value of 1 for households that use the internet and 0 for households that do not use the internet. Then the dependent variable in this study is household involvement in household activities which is a dummy variable that takes the value of 1 for entrepreneurs who are involved in entrepreneurial activities. To represent the data used at the national level in Indonesia, all estimation results are weighted.

	(1)	(2)	(3)	(4)	(5)	(6)
Internet	0.127*** (0.030)	0.097*** (0.026)	0.074*** (0.026)	0.074*** (0.025)	0.074*** (0.027)	0.074*** (0.027)
Age	-0.009* (0.005)	-0.007** (0.006)	-0.009* (0.005)	-0.009 (0.006)	-0.009 (0.006)	-0.009 (0.006)
Age squared	0.000*** (0.000)	0.000** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
Male binary	-0.012 (0.010)	-0.018 (0.013)	-0.021 (0.013)	-0.021 (0.013)	-0.025* (0.014)	-0.025* (0.014)
Binary marriage	-0.007 (0.036)	-0.006 (0.038)	-0.016 (0.037)	-0.016 (0.037)	-0.014 (0.035)	-0.014 (0.035)
Education level		-0.010*** (0.002)	-0.007*** (0.002)	-0.007*** (0.002)	-0.007*** (0.002)	-0.007*** (0.002)
Rural binary			0.133*** (0.030)	0.133*** (0.030)	0.130*** (0.030)	0.131*** (0.030)
Household size				0.000 (0.005)	0.000 (0.005)	0.001 (0.005)
Binary health					0.058* (0.030)	0.057* (0.030)
Internet Signal						0.000 (0.000)
<i>Region fixed effect</i>	Yes	Yes	Yes	Yes	Yes	Yes

<i>Year fixed effect</i>	Yes	Yes	Yes	Yes	Yes	Yes
N	1,271,913	1,222,121	1,222,121	1,222,121	1,211,477	1,211,477

Notes: The estimation results in the table show the coefficient level (standard error). The \*, \*\*, \*\*\* indicate statistical significance at the 10 percent, 5 percent, and 1 percent significance levels, respectively.

**Table 3.** Estimation results of the probit marginal effect of internet usage on self-employment

Adopting the research conducted by Tan and Li (2022), this study conducted a stepwise regression by adding control variables in the benchmark model used in a stepwise manner to examine the effect of internet usage on household involvement in entrepreneurial activities. Table 3 shows the regression results according to the benchmark model, in Column (1) the control variables used are age, age squared, gender and marital status. The results show that internet usage positively affects the probability of households engaging in entrepreneurial activities to the extent of 12.7 p.p at 1 percent significance level. Furthermore, Column (2) to Column (6) of this study adds other control variables, namely school year, regional classification, family size, health condition, and internet quality. The regression results by adding all the control variables in the model show that internet use increases the probability by 7.4 p.p of households engaging in entrepreneurial activities and is significant at the 1 percent level. The regression results in Columns (1) to (6) show results that are not significantly different, indicating that the estimation is robust.

	(1)	(2)	(3)	(4)	(5)	(6)
Internet	0.082** (0.034)	0.070** (0.030)	0.040** (0.029)	0.037** (0.029)	0.033** (0.028)	0.033** (0.028)
Control variables	Ya	Ya	Ya	Ya	Ya	Ya
Region fixed effect	Ya	Ya	Ya	Ya	Ya	Ya
N	542,542	514,695	514,695	514,695	508,603	508,603

Notes: The estimation results in the table show the coefficient level (standard error). The \*, \*\*, \*\*\* indicate statistical significance at the 10 percent, 5 percent, and 1 percent significance levels, respectively.

**Table 4.** Estimation results of the probit marginal effect of internet usage on new entrepreneurs

Regression results using the benchmark model show that internet usage positively affects the probability of households engaging in entrepreneurial activities. However, the benchmark model used challenges endogeneity issues that may cause the estimation results to be biased. The benchmark model used may have a reverse causality problem due to the possibility that internet usage is caused by engaging in entrepreneurial activities.

To identify the reverse causality effect of internet usage on entrepreneurial activity, this study constructs a new entrepreneur variable based on Susenas data in 2020 and 2021. New entrepreneurs refer to households that are not engaged in entrepreneurial activities in 2020 and then in 2021 data are engaged in entrepreneurial activities. Table 4 shows the regression results of the effect of the internet on new entrepreneurs. The specification used is similar to the regression in the benchmark model. The estimation results on new entrepreneurs still show that the internet positively increases the probability of households engaging in entrepreneurial activities by 3.3 p.p with a significance level of 5 percent.

To determine the effect of internet usage on the probability of households engaging in entrepreneurial activities based on different types of entrepreneurship and different regions, this study divides the sample into several sub-samples to analyze the heterogeneous effects of internet usage on the probability of households engaging in entrepreneurial activities. First, this study divides the type of self-employment into two types. The Global Entrepreneurship Monitor (GEM) divides entrepreneurial types into necessity-based entrepreneurship and opportunity-based entrepreneurship. Necessity-based entrepreneurs are individuals who choose to engage in entrepreneurial activities because they cannot find employment or other methods of earning income to meet their needs. Necessity-based entrepreneurs are generally smaller in scale. In contrast, opportunity-based entrepreneurs are generally larger in scale and growth and create more employment opportunities. To distinguish between necessity-based and opportunity-based types of self-employment, this research is based on food poverty grains.

	(1)	(2)	(3)	(4)
	Kebutuhan	Peluang	Desa	Kota
Internet	0.073** (0.024)	0.042** (0.019)	0.072*** (0.019)	0.099 (0.076)
Control variables	Yes	Yes	Yes	Yes
Region fixed effect	Yes	Yes	Yes	Yes
N	421,811	102,726	244,392	262,934

Notes: The estimation results in the table show the coefficient level (standard error). The \*, \*\*, \*\*\* indicate statistical significance at the 10 percent, 5 percent, and 1 percent significance levels, respectively.

**Table 5.** Estimation results of the marginal effect probit of internet usage on self-employment by type and region

In Table 5 Columns (1) and (2) show the estimated marginal effects of the impact of internet usage on the probability of households engaging in opportunity-based and necessity-based self-employment activities. A comparison of the regression results in Table 5 shows that internet usage positively encourages households to engage in both necessity-based and opportunity-based entrepreneurial activities at the 5 percent significance level with a larger contribution to necessity-based entrepreneurship. This result is in line with the results of (Liu, Ren, and Mei, 2022) that the impact of the internet is greater on necessity-based entrepreneurship. For necessity-based entrepreneurs, information obtained through the internet will significantly increase the probability of them engaging in entrepreneurial activities because they have no other better options to fulfill their life needs.

Furthermore, this study divides the sub-sample based on regional classification, namely rural and urban areas, to test the differences in the effect of internet usage on the probability of households engaging in entrepreneurial activities in rural and urban areas. In this study, the regional classification is based on data from the Central Bureau of Statistics. The regression results in Columns (3) and (4) show that internet usage has a positive and significant effect on the probability of households engaging in entrepreneurial activities in rural areas but no effect for urban areas. These results are in line with research (Kim and Orazem, 2017; Liu, Ren, and Mei, 2022; Tan and Li, 2022). The use of the internet in rural areas can help entrepreneurs to reach the market in meeting production raw materials and marketing production results. In contrast to urban areas, without using the internet, production needs and marketing of production products are easier to do.

	(1)	(2)	(3)	(4)
Internet	0.071*** (0.036)	0.002 (0.015)	0.031 (0.019)	0.048*** (0.062)
Use of the internet to get information	0.108*** (0.046)			
Use of the internet for learning		0.009 (0.066)		
Use of the internet for entertainment			0.052 (0.031)	
Use of the internet for social networking				0.054*** (0.070)
Control variables	Yes	Yes	Yes	Yes
Region fixed effect	Yes	Yes	Yes	Yes
N	190,109	190,109	190,109	190,109

Notes: The estimation results in the table show the coefficient level (standard error). The \*, \*\*, \*\*\* indicate statistical significance at the 10 percent, 5 percent, and 1 percent significance levels, respectively.

**Table 6.** Estimation results of the probit marginal effect of internet usage on self-employment based on internet usage behavior.



It is mentioned in the literature review that the internet has many benefits, one of which is as a source of more efficient and accurate information. The benefits in obtaining information are needed by entrepreneurs to reduce asymmetric information, reduce transaction costs and identify opportunities (Wang, Hu, and Xiong, 2022). This study also estimates the effect of internet usage based on different internet usage behaviors. This study divides internet usage behavior into several categories such as internet usage for information, entertainment, learning, and social networking.

In Table 6, the use of the internet for information and learning has significant results at the 1 percent level. Using the internet for information activities increases the probability of households engaging in entrepreneurial activities by 10.8 p.p. This is related to the increase in digital human capital, which indicates that using the internet for information can increase personal skills (Baker et al., 2020). This is related to the increase in digital human capital, which indicates that using the internet for information can improve personal skills (Baker et al., 2020). These results confirm that the internet has a positive effect on entrepreneurship as an important channel to obtain information necessary for entrepreneurship.

Meanwhile, using the internet for social networking increases the probability of households engaging in entrepreneurial activities by 5.4 p.p and is significant at the 1 percent level. Using the internet for social networking can expand an individual's social network and thus increase the probability of engaging in entrepreneurial activities. Social capital is an important factor in entrepreneurship (Arafat et al. 2020). More social capital means more social exchange (Emerson, 1972) and interaction with relevant information and access to useful tools related to entrepreneurship (Davidsson and Honig 2003). Meanwhile, using the internet for social networking increases the probability of households engaging in entrepreneurial activities by 5.4 p.p and is significant at the 1 percent level. Using the internet for social networking can expand an individual's social network and thus increase the probability of engaging in entrepreneurial activities. Social capital is an important factor in entrepreneurship (Arafat et al. 2020). More social capital means more social exchange (Emerson, 1972) and interaction with relevant information and access to useful tools related to entrepreneurship (Davidsson and Honig 2003). Interpersonal communication is an important way for people to obtain social and economic resources and maintain and develop social networks (Cho et al., 2007). Several studies have shown the positive effects of social networks on entrepreneurial activities. Social networks are utilized by entrepreneurs to obtain external financing to carry out entrepreneurial activities (Barnett, Hu, and Wang, 2019).

	(1)	(2)	(3)	(4)
Internet	0.097** (0.044)	0.116*** (0.042)	0.085* (0.046)	0.106** (0.050)
Bank loan	0.071*** (0.041)	0.118*** (0.034)		
Bank loan*internet		0.122** (0.049)		
Non-bank loans			0.027 (0.052)	0.093 (0.068)
Non-bank loans*internet				-0.121** (0.057)
Control variables	Yes	Yes	Yes	Yes
Region fixed effect	Yes	Yes	Yes	Yes
N	445,226	445,226	433,061	433,061

Notes: The estimation results in the table show the coefficient level (standard error). The \*, \*\*, \*\*\* indicate statistical significance at the 10 percent, 5 percent, and 1 percent significance levels, respectively.

**Table 7.** Estimation results of the marginal effect probit of internet usage on self-employment based on access to credit.

In this section, the research estimates by adding the mechanism of the effect of internet usage on the probability of engaging in entrepreneurial activities from the financing side. Paulson and Townsend (2004) mentioned that households with fewer financial constraints will make them more likely to start a business. Column (1) adds the bank credit variable to the benchmark model and further in Column (2) adds the interaction of internet and bank credit variables. The results show that significantly at the 5 percent level access to credit from banking institutions increases the probability of households engaging in entrepreneurial activities. This is of course influential because access to financing from banks increases the financial capital required to undertake entrepreneurial activities.

Furthermore, in Columns (3) and (4) this study adds the variable of credit other than from banks and also adds the interaction variable between the internet and credit other than banks. In this case, non-bank credit includes online loans, pawnshops, individuals, Joint Business Groups, cooperatives and leasing companies. There is an insignificant result in Column (3) which indicates that access to credit from financial institutions other than banks has no effect on the probability of households undertaking entrepreneurial activities. This is because access to credit other than from banks is used more for consumption needs than as capital in running entrepreneurial activities. Nguyen (2007) shows that informal credit increases household consumption. Furthermore, after interacting non-banking credit and internet usage, it has a negative effect on entrepreneurship with a significance

level of 5 percent. This result could be related to the fact that non-banking credit increases their consumption rather than business capital.

## **V. Conclusion**

This study empirically explores the effect of internet usage on the probability of households engaging in entrepreneurial activities in Indonesia. Using a probit model, this study shows that internet usage positively affects the probability of households engaging in entrepreneurial activities in Indonesia by up to 7.4 p.p. in general after adding several control variables. To address possible endogeneity issues in the benchmark model, this study constructs a new self-employment variable by tracking household heads. The results show that internet usage still positively impacts the probability of households engaging in new entrepreneurial activities by 3.3 p.p with 5 percent significance level.

Internet use is heterogeneous across different types of entrepreneurs and regions. The results of the analysis show that internet use has a positive effect on opportunity-based and necessity-based entrepreneurs, but has a greater impact on necessity-based entrepreneurs. Based on region, internet use also has a positive and significant effect for rural areas.

Based on the mechanism of using the internet as a source of information on household entrepreneurial activity in Indonesia, this study shows that internet use positively affects the probability of households engaging in entrepreneurial activity in Indonesia. The behavior of using the internet to get information can improve individual skills and encourage them to engage in entrepreneurial activities. Then the use of the internet for social networking also has a positive effect on the probability of households engaging in entrepreneurial activities. Using the internet for social networking will make communication more efficient so that it can make it easier for individuals to build social networks.

There is a possible endogeneity problem that occurs in this study, namely the reverse causality of internet usage on entrepreneurship. This study has tried to overcome the endogeneity problem by building a new variable, namely new entrepreneurs, but this research still has limitations. Although this study has tried to overcome the reverse causality problem, there are other challenges that can lead to endogeneity problems, namely the existence of omitted variable bias. For example, individual ability may influence internet usage and entrepreneurial decisions (Tan and Li 2022).

The data used in this study are 2020 and 2021, during which period the Covid-19 pandemic has occurred. The existence of the pandemic increases the intensity of people's use of the internet. Then from the employment

sector, the pandemic caused a lot of layoffs, which also affected individual decisions to become entrepreneurs to get income. However, this study does not include the variable impact of the Covid-19 pandemic as estimation material.

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