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Digital Jobs and Married Women's Labor Supply: Evidence and Policy Lessons

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ABSTRACT

The digital transformation in the labor market has enabled individuals to work remotely from home, reshaping traditional employment structures. This study investigates the impact of remote work on the labor supply of married women in the regions of Sulawesi, Maluku, and Papua (SULAMPUA), utilizing data from the 2023 National Socioeconomic Survey (SUSENAS). Employing advanced econometric techniques to correct for selection bias, we isolate the causal effect of remote work on weekly working hours. While initial observations suggest that working from home increases women's labor supply, a rigorous causal analysis reveals the opposite finding that remote work actually reduces formal working hours by approximately 10–15 hours per week. This finding indicates that without adequate support systems, remote work arrangements tend to blur the boundaries between professional and domestic activities, causing women to substitute formal employment time with increased household responsibilities. For public administration and policymakers, this study highlights that digital infrastructure expansion alone is insufficient to close the gender gap. Effective digital employment policies require a foundation of gender-responsive services, specifically accessible childcare and social protection, to prevent remote work from reinforcing traditional domestic inequalities.

Introduction

The female Labor Force Participation Rate (LFPR) in Indonesia remains significantly lower than that of men and the national average. As of 2022, the female LFPR stood at 54.2%, compared to 83.6% for men. Consequently, women's involvement in the labor market is relatively low, with only 40% of Indonesia's total labor force consisting of women. In Eastern Indonesia—comprising Sulawesi, Maluku, and Papua—the highest female LFPR was recorded in Papua Province at

66.27%. The persistently low female labor participation rate is a major contributing factor to Indonesia's relatively high level of gender inequality. In 2023, Indonesia's Gender Inequality Index (GII) was recorded at 0.447. Within Eastern Indonesia, South Sulawesi had the lowest GII at 0.336, while West Papua recorded the highest at 0.537.

Indonesia's digital labor policy is currently anchored in the Digital Indonesia Roadmap 2021–2024 and the Electronic-Based Government System (SPBE) mandated by Presidential Regulation No. 95 of 2018, which collectively aim to modernize public governance and integrate national employment services. These initiatives are complemented by the National Strategy for Financial Inclusion for Women (SNKI Perempuan), which explicitly positions digital adoption as a key driver for women's economic empowerment. However, a critical disconnect remains between these national frameworks and local realities. While the Making Indonesia 4.0 roadmap focuses heavily on infrastructure and industrial competitiveness, it lacks specific policy mechanisms to address the domestic 'double burden' that hinders married women's workforce participation. Consequently, without empirical evidence on how remote work interacts with household dynamics in developing regions like SULAMPUA, these high-level digital empowerment agendas risk being ineffective in practice.

The expectation for women to take on domestic household responsibilities creates significant barriers to their access to the labor market (Strom, 2002). These expectations have evolved into widely accepted social norms, wherein the burden of domestic work is disproportionately placed on women (Deshpande & Kabeer, 2024; McClelland & Sliwa, 2023). As a result, married women face lower chances of participating in formal employment and are at a higher risk of transitioning into unemployment (Assaad et al., 2022; Ehab, 2022). Moreover, the responsibility of childcare—predominantly assigned to women—is positively associated with an increased likelihood of women exiting the workforce (Kim, 2023; Rao, 2020)

Several policies have been implemented to promote women's participation in the labor market. One of the most effective approaches has been policies that allocate more time and flexibility for women to engage in professional work. These policies are often translated into the provision of childcare services or workplace childcare facilities for working mothers (Anderson & Levine, 1999; Givord & Marbot, 2014). However, beyond childcare support, lessons learned from the COVID-19 pandemic have also led to new efforts to enhance women's labor force participation by enabling them to work from home.

In the post-COVID-19 era, the labor market and business landscape have shown significant potential to transition toward digital work models, facilitating the broader adoption of remote work (WFH) (Alon et al., 2020; Kong et al., 2022; Sostero et al., 2020). The implementation of WFH after the pandemic has introduced substantial changes in workplace dynamics, including increased productivity driven by technological adoption and a reduced demand for office spaces (Davis et al., 2024). This transformation presents new opportunities for married women to

remain in the labor market, as many domestic responsibilities that previously required them to stay at home can now be managed alongside professional work.

This study aims to investigate the impact of remote work (WFH) on the labor supply of married women, measured by their average weekly working hours. Utilizing data from the National Socioeconomic Survey (SUSENAS), which covers all provinces in the SULAMPUA region—(1) South Sulawesi, (2) West Sulawesi, (3) Central Sulawesi, (4) Southeast Sulawesi, (5) Gorontalo, (6) North Sulawesi, (7) West Papua, and (8) Papua—the relationship is estimated using the Instrumental Variable (IV) regression technique.

This study addresses a critical gap in labor policy research in developing regions by examining the causal impact of remote work on the labor supply of married women in the SULAMPUA region. Unlike most previous studies, this research employs an Instrumental Variable (IV) regression technique using data from the 2023 National Socioeconomic Survey (SUSENAS) to account for selection bias. The study investigates an important policy question regarding whether remote work availability enhances women's labor supply or if the absence of supportive institutional frameworks leads to a decline in effective working hours. In doing so, it offers an empirical basis for integrated digital and gender policies that extend beyond physical infrastructure to target the structural roots of inequality.

Literature Review

Several studies have examined the impact of remote work (WFH) on the labor supply of married women, using data from both developed and developing countries. These studies commonly rely on micro-level data and employ methodologies such as Quasi-Experimental Design or the Instrumental Variable (IV) technique to estimate the effects.

Studies on Digitalization and Women's Labor (Global Context)

Time allocation theory introduced by Becker (1965) explains household behavior in terms of the Marshallian demand for goods produced within the household and labor supply related to time use. Households allocate time strategically to optimize overall utility, balancing market work and home production. When the husband's earnings potential increases, the opportunity cost of the wife's time spent in the labor market also rises, leading to a reallocation of her time toward household responsibilities.

In the United States, a study by Dettling (2017) investigated the impact of high-speed home internet availability on the labor supply of married women. Utilizing the Instrumental Variable (IV) technique—where supply-side constraints on broadband internet access served as the instrumental variable—the study found that high-speed home internet increased women's labor force participation by 4.1 percentage points. The analysis was based on data from the Central Population Survey (CPS), which provides comprehensive information on labor market outcomes and workers' demographic characteristics in the U.S..

A study by Yang et al (2024) also examined the impact of digitalization on gender disparities in the labor market across Latin America and the Caribbean. Using a fixed-effects model, the study revealed that higher levels of digitalization positively contribute to increased female labor force participation while reducing job losses for both men and women. These positive effects were observed at both the household and country levels, highlighting the broader economic implications of digital transformation in the region.

In Europe, a study by Chung & van der Horst (2018) examined whether job flexibility and digital-based employment enable women to remain in the labor market or retain their jobs after childbirth. Using data from *Understanding Society* (2009–2014), a large-scale household panel dataset in the UK, the study analyzed preferences for flexible work arrangements. The logistic regression estimates indicated that women who had given birth and held flexible jobs with access to teleworking were less likely to reduce their working hours postpartum.

Still drawing from data collected in Europe, a study by Esposito et al (2024) examined the effects of working from home (WFH) on job satisfaction using panel data from the *Participation, Labor, and Unemployment Survey (PLUS)* in Italy, collected in 2019 and 2021. The estimation results, derived from the *difference-in-differences* technique, found that WFH positively influenced job satisfaction—but exclusively for female workers.

Empirical Evidence from Developing Countries

Similar studies have also been conducted in several Asian countries. Research by Jalota & Ho (2024) investigated the impact of the availability of remote work options on employment mode choices among housewives in Mumbai, India. Using a *Randomized Controlled Trial (RCT)* approach, the study found that 56% of housewives opted to work from home. Even after simulating a scenario where office-based workers received double their salary, there was no significant shift in the preferences of housewives in the sample. Furthermore, the study found that policies requiring daily office check-ins significantly reduced labor force participation among married women.

Still in India, (Dadheech & Sharma, 2023) conducted an in-depth study on the factors influencing job choices among women working in the informal sector, particularly in the manufacturing industry. Their research examined the relationship between cultural norms and social expectations on women's decisions to participate in home-based jobs versus non-home-based work. Using a *multinomial logistic regression* approach, the study found that the high *fixed costs* associated with working outside the home led many women in India to opt for home-based jobs. These fixed costs were represented by the substantial loss of ability to perform *household production*, such as managing daily household needs and caregiving responsibilities. Additionally, prevailing social norms that expect women to remain at home further reinforced their preference for home-based work.

In China, Lu et al (2023) also explored similar impacts of digitalization in the workforce. Using data from the *China General Social Survey* and the *China Family*

Panel Studies, their research examined the effects of the *digital economy* on female labor force participation. Estimation results using the *Probit model* indicated that the probability of female employment in China increased significantly as a result of the expansion of the digital economy.

Indonesian Studies and Policy Gaps

A domestic study by Sulistyaningrum et al (2018) also examined the impact of internet access on the working hours of married women engaged in micro, small, and medium enterprises (*UMKM*). Using survey data collected from *Yogyakarta City* and *Bantul Regency* in 2018, their estimation results, based on the *IV regression technique*, revealed that internet access significantly increased the number of hours married women dedicated to their businesses. A deeper analysis further indicated that the increase in working hours due to internet access was more pronounced among married women residing in urban areas.

A review of Indonesian policy studies reveals a critical fragmentation between digital infrastructure goals and the socio-economic realities of women. Regarding women's economic empowerment, Cameron et al. (2019) argue that despite consistent national economic growth, Indonesia's female labor force participation has remained stagnant for two decades, primarily because policies have failed to address deep-seated social norms that prioritize women's domestic roles over market work. In the realm of ICT policy, Puspitasari and Ishii (2016) identify a persistent 'second-level digital divide' in Indonesia; while physical access (infrastructure) has improved, a significant gap remains in the productive usage of technology, particularly among rural populations who lack the digital literacy to convert connectivity into economic gain. Synthesizing these perspectives reveals a distinct policy gap wherein the government's digital transformation agenda acts as an infrastructural overlay that, without targeted social engineering, fails to penetrate the structural barriers identified in empowerment and rural development literature.

Public Policy Theory and Policy Context

From a public administration perspective, the efficacy of digital work is inextricably linked to the quality of governance and institutional support. The literature demonstrates that remote work does not operate in a regulatory vacuum; its success in enhancing female labor supply depends heavily on state-level interventions, such as the provision of public childcare and legal frameworks for flexible employment. While successful Western models often integrate telework within broader family welfare policies, governance in developing contexts often treats digital transformation purely as an infrastructure challenge—focusing on signal coverage rather than social adaptation. This divergence highlights the necessity of viewing digital employment not merely as a technological adoption curve, but as a crucial domain of gender-responsive public policy that requires active regulation to prevent the exacerbation of domestic inequalities.

To interpret the divergence between digital potential and labor outcomes, this study adopts an Institutional Theory lens, specifically North's (1990) distinction

between formal rules (digital infrastructure and WFH mandates) and informal constraints (cultural norms and domestic expectations). In the context of digital governance, this interaction is best understood through Fountain's (2001) Technology Enactment Framework, which argues that new technologies do not automatically transform behavior but are 'enacted' through existing social structures; in this case, remote work technologies are filtered through deep-seated patriarchal norms in Eastern Indonesia. Consequently, the observed reduction in working hours suggests a failure of Gender Mainstreaming—as defined by Walby (2005)—within Indonesia's current public service design. By treating digital transformation as a gender-neutral administrative modernization, current policies inadvertently allow informal domestic institutions to overpower formal employment objectives, creating a governance gap where digital inclusion fails to translate into substantive labor empowerment.

Research Methods

This study utilizes data on married women who are within the productive age category, defined as those aged 15 and above. The observations are derived from the *Survei Sosial Ekonomi Nasional (SUSENAS)* conducted by *Badan Pusat Statistik (BPS)* in March 2023. *SUSENAS* is a nationwide survey designed to collect information on the socioeconomic conditions and well-being of Indonesian households and individuals. The study focuses on provinces within the *SULAMPUA* region, covering Sulawesi Selatan, Sulawesi Barat, Sulawesi Tengah, Sulawesi Tenggara, Gorontalo, Sulawesi Utara, Maluku, Maluku Utara, Papua Barat, and Papua. Additionally, data from the *Survei Potensi Desa (PODES)* is incorporated to formalize the instrumental variable used in the model. *PODES* provides detailed information on infrastructure conditions at the village/kelurahan level, making it a valuable source for constructing instruments relevant to the study.

Several variables derived from the *SUSENAS* data are utilized in this study, including the average weekly working hours as the outcome variable, control variables encompassing individual-specific characteristics, household attributes, and demographic conditions, as well as the variable of interest, which is *work from home*. The outcome variable is constructed based on a survey question asking respondents whether they had used the internet to work from home within the past three weeks. Additionally, this study incorporates several control variables that include socioeconomic and demographic information, such as the education level of both the woman and her husband, age, age at first marriage, health status, number of children, children's conditions (highest education level attained, age of the eldest child, and health status), and husband's characteristics (education level, age, and age at marriage). Moreover, residential characteristics, such as province, district, and urban or rural classification, are also included as part of the control variables.

The estimation technique employed in this study is *Instrumental Variable (IV) regression*, a method designed to address endogeneity bias in multivariate *Ordinary Least Squares (OLS) regression* (Angrist & Krueger, 2001). Theoretically, endogeneity

bias arises when OLS estimates become inconsistent due to the presence of *unobserved variables* that are omitted from the regression model but are correlated with both the outcome variable and the variable of interest. (Stock & Watson, 2020). By introducing a valid instrument—one that is correlated with the endogenous explanatory variable but uncorrelated with the error term—IV regression helps to obtain unbiased and consistent estimates, thereby improving the causal interpretation of the relationship under investigation.

The IV technique addresses endogeneity bias by first identifying a suitable *instrumental variable* and then expressing the variable of interest as the *predicted value* from a regression of that variable on the chosen instrument. An *instrumental variable* is an exogenous predictor that influences the endogenous regressor while satisfying two key conditions: (1) *Instrument Relevance* and (2) *Instrument Exogeneity*. *Instrument Relevance* requires that the instrument has a statistically significant effect on the variable of interest, ensuring a strong first-stage relationship. *Instrument Exogeneity* dictates that the instrument affects the outcome variable only through the variable of interest and is not correlated with any unobserved factors that influence the outcome. These conditions ensure that the instrument provides a valid and unbiased estimate of the causal effect under investigation.

In this study, the instrumental variable used is the ratio of villages with internet signal coverage to the total number of villages within each district/city, derived from PODES data. This instrument was selected based on the rationale that internet access is a crucial predictor for the ability to work from home. Moreover, the presence of an internet signal largely depends on the physical infrastructure of telecommunication towers in each village or subdistrict, which is determined by regional development policies rather than individual employment choices. Since the construction of these towers is not directly related to the average weekly working hours of individuals, the instrumental variable satisfies the *exogeneity* condition. At the same time, the availability of internet access is strongly correlated with the likelihood of engaging in remote work, ensuring that the *relevance* condition is also met. Thus, this instrument provides a valid approach to address potential endogeneity in the estimation

Beyond their statistical utility, the variables selected for this model serve as indicators for specific public policy domains. The instrumental variable—internet signal coverage at the village level—directly reflects the reach of regional digital inclusion policies and the efficacy of state-led infrastructure development in enabling remote work opportunities. Similarly, the educational attainment variables for both the wife and husband capture the outcomes of human capital investment strategies, representing the foundational capacity of the workforce to adapt to digital employment transformations. Access to ICT devices (phones and computers) serves as a proxy for digital literacy programs and household technology adoption, while variables concerning the number and health status of children highlight the intersection of labor supply with social protection and childcare support systems. Collectively, these covariates allow the model to isolate the causal effect of remote work while accounting for the varied institutional and

infrastructural environments shaped by government planning. This study uses the following specification:

$$workhours_i = a + \beta.WFH_i + \gamma_1 \boldsymbol{X}_i^{ind} + \gamma_2 \boldsymbol{X}_i^{child} + \gamma_3 \boldsymbol{X}_i^{husb} + \gamma_4 \boldsymbol{X}_i^{hh} + \delta_{r(i)} + \varepsilon_i$$

Specifically, the instrumental variable (IV) model employed in this study is derived from the structural framework described above. The estimation incorporates a comprehensive set of covariates capturing individual, household, and regional characteristics. Individual-level covariates for married women include ($\boldsymbol{X}_i^{ind}$) education, age, age at first marriage, health status (indicators for illness and functional disability), and access to communication technologies such as mobile phones, the internet, and computers. The corresponding covariates for their husbands ($\boldsymbol{X}_i^{husb}$) comprise age, age at first marriage, education, and employment status (whether currently employed). Child-level covariates ($\boldsymbol{X}_i^{child}$) include age, education, disability status, illness condition, and the total number of children in the household. In addition, household-level characteristics ($\boldsymbol{X}_i^{hh}$) encompass residential location (urban or rural), housing tenure (owned or rented), and the number of household members. Regional fixed effects at the regency and provincial levels are also included to capture unobserved heterogeneity across regions.

To address potential endogeneity issues within this model, the variable WFH_i is expressed as the predicted value obtained from the regression of the instrumental variable. This approach ensures that variations in work-from-home status are driven by exogenous factors rather than unobserved confounders, thereby improving the causal interpretation of the estimates.

This study adopts the instrumental variable regression procedure employed by Angrist & Krueger (2001). In their study, the endogenous variable under investigation is binary, while the dependent variable is continuous. This characteristic necessitates an additional step in the first-stage regression, where the endogenous binary variable is first expressed as predicted probit values using the instrumental variable. Before performing the first-stage regression, the endogenous binary variable is estimated through a probit model, generating predicted values that serve as the instrument. These predicted values are then included in the first-stage regression as the instrumental variable for the endogenous variable. In the second-stage regression, the predicted values of the endogenous variable—obtained from the first-stage regression—are substituted for the original endogenous variable, ensuring that the estimation process mitigates endogeneity bias and produces more reliable causal inferences.

This study follows a similar procedure by first obtaining the predicted value of WFH_i through a probit model, incorporating the variable $internet - ratio_i$ The first-stage regression is specified as follows:

$$\Pr\left(WFH = 1 | internet - ratio, X'\right) = \Phi(\gamma_0 + \gamma_1 internet - ratio_i + \gamma_{11} X'_i + v_i)$$

The probit predicted value of the variable WFH_i is then used as the instrumental variable in the first-stage regression. In this first-stage regression, WFH_i is regressed using a linear regression model against its probit predicted value. The predicted value from this first stage, denoted as $(\widehat{WFH_i})$, is then substituted into the structural model, replacing the original WFH_i variable. This results in the model expressed in equation (2), where the variation in work-from-home status is now treated as exogenous to the error term, addressing the endogeneity issue present in the original specification.

$$workhours_i = \beta_o + \beta_1 \widehat{WFH_i} + \beta_{11} X'_i + e^*_i$$

This study utilizes anonymized secondary data from the National Socioeconomic Survey (SUSENAS), adhering to the data privacy and usage standards established by Badan Pusat Statistik (BPS). To ensure that the findings accurately reflect the demographic composition of the SULAMPUA region, all descriptive and econometric estimates incorporate the individual weighting variable provided in the dataset. However, the use of SUSENAS for causal inference presents inherent limitations. As a cross-sectional survey, it captures a single snapshot in time, which restricts the ability to observe dynamic behavioral changes or control for time-invariant individual heterogeneity as effectively as panel data.

Results and Discussion

The results of the descriptive statistical analysis show that the average weekly working hours of married women in the SULAMPUA region is 18 hours per week, which translates to approximately 3.6 hours per day, assuming a five-day workweek. Out of the total 6.29 million married women in SULAMPUA, only about 48% were recorded as having worked in the past week. Meanwhile, the proportion of those engaged in work-from-home (WFH) activities is only 1.1%, or approximately 69,000 individuals from the total population.

The majority of married women in the SULAMPUA region have completed Senior High School (SMA), accounting for 26.2%, followed by those with a Junior High School (SMP) education at 18.2%. The percentage of married women with a higher education qualification is recorded at only 13.7%, although this is relatively higher compared to the percentage of husbands who have completed higher education, which stands at 12.7%. However, a significant proportion of married women, approximately 41%, have only completed elementary school or lower. This indicates that a large number of married women in the SULAMPUA region still possess low educational qualifications and have yet to meet the minimum education standard.

The average age of married women in the SULAMPUA region is 42 years, indicating that the majority belong to Generation X or the early cohort of Millennials

and are still within a highly productive age group. The average age at marriage is 21 years, which falls within the period typically associated with higher education pursuits.

Tabel 1. Descriptive Statistics

Description	**Summary**
Observations (N)	6,284,152
Average Hours Spent on Working in a Week	18.858 (23.312)
Is currently working?	
Not Working	3,264,233 (51.9%)
Working	3,019,919 (48.1%)
Working from Home	
No	6,214,659 (98.9%)
Yes	69,493 (1.1%)
Level of Education	
No Education	1,101,532 (17.5%)
Elementary	1,536,408 (24.4%)
Junior High	1,142,578 (18.2%)
Senior High	1,642,105 (26.1%)
Bachelor	827,402 (13.2%)
Postgraduate	34,127 (0.5%)
Age	42.589 (12.674)
Age at first marriage	21.341 (4.782)
Have any health problems?	
No	4,843,591 (77.1%)
Yes	1,440,561 (22.9%)
Have functional disorder?	
No	5,725,277 (91.1%)
Yes	558,875 (8.9%)
Phone ownership	
No	2,154,537 (34.3%)
Yes	4,129,615 (65.7%)
Using internet?	

Description	Summary
No	2,740,440 (43.6%)
Yes	3,543,712 (56.4%)
Using computer?	
No	5,703,306 (90.8%)
Yes	580,846 (9.2%)
Number of children	1.763 (1.280)
Child age	14.241 (11.270)
Child level of education	
No Education	3,183,169 (50.7%)
Elementary	731,161 (11.6%)
Junior High	910,166 (14.5%)
Senior High	1,039,255 (16.5%)
Bachelor	408,181 (6.5%)
Postgraduate	12,220 (0.2%)
Mother has a disabled child (1=Yes, 0=No)	
No	6,144,455 (97.8%)
Yes	139,697 (2.2%)
Mother has a sick child (1=Yes, 0=No)	
No	4,896,048 (77.9%)
Yes	1,388,104 (22.1%)
Husband age	46.201 (13.274)
Husband age at first marriage	24.904 (5.210)
Is husband currently working?	
Not working	550,234 (8.8%)
Working	5,733,918 (91.2%)
Husband education	
No Education	1,077,148 (17.1%)
Elementary	1,516,141 (24.1%)
Junior High	1,106,040 (17.6%)
Senior High	1,789,552 (28.5%)
Bachelor	728,346 (11.6%)
Postgraduate	66,925 (1.1%)

Description	Summary
Living in urban area?	
Rural	3,867,011 (61.5%)
Urban	2,417,141 (38.5%)
House is owned?	
No	769,977 (12.3%)
Yes	5,514,175 (87.7%)
Province	
Sulawesi Utara	616,482 (9.8%)
Sulawesi Tengah	752,894 (12.0%)
Sulawesi Selatan	2,037,992 (32.4%)
Sulawesi Tenggara	614,027 (9.8%)
Gorontalo	289,527 (4.6%)
Sulawesi Barat	314,595 (5.0%)
Maluku	380,709 (6.1%)
Maluku Utara	291,046 (4.6%)
Papua Barat	218,872 (3.5%)
Papua	768,008 (12.2%)

** The author's calculations are based on the individual weighting variable in SUSENAS*

Meanwhile, regarding access to technology, information, and communication (ICT), the majority of married women have accessed the internet (56%) and used mobile phones (65%). However, the proportion of those using computers or tablets remains very low, at only 9.2%. This indicates that internet usage is still largely driven by consumer-oriented activities and simpler tasks, as work requiring a laptop and internet access generally demands higher skill levels and greater complexity.

From the perspective of residential categories, the majority of married women in the SULAMPUA region reside in rural areas. The percentage of those living in rural areas is 61.60%, while those in urban areas account for only 38.40%. This indicates that most married women in the SULAMPUA region still reside and depend on livelihoods in rural areas.

Considering that children are one of the main factors influencing married women's participation in the labor market, descriptive statistics from the SULAMPUA region show that the majority of married women have children who have not yet entered formal education (92%). Only about 3% have children who have reached the upper secondary education level.

From a spatial perspective, South Sulawesi Province has the largest population of married women (32.40%), followed by Papua (12.20%) and Central Sulawesi in third place with 12%. Meanwhile, Southeast Sulawesi and North Sulawesi each recorded a percentage of 9.8%

Tabel 2. Estimation results using Multivariate OLS Regression

	(1)	(2)	(3)	(4)
	Mother covariates only	**Mother + Husband Information**	**Mother + Husband + Child Characteristics**	**Mother + Husband + Child + Household Covariates**
Working from Home	6.009***	5.965***	5.990***	6.188***
	(0.953)	(0.952)	(0.950)	(0.927)
Age	0.0609***	0.0549**	0.0432*	0.102***
	(0.00829)	(0.0231)	(0.0236)	(0.0231)
Age at first marriage	-0.0159	0.0161	0.0409	-0.0140
	(0.0192)	(0.0275)	(0.0279)	(0.0273)
Elementary Education (Wife)	-2.069***	-1.472***	-1.865***	0.516*
	(0.259)	(0.285)	(0.286)	(0.288)
Junior High Education (Wife)	-2.350***	-1.871***	-2.194***	0.166
	(0.293)	(0.319)	(0.320)	(0.321)
Senior High Education (Wife)	-1.845***	-1.448***	-1.784***	0.439
	(0.290)	(0.323)	(0.324)	(0.325)
Bachelor Education (Wife)	3.632***	4.367***	4.222***	6.175***
	(0.393)	(0.427)	(0.427)	(0.423)
Postgraduate Education (Wife)	1.751	3.490**	3.364**	5.439***
	(1.412)	(1.453)	(1.452)	(1.417)
Wife with health problems	0.693***	0.688***	0.475**	0.756***
	(0.210)	(0.210)	(0.221)	(0.217)
Wife with	-4.104***	-3.869***	-3.669***	-2.957***

	(1)	(2)	(3)	(4)
	Mother covariates only	**Mother + Husband Information**	**Mother + Husband + Child Characteristics**	**Mother + Husband + Child + Household Covariates**
functional disorder				
	(0.323)	(0.323)	(0.325)	(0.319)
Phone ownership	1.638***	1.686***	1.726***	3.194***
	(0.237)	(0.237)	(0.238)	(0.239)
Internet usage	-1.177***	-1.077***	-1.096***	0.587**
	(0.250)	(0.251)	(0.251)	(0.253)
Computer usage	15.23***	15.29***	15.21***	15.15***
	(0.385)	(0.388)	(0.387)	(0.378)
Husband age		0.0348	0.0347	0.0551**
		(0.0223)	(0.0223)	(0.0218)
Husband age at first marriage		-0.0526**	-0.0576**	-0.0151
		(0.0253)	(0.0253)	(0.0247)
Elementary Education (Husband)		-1.637***	-1.886***	-0.558*
		(0.289)	(0.290)	(0.286)
Junior High Education (Husband)		-1.074***	-1.311***	-0.297
		(0.320)	(0.321)	(0.317)
Senior High Education (Husband)		-0.310	-0.604*	-0.00715
		(0.310)	(0.311)	(0.308)
Bachelor Education (Husband)		-1.478***	-1.663***	-1.747***
		(0.395)	(0.395)	(0.390)
Postgraduate Education (Husband)		-3.887***	-4.195***	-4.722***
		(1.043)	(1.044)	(1.021)

	(1) Mother covariates only	(2) Mother + Husband Information	(3) Mother + Husband + Child Characteristics	(4) Mother + Husband + Child + Household Covariates
Working husband		4.435***	3.944***	3.610***
		(0.353)	(0.355)	(0.347)
Child age			-0.102***	-0.130***
			(0.0154)	(0.0152)
Mother with a disabled child			1.205*	1.805***
			(0.630)	(0.614)
Mother with a sick child			0.738***	0.917***
			(0.229)	(0.225)
Elementary Education (Children)			3.118***	3.669***
			(0.307)	(0.301)
Junior High Education (Children)			3.955***	4.533***
			(0.313)	(0.307)
Senior High Education (Children)			3.239***	4.136***
			(0.364)	(0.358)
Bachelor Education (Children)			3.297***	3.830***
			(0.530)	(0.519)
Postgraduate Education (Children)			-1.732	-1.526
			(2.868)	(2.794)
Number of children			0.154*	0.0282
			(0.0802)	(0.0809)
Urban residence				1.356***
				(0.245)

	(1) Mother covariates only	(2) Mother + Husband Information	(3) Mother + Husband + Child Characteristics	(4) Mother + Husband + Child + Household Covariates
House owner				0.120
				(0.282)
Constant	16.67***	12.17***	12.46***	0.253
	(0.517)	(0.719)	(0.752)	(1.234)
Observations	67172	67172	67172	67172

Reference group for wife, husband and children education level variables are the group with no education
Standard errors in parentheses
** p < 0.10, ** p < 0.05, *** p < 0.01*

The estimation results derived from the multivariate Ordinary Least Squares (OLS) model provide compelling evidence of a positive and statistically significant relationship between working from home (WFH) and the average number of working hours per week. Specifically, the model suggests that women who engage in WFH arrangements dedicate, on average, approximately 6.18 additional hours per week to their jobs compared to their counterparts who do not work remotely—equivalent to roughly one extra hour per working day under a standard five-day schedule. This finding is obtained at a strong significance level of 1%. Such results align with the growing literature on remote work, which often highlights the tendency for flexible work arrangements to blur the boundaries between professional and personal time, thereby increasing total hours worked. The strength of the coefficient also suggests that WFH may alter daily routines, workload expectations, or employer monitoring practices in ways that encourage longer working hours, particularly among women, who may face distinctive household and occupational dynamics.

The estimation results for the various control variables largely conform to theoretical expectations and previous empirical findings, thereby reinforcing the credibility of the model. In particular, higher education levels emerge as a strong predictor of increased labor supply, suggesting that women with more education may not only possess greater human capital and earning potential but also be more likely to participate actively in the labor market and work longer hours. Conversely, the presence of functional impairments—either on the part of the respondent herself or her children—substantially reduces labor supply, by approximately two to four hours per week. This outcome is consistent with the notion that health limitations and caregiving responsibilities constrain the time and energy available for market work. Interestingly, having a husband who is also employed appears to be associated with an increase in women's labor supply of about four hours per week, which may reflect complementarities in household income strategies, shared resources for childcare, or a household culture that supports dual-earner arrangements. Furthermore, the results indicate that as women age, their labor

supply tends to rise, potentially capturing the effects of accumulated work experience, greater job stability, or changes in household responsibilities over the life course. Finally, access to information and communication technology (ICT)—including the internet, mobile phones, and computers—is consistently and positively related to the average number of working hours per week. This relationship underscores the role of ICT in enabling more efficient work practices, expanding access to employment opportunities, and reducing barriers to communication and coordination that can otherwise limit labor supply, especially for women balancing work and household responsibilities.

These findings regarding husbands' education levels provide an especially interesting and somewhat nuanced perspective on household labor dynamics. The multivariate OLS estimates suggest that as husbands attain higher levels of education, married women's labor supply tends to decrease, indicating a potentially important interplay between spousal characteristics and women's labor market behavior. This result implies a trade-off, wherein women are more likely to specialize in household production and reduce their market work when their husbands have better employment opportunities accompanied by higher and more stable earnings. From a theoretical standpoint, this pattern resonates with classic household economics models—such as Becker's specialization and trade framework explained in his time allocation theory —which posit that when one spouse enjoys a comparative advantage in market work, the other may shift toward home production to maximize household welfare. In the Indonesian context, where cultural norms and institutional factors may still reinforce gendered divisions of labor, higher male earnings can strengthen the economic feasibility of such specialization. At the same time, these findings point to potential implications for gender equity and labor market participation: while higher spousal education and income can improve household living standards, they may inadvertently discourage married women's economic activity or limit their career advancement, particularly in settings with limited childcare infrastructure or social support for working mothers.

The results of the Instrumental Variable (IV) estimation reveal a striking contrast to the baseline OLS findings, underscoring the importance of addressing potential endogeneity in the relationship between work-from-home (WFH) arrangements and labor supply among married women. While the OLS model initially suggested a positive association—indicating that women who work from home tend to supply roughly six additional hours of labor per week compared to their counterparts working on-site—the IV estimates tell a different story once selection bias and omitted variable problems are accounted for. The IV results indicate that WFH actually exerts a negative causal effect on women's labor supply, with married women who work from home reducing their working hours by about 10–15 hours per week, equivalent to approximately 2–3 hours per day. This reversal implies that the positive OLS relationship was likely driven by unobserved factors such as higher motivation, job flexibility, or occupational differences that make certain women both more likely to adopt WFH and to work longer hours. Once these confounding factors are instrumented out, the true effect of WFH appears to

reflect a substitution of work time with household or caregiving responsibilities, which are more salient for married women working from home. These findings suggest that while WFH offers flexibility, it may simultaneously intensify the competing demands of domestic and market work, ultimately leading to a reduction in formal labor supply. The reduction in working hours of married women confirms that in the absence of the comprehensive social protection and empowerment frameworks advocated by Cameron et al. (2019), digital infrastructure merely facilitates the substitution of market work with domestic responsibilities rather than expanding female labor participation.

Tabel 3. Estimation results using Instrumental Variable (IV) Regression

	(1)	**(2)**	**(3)**	**(4)**
	Mother Covariates Only	**Mother + Husband Covariates**	**Mother + Husband + Child Covariates**	**Mother + Husband + Child + Household Covariates**
Working from Home	-10.12	-11.21	-10.28	-15.43**
	(6.811)	(6.861)	(6.877)	(6.993)
Age	0.259***	0.252***	0.191***	0.184***
	(0.0141)	(0.0399)	(0.0415)	(0.0416)
Age at first marriage	-0.0254	-0.00173	0.0734	0.0688
	(0.0327)	(0.0461)	(0.0475)	(0.0476)
Elementary Education (Wife)	-0.0203	-0.109	-0.270	-0.266
	(0.639)	(0.660)	(0.659)	(0.661)
Junior High Education (Wife)	0.252	0.0641	0.0336	-0.0275
	(0.623)	(0.652)	(0.652)	(0.654)
Senior High Education (Wife)	1.108*	0.907	0.852	0.687
	(0.600)	(0.639)	(0.638)	(0.642)
Bachelor Education (Wife)	6.840***	7.012***	7.102***	7.047***
	(0.678)	(0.721)	(0.720)	(0.722)
Postgraduate	5.040***	6.645***	6.810***	6.927***

	(1)	(2)	(3)	(4)
	Mother Covariates Only	**Mother + Husband Covariates**	**Mother + Husband + Child Covariates**	**Mother + Husband + Child + Household Covariates**
Education (Wife)				
	(1.726)	(1.776)	(1.773)	(1.779)
Wife with health problems	1.048***	1.039***	0.839**	0.874**
	(0.334)	(0.334)	(0.352)	(0.353)
Wife with functional disorder	-2.496***	-2.357***	-2.011***	-1.981***
	(0.689)	(0.690)	(0.692)	(0.694)
Phone ownership	3.027***	3.056***	3.282***	3.233***
	(0.551)	(0.552)	(0.551)	(0.553)
Computer usage	15.46***	15.62***	15.43***	15.68***
	(0.564)	(0.565)	(0.565)	(0.569)
Husband age		0.0297	0.0305	0.0304
		(0.0386)	(0.0385)	(0.0386)
Husband age at first marriage		-0.0298	-0.0330	-0.0352
		(0.0427)	(0.0426)	(0.0427)
Elementary Education (Husband)		-0.0254	-0.158	-0.174
		(0.603)	(0.601)	(0.603)
Junior High Education (Husband)		0.318	0.290	0.204
		(0.610)	(0.608)	(0.610)
Senior High Education (Husband)		0.860	0.760	0.591
		(0.582)	(0.582)	(0.585)
Bachelor Education		-0.264	-0.180	-0.410

	(1)	(2)	(3)	(4)
	Mother Covariates Only	**Mother + Husband Covariates**	**Mother + Husband + Child Covariates**	**Mother + Husband + Child + Household Covariates**
(Husband)				
		(0.656)	(0.655)	(0.659)
Postgraduate Education (Husband)		-4.308***	-3.974***	-4.404***
		(1.251)	(1.251)	(1.259)
Working husband		3.498***	2.766***	2.952***
		(0.592)	(0.595)	(0.598)
Child age			0.0228	0.0233
			(0.0359)	(0.0360)
Mother with a disabled child			-0.255	-0.283
			(1.075)	(1.078)
Mother with a sick child			0.743**	0.720**
			(0.339)	(0.340)
Elementary Education (Children)			3.099***	3.062***
			(0.514)	(0.516)
Junior High Education (Children)			4.048***	3.990***
			(0.569)	(0.571)
Senior High Education (Children)			2.074***	1.898***
			(0.698)	(0.701)
Bachelor Education (Children)			-0.851	-0.993
			(0.998)	(1.001)

	(1)	(2)	(3)	(4)
	Mother Covariates Only	**Mother + Husband Covariates**	**Mother + Husband + Child Covariates**	**Mother + Husband + Child + Household Covariates**
Postgraduate Education (Children)			-7.326*	-7.495*
			(3.828)	(3.839)
Number of children			-0.0794	-0.0983
			(0.148)	(0.149)
Urban residence				1.378***
				(0.303)
House owner				0.284
				(0.378)
Constant	4.270***	0.0226	-0.0442	-0.205
	(1.019)	(1.334)	(1.380)	(1.426)
Observations	29644	29644	29644	29644

Reference group for wife, husband and children education level variables are the group with no education
Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

This attenuation in the coefficient aligns with the expectation that unobserved factors—such as intrinsic motivation, job flexibility, or household support—might create a positive correlation between the likelihood of working from home and labor supply. By addressing potential endogeneity, the IV approach helps mitigate bias from omitted variables, ensuring that the estimated effect of WFH on labor supply reflects a more causal relationship rather than spurious correlations.

The justification for using the percentage of villages or sub-districts with internet access in a given regency ($internet - ratio$) as an instrumental variable is based on two key criteria: relevance and exogeneity. The relevance condition requires that *internet-ratio* be a strong predictor of the endogenous variable, in this case, the likelihood of working from home (*WFH*). This can be empirically validated through the probit regression results, which should demonstrate a statistically significant relationship between *internet-ratio* and *WFH*. Meanwhile, the exogeneity condition requires that *internet-ratio* affects the dependent variable, weekly working hours, only through its impact on *WFH* and not through any other direct channel. This assumption holds if there is no strong theoretical or empirical evidence suggesting that *internet-ratio* directly influences labor supply beyond its effect on *WFH*. The first-stage regression, which incorporates the probit-predicted values as the instrument, provides additional statistical validation. A strong first-stage F-statistic further reinforces the credibility of *internet-ratio* as a valid instrument for addressing endogeneity in the relationship between *WFH* and labor supply.

Tabel 4. The result of Probit Regression for endogenous variable (WFH) on Instrument Variable ($internet - ratio$)

	(1)
VARIABLES	**Wfh**
percent_villageintrnet	0.000258
	(0.000230)
Observations	29,618

Standard errors in parentheses

The estimation results from the probit regression on the endogenous variable provide important insights into the structural factors that shape women's ability to engage in remote work. Specifically, the analysis reveals that internet accessibility significantly increases the likelihood of married women working from home. Quantitatively, the results indicate that for every one percentage point increase in the coverage of villages or sub-districts with internet access within a given district or city, the probability of women working from home rises by approximately 0.025 percentage points. This finding underscores the crucial role of improved digital infrastructure in enabling and expanding remote work opportunities for married women. By reducing information frictions, transaction costs, and geographic constraints, internet access can serve as a key facilitator of labor market participation, especially for women who may face mobility limitations due to household responsibilities, cultural norms, or caregiving duties. In regions where traditional employment opportunities are scarce or concentrated in urban centers, the availability of reliable internet can open up new avenues for productive work without requiring physical relocation, thereby potentially reducing barriers to entry and enhancing economic inclusion. From a policy perspective, this evidence highlights the broader significance of investments in information and communication technology (ICT) infrastructure—not only for promoting digital connectivity but also for fostering more equitable and inclusive labor market outcomes for women.

Furthermore, the results of the first-stage regression indicate a strong relationship between the constructed model and the predicted value of the endogenous variable (WFH). This is evidenced by the F-test statistic, which exceeds the critical threshold of 10, suggesting that the first-stage regression model possesses strong predictive power in explaining variations in the endogenous variable. Additionally, the t-test statistic of the probit predicted value for WFH exhibits the expected positive sign with a high level of statistical significance, reinforcing the validity of the chosen instrumental variable. These findings confirm that the instrument is both relevant and strongly correlated with the endogenous variable, thereby justifying its use in the estimation process.

Policy Implications for Public Service and Labor Regulation

The empirical finding that remote work reduces married women's formal labor supply by approximately 10–15 hours per week indicates that the current digital employment landscape is constrained by deep structural deficits rather than mere individual preferences. This reduction suggests that without institutional support, the home environment in the SULAMPUA region functions less as a flexible workspace and more as a domain of intensified domestic responsibility. Consequently, the Ministry of Women's Empowerment and Child Protection (KemenPPPA) must shift its focus from advocating for digitalization in isolation to establishing a "care infrastructure." This involves coordinating with local governments to provide affordable, community-based childcare services. As noted in the literature, the availability of such services is a critical prerequisite for women to convert time savings from remote work into productive market hours rather than absorbing unpaid domestic labor.

Furthermore, the Ministry of Manpower (Kemnaker) faces an urgent need to modernize labor regulations to protect the growing workforce of flexible and remote employees. The "blurring of boundaries" identified in this study implies that remote work often occurs informally, outside the purview of standard labor protections. To address this, regulatory frameworks must be adapted to define clear standards for remote working hours and the right to disconnect, preventing "flexibility" from devolving into precarious, task-based employment that offers neither stability nor full-time wages. Explicit labor protections are necessary to ensure that all female remote workers are integrated into the formal social security system (BPJS Ketenagakerjaan), safeguarding them from the vulnerability of informal home-based work.

Finally, the role of the Ministry of Communication and Informatics (Kominfo) must extend beyond the physical expansion of telecommunication towers. While our first-stage estimation confirms that internet signal coverage increases the probability of working from home , the descriptive data reveals a persistent rural-urban digital divide where computer ownership remains as low as 9.2%. This gap suggests that infrastructure investments alone are insufficient to close gender disparities. Digital infrastructure policy must be integrated with digital literacy programs specifically targeting rural women, ensuring they possess not just the connectivity (signal) but the capital (devices and skills) required to access higher-value remote jobs that justify longer working hours, rather than low-skill micro-tasks that reinforce marginal labor participation.

Conclusion

This study utilizes data from the March 2023 SUSENAS survey, covering the regions of Sulawesi, Maluku, and Papua, to analyze the impact of remote work (WFH) on the labor supply of married women. Using both Multivariate OLS and Instrumental Variable (IV) regression approaches, the results reveal contrasting findings. The OLS estimates indicate that working from home increases the average

weekly working hours of married women by around 6 hours, or about 1 hour per day. However, after addressing potential endogeneity using the IV regression, the results show that WFH reduces average weekly working hours by approximately 10–15 hours, or around 2–3 hours per day.

These results suggest that while remote work may appear to enhance women's labor participation in simple correlations, its causal effect might actually reflect additional domestic burdens or a reduction in formal working time. In other words, WFH does not necessarily ease the constraints faced by married women in the labor market; instead, it may blur the boundary between household and professional responsibilities, leading to reduced effective working hours.

From a policy perspective, these findings underscore that digital transformation alone is not sufficient to improve women's labor outcomes. Efforts to promote remote work must be complemented by policies that support equitable household labor division, affordable childcare, and institutional mechanisms ensuring fair workload distribution. Only through such integrated measures can digital transformation truly advance gender equality and foster inclusive labor market participation.

Furthermore, this paper's analysis could be deepened by examining outcomes beyond the quantity of working hours. Future studies should investigate the impact of WFH on the quality of employment, including women's wages, productivity, job satisfaction, and opportunities for career progression. This study could also be broadened by exploring intra-household dynamics. A promising avenue would be to integrate time-use survey data to directly measure how WFH causally affects the allocation of time to paid work versus unpaid domestic labor.

Conflict of Interest Declaration

The authors declare that they have no known competing financial or personal interests that could have influenced the work reported in this manuscript.

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