Can Digital Technology Unlock Economic Opportunities for Women? Evidence From the Mashreq

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This paper builds on work done by the authors for the World Bank on the "Third State of the Mashreq Women" report, which is still in progress. The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the views of the World Bank and its affiliated organizations, or those of the Executive Directors of the World Bank or the governments they represent.

ABSTRACT

We study the extent of the digital gender gap in the Mashreq region (Iraq, Lebanon, and Jordan) and estimate the strength of the relationship between digital technology, work, and earnings. Using data on 4,500 individuals from the Digital Gender Gap and Economic Opportunities Survey (World Bank, April-June 2023), we find that, unconditionally, working women have the highest levels of digital technology usage and skills in the region, while non-working women have the lowest. Even after controlling for other covariates (including educational attainment and household income), working women generally have higher levels of digital skills and technology usage compared to both men and non-working women. Two exceptions are coding skills and internet banking use, which are highest amongst working men. Non-working women have the lowest levels of digital skills and technology usage. We also find that digital skills and technology usage are positively associated with the probability of working after controlling for other determinants of work. This association is stronger for women compared to men. Despite this, the gender earnings gap exists even after controlling for the usual determinants of earnings and correcting for selection bias. Our results suggests that the Mashreq region may be characterized by a dual economy setup – a traditional segment where women are not engaged in any kind of economic activity and are not using technology or acquiring digital skills, and a more modern segment in which women are much more tech-savvy and actively participating in the economy. Given how these trends hold even after controlling for education and household income, our findings suggest that the key driver of this dichotomy is cultural, rather than economic, in nature. *JEL* Codes: J16, J24, J31

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1. INTRODUCTION

Digital technology has become an integral part of modern economies across the world, yet wide gaps in access to such technology and digital skills continue to persist. This digital divide is especially prominent for women in developing economies. Significant gender gaps exist in mobile ownership, internet use, and digital finance use in low-income and lower-middle income countries (Global Findex 2021, International Telecommunication Union (ITU) 2023). Given the low levels of female labor force participation (FLFP) in these countries, a natural question is how digital technology can be used to improve economic opportunities for women.

We address this question by using novel data from a World Bank survey (2023) on digital technology use, digital skills, and aspects of work in the Mashreq region (Iraq, Jordan, and Lebanon). This data is unique in terms of being the first to document digital skills at a granular level in low and middle-income countries. It is also the first to look at aspects of work alongside digital technology use and skills, allowing us to examine the relationship between them.

We frame our analysis in a dual-economy model where the digital divide is directly linked to the traditional-modern sector divide. The traditional sector of the economy is characterized by agricultural or subsistence activities, low levels of education and skills (including digital skills), low levels of technology usage, and a higher incidence of the traditional family setup where women are less likely to be engaged in economic activity. The modern sector is more industrialist, characterized by advanced industries (such as finance or information) with higher-productivity workers who are more tech-savvy, and has a higher incidence of modern families where women are more likely to be working. Our findings support this dual-economy conceptualization, suggesting that any policy prescriptions targeting the digital and economic gender gaps must consider the cultural attitudes and beliefs which reinforce the bridge between the traditional and modern sectors of the economy. We contribute to the literature on development economics in general, and on digital economies in particular, by empirically investigating the relationship between digital technology and its potential to unlock economic opportunities for women.

The remainder of this paper is organized as follows: section 2 describes the data and methodology and presents results; section 3 provides a discussion of the results and concludes.

2. METHODOLOGY AND DATA

2.1 A Dual-Economy Model with Digital Technology as a Moderator

The dual-economy model is a foundational concept in development economics used to explain how structural change occurs during economic development. It distinguishes between

traditional and modern sectors of the economy, and how the composition of an economy changes structurally as the former sector transforms into the latter as countries grow. The classical Lewis model posits that there is an excess supply of labor in the traditional sector, since workers in this sector generally have low productivity. This allows the modern sector to draw labor from the traditional sector at a constant wage, which is set just above the subsistence level. As capitalists in the modern sector reinvest their profits and the modern sector grows, demand for labor keeps increasing until the surplus labor in the traditional sector is completely absorbed. This marks a turning point in the development of the economy as it enters its "developed economy" phase.

Technology plays a pivotal role in the structural development of an economy characterized by a dual-sector setup. It can accelerate growth by lowering production costs, enhancing innovation, increasing productivity, allowing labor to shift to higher value-added activities by automating routine tasks, and facilitate access to new markets through digital platforms and communication tools. Technology, therefore, can be viewed as a moderator variable in this dual-economy characterization. Digital technology, in particular, can speed up the transformation of economies through the upskilling of low-productivity labor, reduced job search costs, better matching mechanisms, and more efficient markets.

While the dual-economy representation can explain well how developing economies grow, there are concerns about inequality levels increasing if the benefits of industrialization are not fairly distributed. With digital technology growing rapidly and becoming integral to the global economy, it is important to question whether marginalized groups will benefit from this growth or be left further behind. For women, who already lag behind men in terms of digital technology access and use and are less engaged with economic activity, the digitally-augmented transformation of traditional economies into modern ones can exacerbate economic gender gaps. Cultural attitudes and beliefs regarding work and digital technology use for women can further impact these gaps, so any policy targeting inclusive growth for women must take these factors into account and ensure that women in the traditional sector do not stay disengaged with digital technology.

In line with this framework, we hypothesize that digital technology is strongly associated with the modern sector of the economy. Furthermore, we expect digital technology to be positively associated with work in more advanced industries and in more lucrative occupations. Digital technology users, who are more likely to be in the modern sector, are expected to be younger, more educated, richer, more likely to be urban-based, and less likely to belong to traditional or conservative families (large household size, sole or fewer breadwinners, women less likely to work, lower levels of individual autonomy).

2.2 Data

A high-frequency telephonic survey (using random digit dialing) was conducted in Iraq, Jordan, and Lebanon from April to June, 2023, by the World Bank as part of its third State of the Mashreq Women report. The survey included questions on digital technology use and ownership, digital skills (self-reported proficiency on a range of digital skills), work, agency (level of autonomy an individual has in their decision-making), and demographics (see box A1

in the appendix for details on how digital technology and skills were measured). The data consists of 1,500 observations in each country (for a total of 4,500 observations). Sampling was clustered to ensure the sample consisted of 500 working women, 500 non-working women, and 500 men in each country. The final sample aligned well with national statistics of the three countries and sampling weights were used to further improve representativeness. Definitions of variables used in our analysis are given in table 1 and summary statistics of variables are given in table 2.

Table 1. Variable Definitions

Variable	*Definition*
Own Computer	Dummy variable with the reference category capturing individuals who do not own a laptop, desktop or tablet
Own Email	Dummy variable with the reference category capturing individuals who do not own have their own email address
Use Internet Banking	Dummy variable with the reference category capturing individuals who do not use internet banking
Key Groups (Working Women, Non-Working Women, Working Men, Non-Working Men)	Dummy variables (reference cateogry is working women)
Urban	Dummy variable with rural as the reference category
National	Dummy variable with non-nationals as the reference category
Married	Dummy variable with “not married” as the reference category
Working	Dummy variable with “not working” as the reference category
Manager/Professional	Dummy variable with occupations other than managers and professionals as the reference category
Ever Worked Remotely	Dummy variable with “never worked remotely” as the reference category
High educational attainment	Dummy variable with low educational attainment (individuals without an undergraduate degree (or higher)) as the reference cateogry
Head of Household	Dummy variable with the reference category capturing individuals who are not the head of the housheold
Income Sufficient for	Dummy variable with the reference category capturing

Expenses	individuals who said their income was insuffcient to cover monthly household expenses
Has Education Autonomy	Dummy variable with reference category capturing individuals who do not have education autonomy (do not make decisions regardng their education either themselves or jointly with a partner/parent)
Has Work Autonomy	Dummy variable with reference category capturing individuals who do not have work autonomy (do not make decisions regardng their work either themselves or jointly with a partner/parent)
Involved in Major Household Purchases	Dummy variable with reference category capturing individuals who do are not involved with major household purchases
Age (Years)	Age in years
Monthly Total Household Income (USD)	Monthly total household income (USD)
Yearly Work Income (USD)	Yearly work income (USD)
Monthly Internet Expenditure (USD)	Monthly Internet Expenditure (USD)
Household Size	Number of household members
Economically Active Household Members	Number of household members who are economically active

Source: Survey data from Digital Gender Gap and Economic Opportunities Survey, World Bank, April-June 2023.

Table 2. Summary Statistics

VARIABLES	Total Observations	Percentage	Mean	Standard Deviation	Min	Max
Own Computer	4,592	29.64				
Own Email	4,592	49.98				
Use Internet Banking	4,592	21.41				
Urban	4,592	68.01				
National	4,592	91.49				
Married	4,592	69.88				

Working	4,592	56.75				
Manager/Professional	2,606	35.84				
Ever Worked Remotely	2,546	19.80				
High educational attainment	4,583	37.90				
Head of Household	4,592	32.95				
Income Sufficient for Expenses	4,592	36.74				
Education Autonomy	3,684	77.23				
Work Autonomy	4,094	79.82				
Involved in Major Household Purchases	4,365	76.29				
Age (Years)	4,592		37.2	11.62	18	64
Monthly Total Household Income (USD)	3,315		562.8	707.6	5.33	15,000
Yearly Work Income (USD)	1,873		4,810	5,788	0	90,000
Monthly Internet Expenditure (USD)	3,615		25.68	19.95	0.085	320
Household Size (Number of Members)	4,567		5.2	2.46	1	20
Economically Active Household Members	4,567		1.34	1.05	0	16

Source: Survey data from Digital Gender Gap and Economic Opportunities Survey, World Bank, April-June 2023.

2.3 Profile of Digital Technology Users

To test our hypothesis of digital technology being linked to the modern sector of the economy, we estimate a series of probit regressions:

$$\text{Prob}(\boldsymbol{Y}_i = 1) = \Phi(\boldsymbol{X}_i\boldsymbol{\beta})$$

where $\boldsymbol{Y}_i$ = Digital technology use and ownership variables (Computer Ownership, Email Ownerhsip, and Internet Banking Use)

$\boldsymbol{X}_i$ = Demographic variables

Φ() = Standard Normal Cumulative Distribution Function

Table 3 shows results from separately estimated probit regressions of digital technology ownerhsip and use variables on various demographic and behavioral factors for the pooled sample of individuals from the three countries.

Table 3: Probit Regressions of Digital Technology Variables on Demographic and Behavioral Factors

VARIABLES	(1) Own Computer	(2) Own Email	(3) Use Internet Banking
Key Groups (Reference group: Working women)			
Non-working women	-0.0140	**-0.0808*** **	**-0.0991*** **
	(0.0227)	(0.0248)	(0.0233)
Working men	0.0285	**-0.0589** **	**0.0638** **
	(0.0257)	(0.0296)	(0.0310)
Non-working men	0.0593	-0.0647	-0.0003
	(0.0366)	(0.0412)	(0.0414)
Urban	-0.0248	-0.0032	**0.0545** **
	(0.0203)	(0.0209)	(0.0214)
Age	0.0004	**-0.0095*** **	0.0001
	(0.0009)	(0.0009)	(0.0010)
National	**0.0928** **	0.0268	**-0.0860** **
	(0.0362)	(0.0359)	(0.0420)
Married	**-0.0447** **	**-0.0396** *	-0.0179
	(0.0199)	(0.0219)	(0.0216)
High educational attainment	**0.274*** **	**0.192*** **	**0.137*** **
	(0.0225)	(0.0223)	(0.0220)
Income Sufficient for Expenses	**0.0596*** **	0.0258	0.0108
	(0.0192)	(0.0209)	(0.0200)
Head of Household	-0.0299	-0.0104	-0.0226
	(0.0238)	(0.0262)	(0.0263)
Log of Monthly Total Household Income (USD)	**0.0777*** **	**0.0966*** **	**0.0747*** **
	(0.0122)	(0.0122)	(0.0129)
Log of Monthly Internet Expenditure (USD)	**0.0826*** **	0.0099	**0.0475*** **
	(0.0121)	(0.0117)	(0.0131)
Household Size	**-0.0156*** **	**-0.0147*** **	-0.0040
	(0.0040)	(0.0042)	(0.0045)
Economically Active Household Members	**0.0456*** **	0.0096	**-0.0367*** **
	(0.0099)	(0.0116)	(0.0112)
Education Autonomy	**0.0667** **	0.0280	**0.0601** *
	(0.0319)	(0.0345)	(0.0335)
Work Autonomy	0.0381	**0.1230*** **	-0.0079
	(0.0336)	(0.0363)	(0.0365)

Observations	2,168	2,168	2,168

Robust standard errors in parentheses
***1 percent statistical significance, **5 percent statistical significance, *10 percent statistical significance
Note: Estimated coefficients represent average marginal "effects" (we are careful about implying causality here).

Results show that working women are more likely to have their own email address compared to both non-working women and working men, and are also more likely to use internet banking compared to non-working women. They are, however, less likely to use internet banking compared to working men, suggesting that gender stereotypes regarding women and digital finance persist even amongst working women. We also find that digital technology use and ownership is positively associated with education, income, location (urban), autonomy, and number of economically active household members, and that it is negatively associated with age, marital status, and household size. These findings are mostly in line with our hypothesis on how digital technology is strongly linked to the modern sector of the economy.

Next, we run ordered probit regressions of computer literacy proficiency (used as a measure of digital skills) on the demographic and behavioral factors specifed in **X**. Table 4 gives these results:

Table 4: Ordered Probit Regressions of Digital Skills Variables on Demographic and Behavioral Factors

VARIABLES	Computer Skills	Word Skills	Communication Skills	Excel Skills	Social Media Skills	Video Conferencing Skills	Software Skills	Content Creation Skills	Project Management Platforms Skills	Coding Skills
Key Groups (Reference group: Working women)										
Non-working women	**-0.193*** **	**-0.167** **	**-0.137** **	**-0.226*** **	-0.00433	**-0.147** **	**-0.144** **	-0.0192	**-0.330*** **	-0.0415
	(0.0663)	(0.0686)	(0.0608)	(0.0704)	(0.0618)	(0.0722)	(0.0662)	(0.0666)	(0.107)	(0.0881)
Working Men	-0.0342	**-0.176** **	**-0.176** **	-0.0735	**-0.202*** **	-0.0108	**-0.129***	**-0.196** **	0.0786	**0.190***
	(0.0742)	(0.0778)	(0.0735)	(0.0788)	(0.0729)	(0.0812)	(0.0781)	(0.0770)	(0.108)	(0.0994)
Non-working Men	0.0141	-0.141	**-0.334*** **	-0.0616	-0.0441	-0.0279	**-0.327*** **	-0.125	-0.0198	0.150
	(0.101)	(0.105)	(0.0983)	(0.108)	(0.101)	(0.120)	(0.107)	(0.106)	(0.138)	(0.133)
Urban	**-0.148*** **	**-0.167*** **	-0.0746	**-0.168*** **	-0.0865	**-0.142** **	-0.0881	**-0.149** **	0.0904	0.0447
	(0.0572)	(0.0600)	(0.0547)	(0.0600)	(0.0558)	(0.0636)	(0.0599)	(0.0582)	(0.0822)	(0.0788)
Age	**-0.0237*** **	**-0.0250*** **	**-0.0222*** **	**-0.0210*** **	**-0.0233*** **	**-0.0183*** **	**-0.0315*** **	**-0.0308*** **	**-0.0152*** **	**-0.0188*** **
	(0.00257)	(0.00271)	(0.00237)	(0.00272)	(0.00241)	(0.00282)	(0.00262)	(0.00263)	(0.00371)	(0.00335)
National	0.132	**0.295** **	**0.160***	**0.327*** **	**0.273*** **	0.195	0.0426	0.117	**0.408***	0.261
	(0.0945)	(0.115)	(0.0933)	(0.127)	(0.0982)	(0.132)	(0.106)	(0.102)	(0.217)	(0.164)
Married	**-0.228*** **	**-0.0998***	**-0.141*** **	**-0.201*** **	**-0.182*** **	**-0.212*** **	-0.0931	**-0.153*** **	**-0.195** **	-0.116
	(0.0544)	(0.0567)	(0.0531)	(0.0580)	(0.0524)	(0.0592)	(0.0575)	(0.0551)	(0.0802)	(0.0747)
High Educational Attainment	**1.004*** **	**1.170*** **	**0.328*** **	**1.140*** **	**0.346*** **	**1.066*** **	**0.423*** **	**0.374*** **	**0.531*** **	**0.474*** **
	(0.0593)	(0.0616)	(0.0526)	(0.0635)	(0.0532)	(0.0649)	(0.0585)	(0.0572)	(0.0843)	(0.0735)
Income Sufficient for Expenses	**-0.0972***	**-0.137** **	**-0.166*** **	-0.0722	**-0.104** **	**-0.147** **	**-0.240*** **	**-0.106***	**-0.152** **	-0.0745
	(0.0542)	(0.0569)	(0.0514)	(0.0570)	(0.0510)	(0.0588)	(0.0549)	(0.0552)	(0.0766)	(0.0706)
Head of Household	**0.146** **	**0.359*** **	**0.183*** **	**0.339*** **	0.00992	0.0660	**0.132***	**0.218*** **	**0.408*** **	**0.353*** **
	(0.0679)	(0.0727)	(0.0674)	(0.0736)	(0.0664)	(0.0773)	(0.0722)	(0.0710)	(0.0977)	(0.0910)
Log of Monthly Total HH Income (USD)	**0.228*** **	**0.260*** **	**0.252*** **	**0.210*** **	**0.253*** **	**0.114*** **	**0.295*** **	**0.184*** **	**0.179*** **	**0.186*** **
	(0.0326)	(0.0344)	(0.0304)	(0.0335)	(0.0310)	(0.0359)	(0.0345)	(0.0327)	(0.0466)	(0.0442)
Log of Monthly Internet Exp. (USD)	0.0121	**0.0536***	**0.0604** **	0.0319	0.0243	**0.143*** **	0.00117	0.0505	0.0686	**0.0867** **
	(0.0301)	(0.0320)	(0.0297)	(0.0327)	(0.0296)	(0.0351)	(0.0316)	(0.0324)	(0.0448)	(0.0419)
Household Size	**-0.0878*** **	**-0.0818*** **	**-0.0349*** **	**-0.0783*** **	**-0.0628*** **	**-0.0440*** **	**-0.0766*** **	**-0.0641*** **	-0.00727	-0.0153
	(0.0111)	(0.0114)	(0.0109)	(0.0115)	(0.0113)	(0.0125)	(0.0117)	(0.0117)	(0.0152)	(0.0149)
Economically Active Household Members	**0.166*** **	**0.182*** **	**0.113*** **	**0.182*** **	**0.116*** **	**0.125*** **	**0.0896*** **	**0.127*** **	**0.0918** **	**0.0661** **
	(0.0282)	(0.0297)	(0.0267)	(0.0280)	(0.0284)	(0.0289)	(0.0287)	(0.0285)	(0.0375)	(0.0333)
Education Autonomy	-0.143	**-0.273*** **	-0.133	**-0.276*** **	0.123	**-0.293*** **	**-0.200** **	**-0.258*** **	**-0.658*** **	**-0.453*** **
	(0.0949)	(0.0989)	(0.0995)	(0.0940)	(0.0962)	(0.0980)	(0.0931)	(0.0958)	(0.122)	(0.113)
Work Autonomy	**0.301*** **	**0.233** **	0.0575	**0.198** **	**0.193** **	0.145	**0.219** **	**0.161***	-0.0703	0.0442
	(0.0981)	(0.0984)	(0.103)	(0.0955)	(0.0978)	(0.0978)	(0.0942)	(0.0972)	(0.124)	(0.117)
Observations	2,168	2,168	2,168	2,168	2,168	2,168	2,168	2,168	2,168	2,168

Robust standard errors in parentheses
***1 percent statistical significance, **5 percent statistical significance, *10 percent statistical significance
Note: Estimated coefficients are raw probit coefficients, not average marginal effects.

Findings are once again in line with our hypothesis – digital skills, much like digital technology use and ownerhsip, are positively associated with the modern sector of the economy (characterized by individuals who are younger, more urban, richer, more educated, belong to smaller but more economically active households, and have higher autonomy regarding work decisions)[1]. Results also show that working women are more likely to have the highest levels

[1] These results are robust to a wide range of digital skills. That is, results are not specific to the use of computer literacy proficiency as a measure of digital skills. When we combine all the digital technology use, ownership,

of these digital skills, even after controlling for other covariates, with the exception being coding skills which are highest amongst working men. Non-working women lag farthest behind in terms of digital skills levels, just likey they do in terms of digital technology use and ownership.

2.4 System of Equations Estimation – Digital Skills, Technology Usage, and Household Income

Since it is difficult to establish the direction of causality between digital technology use, skills, and income, we also estimate the following system of equations model[2]:

Household Income = *f*(Digital Skills, Digital Technology Ownership and Use, Gender, Age, Educational Attainment, Location) (1)

Digital Skills = *g*(Household Income, Digital Technology Ownership and Use, Gender, Age, Educational Attainment, Location) (2)

Digital Technology Ownership and Use = *h*(Household Income, Digital Skills, Gender, Work Status, Age, Educational Attainment, Location) (3)

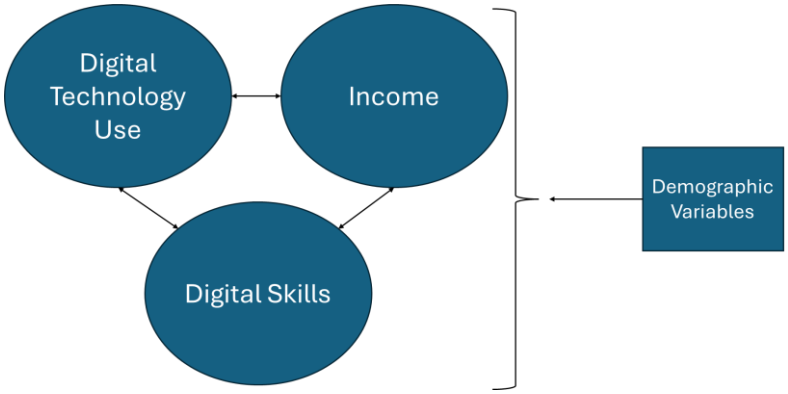
This conceptual framework assumes that digital technology use, skills, and income collectively determine each other (figure 1). We use computer literacy proficiency as a measure of digital skills and computer and email ownership as measures of digital technology ownership and use. Results show that digital technology ownership, usage, and skills are positively related with both work and income. Furthermore, there is a gender income gap (women have lower household income levels compared to men) even after controlling for the factors specified above. These results suggest that digital technology may be a much stronger driver of labor-market outcomes than previously thought and that it could act as a channel for reducing the income gap between men and women in the Mashreq region.

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and skills variables into an underlying construct ("Digital Technology Use and Skills") and regress this construct on the demographic and behavioral factors, every association between digital technology use/skill levels and these factors—except for location (urban/rural)—is statistically significant and signed correctly (in the direction we expect). These results are based on a generalized structural equation model (not shown in this paper but available upon request).

[2] This system is estimated using a mixed process, SUR (seemingly unrelated regressions) estimator.

Figure 1. Conceptual Framework for System of Equations Model



Source: Authors' conceptualization.

Table 5: System of Equations Estimation – Income, Digital Skills, and Digital Technology Usage

VARIABLES	Log of Total Household Income (USD)	Computer Literacy	Email Ownership
Urban	**0.566*** **	**-0.626*** **	**-0.177*** **
	(0.0666)	(0.0946)	(0.0641)
Computer Literacy Proficiency (Reference Category = No Proficiency)			
Low	**0.192*** **		0.0929
	(0.0648)		(0.0686)
Medium	**0.256*** **		**0.518*** **
	(0.0654)		(0.0678)
High	**0.349*** **		**0.724*** **
	(0.0564)		(0.0902)
Computer Ownership	**-0.613*** **	**0.668*** **	
	(0.141)	(0.130)	
Male	**0.129*** **	**-0.137*** **	**-0.158*** **
	(0.0412)	(0.0423)	(0.0534)
Age	0.00191	-0.00227	**-0.0245*** **
	(0.00269)	(0.00305)	(0.00241)
High Educational Attainment	**0.360*** **	**-0.394*** **	**0.137***
	(0.108)	(0.133)	(0.0748)
Email Ownership		**-0.0399*** **	
		(0.00416)	
Log of Total Household Income (USD)		**1.106*** **	**0.747*** **
		(0.0419)	(0.0346)
Working (Yes=1, No=0)		**0.00341*** **	**0.160*** **
		(0.000923)	(0.0489)
Constant	**5.513*** **		**-3.649*** **
	(0.261)		(0.166)
Observations	3,307	3,307	3,307

Robust standard errors in parentheses
***1 percent statistical significance, **5 percent statistical significance, *10 percent statistical significance

2.5 Heckman Selection Model of Earnings

We also estimate a Heckman selection model of earnings using the natural logarithm of yearly work income as the main outcome variable. We find that men earn 35 percent more than women, even after controlling for selection bias and a number of covariates. Digital technology use and ownership are also positively associated with work income, but digital skills appear to have no effect, with the exception of software skills and coding skills, which are estimated to

have a negative effect on work income. This may be due to the small number of individuals having software and coding skills in the sample, which could result in noisy estimates of these coefficients.

Table 6: Heckman Selection Model of Earnings

VARIABLES	Log of Yearly Work Income (USD)	*Selection Equation* Work
Male	**0.358****	**0.481*****
	(0.150)	(0.0598)
National	**0.468*****	-0.0960
	(0.139)	(0.0928)
Computer Ownership	**0.464*****	**-0.103***
	(0.0818)	(0.0588)
Internet Banking Use	0.0340	**0.306*****
	(0.108)	(0.0548)
Email Ownership	**0.281****	**0.244*****
	(0.111)	(0.0552)
Computer Literacy (Reference = No Proficiency)		
Low	0.0930	-0.0363
	(0.113)	(0.0765)
Medium	-0.0253	-0.00961
	(0.121)	(0.0842)
High	-0.0446	0.0183
	(0.156)	(0.109)
Excel Skills (Reference = No Proficiency)		
Low	-0.0173	**0.284*****
	(0.138)	(0.0787)
Medium	0.0201	0.0733
	(0.127)	(0.0840)
High	0.162	0.124
	(0.150)	(0.102)
Word Skills (Reference = No Proficiency)		
Low	0.0840	
	(0.119)	
Medium	0.135	
	(0.127)	
High	0.236	
	(0.151)	
Software Skills (Reference = No Proficiency)		
Low	-0.115	0.0293
	(0.101)	(0.0744)
Medium	**-0.243****	0.0943
	(0.0986)	(0.0708)
High	**-0.263****	-0.0394
	(0.104)	(0.0790)
Communication Skills (Reference = No Proficiency)		
Low	0.146	-0.120
	(0.148)	(0.0939)
Medium	-0.00776	**0.150***
	(0.137)	(0.0868)
High	0.107	**0.280*****
	(0.152)	(0.0904)

Coding Skills (Reference = No Proficiency)			
	Low	**-0.307*** **	**0.260*** **
		(0.117)	(0.0811)
	Medium	**-0.296** **	0.0130
		(0.135)	(0.104)
	High	-0.0618	0.0244
		(0.177)	(0.145)
Urban		**0.206*** **	**0.0992** *
		(0.0794)	(0.0518)
Age		**0.0166*** **	-0.000271
		(0.00347)	(0.00244)
Married		**-0.171** *	**0.231*** **
		(0.0942)	(0.0529)
High Educational Attainment		**0.186** *	**0.248*** **
		(0.109)	(0.0594)
Head of Household		-0.0379	**0.261*** **
		(0.111)	(0.0640)
Manager/Professional		**0.178*** **	
		(0.0642)	
Ever Worked Remotely		0.0508	
		(0.0761)	
Country Dummies (Reference: Iraq)			
	Jordan	-0.0146	
		(0.0729)	
	Lebanon	**-1.265*** **	
		(0.0988)	
Involved in Major HH Purchases			0.0459
			(0.0552)
Education Autonomy			-0.0534
			(0.0898)
Work Autonomy			**0.315*** **
			(0.0914)
Constant		**7.016*** **	**-1.408*** **
		(0.714)	(0.149)
Observations		3,579	3,579

Robust standard errors in parentheses
***1 percent statistical significance, **5 percent statistical significance, *10 percent statistical significance

3. DISCUSSION AND CONCLUSION

A consistent finding in our results is that non-working women lag farthest behind in terms of both digital technology use and digital skills, even after controlling for other covariates. On the other hand, working women often lead in terms of digital technology use and skills, even compared to working men. This suggests that digital technology can be pivotal for opening up economic opportunities for women. Digital technology is also associated with higher levels of income, so digital empowerment of women can also improve their economic outcomes and lower the gender pay gap, which is persistent in the Mashreq region. However, any policy aimed at such digital empowerment must take into account cultural attitudes and beliefs about work and digital technology use for women, otherwise the non-working women with low levels of digital technology use in the traditional sector of the economy will get left behind. One way to do this could be through the promotion of remote and gig work amongst these groups of

women, which can allow them to engage with economic activity without needing to go out of their homes for work (which is a major constraint for women in the traditional sector). Our findings show that remote work is positively associated with both digital skills and work income, and that the level of remote work in the Mashreq is very low (more than 80 percent of respondents said they had never worked remotely in their lives). This means that the potential for using digital technology to enable remote work in the region is huge, which can galvanize the transition of the traditional sector into the modern sector without leaving women behind.

We also find strong support for our theory of the digitally-augmented dual-economy setup, with digital technology being strongly associated with individuals in the modern sector. This is also crucial for policy purposes – often, digital training and development programs by both the government and private sector are targeted at younger, educated people – who are already tech-savvy and using digital technology. Our findings suggest that the individuals who would likely benefit the most from digital technology training and upskilling are also the ones who are most often excluded from such programs. Targeting these groups would yield the highest returns in terms of gains in digital skills and technology use, which in turn could improve their economic outcomes and accelerate the transition of the traditional sector of the economy into the more one.

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APPENDIX

Box A1. Digital Technology Usage and Skills Definitions in the Survey

Digital Technology Usage and Ownership	**Digital Skills Proficiency**
Computer, laptop, or desktop ownership. Whether or not the respondent owns one of these devices. **Email Ownership**. Whether or not the respondent has their own email address. **Email Use**. Whether or not the respondent actively uses their email address. **Internet Banking Use**. Whether or not the respondent uses internet or mobile banking. **Frequency of cell phone usage**. How often the respondent uses a cell phone (options ranging from “almost continuously” to “less than once a month”. **Frequency of computer usage**. How often the respondent uses a computer, laptop, or tablet (options ranging from “almost continuously” to “less than once a month”). **Use of Internet**. For what purposes does the respondent use the internet (work, education, news, job search, entertainment, training, transport, e-commerce, financial services, government services).	*Self-reported proficiency levels on a range of digital skills. Proficiency levels rated from "No Proficiency" to "High Proficiency".* **Computer literacy**. Basic computer skills. **Word processing**. Using Microsoft Word, for example. **Communication tools**. Email, messaging, WhatsApp etc. **Data entry**. In Microsoft Excel, for example. **Social media applications**. Facebook, Twitter, Instagram etc. **Video conferencing platforms**. Zoom, Microsoft Teams, Google Meet etc. **Software or apps installation**. **Content Creation**. Presentations, video/image creation and editing etc. **Work/project management platforms**. Asana, Trello, Jira etc. **Advanced digital skills**. Coding/programming, building platforms etc.