Investigating the Role of Technology in Women's Education and Employability in a Patriarchal Society: Evidence from Pakistan

Amna Nasir*, Ahmad Nawaz†

Abstract

Education helps women find paid work, but in patriarchal societies social and cultural norms often weaken this link. This paper asks whether information and communication technology (ICT) helps women in Pakistan turn their education into employment. Using data on 15,068 ever-married women from the 2017–18 Pakistan Demographic and Health Survey, we estimate logit models of women's employment. More educated women are significantly more likely to work, even after we account for age, household wealth, children, marital status, house ownership, residence and husbands' characteristics. Access to ICT, measured through mobile phone ownership, internet use and mass media exposure, raises women's likelihood of employment and strengthens the effect of education: education matters more for women who use these technologies. Women's employment falls as household wealth, the number of dependent children and husbands' education rise. We recommend community-based technology training for women and vocational programs that reach disadvantaged women.

Keywords: Women's employment, Education, Information and communication technology, Patriarchy, Pakistan.

1. Introduction

Neoclassical economists treat education as an important factor affecting the female employability. Schooling raises the returns to market work, and hence more educated women have higher chances of taking part in paid economic activity (Becker, 1965; Mincer, 1980). Education also lifts women's socio-economic standing, which widens the range of jobs open to them, and investment in human capital through schooling, training and experience raises productivity and earnings. Beyond education, a woman's decision to take up paid work depends on demographic and household characteristics such as family structure, location, age, number of children and dependents, and her husband's education and income (Mincer & Polachek, 1974). Wider and easier access to labor market opportunities should raise women's living standards, and the World Bank has identified closing gender gaps in economic opportunity as a policy priority (World Bank, 2011). Theory and evidence also dictate that better job prospects for women reduce fertility rates and early marriages (Singh & Samara, 1996; Jensen, 2012).

Globally, labor force participation of women has fallen over the past two decades from 51.3% in 1998 to 48.5% in 2018 despite the fact that developing economies have grown (International Labor Organization [ILO], 2018). More than 307 million women have entered the labor market over this period, but still women make up only 39.2% of the global workforce, and the ILO (2018) projects that participation will fall further, to 45.9% by 2030. Reversing this trend will require deliberate policies that bring more women into work. Regional patterns differ: between 1998 and 2018, women's employment rose in the Middle East and North Africa but fell in South Asia, where conservative norms continue to restrict women's work outside the home (Gaddis & Klasen, 2014; Klasen, 2019). Recent work shows that such norms remain among the most binding constraints on women's employment in developing countries (Jayachandran, 2021), and that they can persist even when many people privately support women working (Bursztyn et al., 2020).

In developing countries, many interacting forces shape women's employment, therefore the socio-economic factors behind women's choice and her ability to become a part

* Senior Research Associate, Research and Product Development, Kashf Foundation. Email: amnanasirzaman@gmail.com

† Associate Professor and Director of Research, Graduate Institute of Development Studies (GIDS), Lahore School of Economics. Email: ahmad.nawaz@lahoreschool.edu.pk

of labor force need careful analysis. In this regard, the existing body of literature emphasizes the overall economic conditions, educational levels, household income, prevailing cultural and social norms surrounding marriage and inheritance, and women's resourcefulness and agency levels to community and public resources as significant determinants of women employability (Gaddis & Klasen, 2014; Klasen, 2019).

A large body of research suggests that paid work outside the home helps women gain social and political freedom and strengthens their empowerment. When families see that working women add to household income, they tend to invest more in girls' health and education (Ross, 2008). Women's employment is also linked to lower fertility and more deliberate family planning, which helps moderate population growth (Brewster & Rindfuss, 2000).

Scholars widely regard patriarchy as one of the strongest influences on women's social status in the Middle East (Moghadam, 2004; Olmsted, 2005; Karshenas, 2001) and in South Asia, where Kandiyoti (1988) described a "classic patriarchy" in which women's security depends on their male kin. Modernization has weakened the patriarchal family in many parts of the world, but its imprint remains visible in many Middle Eastern countries in the form of predatory economic and political institutions (Moghadam, 2004).

In Pakistan, women have had limited access to resources and institutions, and few institutional reforms have favored them, particularly in the public sector. Women work across every sector of the economy, yet their representation in public sector organizations remains far from equitable. Haeri (2002) notes that *zar* (wealth) and *zamin* (land) shape women's social and cultural standing, and that this standing depends on men's honor and their control over "*zar*, *zan* and *zamin*" (wealth, women and land). Pakistan ranked last of 148 countries on the Global Gender Gap Index in 2025 (World Economic Forum [WEF], 2025), which shows how wide these gaps remain.

Greater access to information and communication technology (ICT) in developing countries can open an array of possibilities, including poor women in rural areas. Wider access and adequate infrastructure can encourage women's participation in economic activity and raise employment, and efficient use of the internet speeds up job finding and makes recruitment more efficient (Choi, 2011). Evidence from Africa shows that the arrival of fast internet raised employment, including in skilled occupations (Hjort & Poulsen, 2019). The World Bank data suggests that Pakistan's female labor force participation rate averaged 18.66% between 1990 and 2018, ranging from 12.51% in 1995 to 25.12% in 2018. The Labour Force Survey 2020–21 put the rate at around 21% (Pakistan Bureau of Statistics [PBS], 2022), well short of the 45% target set in the national development plan, Vision 2025 (Planning Commission, 2014). Participation has therefore improved over time, but major challenges remain, and women's employment continues to lag well behind men because of demographic, social, legal and cultural factors. This paper examines how economic, social and demographic factors shape the employment of married women in Pakistan.

The first Human Development Report, launched by the United Nations Development Programme in 1990 under Mahbub ul Haq and drawing on the work of Amartya Sen, placed gender equality at the center of socio-economic development (United Nations Development Programme [UNDP], 1990). Human rights advocates, feminists and economists have since argued for women's equal participation in the labor force on the grounds that it is vital for developing a country's human resources (Bloom et al., 2009; Nussbaum, 2000). A country's human capital consists of the skills and productivity of its workforce, half of whom are women; meeting national development goals therefore requires equal rights for women in education, health, and economic, social and political life. In a patriarchal society, household structure and

gender-sensitive markets and institutions are central to progress toward gender equality (Revenga & Shetty, 2012), yet in developing countries the barriers that keep women out of the labor force remain the main obstacles to their empowerment. Several studies also document a "feminization of poverty", to highlight women who are dependent on others because of their particular status such as widows, single mothers, divorced and their old age which make up a large share of poverty among women (Chant, 2003; McLanahan & Kelly, 2006; Moghadam, 2005).

Women's education is central to a country's socio-economic development and is a key route to employment and empowerment, since it widens the opportunities available to both working and non-working women (Sonowal, 2013). Some groups of women, however, are less likely to become empowered, including younger women, women with little or no education, rural women, and women with few financial resources (Hunter et al., 2013). Higher educational attainment raises literacy, which in turn draws more women into paid work, and control over financial resources gives women a greater say in household financial decisions. Education and employment status are therefore widely seen as key determinants of women's empowerment (Choudhry et al., 2019; Kabeer, 2012; Noreen, 2011), although rural women in particular still have limited access to both education and suitable jobs (Sadaquat & Sheikh, 2011).

Evidence from Pakistan points in the same direction. Ahmad and Hafeez (2007) examined the determinants of women employment in Mandi Bahauddin, a district in northern Punjab, and found that education and economic development were central to women's decision to enter the labor force. In Southern Punjab, Faridi et al. (2011) used data from Bahawalpur and found that women's self-employment rose with their age and experience. Using the 1998–99 Pakistan Integrated Household Survey, Naqvi and Shahnaz (2002) showed that age and education were positively and significantly related to women's decision to work, while married women were less likely to participate. More recently, Amber and Chichaibelu (2023), using the 2019–20 Pakistan Social and Living Standards Measurement Survey, found that social and institutional norms explain most of the gender gap in mobile phone ownership and that owning a phone raises women's labor force participation. Experimental evidence from urban Pakistan also shows that safe, women-only transport more than doubles women's job applications, pointing to mobility and propriety concerns as binding constraints (Garlick et al., 2025).

The literature also stresses the role of technology in helping women convert their education into employment. Dettling (2017) shows that access to high-speed internet raises home internet use and, in turn, the labor force participation of married women. With wider access to ICT, women can work from home or from another convenient location rather than an office (Choi, 2011). In Jordan, the rollout of mobile broadband increased female labor force participation, with employment gains concentrated among older, more educated women (Viollaz & Winkler, 2022). Moving from traditional channels to ICT can also give poor households access to education, health care, government services and financial services (Mehta & Kalra, 2006), and mobile phone ownership has been linked to lower gender inequality and better outcomes for women across a range of development indicators (Rotondi et al., 2020). ICT can also help women who face domestic violence find job opportunities, reach markets and raise their incomes. Whether women can take advantage of these opportunities, however, depends on government policy and on the environment which supports education, financial access and infrastructure (Prasad & Sreedevi, 2007). Access to ICT is further limited by weak infrastructure, unreliable power supply, high equipment costs and poor telecommunication connectivity (Sylla, 2002). In Pakistan, women were 25% less likely than men to use mobile internet in 2024, down from 38% a year earlier (GSMA, 2025). ICTs have created better and more suitable jobs, but Dell'Anno and Solomon (2014) argue that their benefits accrue mainly

to highly skilled workers, and therefore ICTs tend to improve business performance more in developed than in developing countries (Opiyo & K'Akumu, 2006). Raja, Imaizumi, Kelly, Narimatsu and Paradi-Guilford (2013) identify three channels through which ICTs shape labor markets: greater connectivity, the digitization of the economy and the globalization of skills. The last of these allows highly skilled workers in developing countries to find well-paid jobs that match their skills. ICTs can also harm workers, however, when automation and the transformation of tasks lead to job losses and displacement (Raja et al., 2013).

ICT contributes to women's economic development by building leadership skills and encouraging participation in community life, making women more active members of society (Anitha & Sundharavadivel, 2012). National case studies show that ICT is a key component in improving women's employability and, through it, their empowerment (Wamala, 2012; Yap, 2013; Suhaida et al., 2015; and Shirazi, 2012), and empirical studies of ICT and women's empowerment report positive effects of ICT adoption on labor market outcomes. UNESCO has also run a range of initiatives that use ICT to improve women's employability, skills and confidence in their daily activities (UNESCO, 2016). Financial access matters as well for example in Indian context, women who receive their salaries directly into their bank accounts results in increase in their labor supply and eventually led to changing perceptions about women's work (Field et al., 2021).

Drawing on this literature and its theoretical and conceptual foundations, we develop the framework shown below. We expect education to have a positive effect on women's employability and examine whether technology moderates this relationship in Pakistan.

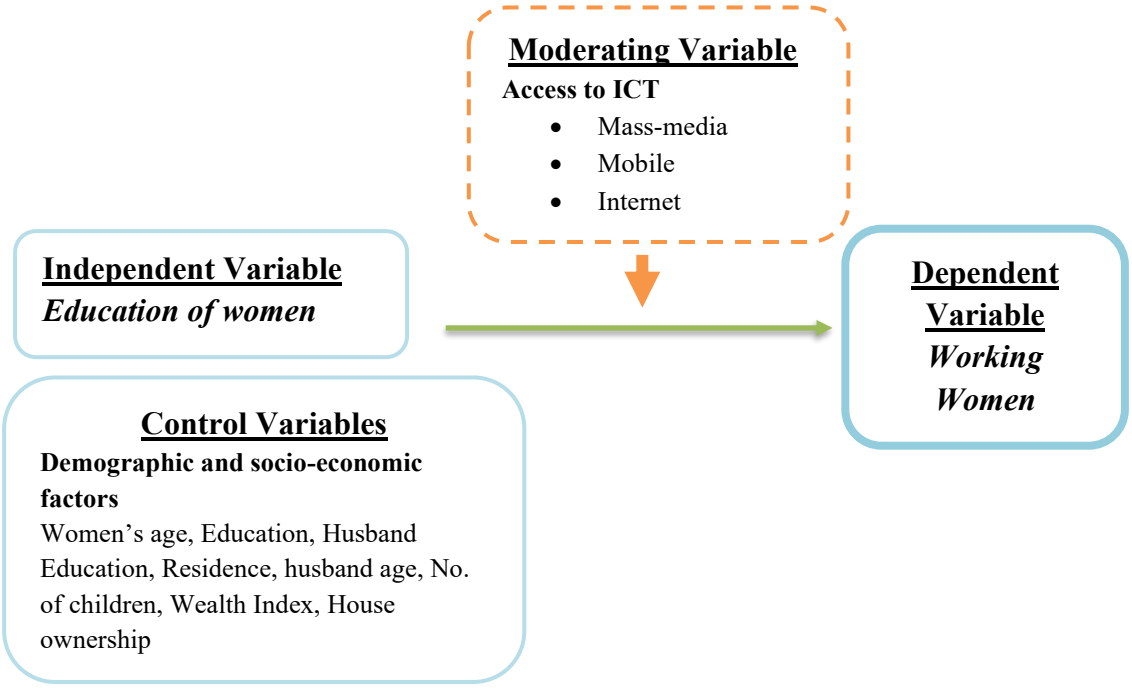


Figure 1. Theoretical Framework

The framework in Figure 1 draws on Sen's (1999) capability approach. We use it to empirically test women education-employability nexus and further to assess the role of technology. In a way, we want to captures the opportunities households have to access ICT, the socio-demographic characteristics of users and non-users, and their economic reasons for using ICT.

National indicators of ICT access cover social, economic and environmental factors, but relying on them alone can mask differences across a nation's socio-demographic groups (International Telecommunication Union [ITU], 2003). These differences matter because gender (Colle & Roman, 2002; Richardson et al., 2000), background (Heeks, 2002), age (Delgadillo et al., 2002) and income (Gomez & Casadiego, 2002; O'Farrell, 2001; Richardson et al., 2000) recur in the literature as factors that may shape the adoption and use of ICT. Other researchers stress education, literacy and skills as conditions for using ICT to benefit from the digital economy (Lopez & Villaseca, 1996; Sylla, 2002). School enrollment and technical training can serve as proxies for ICT use (Campbell, 2001), and O'Farrell (2001) emphasizes on the community mobility, access to commercial training centers, class divisions and ethnic polarization. Likewise, a person's skills, the tasks they perform and their profession all affect their use of advanced technologies and, with it, their private and working life (Winter & Taylor, 2001; Rubery & Grimshaw, 2001; Miller & Cardy, 2000).

This paper therefore addresses two research questions: (1) Does women's education affect their employment after controlling for socio-economic, cultural and institutional factors? (2) Does technology (ICT) moderate this relationship?

2. Methodology

We utilize the data set of Pakistan Demographic and Health Survey 2018-19 (National Institute of Population Studies [NIPS] & ICF, 2019). The PDHS covers 15,068 ever-married women and 3,691 ever-married men aged 15–49 across Pakistan, including Azad Jammu and Kashmir and Gilgit-Baltistan. Our analysis uses the sample of 15,068 ever-married women. Table 1 describes the variables used in the analysis.

Table 1. Variables and their description

Variable	Variable-Name	Variable-Measurement	Variable-Definition
		Dependent variable, y	
Working women	WNW	Working seasonally or round the year No = 0 Yes = 1 WNW (0,1)	Women who has worked all the year or seasonally
		Independent variable, x	
Educational attainment	EducW	**Schooling Levels**: Higher, Secondary, Middle, Primary, No schooling	What is the highest level of your schooling?
		Demographic and socio-economic variables *(control-factors)*	
Age (yrs)	Age	Range = [15,49]	Age of ever-married woman
Children (dependent)	Children	Yes = 1 No = 2	If the children are currently living with the woman
Wealth Index	WIw	Range = [1,5]	Wealth index created by DHS (2017-18)
		Cultural beliefs and norms	
Attitude of woman towards domestic violence	AttitudeDVm	Average of binary responses of all 6 categories Range = [0,1] Justified = Yes = 1 Not-justified = No = 0	If women justify husband beating in the scenarios below if she: - went outside without informing him. - no attention to her children. - debates with him. - does not allow him for sex. - burns the food. - neglects the in-laws
		Access to ICT *(moderator)*	

Access to mass-media	AccessMM	once a week minimum = 1 fewer than once a week = 2 Not use = 3	Usage of newspaper, radio and TV (average)
Mobile ownership	ownmobile	Yes = 1 No = 0	If respondent owns a mobile phone or not
Internet usage	Internetusage	No use = 0 fewer than once a week = 1 once a week minimum = 2 every day (almost) = 3	Frequency of using the internet

Note: DHS = Demographic and Health Survey; ICT = information and communication technology.

The unit of analysis is the ever-married woman. The dependent variable is binary, taking the value 1 if the woman worked throughout the year or seasonally and 0 otherwise. We estimate logit models to examine the role of ICT as a moderator between education-employment of ever-married women nexus.

$$Y = \beta_0 + \beta_1 X_{1i} + \beta_2 ICT_{2i} + \beta_3 V_{2i} + e_i \quad (1)$$

Where,

Y = ever-married women worked throughout the year or not, such that y = (0, 1)

X_1 = Women Education, V_{2i} = Control factors

To test whether ICT moderates the effect of education on women's employment, we estimate:

$$Y = \beta_0 + \beta_1 X_{1i} + \beta_2 ICT \times X_{1i} + \beta_3 ICT + \beta_4 V_{2i} + e_i \quad (2)$$

3. Results and Discussion

3.1 Descriptive Analysis

Figure 2 compares women employability with their education levels. Most women in both groups have no formal education. Secondary education is more common among non-working women (22.15%) than among working women (13.28%), whereas higher education is more common among working women (22.25%) than among non-working women (13.36%).

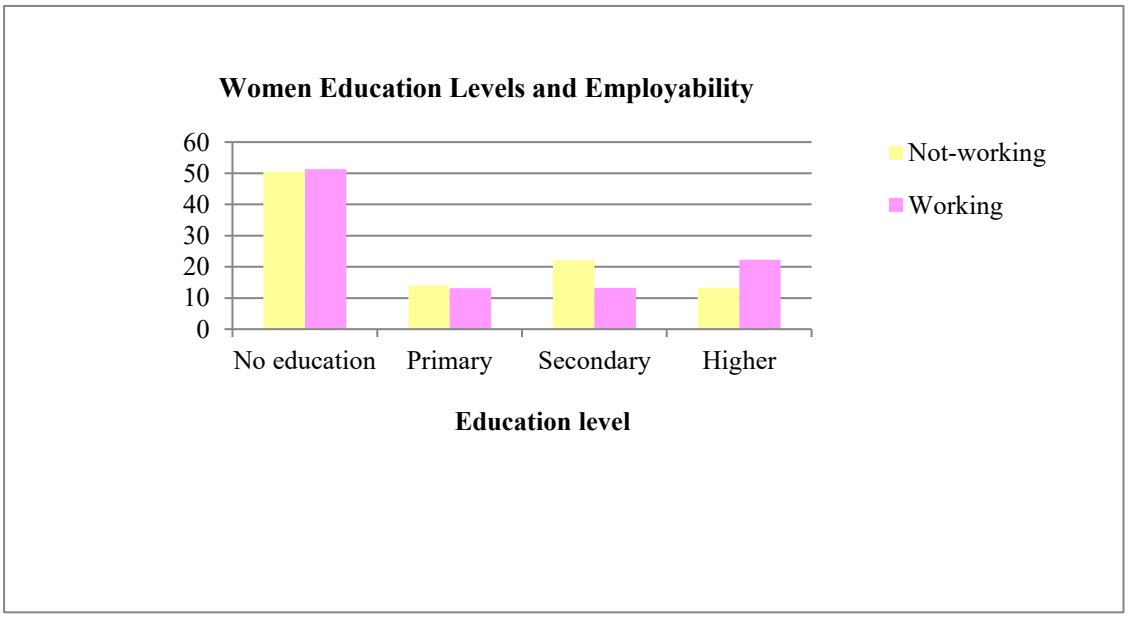


Figure 2. Educational levels and women employability

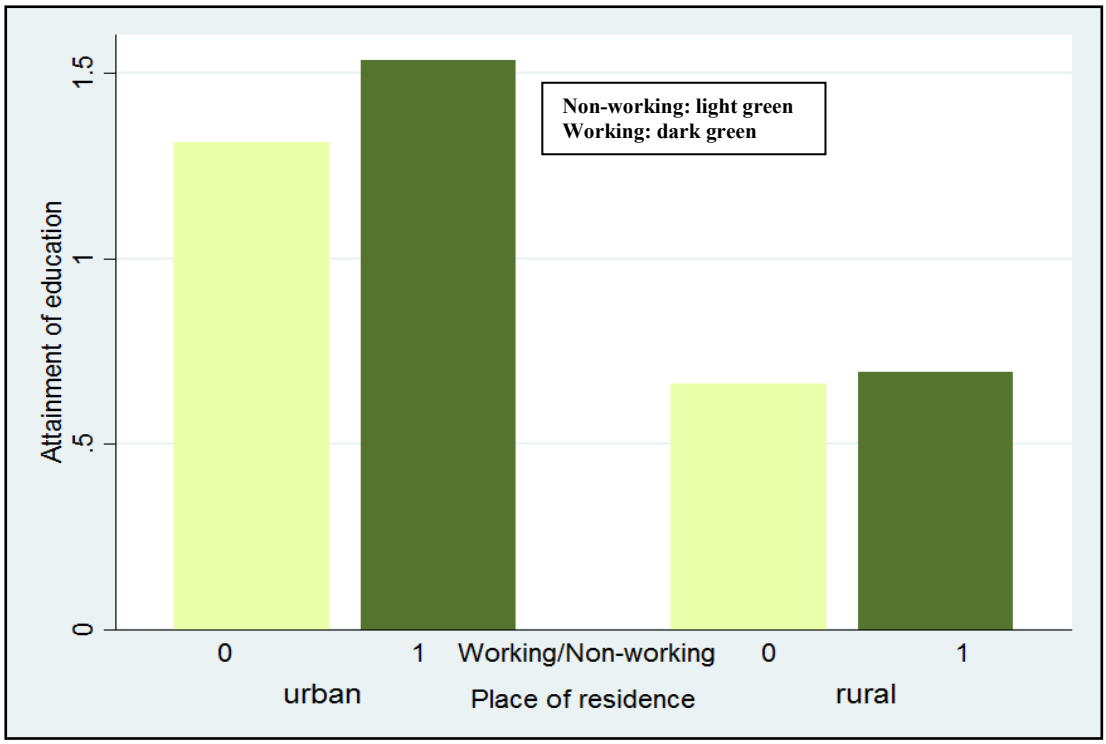


Figure 3. Attainment of education in urban/rural areas

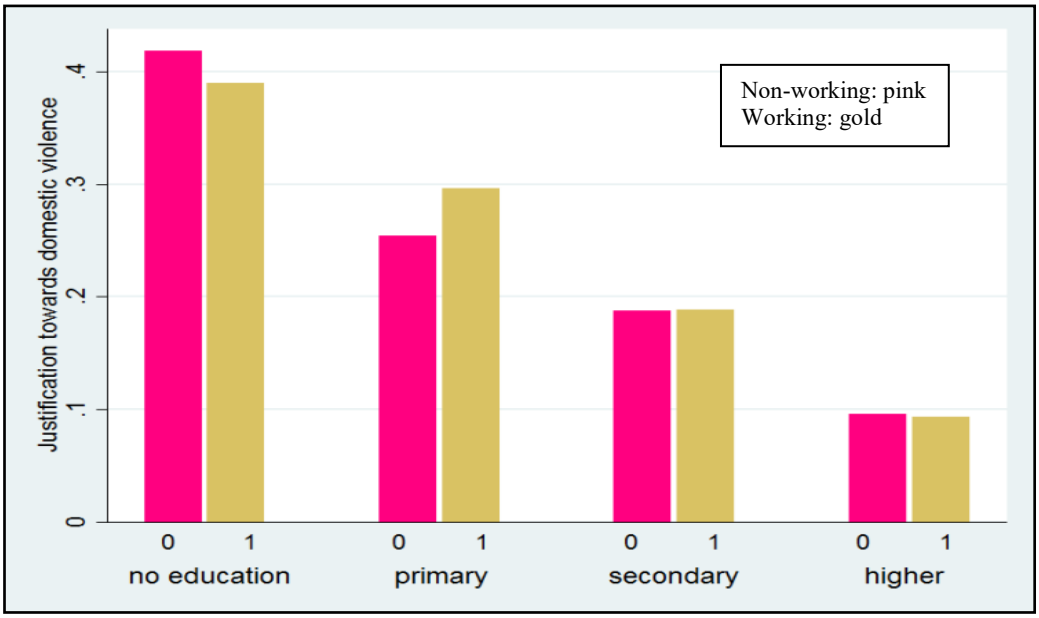


Figure 4. Violence Justification and level of education

Figure 3 shows the educational attainment of working and non-working women by place of residence. Both groups have higher educational attainment in urban than in rural areas, and in urban areas working women are more educated (mean = 1.6) than non-working women (mean = 1.3). Figure 4 shows that women with no education, whether working or not, are the most likely to justify domestic violence. However, working women having secondary and higher levels of education less justify domestic violence compared to non-working women having the same levels of education.

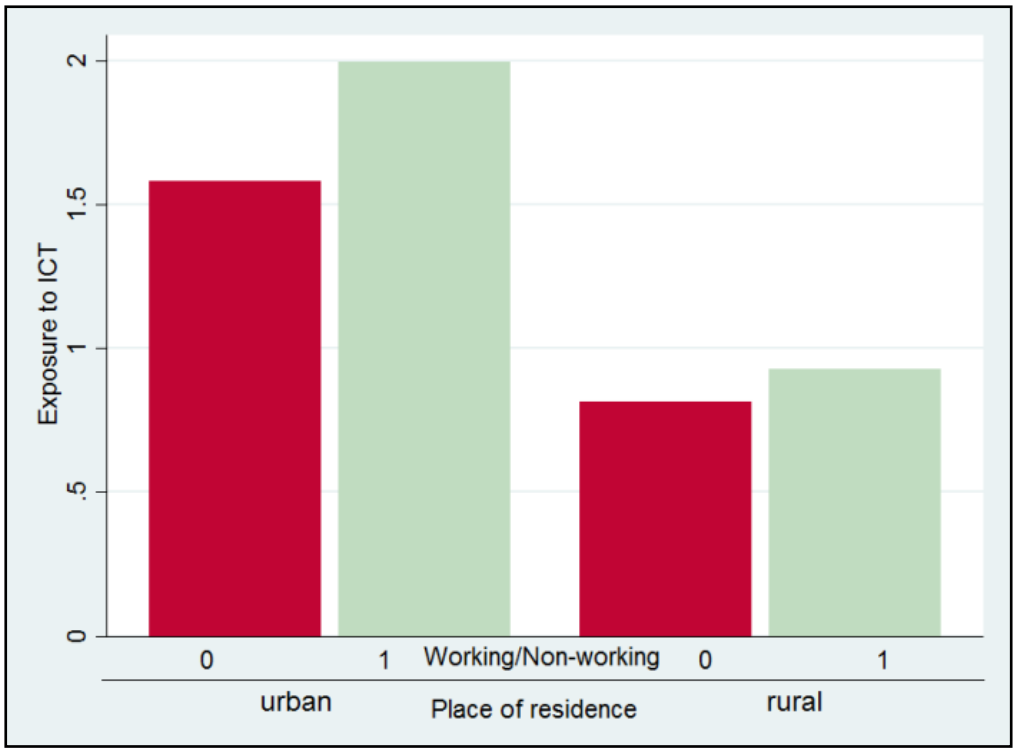


Figure 5. Exposure of ICT (urban and rural areas)

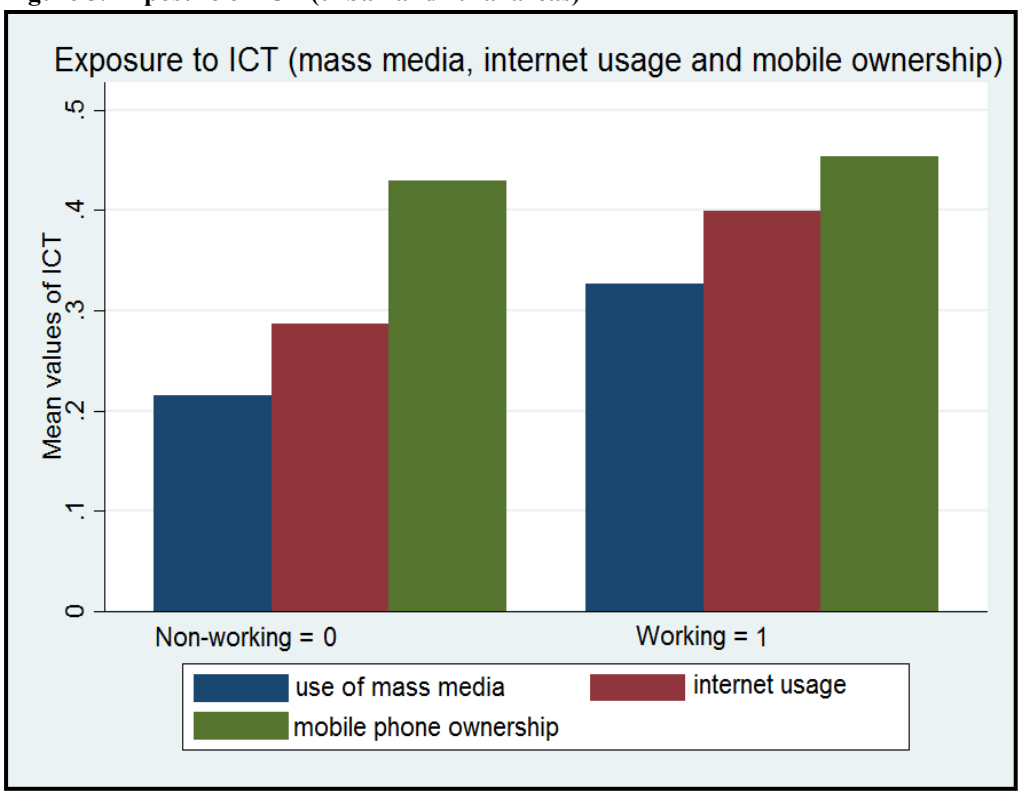


Figure 6. ICT (working and non-working women)

Figure 5 shows that urban women, both working and non-working, have greater exposure to ICT than rural women. Figure 6 shows that working women have greater exposure than non-working women to all three sources of ICT: mass media, internet use and mobile phone ownership. Figure 7 shows that justification of domestic violence rises as exposure to ICT falls, for both working and non-working women. When exposed to ICT, however, working women justify domestic violence less than non-working women. Figure 8 shows that exposure

to ICT declines as the number of dependent children rises, for both working and non-working women. Among women with fewer children, working women (pink dots) have greater exposure to ICT than non-working women (purple dots).

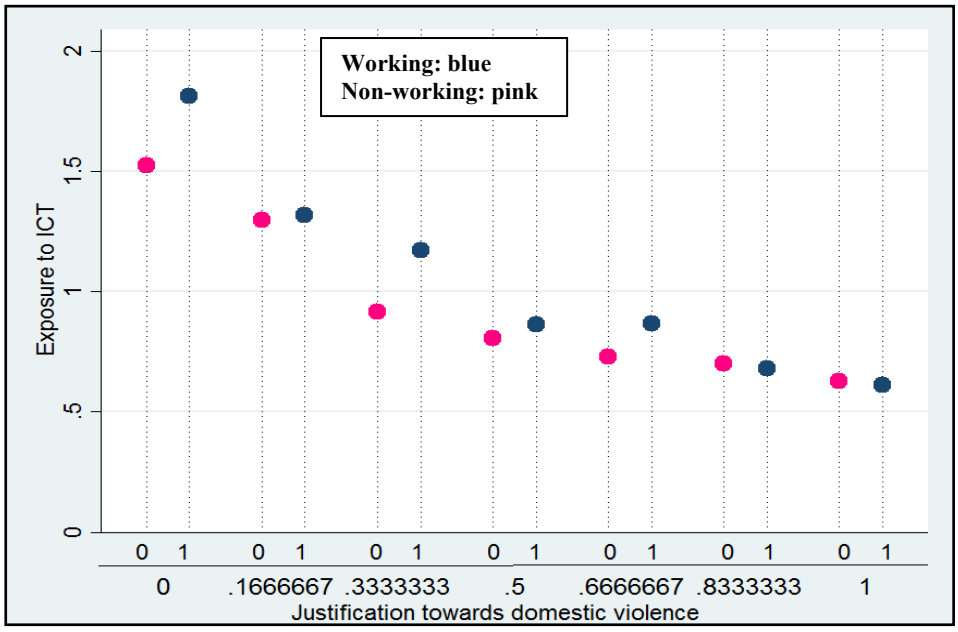


Figure 7. ICT and domestic violence perception

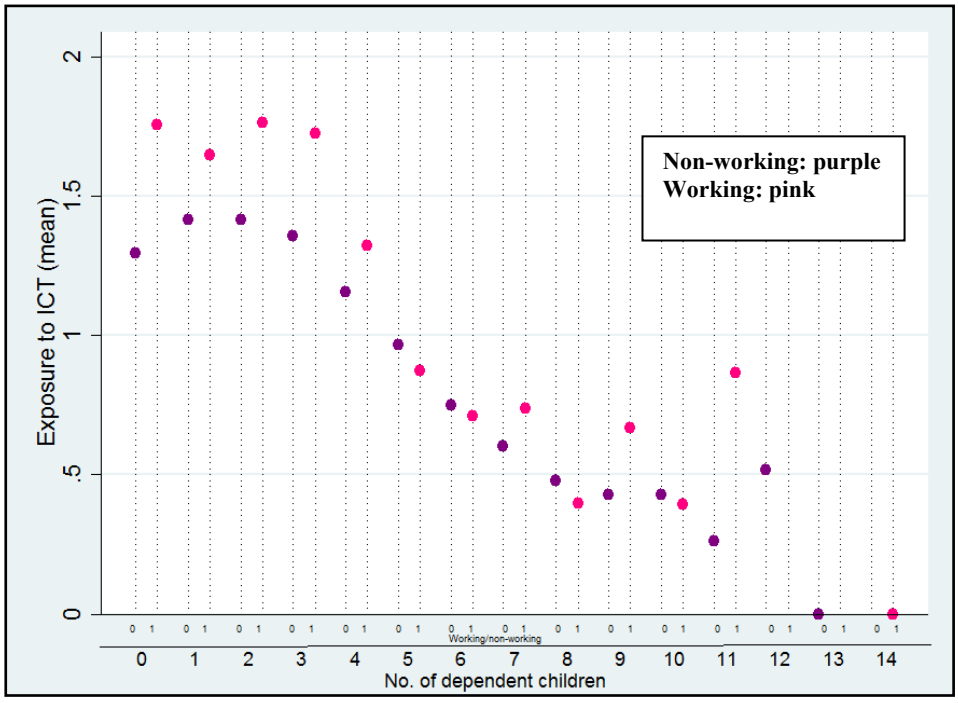


Figure 8. ICT and according to no. of children

3.2 Empirical Analysis

Table 2 reports logit estimates of the effect of education on women's employability, controlling for demographic and socio-economic factors. In each model, the dependent variable is binary (working versus non-working women), and the woman's education is the main explanatory variable. The coefficient on education is positive and significant, indicating that education raises the likelihood of employment. This is consistent with Smock (1981), who found that women's desire to work grew with their education, giving them more job prospects and increasing their income-generating potential, which in turn can raise their satisfaction and

well-being (Morgan, Sirageldin & Baerwaldt, 1966; Stevenson & Wolfers, 2009). Bandyopadhyay (2008) likewise argues that women's empowerment rises with their educational attainment and working status. Recent evidence from Pakistan also links women's labor force participation to their education and literacy (Amber & Chichaibelu, 2023).

Table 2. Logit estimates of women's education and employability

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dependent variable: Working Women						
Educational attainment	0.1644**	0.1503***	0.1557***	0.1537***	0.1541***	0.1528***	0.1892***
	(0.0150)	(0.0152)	(0.0152)	(0.0152)	(0.0153)	(0.0153)	(0.0162)
Age (yrs)		0.0527***	0.0472***	0.0464***	0.0464***	0.0537***	0.0539***
		(0.0032)	(0.0033)	(0.0033)	(0.0033)	(0.0053)	(0.0053)
HH Wealth		−0.285***	−0.283***	−0.286***	−0.276***	−0.275***	−0.237***
		(0.0201)	(0.0201)	(0.0202)	(0.0215)	(0.0215)	(0.0224)
No. of Children		−0.071***	−0.053***	−0.053***	−0.052***	−0.051***	−0.051***
		(0.0123)	(0.0124)	(0.0124)	(0.0124)	(0.0124)	(0.0124)
Marital status			0.4023***	0.3921***	0.3926***	0.3786***	0.2842***
			(0.0372)	(0.0374)	(0.0374)	(0.0388)	(0.0410)
Ownership (House)				0.3990***	0.3975***	0.3934***	0.4010***
				(0.1180)	(0.1181)	(0.1184)	(0.1195)
Location (Urban)					0.0552	0.0518	0.0637
					(0.0524)	(0.0524)	(0.0526)
Husband Age						−0.0082	−0.0093*
						(0.0044)	(0.0044)
Husband Education							−0.176***
							(0.0246)
Con.	−2.581***	−2.652***	−2.997***	−2.962***	−3.078***	−2.997***	−2.799***
	(0.1055)	(0.1044)	(0.1099)	(0.1102)	(0.1551)	(0.1602)	(0.1622)
Chi-square	370.55	407.90	532.49	543.94	543.69	545.10	590.87
P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pseudo R^2	0.0270	0.0295	0.0382	0.0390	0.0391	0.0394	0.0429
Observations	15,068	15,068	15,068	15,068	15,068	15,068	15,068

Note: Coefficients are logit estimates. Robust standard errors are in parentheses below the coefficients. Pseudo R^2 is reported. *** p < .001, ** p < .01, * p < .05.

Models 2–7 add demographic and socio-economic covariates, and the education coefficient remains positive and significant throughout. The household wealth index is negatively related to women's employment in every specification. This fits the U-shaped relationship between economic status and women's work, in which women in poorer households often work out of economic necessity and withdraw from the labor market as household income rises (Gaddis & Klasen, 2014; Klasen, 2019). Kabeer (2012) similarly found that although women said little about their earnings or claims on resources, greater wealth was associated with higher self-esteem, happiness and standing within the family, which may reduce their desire to work outside the home. The number of dependent children also robustly reduces the likelihood of employment, in line with Presser and Baldwin (1980), who found that the presence of children limits women's work opportunities. Marital status is positively associated with employment, which may reflect the greater economic and social needs of married households (Myrdal & Klein, 1956). House ownership is also positively and significantly associated with employment. Urban residence has a positive but statistically insignificant coefficient, so once we control for other factors, living in an urban area does not significantly change women's likelihood of employment, even though urban areas typically offer more work opportunities, mobility and access to resources (Abrar ul Haq et al., 2017; Gautam, 2018).

Finally, women's employability declines with their husband's education and, in the full specification (Model 7), with their husband's age (significant at the 5% level). One interpretation is that as marriages lengthen, husbands gain greater control over household

decisions. Similarly, a more educated husband improves the household's economic position, which reduces the incentive for women to work.

To test whether ICT moderates the relationship between education and employment among ever-married women, we add an interaction term (Educational attainment × ICT). Table 3 reports logit estimates without ICT (Model 1), with ICT (Model 2) and with the interaction term (Model 3). ICT has a positive and significant effect on employment, and the interaction term is positive and significant (β = 0.0576, $p < .001$), indicating that the effect of education on employment is stronger for women with greater access to ICT. As their education increases, women become better able to use technology and acquire ICT skills, which makes them more capable of taking up income-generating opportunities.

Table 3. Logit estimates of the moderating role of ICT (Ever-married women's employment & ICT as a moderator)

	(1)	(2)	(3)
	Dependent variable: Working Women		
Educational attainment	0.1891***	0.1168***	0.0454*
	(0.0161)	(0.0177)	(0.0218)
Age (yrs)	0.0539***	0.0534***	0.0525***
	(0.0053)	(0.0053)	(0.0053)
ICT		0.2369***	0.2351***
		(0.0210)	(0.0420)
Educational attainment × ICT			0.0576***
			(0.0098)
Wealth Index	−0.2375***	−0.3046***	−0.2838***
	(0.0224)	(0.0237)	(0.0241)
Children (dependent)	−0.0516***	−0.0439***	−0.0437***
	(0.0124)	(0.0124)	(0.0124)
Marital status	0.2841***	0.2841***	0.2926***
	(0.0409)	(0.0409)	(0.0413)
House ownership	0.4009***	0.4009***	0.3665**
	(0.1195)	(0.1195)	(0.1209)
Residence (Urban)	0.0637	0.0637	0.0661
	(0.0526)	(0.0526)	(0.0535)
Age (husband)	−0.0092*	−0.0092*	−0.0096*
	(0.0044)	(0.0044)	(0.0044)
Education (husband)	−0.1715***	−0.1715***	−0.1866***
	(0.0246)	(0.0246)	(0.0254)
Constant	−2.7998***	−2.751***	−2.645***
	(0.1622)	(0.1629)	(0.1640)
Chi-square	590.86	590.86	691
P-value	0.0000	0.0000	0.0000
Pseudo R^2	0.0429	0.0429	0.054
Observations	15,068	15,068	15,068

Note: Coefficients are logit estimates. Robust standard errors are in parentheses below the coefficients. Pseudo R^2 is reported. *** p < .001, ** p < .01, * p < .05. ICT = information and communication technology.

Women who use ICT effectively therefore tend to be those with more education, because they adapt more readily to skills and tasks that involve technology. Mobile phones improve labor market intermediation by delivering faster, cheaper and more up-to-date information on job openings through text messages, calls and notifications, helping women participate actively and efficiently in the labor market (Dammert et al., 2015).

ICT makes educated women more resourceful which increases her agency levels. No wonders, she tends to have more control over the assets because an access to information with the help of technology make it easier for her to utilize financial services for the management of savings and assets. Further, Greene and Mamic (2015) argue that access to ICT helps in

reducing gender gaps and social and economic barriers, and ultimately instrumental in changing the dynamics of work around the world.

As women gain exposure to ICT-enabled financial services, including bank accounts, internet banking, mobile money and information about microcredit through television and radio, more of them enter the labor force as they become socially and economically empowered. This is consistent with experimental evidence that strengthening women's control over their own earnings raises their labor supply (Field et al., 2021). Greater ICT-enabled access to financial institutions can also help rural women working in agriculture join the labor force by connecting them to markets (Mehta & Kalra, 2006).

4. Conclusion

This paper examines the effect of education on women's employment in Pakistan and the role of technology as a moderator, using data from the 2017–18 PDHS. Educated women are more likely to be employed, and access to ICT strengthens this relationship: educated women are better able to adopt and use technology, which raises their employability. By contrast, women's employment declines as their husband's education and age increase. Overall, our findings support policies that combine efforts to raise women's working status with wider use of ICT, helping women move beyond the constraints of patriarchal norms. These policies should address the market failures that affect particularly the rural women living in marginalized circumstances. These should also be sensitive to how households allocate resources and responsibilities, since the women empowerment is intimately linked to their ownership of assets and their role in household decision making. Based on these findings, the study recommends the following:

- The government should appropriate funds to establish training and learning institutes owned and managed by the community which are accessible to women.
- The government should launch vocational training and employment projects for women and ensure that these projects include disadvantaged groups of women.

References

Abrar ul Haq, M., Jali, M. R. M., & Islam, G. M. N. (2017). Empowering rural women in Pakistan: Empirical evidence from Southern Punjab. *Quality & Quantity, 51*(4), 1777–1787.

Ahmad, E., & Hafeez, A. (2007). Labour supply and earning functions of educated married women: A case study of Northern Punjab. *The Pakistan Development Review, 46*(1), 45–62.

Amber, H., & Chichaibelu, B. B. (2023). Narrowing the gender digital divide in Pakistan: Mobile phone ownership and female labor force participation. *Review of Development Economics, 27*(3), 1354–1382. https://doi.org/10.1111/rode.12994

Anitha, L., & Sundharavadivel, D. (2012). Information and communication technology (ICT) and women empowerment. *International Journal of Advanced Research in Management and Social Sciences, 1*(4), 143–152.

Bandyopadhyay, S. (2008). *Microfinance in the improvement of living standard and GNH* (pp. 248–271). Thimphu: The Centre for Bhutan Studies.

Becker, G. S. (1965). A theory of the allocation of time. *The Economic Journal, 75*(299), 493–517. https://doi.org/10.2307/2228949

Black, T. R. (2002). *Understanding social science research* (2nd ed.). London: Sage.

Bloom, D. E., Canning, D., Fink, G., & Finlay, J. E. (2009). Fertility, female labor force participation, and the demographic dividend. *Journal of Economic Growth, 14*(2), 79–101. https://doi.org/10.1007/s10887-009-9039-9

Brewster, K. L., & Rindfuss, R. R. (2000). Fertility and women's employment in industrialized nations. *Annual Review of Sociology, 26*, 271–296. https://doi.org/10.1146/annurev.soc.26.1.271

Bursztyn, L., González, A. L., & Yanagizawa-Drott, D. (2020). Misperceived social norms: Women working outside the home in Saudi Arabia. *American Economic Review, 110*(10), 2997–3029. https://doi.org/10.1257/aer.20180975

Campbell, D. (2001). Can the digital divide be contained? *International Labour Review, 140*(2), 119–141.

Chant, S. (2003). *Female household headship and the feminisation of poverty: Facts, fictions and forward strategies* (New Working Paper Series, Issue 9). London: Gender Institute, London School of Economics.

Choi, E. J. (2011). *Does the internet help the unemployed find jobs?* [Unpublished manuscript].

Choudhry, A. N., Mutalib, R. A., & Ismail, N. S. A. (2019). Socio-cultural factors affecting women economic empowerment in Pakistan: A situation analysis. *International Journal of Academic Research in Business and Social Sciences, 9*(5), 78–88.

Colle, R. D., & Roman, R. (2002, July–September). Gender as an access issue. *TechKnowLogia*.

Dammert, A. C., Galdo, J. C., & Galdo, V. (2015). *Integrating mobile phone technologies into labor-market intermediation: A multi-treatment experimental design* (IZA Discussion Paper No. 9012). Bonn: Institute of Labor Economics.

Delgadillo, K., Gomez, R., & Stoll, K. (2002). *Community telecentres for development: Lessons from community telecentres in Latin America and the Caribbean*. Ottawa: International Development Research Centre.

Dell'Anno, R., & Solomon, O. H. (2014). Informality, inequality, and ICT in transition economies. *Eastern European Economics, 52*(5), 3–31.

Dettling, L. J. (2017). Broadband in the labor market: The impact of residential high-speed internet on married women's labor force participation. *ILR Review, 70*(2), 451–482. https://doi.org/10.1177/0019793916644721

Faridi, M. Z., Chaudhry, I. S., & Malik, M. S. (2011). Why women are self-employed? Empirical evidence from Pakistan. *International Journal of Economics and Finance, 3*(1), 198–207.

Field, E., Pande, R., Rigol, N., Schaner, S., & Troyer Moore, C. (2021). On her own account: How strengthening women's financial control impacts labor supply and gender norms. *American Economic Review, 111*(7), 2342–2375. https://doi.org/10.1257/aer.20200705

Gaddis, I., & Klasen, S. (2014). Economic development, structural change, and women's labor force participation: A reexamination of the feminization U hypothesis. *Journal of Population Economics, 27*(3), 639–681. https://doi.org/10.1007/s00148-013-0488-2

Garlick, R., Field, E., & Vyborny, K. (2025). *Women's mobility and labor supply: Experimental evidence from Pakistan* (IZA Discussion Paper No. 17883). Bonn: Institute of Labor Economics.

Gautam, D. (2018). Empowerment of tribal women through skill development: The role of self-help groups. *International Journal of Academic Research & Development, 4*(1), 34–38.

Gomez, R., & Casadiego, B. (2002). *Letter to Aunt Ofelia: Seven proposals for human development using new information and communication technologies*. Ottawa: International Development Research Centre.

Greene, L., & Mamic, I. (2015). *The future of work: Increasing reach through mobile technology*. Bangkok: International Labour Organization.

GSMA. (2025). *The mobile gender gap report 2025*. London: GSMA.

Haeri, S. (2002). *No shame for the sun: Lives of professional Pakistani women*. Syracuse, NY: Syracuse University Press.

Heeks, R. (2002). i-Development not e-development: Special issue on ICTs and development. *Journal of International Development, 14*(1), 1–11.

Hjort, J., & Poulsen, J. (2019). The arrival of fast internet and employment in Africa. *American Economic Review, 109*(3), 1032–1079. https://doi.org/10.1257/aer.20161385

Hunter, B. A., Jason, L. A., & Keys, C. B. (2013). Factors of empowerment for women in recovery from substance use. *American Journal of Community Psychology, 51*(1–2), 91–102. https://doi.org/10.1007/s10464-012-9499-5

International Labour Organization. (2018). *World employment and social outlook: Trends for women 2018 – Global snapshot*. Geneva: International Labour Office.

International Telecommunication Union. (2003). *World telecommunication development report 2003: Access indicators for the information society*. Geneva: ITU.

Jayachandran, S. (2021). Social norms as a barrier to women's employment in developing countries. *IMF Economic Review, 69*(3), 576–595. https://doi.org/10.1057/s41308-021-00140-w

Jensen, R. (2012). Do labor market opportunities affect young women's work and family decisions? Experimental evidence from India. *The Quarterly Journal of Economics, 127*(2), 753–792. https://doi.org/10.1093/qje/qjs002

Kabeer, N. (2012). *Women's economic empowerment and inclusive growth: Labour markets and enterprise development* (SIG Working Paper 2012/1). Ottawa: International Development Research Centre.

Kandiyoti, D. (1988). Bargaining with patriarchy. *Gender & Society, 2*(3), 274–290. https://doi.org/10.1177/089124388002003004

Karshenas, M. (2001). Economic liberalization, competitiveness and women's employment in the Middle East and North Africa. In D. Salehi-Isfahani (Ed.), *Labour and human capital in the Middle East: Studies of markets and household behaviour* (pp. 92–147). Reading: Ithaca Press.

Klasen, S. (2019). What explains uneven female labor force participation levels and trends in developing countries? *The World Bank Research Observer, 34*(2), 161–197. https://doi.org/10.1093/wbro/lkz005

Lopez, E. J., & Villaseca, M. G. (1996). IT as a global economic tool. In E. M. Roche & M. J. Blaine (Eds.), *Information technology, development and policy: Theoretical perspectives and practical challenges*. Aldershot: Avebury.

McLanahan, S. S., & Kelly, E. L. (2006). The feminization of poverty: Past and future. In J. S. Chafetz (Ed.), *Handbook of the sociology of gender* (pp. 127–145). New York: Springer.

Mehta, S., & Kalra, M. (2006). Information and communication technologies: A bridge for social equity and sustainable development in India. *The International Information & Library Review, 38*(3), 147–160.

Miller, J. S., & Cardy, R. L. (2000). Technology and managing people: Keeping the "human" in human resources. *Journal of Labor Research, 21*(3), 447–461.

Mincer, J. (1980). Labor force participation of married women. In A. H. Amsden (Ed.), *The economics of women and work*. Harmondsworth: Penguin.

Mincer, J., & Polachek, S. (1974). Family investments in human capital: Earnings of women. *Journal of Political Economy, 82*(2), S76–S108. https://doi.org/10.1086/260293

Moghadam, V. M. (2004). Patriarchy in transition: Women and the changing family in the Middle East. *Journal of Comparative Family Studies, 35*(2), 137–162. https://doi.org/10.3138/jcfs.35.2.137

Moghadam, V. M. (2005). *The "feminization of poverty" and women's human rights* (SHS Papers in Women's Studies/Gender Research No. 2). Paris: UNESCO.

Morgan, J. N., Sirageldin, I. A., & Baerwaldt, N. (1966). *Productive Americans: A study of how individuals contribute to economic progress*. Ann Arbor: Survey Research Center, University of Michigan.

Myrdal, A., & Klein, V. (1956). *Women's two roles: Home and work*. London: Routledge & Kegan Paul.

Naqvi, Z. F., & Shahnaz, L. (2002). How do women decide to work in Pakistan? *The Pakistan Development Review, 41*(4), 495–513.

National Institute of Population Studies, & ICF. (2019). *Pakistan demographic and health survey 2017–18*. Islamabad, Pakistan, and Rockville, MD: NIPS and ICF.

Njelekela, C., & Sanga, C. (2015). Contribution of information and communication technology in improving access to market information among smallholder farmers: The case study of Kilosa District. *The International Journal of Management Science and Information Technology*, 56–72.

Noreen, S. (2011). Role of microfinance in empowerment of female population of Bahawalpur district. In *International Conference on Economics and Finance Research* (IPEDR Vol. 4). Singapore: IACSIT Press.

Nussbaum, M. C. (2000). *Women and human development: The capabilities approach*. Cambridge: Cambridge University Press.

O'Farrell, C. (2001). *Information flows in rural and urban communities: Access, processes and people* [Paper presentation]. UDRSA Conference 2001.

Olmsted, J. C. (2005). Is paid work the (only) answer? Neoliberalism, Arab women's well-being, and the social contract. *Journal of Middle East Women's Studies, 1*(2), 112–139.

Opiyo, R. O., & K'Akumu, O. A. (2006). ICT application in the informal sector: The case of the Kariokor market MSE cluster in Nairobi. *Urban Forum, 17*(3), 241–261.

Pakistan Bureau of Statistics. (2022). *Labour force survey 2020–21*. Islamabad: Government of Pakistan.

Planning Commission. (2014). *Pakistan 2025: One nation – one vision*. Islamabad: Ministry of Planning, Development & Reform, Government of Pakistan.

Prasad, P. N., & Sreedevi, V. (2007). Economic empowerment of women through information technology. *Journal of International Women's Studies, 8*(4), 107–120.

Presser, H. B., & Baldwin, W. (1980). Child care as a constraint on employment: Prevalence, correlates, and bearing on the work and fertility nexus. *American Journal of Sociology, 85*(5), 1202–1213.

Raja, S., Imaizumi, S., Kelly, T., Narimatsu, J., & Paradi-Guilford, C. (2013). *Connecting to work: How information and communication technologies could help expand employment opportunities*. Washington, DC: World Bank.

Revenga, A., & Shetty, S. (2012). Empowering women is smart economics. *Finance & Development, 49*(1), 40–43.

Richardson, D., Ramirez, R., & Haq, M. (2000). *Grameen Telecom's village phone programme in rural Bangladesh: A multi-media case study* (Final report). Ottawa: Canadian International Development Agency.

Ross, M. L. (2008). Oil, Islam, and women. *American Political Science Review, 102*(1), 107–123. https://doi.org/10.1017/S0003055408080040

Rotondi, V., Kashyap, R., Pesando, L. M., Spinelli, S., & Billari, F. C. (2020). Leveraging mobile phones to attain sustainable development. *Proceedings of the National Academy of Sciences, 117*(24), 13413–13420. https://doi.org/10.1073/pnas.1909326117

Rubery, J., & Grimshaw, D. (2001). ICTs and employment: The problem of job quality. *International Labour Review, 140*(2), 165–192.

Sadaquat, M. B., & Sheikh, Q. A. (2011). Employment situation of women in Pakistan. *International Journal of Social Economics, 38*(2), 98–113.

Sen, A. (1999). *Development as freedom*. Oxford: Oxford University Press.

Shirazi, F. (2012). Information and communication technology and women empowerment in Iran. *Telematics and Informatics, 29*(1), 45–55.

Singh, S., & Samara, R. (1996). Early marriage among women in developing countries. *International Family Planning Perspectives, 22*(4), 148–157, 175. https://doi.org/10.2307/2950812

Smock, A. C. (1981). *Women's education in developing countries: Opportunities and outcomes*. New York: Praeger.

Sonowal, M. K. (2013). Impact of education in women empowerment: A case study of SC and ST women of Sonitpur District, Assam. *International Journal of Computer Applications in Engineering Sciences, 3*(Special issue), 27–33.

Stevenson, B., & Wolfers, J. (2009). The paradox of declining female happiness. *American Economic Journal: Economic Policy, 1*(2), 190–225. https://doi.org/10.1257/pol.1.2.190

Suhaida, M. A., Nurulhuda, M. S., & Yap, S.-F. (2013). Access to ICT as moderating factor to women's participation in the labor force: A conceptual framework. *International Journal of Trade, Economics and Finance, 4*(4), 197–201.

Sylla, F. S. (2002). *ICT as an instrument for participation: The regional perspective from Africa* [Paper presentation]. United Nations Division for the Advancement of Women Expert

Group Meeting on Information and Communication Technologies and Their Impact on and Use as an Instrument for the Advancement and Empowerment of Women, Seoul, Republic of Korea.

UNESCO. (2016). *ICTs and the informal economy: UNESCO trains women in e-commerce*. Paris: UNESCO.

United Nations Development Programme. (1990). *Human development report 1990*. New York: Oxford University Press.

Viollaz, M., & Winkler, H. (2022). Does the internet reduce gender gaps? The case of Jordan. *The Journal of Development Studies, 58*(3), 436–453. https://doi.org/10.1080/00220388.2021.1965127

Wamala, C. (2012). *Empowering women through ICT* (Spider ICT4D Series No. 4). Stockholm: Spider, Stockholm University.

Winter, S. J., & Taylor, S. L. (2001). The role of information technology in the transformation of work: A comparison of post-industrial, industrial, and proto-industrial organization. In J. Yates & J. Van Maanen (Eds.), *Information technology and organizational transformation: History, rhetoric, and practice*. Thousand Oaks, CA: Sage.

World Bank. (2011). *World development report 2012: Gender equality and development*. Washington, DC: World Bank.

World Economic Forum. (2025). *Global gender gap report 2025*. Geneva: World Economic Forum.