Digitalization and Firm Performance in The Middle East and North Africa: Case Studies of Jordan, Morocco, and Egypt

Nong Zhu and Xubei Luo

DIGITALIZATION AND FIRM PERFORMANCE IN THE MIDDLE EAST AND NORTH AFRICA: CASE STUDIES OF JORDAN, MOROCCO, AND EGYPT[1]

Nong Zhu[2] and Xubei Luo[3]

Working Paper No. 1637

April 2023

Send correspondence to:
Nong Zhu
Institut National de la Recherche Scientifique
nong.zhu@inrs.ca

Abstract

In a digitalizing global economy, countries that successfully harness the potential of e-commerce are better placed to take advantage of the access to regional and international markets for sustainable growth, while those that fail to do so may risk falling behind. For the Middle East and North Africa (MENA) region, digitalization of business activities is key to connect producers with customers, support the integration of regional and global value chains (GVCs), and foster the dynamism of private sector to aid productive job creation and inclusive growth. This study aims to examine the relationships between participation in e-commerce and firm performance (measured by production, productivity, export and/or import, and innovation) in MENA, with case studies in Jordan, Morocco, and Egypt. The analyses are based on an original survey at firm-level, carried out by the Economic Research Forum (ERF) in 2022, and data from the World Bank Enterprise Survey. The main findings are as follows: (i) E-commerce participation is relatively low in the three case study countries compared with regional peers or countries with similar development levels. (ii) E-commerce participation varies widely across firms with different characteristics: large firms, young firms, firms in "information and communication" sector, and firms with more educated workers are more likely to participate in e-commerce. (iii) Production is positively associated with e-commerce participation. However, among the three countries, the positive association between e-commerce participation and productivity is significant only in Jordan where e-commerce is most developed. (iv) Participation in e-commerce is also positively associated with firms' exports and/or imports and innovation activities. (v) Depending on the level of e-commerce development and the structural characteristics, the role of the difference in the attributes between e-firms and non-e-firms and the difference in the returns to these attributes in firm performance may vary. (vi) Firms involved in e-commerce are performing better than other firms during the COVID-19 pandemic. Overall, our study finds that e-commerce is positively associated with the viability of enterprises and their ability to maintain the level of sales.

Keywords: Digitalization, E-commerce, Survey, Firm, Productivity, COVID-19, MENA countries
JEL Classifications: C13; L25; O30; O40; O50.

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ملخص

في الاقتصاد العالمي الرقمي، تكون البلدان التي تسخر بنجاح إمكانات التجارة الإلكترونية في وضع أفضل للاستفادة من إمكانية الوصول إلى الأسواق الإقليمية والدولية لتحقيق النمو المستدام، في حين أن البلدان التي لا تفعل ذلك قد تتخلف عن الركب. بالنسبة لمنطقة الشرق الأوسط وشمال إفريقيا، تعد رقمنة الأنشطة التجارية أمرًا أساسيًا لربط المنتجين بالعملاء، ودعم تكامل سلاسل القيمة الإقليمية والعالمية (GVCs)، وتعزيز ديناميكية القطاع الخاص للمساعدة في خلق فرص عمل منتجة والنمو الشامل. تهدف هذه الدراسة إلى دراسة العلاقات بين المشاركة في التجارة الإلكترونية وأداء الشركات تستند التحليلات إلى دراسة استقصائية أصلية على مستوى الشركات أجراها منتدى البحوث الاقتصادية. في عام 2022، وبيانات من مسح مؤسسات البنك الدولي. وتتمثل النتائج الرئيسية فيما يلي: '1' المشاركة في التجارة الإلكترونية منخفضة نسبياً في بلدان دراسات الحالات الإفرادية الثلاثة مقارنة بنظرائها الإقليميين أو البلدان ذات المستويات الإنمائية المماثلة. '2' تختلف المشاركة في التجارة الإلكترونية تفاوتاً واسعاً بين الشركات ذات الخصائص المختلفة: فالشركات الكبيرة، والشركات الشابة، والشركات العاملة في قطاع «المعلومات والاتصالات»، والشركات التي لديها عمال أكثر تعليماً هي الأكثر احتمالاً للمشاركة في التجارة الإلكترونية. '3' يرتبط الإنتاج ارتباطاً إيجابياً بالمشاركة في التجارة الإلكترونية. غير أن الارتباط الإيجابي بين المشاركة في التجارة الإلكترونية والإنتاجية بين البلدان الثلاثة لا يكون هاماً إلا في الأردن حيث تكون التجارة الإلكترونية هي الأكثر تطوراً. '4' ترتبط المشاركة

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في التجارة الإلكترونية أيضاً ارتباطاً إيجابياً بصادرات الشركات و/أو وارداتها وأنشطة الابتكار. '5' رهناً بمستوى تنمية التجارة الإلكترونية والخصائص الهيكلية، قد يختلف دور الاختلاف في الخصائص بين الشركات الإلكترونية والشركات غير الإلكترونية والاختلاف في عوائد هذه الخصائص في أداء الشركات. '6' الشركات المشاركة في التجارة الإلكترونية تعمل بشكل أفضل من الشركات الأخرى خلال جائحة كوفيد -19. بشكل عام، وجدت دراستنا أن التجارة الإلكترونية مرتبطة بشكل إيجابي بجدوى الشركات وقدرتها على الحفاظ على مستوى المبيعات.

1. Introduction

With new rounds of technological and industrial revolution sweeping the world, digital technology and digital economy have developed rapidly in recent years and is becoming a new engine of economic growth. With the right conditions, digital transformation offers a potential to create more and better jobs, enhance firm productivity and living standards, and drive more innovative, inclusive, and sustainable growth. Digitalization can reduce transaction costs, expand sales markets, and increase productive revenues. In recent years, with the development of mobile Internet platforms, the cost of finding and comparing information has been greatly reduced. Internet-based information technology has reduced information asymmetry in market transactions (Zhu et al., 2021) and improved the efficiency of markets. For countries in the Middle East and North Africa (MENA), on the one hand, digital technologies offer potential opportunities to diversify production and integrate into the regional and GVCs, and enhance resilience to international shocks (Hoekman, 2021); on the other hand, while technology does not appear to have caused much displacement of labor in manufacturing or formal services in the region as it has occurred in some of the OECD economies, if the workers displaced by the continuing penetration of digital technologies cannot be absorbed by the state sector or into new occupations, unemployment, wage compression, and inequality could increase (Yusuf, 2021).

Since the start of 2020, the COVID-19 pandemic has significantly impacted the global economic development. In MENA, like most of the world, countries experienced significant decline in the rates of growth and of employment. Restrictions on movement and other interventions to protect public health have reduced economic activity in most countries, affecting production, distribution, and consumption (United Nations, 2021). At the same time, the COVID-19 pandemic has significantly changed trade patterns and bolstered the growth of online transactions of goods and services in domestic and international markets. While countries are emerging from lockdown and gradually recovering from the COVID-19 pandemic, it is likely that the accelerated trend towards e-commerce seen during the pandemic will continue during the economic recovery and beyond. In a digitalizing global economy, countries that successfully harness the potential of e-commerce will be better placed to take advantage of the regional and international markets for their goods and services, while those that fail to do so may risk falling behind.

E-commerce stands out among many digital applications relevant to development because of its ability to instantly link sellers with buyers, lower transaction costs, and create new niche markets tailored to consumer demand. The market access afforded by e-commerce and the expansion of the spectrum for trade created by the platforms can support producers reap the benefit, including from the otherwise under-explored long-tailed market, and facilitate their integration into GVCs. Meanwhile, online transaction may substitute traditional offline business and the increase in competition may result in the closure of the less productive firms. Research shows that, with the right conditions, e-commerce can still generate net trade increase. For example, through enhanced competition, productivity and innovation, and improved access to talents and skills, the increase in

trade thanks to the lower transaction cost can contribute to the increase of welfare of the economy as a whole. A proper institutional and regulatory framework that supports access to and use of digital technologies and market platforms is crucial for small and medium enterprises (SMEs) to reap the benefit of digitalization (Hoekman, 2021). With the proper conditions and frameworks, there is a potential that the benefits of digitalization can be shared across the different segments of the population in an inclusive manner.

This study aims to examine the relationships between participation in e-commerce and firm performance (measured by production, productivity, export and/or import, and innovation) in MENA, with case studies in Jordan, Morocco, and Egypt. While digitization of business and digital transformation of supply chains are underway in several countries in MENA, and there is a high share of well-educated youth, continuing improving the access to and affordability of broadband internet and digital payment infrastructure are key to connecting producers with customers, increasing the dynamism of the private sector, and supporting the creation of productive jobs and inclusive growth. With the right conditions, e-commerce platforms have the potential to enable people and firms to enhance the effective use of physical and human capital (The World Bank, 2019), which is particularly important for countries in MENA where creating more jobs, including for the youth and women, and enhancing labor productivity are crucial.

The main data source of this study is a survey conducted by ERF in three countries (Jordan, Morocco and Egypt) in 2022, and it is complemented by the Enterprise Survey (ES) and the COVID 19 Impact ES Follow-up Survey conducted by the World Bank during the period of 2019-2021. We aim to answer the following questions: What types of firms are more likely to participate in e-commerce? What is the association between e-commerce participation and firms' performance, such as production, productivity, export and/or import, and innovation? What is the role of e-commerce in firms' functioning during the COVID-19 pandemic? We will include experience of e-commerce development in China. Our results will shed light on devising policies to address the binding constraints in digitalization, enhance firm level productivity, and create jobs in an inclusive manner in MENA.

As digitalization develops, an increasingly rich literature has emerged on the role of digitalization in economy and society. The value-added of our study is three-folds. (i) Most of previous studies are country-level analyses, focusing on economic environment, infrastructure, policies and regulations, etc. Firm-level analyses are relatively rare. Participation in the digital economy is a business decision that depends on both the external environment and the firm's intrinsic endowment. This study aims to examine the relationships between participation in e-commerce, firms' characteristics, and their performance from a microeconomic perspective. (ii) As mentioned above, our analyses are based on an original survey at firm-level. To our knowledge, this is the first firm-level survey on e-commerce representative at the national level during the pandemic in these countries. (iii) Most of previous studies are descriptive and qualitative analyses. The present study

builds on empirical work using econometrics to fill some gaps in existing research.

This research report is organized as follows. Section 2 presents the literature review and the theoretical framework. Section 3 briefly discusses the development of digital economy in MENA. Section 4 describes the methodology. Sections 5 identifies the factors associated with firms' participation in e-commerce. Section 6 examines the linkage between e-commerce participation and firm's performance. Section 7 analyzes the role of digital economy in firms' operation during COVID-19 pandemic. Section 8 discusses China's experience. Finally, section 9 presents the conclusions.

2. Digitalization in the global arena

2.1. Digitalization, productivity, and employment

Many studies of digitalization mainly focus on its definition and effect on various macroeconomic measures such as gross domestic product (GDP) per capita, total factor productivity (TFP), growth, and productivity. However, the impact of digitalization is uneven across countries and sectors.

The World Development Report 2016 shows that access to mobile services, data and broadband has significant positive impact on the economic activity (The World Bank, 2016a; 2016b). Atiyaz and Dutz (2021) documents that internet availability leads to an increase in the probability of employment, labor force participation, and falling poverty rates. Sabbagh et al. (2013) conducted an analysis on 150 countries using a classical production function model to assess economic impact show that an increase in digitalization by 10 percent results in a 0.5 to 0.62 percent increase in GDP per capita.

The economic literature shows the positive impact of Information and Communications Technology (ICT) on economic growth is attributable to the fact that access to and use of these services can improve (i) participation to the global economy; (ii) the efficiency of productive systems; and (iii) innovation. Broadly speaking, ICT can help reduce transaction costs by making access to information easier, which reduces the cost of searching and increases coordination between individuals, businesses, and public administrations (The World Bank, 2016a). Online trading platforms can reduce information asymmetries by reducing the need for intermediaries to establish commercial relationships or participation in costly trade shows to market their products (Clarke & Wallsten, 2006; Freund & Weinhold, 2002; 2004). Further, with the right conditions, ICT can help improve the business environment by simplifying business registration procedures and customs procedures (The World Bank, 2016b).

A number of firm/industry-level studies provide evidence of positive links between investment in digital technologies and productivity performance. Peter et al. (2019) document that digital adoption in an industry is associated with productivity gains at the firm-level in 20 countries in the

European Union and Turkey. Hjort and Poulsen (2019) find positive effects of the arrival of internet on firm-level productivity in Africa. World Bank research on Argentina, Brazil, Chile, Colombia, and Mexico concludes that digital technology adoption offers a pathway to higher productivity (Dutz et al., 2018).

The impact of digitalization on job creation and job replacement has been a hot debate. The nature of work is changing as a result of the advancement and application of technology. Many studies provide a range of estimates of the number of job losses due to technology and automation and the resulted potential increase in inequality (Muro et al., 2019; OECD, 2018), while other studies focus on the number of new jobs created / the net positive effect as well as the potential to job creation and inclusive growth (Mandel, 2017; The World Bank, 2021). The World Development Report 2019 argues that on balance "technology provides opportunities to create new jobs, increase productivity, and deliver effective public services" and "the rise of platform marketplaces allows the impacts of technology to reach more people more quickly than ever before".

A recent research of Fardoust & Nabli (2022) suggests that digitalization creates both opportunities and risks. On the one hand, increases in the access and use of Internet can lead to increases in economic activity and welfare in the MENA region. On the other hand, digital transformation can have unpredictable impacts on socio-economic inequality and environmental and climate-related challenges. Atiyas and Dutz (2021) highlights the limited uptake and use of internet for productive activities remained the main constraint to the benefit from broader digitalization in the MENA region. Their study suggests a positive correlation between lower uptake and lower incomes, lower capabilities, and lower access to electricity; and meanwhile, a negative correlation between uptake and the degree of concentration in the mobile market as well as the key regulatory variable of Mobile Termination Rates.

2.2. E-commerce development and economic growth

While online transaction may substitute traditional offline business, research shows that e-commerce can still generate net trade increase. Increased trade at lower costs can have positive spillover effects on the economy as a whole, for example through enhanced competition, productivity and innovation, and improved access to talents and skills. E-commerce can promote economic growth through several channels.

E-commerce can lower transaction costs. As commerce does not require a physical business location, the savings from the rental and other associated fees can reduce the threshold for new business entry to the online market. The decrease of transaction costs – including searching, operation, inventory, and fixed costs - can lead to a decline in the minimum productivity required

to participate in trade and an increase in profits (Melitz, 2003)[4]. The resulted creation of trade, including the expansion of the long-tailed market and that of the trade opportunities for remote areas hindered by high transport costs, supports the increase of welfare for consumers and producers.

E-commerce can reduce search and communication costs by making it easier for sellers and consumers to find and interact with each other and increasing the efficiency for firms to source input (Levin, 2011). Internet help improve information about new markets and thus reducing entry costs (Freund and Weinhold, 2004). Online platform provides an organized marketplace that help reduce information asymmetries and lower moral hazard costs (Fernandes et al., 2019). Network technologies enlarge coordination scope and reduce transaction cost by improving communication efficiency (Fine and Raff, 2000). The cost saving is considerable comparing to the costs to travel and search among offline sellers, especially for people in remote areas with limited access to markets (Lieber and Syverson, 2012; Luo et al., 2019; Luo and Niu, 2019).

E-commerce can reduce operation and coordination costs and improves efficiency through process and product improvements (Garicano and Kaplan, 2001). Kumar and Petersen (2006) argued that e-commerce reduces operational costs by improving information availability, reducing processing errors, reducing response times, and lowering the cost of services. Fernandes et al. (2019) indicated that internet increases efficiency for firms to organize production and adopt new technologies.

E-commerce can save inventory costs and fixed costs. Proximity of e-shops to producers and timely logistics can lower the need to hold large inventory, further reducing the startup capital. Online platform reduces inventory costs and fixed costs by allowing online sellers to hold less inventory benefiting from the feasibility of quick responses online. Dai and Zhang (2015) found that online sellers in Baigou, China, can hold few inventories and only post pictures of available goods, then purchase from local manufactures after receiving orders.

E-commerce can also promote economic growth by increasing market access and integration to GVCs, especially benefiting small economies and SMEs. E-commerce enables companies to sell goods and services to a broader market, benefiting especially those once limited to the local markets, and is inclusive to SMEs (Albastroiu 2007). E-commerce can encourage formalization and growth of SMEs and promote their integration into GVCs and markets (OECD, 2017). Soobramanien and Worrall (2017) point out that e-commerce simulates development in small countries, especially those remote from markets, in three ways: facilitating the creation of and access to a global market,

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[4] Transaction costs broadly refer to all costs incurred in getting a good to a final user other than the marginal production costs, including transportation costs, policy barriers, information costs, contract enforcement costs, costs associated with the use of different currencies, legal and regulation costs, and local distribution costs. See more details in Anderson and van Wincoop (2004).

enabling providing services via the Internet and eliminating the need to travel or establish office branches, and mitigating exclusion and isolation. It also helps diversify economies of small developing countries and even transform them into service economies.

E-commerce can increase productivity and support technology diffusion. As the e--commerce business clusters and agglomerates together, economy of scale and positive externality contribute to productivity increase thanks to specialization and knowledge spillovers (Guo, 2014). Cohen et al. (2000) stated that the modern electronics-based information technology development increases the productivity of the overall economy by supporting innovation and enhancing the power and finesse of previous tools. Using data between 2005 and 2013 in 21 countries, Anvari and Norouzi (2016) found that e-commerce had positive impact on GDP per capita growth and strong development-enhancing effect.

Increased market access through the e-commerce platform can be particularly beneficial for small economy and small and SMEs. E-commerce enables companies to sell goods and services to a broader market, benefiting especially those once limited to the local markets, and is inclusive to SMEs (Albastroiu, 2007). Soobramanien et al. (2017) pointed out that e-commerce simulates development in small countries, especially those remote from market, in three-folds: facilitating the creation of and access to a global market, enabling providing services via internet and eliminating the need for travel or establish office branches, and mitigating exclusion and isolation. Dai and Zhang (2015) found that, taking the advantage of located at a cluster of producers, e-shops can post pictures of goods and buy product from manufactures only when consumers place online orders of them. In this way, e-shops need only half the inventory typically held by offline shops.

As e-commerce can help jump start business outside of traditional business center, the forward and backward linkage might result in agglomeration of offline service providers and online retailers, which can further promote industrial chain extension and regional labor division (Feibert et al., 2017). Chen et al. (2018) state that e-commerce adoption promotes agricultural cluster upgrade through increased demand and product diversity requirement; competition-induced quality improvement and innovation; formation of new supply chain and labor division and specialization; and a more comprehensive service system such as financial and logistics services.

E-commerce can create incentives for technology innovation (Dobbs et al. 2013). In the near term, e-commerce can support a faster pace of innovation and shift suppliers to a more efficient composition from increasing competition between businesses especially for small-sized producers; and in the long run, it can support the overall economic growth by improving productivity through cost saving on transactions, inventory holding, advertising, searching, and transportation, benefiting from information technology and labor requirement reduction (Willis, 2004).

Meanwhile, e-commerce can also lead to risks, including the potential risks faced by consumers as well as producers, particularly small producers (Choudary, 2017). As technology transformation and platform economy increase market efficiency, the asymmetry of information and the cost of transaction are significantly reduced. In particular, the declining effect of distance and geographic barriers might negatively affect local producers in less developed areas. The increase in competition may result in large turn over, including closure of the less competitive firms, many of them small and in less developed areas, as they may suffer pre-existing disadvantages. The uneven access to ICT infrastructure and human capital endowments can lead to an inequitable distribution of benefits from e-commerce (OECD, 2017). Compared with traditional offline business, e-commerce sellers and buyers may face special risks, including cyber security, privacy, fraudulent or defective/counterfeit products. Proper policy framework and regulatory standards for data protection are essential to facilitate e-commerce development and support inclusive distribution of the benefit of digitalization. The net effect of e-commerce on growth and distribution depends on the magnitude of different forces at play.

2.3. Digitalization and COVID-19 pandemic

The COVID-19 crisis spread across the globe at lightning speed owing to the interconnectedness of today's societies and economies. The immense disruptions in trade and investment, especially at the beginning of the crisis, are clear evidence (Abdelrhim and Elsayed, 2020; United Nations, 2021; 2022). Communication networks have largely held up during the pandemic, but considerable difficulties have been encountered in trade logistics and transport, especially for international transactions. More people have used e-commerce more often. Businesses with an established online presence were better adapted to the changing situation, as were traditional businesses that were flexible and had enough resources to improve their digital marketing and online sales. The rise of e-commerce during the pandemic has enabled more transactions – both business-to-business and business-to-consumer –in many countries. Domestic e-commerce has been boosted by nationwide lockdowns, restriction of movement and mandatory closure of non-essential retail stores, which have affected consumer behavior (Farrell et al., 2021). Creating digital markets and boosting digitalization can yield significant economic benefits and lead to substantial social benefits to societies and communities. With the right conditions, digitalization has the potential to boost productivity, create new jobs, and enhance the quality of life for society at large. Post COVID-19, digitalization can play an important role in assisting policymakers to spur economic growth and employment.

According to a United Nations Conference on Trade and Development (UNCTAD) report (UNCTAD, 2020), the pandemic has accentuated the trend towards greater adoption of social media and growth in sales through e-commerce websites. Shifts in consumption habits have also been observed, driven by the need for sourcing essential items. Social media and own e-commerce shops are important sales channels, and both have witnessed high growth since the beginning of the COVID-19 crisis. More customers have gone online to look for essential products.

A recent United Nations Economic Commission for Europe (UNECE) report argues that the accelerated shift to digital platforms in response to the pandemic led to an increase in online retail trade, but it also unmasked challenges to harnessing the benefits of e-commerce (UNECE, 2022). These challenges arose in the following areas: ICT, trade facilitation and logistics, legal and regulatory framework, electronic payment systems, skills development, etc. The pandemic has aggravated some existing bottlenecks in e-commerce ecosystems in significant and interconnected policy. These challenges have limited the investment in e-commerce business growth, which further exacerbated gaps in ICT adoption and limited consumer protection and fair competition.

Research conducted by Alfonso et al. (2021) shows that, although e-commerce has ramped up during the pandemic around the world, the growth differed across sectors and over different stages of the pandemic. Some changes in consumers' shopping habits and payment behavior may be longer-lasting. This may have implications for structural change and the growth of the digital economy.

According to a recent OECD report (OECD, 2020), the COVID-19 crisis accelerated an expansion of e-commerce towards new firms, new customers (e.g. elderly), and new types of products (e.g. groceries). This provided customers with access to a large variety of products from the convenience and safety of their homes and enabled firms to continue operation in spite of contact restrictions and other confinement measures. Despite persistent cross-country differences, the COVID-19 crisis has enhanced dynamism in the e-commerce landscape and has expanded the scope of e-commerce.

According to Fardoust & Nabli (2022), the Covid-19 pandemic has led to an acceleration in the process of digital transformation in both public and private-sector activities. Meanwhile, the pace of adaptation to this process varies from country to country. Without proper policy and regulatory frameworks, this may widen the digital divides between developed and developing countries, between urban and rural areas, between genders, and between different income groups.

3. Development of digital economy in the MENA

According to a research report of Digital McKinsey (Benni et al., 2016), the Middle East was on the verge of a massive digital disruption. In the past decade, the cross-border data flow connecting the Middle East to the rest of the world increased more than 150-fold. Several countries, including Bahrain, Qatar, and the United Arab Emirates, are leading the digital consumer charge, with high smartphone-adoption rates and social-media use. However, digitization remains uneven from country to country.

In this study, we choose three countries as case studies using the ERF survey data: Jordan (the Middle East), Morocco (Maghreb) and Egypt (the eastern region of North Africa). Figure 3.1 shows

that mobile cellular subscriptions have grown rapidly in MENA and globally over the past two decades. The level in Jordan and Morocco exceeded the regional average level, while Egypt grew rapidly approaching the regional average.

According to a study on the development of the digital economy in Morocco (Abdelkhalek et al., 2021), the privatization in the telecommunication infrastructure has allowed the introduction of competition in the sector, which has led to a significant reduction in the cost of access to telecommunications.: With a penetration rate of 137.5 percent at the end of 2020, most of the Moroccans have access to smartphones; and according to this indicator, the International Telecommunication Union (ITU) ranks Morocco fifth out of 22 Arab countries (ITU, 2021).

Figure 3.1. Mobile cellular subscriptions per 100 people
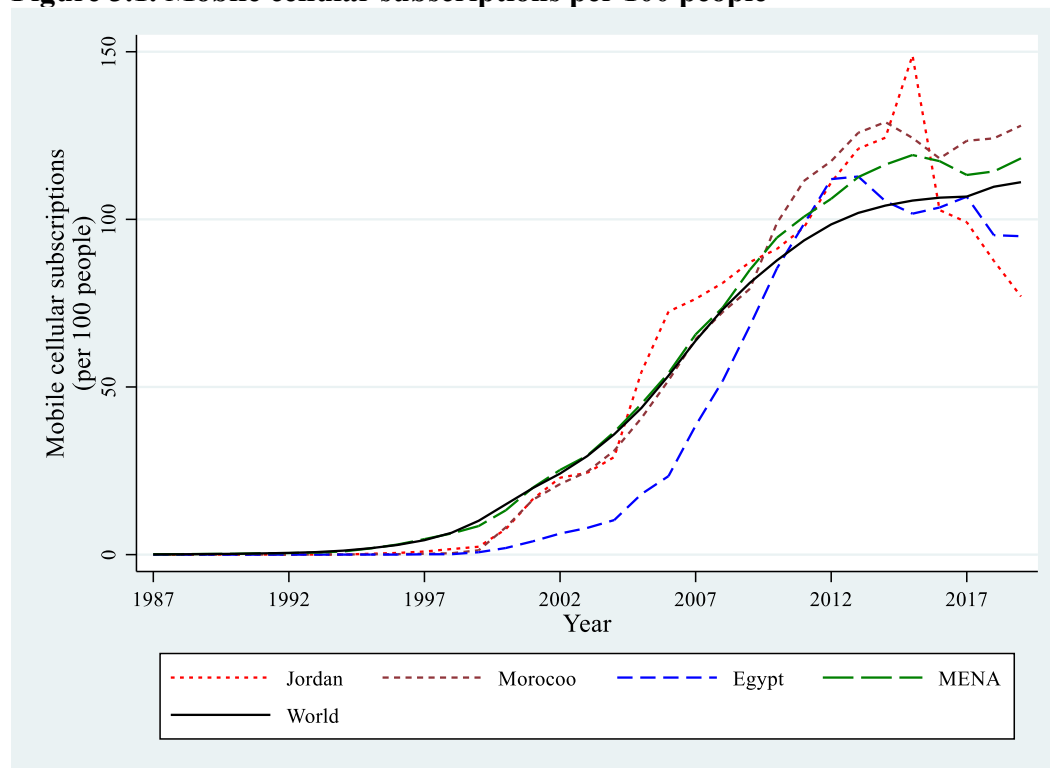
Source: The World Bank, World Development Indicators. Available at Mobile cellular subscriptions (per 100 people) | Data (worldbank.org).

The research report of ITU (2021) shows that, while parts of the Arab region are very advanced, myriad challenges persist for many other countries. Alongside structural impediments to sustainable development, a key barrier to accelerated progress is the lack of meaningful and affordable connectivity. Mobile network coverage is at 95 percent, but Internet use by individuals is at 55 percent and Internet access at home is only 60 percent. This shows that there is a significant use gap, where individuals are covered by the Internet but are not using it owing to lack of affordability, skills, or meaningful/quality access. Fixed broadband use remaining very low. Figure

3.2 shows that fixed broadband subscription per 100 people in the MENA, while increasing over time, is lower than the world average. Only 4.5 percent, 4.8 percent and 7.5 percent of the population in Jordan, Morocco and Egypt, respectively, have fixed broadband subscription in 2019.

Figure 3.2. Fixed broadband subscriptions per 100 people
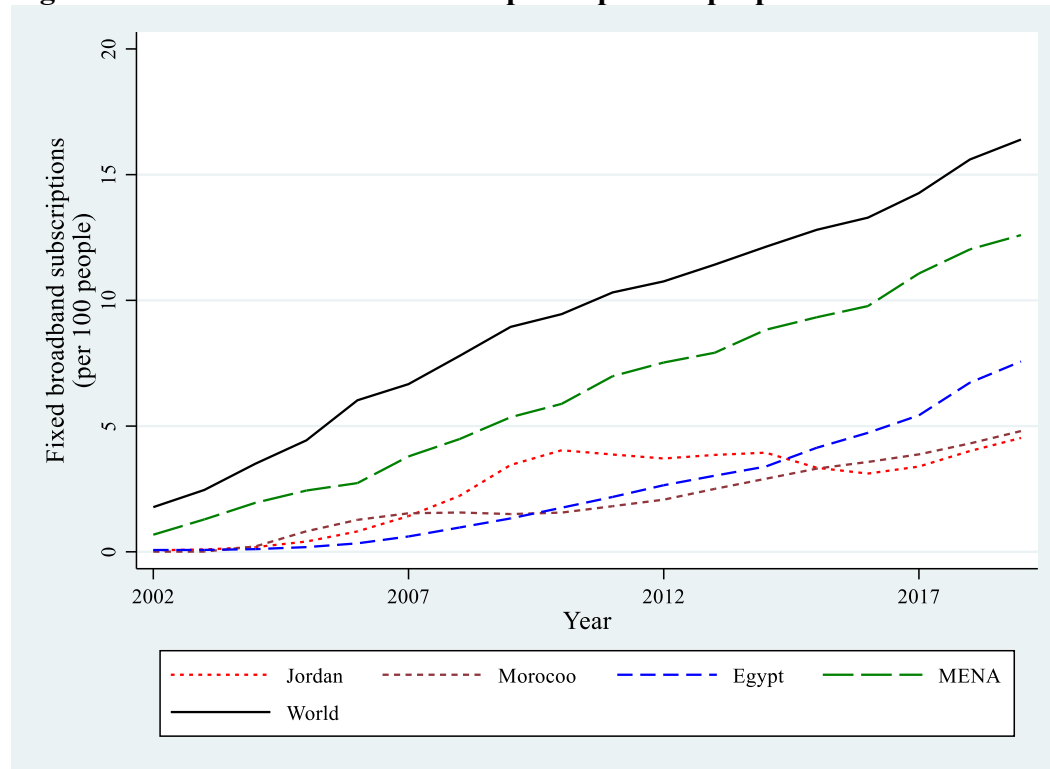
Source: The World Bank, World Development Indicators. Available at Mobile cellular subscriptions (per 100 people) | Data (worldbank.org).

In addition, digital infrastructure development is uneven in the region. Figure 3.3 presents a comparison of Mobile Connectivity Index, developed by the Global System for Mobile Communications (or GSM Association)[5], between various countries and regions. The mobile connectivity in MENA, scored at 61.4, is higher than the world average 58.6. Within the MENA region, there is a wide variation. United Arab Emirates scored the highest at 78.2, while Yemen scored the lowest at 39.0. Jordan and Morocco scoring at 60.4 and 59.9 respectively, slightly below the regional average, while Egypt, with a score of 55.7, is in a lagging position.

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[5] The GSMA Mobile Connectivity Index measures the performance of 170 countries – representing 99% of the global population – against key enablers of mobile internet adoption: infrastructure, affordability, consumer readiness, and content and services. Its objective is to support the efforts of the mobile industry, governments, and the wider international community to deliver on the ambition of universal access to the internet.

Figure 3.3. Mobile Connectivity Index Score
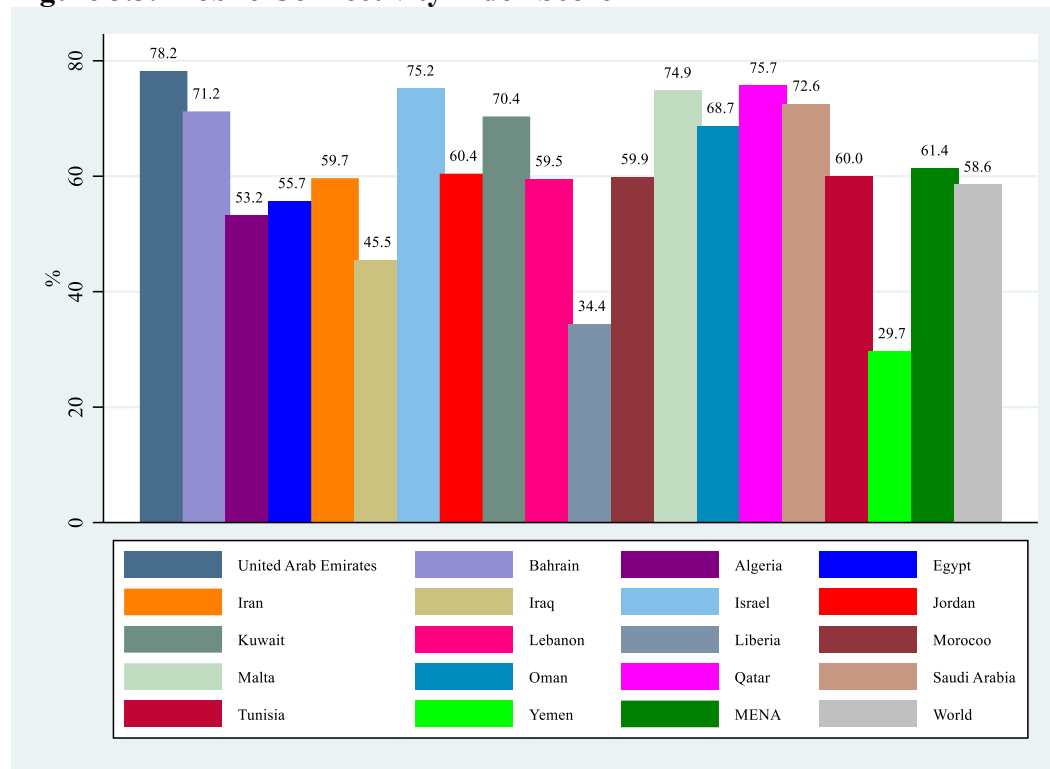
Source: GSM Association, <u>2022 – GSMA Mobile Connectivity Index</u>.

Figure 3.4 presents the Enabler Scores and the Dimension Scores, which include 4 and 14 indicators, respectively. In terms of Infrastructure, Morocco and Jordan both score higher than the MENA regional average. In terms of Affordability, the scores of the three countries are all below the regional average, that of Egypt is particularly low. In terms of Consumer Readiness, only Jordan's score is higher than the regional average. In terms of Content & Services, all three countries score near or above the regional average.

As to the Dimension Scores, each of the three countries has strengths and weaknesses. Jordan has high scores for network coverage, network performance, inequality, and gender equality, but low scores for spectrum, mobile tariffs, and handset prices. Morocco scores high in network coverage, other enabling infrastructure, spectrum, taxation, mobile ownership and availability, and has lower scores in basic skills, gender equality, and online security. Egypt has exceptionally high scores for mobile tariffs and online security, but far lower scores than the other two countries for network coverage, spectrum, taxation and inequality.

Figure 3.4. Mobile Connectivity: Enabler Scores and Dimension Scores
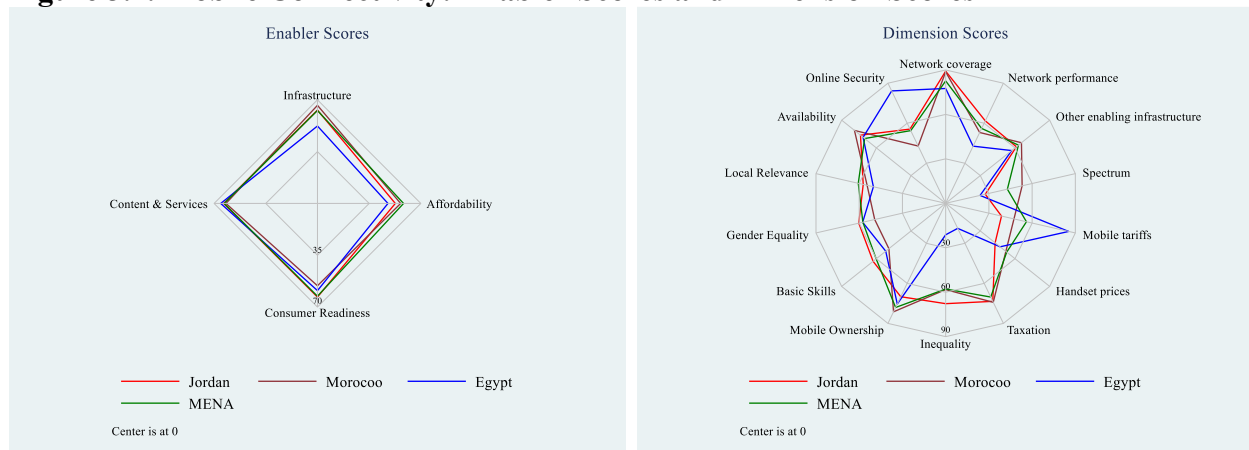
Source: GSM Association, 2022 – GSMA Mobile Connectivity Index.

Fardoust & Nabli (2022) indicate that the impact of digitalization on the economies of Arab countries has been limited. While digitalization may have had transformative impact in other developing regions, the lack of improvements in business climate and digital connectivity as well as in delivery of public services may have limited the benefits of digitalization in economic activity and employment generation in the Arab region. Many of the Arab countries continue to lag behind both in terms of digitalization of public services and the use of digital technology by the business enterprises and financial sector. Business digital technology adoption in the region have been slow except in Jordan, Saudi Arabia and the United Arab Emirates.

Mahroum (2021) argues that while the MENA consumer base is digitalizing rapidly, the productive base is not. Because the exports of MENA countries primarily concentrate in fossil fuel (around 45 percent of total export) and other natural resources, with few intermediate products and limited integration in GVCs, these limit the opportunities for the producers to benefit from digital trade and e-commerce. While consumers may accrue a surplus from participation in e-commerce in the short run, the productive sector may continue to lag and, subsequently, unemployment rates may remain high.

In a case study of Morocco's, Abdelkader et al. (2021) highlights the importance of three pre-requisites for e-commerce development: infrastructure, education, and support programs. In particular, digitalization in the agricultural sector, which plays a central role in Morocco's economy and society, faces many challenges.

In the case of Egypt, Kamel (2021) argues that digital transformation offers potential opportunities for the country but this requires the development of the universal digital infrastructure and skilled human capital, as well as the proper legal, regulatory, investment, governance, educational, security, and other enabling and support environments. A holistic approach to build a dynamic and integrated ecosystem that capitalizes on digital transformation is crucial to enable a more conducive business

environment to support digital transformation and inclusive growth.

According to Cusolito et al. (2021), digital infrastructure, digital payment system, and regulatory framework for e-commerce are the three essential pillars that underpin the creation of an enabling digital environment and a well-functioning digital economy. The MENA region is suffering from a digital paradox: for its level of GDP per capita, the region has an excess of social media accounts but exhibits glaring gaps in use of the internet to make payments. This paradox is partly due to insufficient coverage of ICT infrastructure, slow internet speeds, or insufficient access to the internet; but more importantly, a lack of societal trust in government and the financial system is hindering the wider adoption of digital payment tools. The MENA has a few successful digital businesses and nascent or up-and-coming digital ecosystems (notably in Jordan, Lebanon, Morocco, Saudi Arabia, and the United Arab Emirates), however, the rapid takeoff of digital transformation is not quite at hand.

There is significant potential for MENA to develop e-commerce. Before the onset of the pandemic, the region's online sales revenues have been increasing consistently. According to a Deloitte report (Mehta & Bhandari, 2018), the clothing and footwear, and consumer electronics and media segments were among the top online shopping category. Thanks to the increase in smartphone and tablet use and technological advancement, more online shopping went mobile. However, trade and logistics blockages as well as low credit card use remained major constraints. Due to the lack on the online payment system and low trust, a large share of e-commerce payments relied on cash on delivery. The challenges of the list-mile delivery and low number of delivery orders resulted in a vicious cycle of high logistic costs and low demand for online shopping. The Deloitte report indicated that only 15 percent of businesses in the Middle East have an online presence and almost 90 percent of the online purchases in the region are shipped from abroad, and online sales in the Middle East account for only 2 percent of the overall retail sales, much lower than the 15 percent in developed markets.

The COVID-19 pandemic and the extensive lockdowns catalyzed changes in consumer behavior and led to a shift towards online activities. According to an MIT study, the post-pandemic e-commerce boom created a ripple effect across logistics and fintech (Farrell et al., 2021).This study suggests that over the first three months after the onset of the pandemic, the online business witnessed a sharp increase in demand and adoption. Fintech investments more than doubled in 2020 compared to 2019. The increase in demand contributed to lower the average logistic cost of last-mile delivery and fintech grew along the development of e-commerce with the fear of spreading the coronavirus via cash catalyzing the shift of behavior towards digital payments. The increase in online payment options, including "buy now, pay later" services and digital wallets, facilitated e-commerce sales. The same study indicated that e-commerce in MENA grew by 52 percent and reached an annual gross merchandise value (GMV) of $22 billion in 2020 with a large share of increase taken place in the United Arab Emirates and Saudi Arabia. A McKinsey study showed that consumers in Saudi Arabia and the United Arab Emirates have seen among the highest

rates of "new or increased" users in online deliveries and communications. Egypt, Saudi Arabia and the UAE account for more than 80 percent of the region's overall e-commerce market (McKinsey, 2020).

The shift towards online business is expected to stay. Companies with an online presence, such as grocery retail, witnessed a rapid increase in demand with new customers as people spent more time at home and limited trips to stores. According to a recent Forbes article (Mitzner, 2021)[6], 80 percent of young Arabs shop online frequently in 2021, compared to 71 percent in 2019; 50 percent of those aged 18-24 in MENA are shopping more online after the pandemic. According to a study of Stastista[7], thanks to a young population and high levels of internet penetration, digital savviness is expected to drive e-commerce activities in the future in the MENA region, particularly in the Gulf Cooperation Council.

Digitalization could lead to significant socio-economic benefits in the MENA region and provide jobs, particularly among the youth and women. The region has witnessed rapid growth in internet connectivity in recent years. Internet penetration exceeded 90 percent in Qatar, Bahrain, and the UAE[8]. A recent World Bank study (Cusolito et al. 2021) found that fully digitalizing the economy could increase GDP per capita by at least 46 percent over 30 years, or in dollar terms a long-term gain of at least $1.6 trillion. In particular, the potential benefits would be larger for lower-income MENA countries as at least 71 percent of the gains are driven by closing the access gap to digital technologies, and the universal adoption of digital technologies would double the female labor force participation rate by about 20 percentage points over a 30-year period (from 40 million women to 80 million over that time). The report highlighted the paradox of the high share of population in MENA with access to internet, mainly for social media, but limited use of digital services such as mobile money and digital payments.

The high ratio of access to internet in MENA masks the deep inequalities in the region. According to the Arab Barometer surveys, the proportion of citizens who have access to internet varied largely across countries and socio-demographic groups. While the Arab Region countries are among those with the highest internet penetration in the world[9], over four in ten citizens in Tunisia (41 percent) and Egypt (42 percent) indicated that they have never used internet (Raz, 2020)[10]. Disadvantaged groups, such as women, the elderly, the less educated, and lower income individuals are less likely to use the internet[11].

The MENA region has the highest rates of youth unemployment (15-24 years old) in the world,

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[6] GCC drives e-commerce boom in the Middle East (forbes.com).
[7] Online shopping behavior in the Middle East and North Africa - statistics & facts | Statista.
[8] Source: Internet World Stats.
[9] Countries with the highest internet penetration rate 2022 | Statista.
[10] The Arab World's Digital Divide – Arab Barometer.
[11] The Arab World's Digital Divide – Arab Barometer.

around 25 percent in the past three decades, almost twice the world average[12]. Jordan (43 percent) and Tunisia (35 percent) are among the non-conflict countries with the highest youth unemployment in the world, while Egypt's youth unemployment rate is about 17 percent in the most recent year with available data[13]. Only one-third of young people in MENA had an account at a financial institution or with a mobile-money-service provider, which is even lower than sub-Saharan Africa [14]. Investment in digital infrastructure, governance, and skills to increase digitalization can enhance economic opportunities for young people (Kabbani, 2021). The growth of the digital economy in MENA could become one of the key solutions to the region's youth unemployment crisis by creating new opportunities for employment and political participation and enabling digital authoritarianism in the region (Langendorf, 2020).

4. Methodology
4.1. Data
We analyze the relationships between participation in digital economy, firm productivity, private sector growth and employment in the MENA region focusing on three countries, Jordan, Morocco, and Egypt.

Our empirical analyzes are based on data from two sources. The first is the Survey of Enterprises' Digitization (SED), carried out by ERF in these three countries: Jordan, Morocco and Egypt, representing the Middle East, Maghreb and the eastern region of North Africa, respectively. The collection of data began in April 2022 and phase two was completed in August 2022. The SED is a wide-ranging, nationally representative cross-sectional survey in each country [15]. The questionnaire covers the following aspects: website usage, online transactions, firm's annual sales, number of employees, ownership, human capital, etc. This dataset allows us to conduct a cross-country and comparative research between the three Arab countries.

As the ERF survey was conducted by telephone during the epidemic, the refusal rate in the survey and the proportion of missing values in the responses to some sensitive questions are relatively high, which may lead to bias in the results. For these reasons, we also use the Enterprise Survey (ES) conducted by the World Bank and its partners to complement our analyses. ES offers an expansive array of economic data on 171,000 small, medium, and large firms in 149 countries. ES are repeated surveys that follow the same groups of firms in each country. They collect a wide array of qualitative and quantitative information through face-to-face interviews with firm managers and owners regarding the business environment in their countries and the productivity of their firms.

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[12] Source: Unemployment, youth total (% of total labor force ages 15-24) (modeled ILO estimate) - Middle East & North Africa, World | Data (worldbank.org).
[13] Source: Unemployment, youth total (% of total labor force ages 15-24) (national estimate) | Data (worldbank.org).
[14] Source: Global Financial Inclusion (Global Findex) Database | Data Catalog (worldbank.org).
[15] Details of SED are presented on the following sites:
Jordan - Survey of Enterprises' Digitization in Jordan, SEDJ_2022 (erfdataportal.com);
Morocco - Survey of Enterprises' Digitization in Morocco, SEDM_2022 (erfdataportal.com);
Egypt, Arab Rep. - Survey of Enterprises' Digitization in Egypt, SEDE_2022 (erfdataportal.com).

From March 2020, due to the COVID-19 pandemic, the World Bank used simplified questionnaires and telephone interviews in the surveys. Therefore, the ES data used in the present study consists of two parts: (i) the last wave of ordinary ES before the COVID-19 outbreak, whose data are available for Jordan, Morocco and Egypt; (ii) the COVID-19 Impact ES Follow-up Survey, whose data are only available for Jordan and Morocco.

4.2. Econometric models

Our empirical analyses are composed of three parts. In the first part, we try to identify the factors that influence firms' participation in e-commerce. We start with a comparison of characteristics between e-firms and non-e-forms. Then, we estimate a participation equation using probit model:

$$P_i^* = \alpha Z_i + \varepsilon_i \qquad \text{with } \varepsilon_i \sim N(0,1)$$
$$P_i = 1 \Leftrightarrow P_i^* > 0 \, ; P_i = 0 \Leftrightarrow P_i^* \leq 0$$

where P^* is an unobserved continuous latent variable and P an observed binary variable such that $P = 1$ if firm participated in e-commerce, and $P = 0$ otherwise; Z_i is the vector of variables that influence participation in e-commerce.

The second part aims to analyze the impact of e-commerce on firm performance, such as production, productivity, export and/or import, and innovation. We begin with a comparison of indicators measuring performance between e-firms and non-e-forms. Then, we analyze the association between e-commerce participation and firm performance using regression analyses. The dependent variables are (i) productivity, (ii) production, (iii) export and/or import, and (iv) innovation.

Production is measured by total annual sales. That was the most difficult question to master in the survey. Most respondents reported total sales with a watchful and reserved attitude. Even when respondents were cooperative, total sales was difficult to measure precisely because of its instability, diversification and complexity. For these reasons, the proportion of missing values of total annual sales is very high (67.9%-77.1%) in the survey. To mitigate this problem and provide an alternative, a question with 4 ranges of sales volumes (which differed across country tailoring to the local context) was included to increase the response rate to the question of total sales. In the analysis, in order to expand the number of observations, we first put the 22.9%-32.1% valid values of total sales to the 4 categories; then merge it with "total sales range"[16]. In other words, we supplement responses to the values of total sales with that to its ranges. When merging these two questions, the response rate to "total sales (range)" increase to 71.1%-82.3%. However, this method has two limitations: first, it does not allow to calculate sales per capita (productivity); second, the results are not comparable between the three countries because the range varies from country to country.

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[16] The appendix A1 presents the details of combining the two variables.

Since the measurement scale of production is ordinal, we adopt ordered probit model to estimate production equation:

$$P_i^* = \beta X_i + \mu_i \qquad \mu_i \sim N(0,1)$$

The independent variables (X_i) include dummy variables indicating whether firm participated in e-commerce and control variables.

Productivity is measured by annual sales per employee. The analysis is based on 22.9%-32.1% valid responses of total sales. Since productivity (y_i) is a continuous variable, we adopt a linear model (ordinary least squares, OLS) to estimate productivity equation by taking the logarithm of productivity as dependent variable:

$$log y_i = \beta X_i + \varepsilon_i$$

Similarly, X_i represents a vector of independent variables, that includes dummy variables indicating whether the firm participated in e-commerce and control variables.

Firm's export & import is measured by a binary variable that takes the value 1 if firm has export and/or import, and 0 otherwise. Innovation is measured by two indicators: (i) having introduced new products/services/process, (ii) having spent on R&D. Both are also binary variables. We adopt probit model by taking these indicators as dependent variable, respectively.

It should be noted that an important challenge in the econometric identification of the effects of digital technologies on firm performance is endogeneity, which can result from both reverse causality and common factors influencing productivity and adoption (Peter et al., 2019; Salento, 2018). For example, e-commence adoption may be easier for high-productivity firms, because their high productivity can give them the financial means to invest in new digital technologies. Due to the lack of panel data, we focus the analysis on the association between e-commerce participation and firm performance. The results should be interpreted with caution.

In the third part, we examine the role of e-commerce in firm functioning during the COVID-19 pandemic. The analysis of this part is based the COVID-19 Impact ES Follow-up Survey in different periods (i.e. waves). These surveys allow to constitute a panel database. We define for each period (t) a series of indicators ($P_{i,t}$) that measure firm performance, including open/closure, sales increased or remained the same compared to the same month of the previous year, having indirect & direct exports, having introduced new or improved products or services, growth rate of the number of employees, and change in the proportion of female employees. We explain these indicators by their value of previous period, as well as other characteristics ($X_{i,t-1}$, control variables):

$$P_{i,t} = \alpha P_{i,t-1} + \beta X_{i,t-1} + \varepsilon_i$$

This strategy allows us to avoid the problem of endogeneity and/or causality in the estimation. The regression is thus interpreted as the study of the links of firm performance during a certain duration and firm characteristics at the beginning of this period. As the indicators ($P_{i,t}$) are binary variables, we adopt probit model in the estimation.

4.3. Description of firms' characteristics

We begin with a description of the characteristics of the firms surveyed (Table 4.1), which provides an overview of the three countries.

Table 4.1. Description of firms' characteristics (Weighted values)

	Total	Jordan	Morocco	Egypt
Firm size (worker)				
Mean	14.2	9.9	14.3	18.9
Median	4.0	3.0	7.0	3.0
Size group (%)				
1 worker	16.7	0.7	18.7	12.2
2-3 workers	37.6	18.5	33.5	30.2
4-9 workers	29.6	43.9	27.3	33.4
10-29 workers	11.1	25.7	13.7	16.6
30 workers or above	5.0	11.1	6.9	7.6
Firm age (year)				
Mean	12.3	10.2	12.9	14.2
Median	8.0	6.0	10.0	11.0
Age group (%)				
1-2 years	18.7	3.5	13.5	12.2
3-5 years	28.3	13.2	17.6	20.0
6-9 years	13.9	23.1	12.4	16.4
10-19 years	20.2	31.4	28.8	26.5
20 years or above	15.7	15.6	23.3	18.1
Don't know	3.3	13.1	4.4	6.8
Ownership				
Private domestic individuals, companies or organizations	98.9	98.6	98.4	99.8
Private foreign individuals, companies or organizations	1.1	1.4	1.6	0.2
Located in urban area (%)	90.1	86.9	95.5	88.3
Share of female workers (%)	22.9	16.8	40.5	12.3
Share of highly educated workers (%)				
25 or less	40.9	40.6	33.7	48.4
26 to 50	20.4	13.5	31.7	17.0
51 to 75	11.7	7.7	16.4	11.5
More than 75	27.0	38.2	18.2	23.1
Owner/CEO's characteristics				
Male (%)	88.9	89.0	82.6	95.1
Educational level (%)				
Less than secondary	13.2	14.8	6.0	18.6
Secondary Technical	18.2	22.1	9.8	22.0
Intermediate Institute	10.2	10.0	6.6	13.9
University	31.7	36.2	26.3	31.9
Above university	17.7	14.2	30.9	8.3
Don't know	9.1	2.5	20.4	5.2

Table 4.2. Description of firms' characteristics (contd.)

Annual sales in 2021 (thousand US$)				
Mean	143266	194414	44408	206908
Median	13214	15493	19048	5285
Annual sales per employee (US$)				
Mean	15994	32969	5417	5944
Median	3099	5070	2857	1761
Having export (%)	3.3	3.7	3.0	3.1
Having import (%)	10.8	12.1	13.4	6.9
Having introduced innovation (%)	30.3	28.2	37.0	25.9
Having spent on R&D (%)	24.4	30.9	22.4	19.0
Number of observations	2529	916	807	806

Source: ERF, SED, calculated and presented by the authors.

We observe that, overall, the average size of firms is small with a mean value of 14 employees and a median value of 4 employees. In Morocco and Egypt, more than 40 percent of firms have fewer than three employees, and in Jordan firms with fewer than 10 employees account for 63 percent. Therefore, in these three countries, small and micro businesses constitute the majority, which is in line with other studies (Malouche & Partow, 2019; Partow & Salmon, 2021; Youssef et al., 2020).

In Morocco and Egypt, about a third of firms are less than 6 years old; in Jordan, the share is about one-sixth. Private firms predominate in the economy of all three countries. The average proportion of employed women is 22.9 percent. This proportion reaches 40 percent in Jordan, which is significantly higher than in the other two countries.

Figure 4.1 shows the distribution of firms across industries. According to the survey, in Jordan, "retail or wholesale or services of motor vehicles", representing 45 percent of Jordanian businesses, is in first place. "Health" and "construction or utilities" account for 9.9 percent and 8.8 percent respectively, ranking second and third. The distribution of Moroccan firms is a little more dispersed. "Retail or wholesale or services of motor vehicles" still ranks first, while "accommodation and food services" – a typical traditional industry – is also important, ranking second. This may be one reason for the high proportion of women employed in Moroccan companies (Karam & Zaki, 2021). Among Egyptian firms, "Retail or wholesale or services of motor vehicles" (41.4 percent) still ranks first. The second place is occupied by "Other manufacturing or services", which are mainly composed of "beauty centers and barber", "lawyer office", "utilities", "dry clean", "import and export company", etc.

Regarding firm performance measures, the productivity of Jordanian firms is significantly higher than that of the Egyptian and Moroccan firms. The proportion of firms with exports or imports is relatively low in Egypt. Moreover, Egyptian firms also lag behind in innovation activities.

Figure 4.1. Industrial distribution of firms
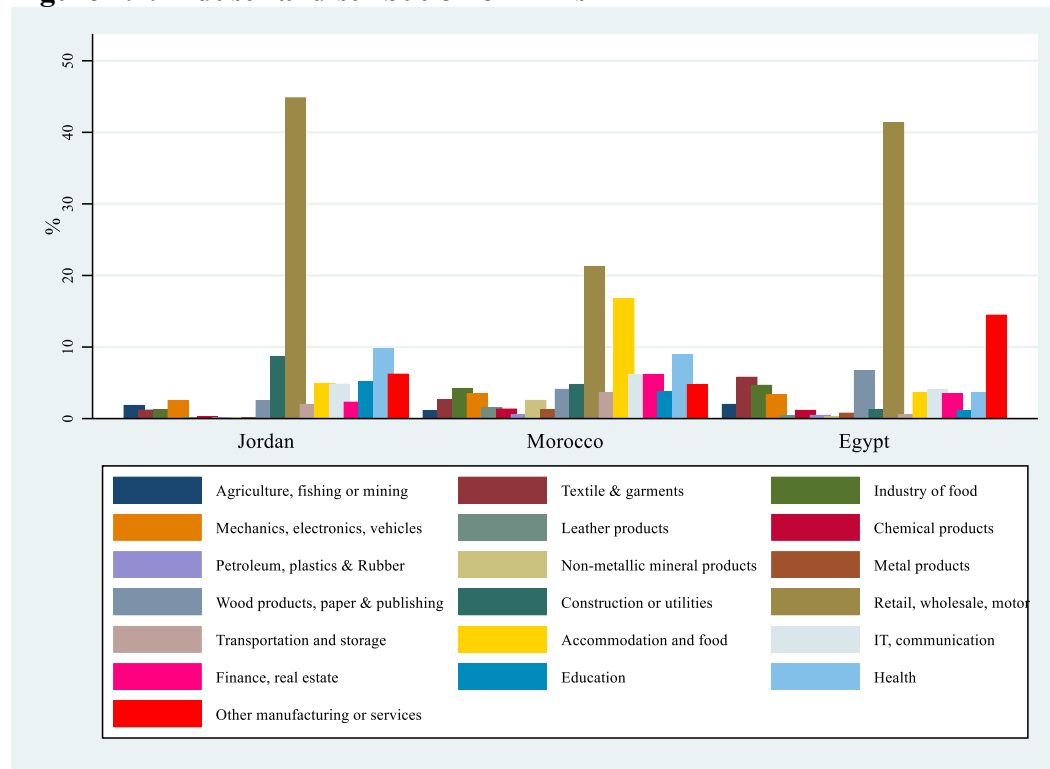
Source: ERF, SED, calculated and presented by the authors.

5. Firms' participation in e-commerce

5.1. Definitions of e-firms

E-firms are those that have participated in electronic business activities (e-commerce). E-commerce is a commercial activity carried out by ICTs. It can be defined in several ways (Abidi et al., 2022; Zhang & Chen, 2019; etc.), and has different definitions in different countries or different areas. With the rapid development of e-commerce, its content is becoming richer and richer, including electronic currency exchange, supply chain management, Internet marketing, online transaction processing, electronic data interchange (EDI), stocks and automatic data collection systems, etc. In a narrow sense, e-commerce includes commercial activities conducted on global scale using electronic tools such as telegraph, telephone, radio, television, fax, computer, Internet, mobile communication, etc. It includes the behaviors of goods and services suppliers, advertisers, consumers, intermediaries and other agents involved. In a broad sense, e-commerce encompasses business activities that use electronic tools to establish electronic information exchanges between enterprises, suppliers, customers and partners, to realize the digitization of commercial process, and improve the efficiency of production, inventory, circulation and capital.

SED questionnaire contains a series of questions designed to identify e-firms. From these questions, we define e-commerce in two ways (see Table 5.1).

Definition1: Having own website or being listed on any app or website. Self-built websites and third-party platforms are necessary conditions for firms to participate in e-commerce. This definition is based on two questions: COR11 and COR12.

Definition 2: Having online buying or online selling of goods and/or services. This definition is based on four questions: COR13, COR14, FIR12 and FIR14.

Having its own website (Definition 1) does not mean that firm is necessarily involved in online selling or online purchasing. It is possible that the website of some firms was not created by their own initiative, but by some advertising companies. The effect of this type of website on business operations is therefore limited. This second definition, in our views, can more accurately identify e-firms, because carrying out online transactions, which signifies that firm is actively participating in digital economy.

These two definitions can intersect. Table 5.1 presents the percentages of e-firms according to the two definitions in the three countries. E-firms according to the two definitions represent 23.6 percent (website) and 16.5 percent (online transactions), respectively. By country, Morocco has relatively high proportions of e-firms, while Egypt has the lowest proportions. But according to the definition 2, Jordan has the highest rate of participation in online transactions.

Table 5.1. Percentage of e-firms according to the different definitions (Weighted values)

	Total	Jordan	Morocco	Egypt
Definition 1: Having the own website or being listed on any app or website	23.6	23.0	29.6	18.2
Questions:				
COR11: Does your firm have its own website in (last month) 2022?	21.6	19.9	28.0	17.3
COR12: Is the firm listed on any app or website?	5.3	7.8	5.5	2.2
Definition 2: Having online buying or selling	16.5	18.5	17.1	13.7
Questions:				
COR13: Does your firm have online buying in (last month) 2022?	8.5	9.3	9.2	6.7
COR14: Does your firm have online selling in (last month) 2022?	8.4	11.0	8.4	5.4
FIR12: Did your establishment have online sales (last month) in 2022?	7.1	6.6	7.1	7.6
FIR14: Did your establishment purchase inputs online (last month) in 2022?	9.2	10.6	9.2	7.6
Number of observations	2529	916	807	806

Source: ERF, SED, calculated and presented by the authors.

5.2. Factors associated with participation in e-commerce

In this section, we use probit model to precisely analyze the determinants of e-commerce participation. Table 5.2 presents the results. There appears to be an inverted U-shaped quadratic relationship between firm size and e-commerce participation in Jordan and Egypt. However, since the average size is much lower than the value at which the probability of participation reaches the maximum, the relationship is monotonically increasing. As for Morocco, the effect of firm size is less significant, but it is positive in the first regression (Definition 1: website). All other things being equal, firm age does not influence e-commerce participation in Jordan. In Morocco and Egypt,

according to the first definition, younger firms have a greater probability of participating in e-commerce.

Table 5.2. Factors associated with participation in e-commerce (Probit model, weighted values)

Dependent variable: e-firm=1; non-e-firm=0

	Jordan		Morocco		Egypt	
	Def. 1	Def. 2	Def. 1	Def. 2	Def. 1	Def. 2
Firm size	0.015***	0.010***	0.014*	0.006	0.011**	0.015***
	(3.28)	(3.00)	(1.75)	(0.96)	(2.17)	(2.92)
Squared firm size (/1000)	-0.022***	-0.015**	-0.044	-0.038	-0.007*	-0.044**
	(-2.93)	(-2.31)	(-0.87)	(-0.98)	(-1.95)	(-2.46)
Firm's age (Ref.: 20 years or above)						
1-2 years	-0.066	-0.053	0.602*	0.555*	1.139***	0.360
	(-0.42)	(-0.39)	(1.79)	(1.81)	(3.88)	(1.21)
3-5 years	-0.026	-0.040	0.881***	0.362	0.763**	0.242
	(-0.13)	(-0.24)	(2.72)	(1.21)	(2.39)	(0.74)
6-9 years	0.083	-0.021	0.751**	0.118	0.717**	0.019
	(0.52)	(-0.14)	(2.33)	(0.40)	(2.53)	(0.06)
10-19 years	0.016	-0.205	0.763**	0.302	0.491*	-0.086
	(0.09)	(-1.23)	(2.14)	(0.88)	(1.76)	(-0.27)
Don't know	0.251	-0.048	0.469	-0.405	0.260	-0.258
	(0.69)	(-0.17)	(1.34)	(-1.22)	(0.65)	(-0.52)
Industry	Yes		Yes		Yes	
Located in urban area	0.804***	0.499***	-0.489	-0.243	0.014	0.064
	(3.36)	(2.93)	(-1.58)	(-0.85)	(0.04)	(0.20)
Share of female workers	0.006**	0.007***	-0.003	-0.004	0.009**	0.007*
	(2.22)	(3.25)	(-0.95)	(-1.33)	(2.53)	(1.79)
Owner/CEO's characteristics						
Male	-0.012	0.125	0.024	-0.101	0.485	-0.353
	(-0.06)	(0.78)	(0.13)	(-0.59)	(1.37)	(-0.93)
Educational level (Ref.: Less than secondary)						
Secondary Technical or intermediate institute	0.266	0.368**	0.097	0.600**	1.693***	0.473
	(1.29)	(2.19)	(0.25)	(2.03)	(4.23)	(1.27)
University or above	0.553***	0.657***	0.487	0.387	1.998***	0.205
	(2.72)	(3.77)	(1.26)	(1.44)	(4.59)	(0.46)
Don't know	0.705*	0.646**	0.551	0.171	2.409***	-0.129
	(1.92)	(2.03)	(1.38)	(0.56)	(4.49)	(-0.22)
Share of highly educated workers (Ref.: 25% or less)						
26% to 50%	0.467***	0.274*	0.113	0.120	0.483*	0.467*
	(2.82)	(1.80)	(0.68)	(0.81)	(1.75)	(1.71)
51% to 75%	0.870***	0.494***	0.372*	0.698***	0.768***	0.579*
	(4.17)	(2.70)	(1.86)	(4.01)	(2.69)	(1.95)
More than 75%	0.546***	0.174	0.233	0.345*	0.750***	0.414
	(3.96)	(1.36)	(1.06)	(1.75)	(2.96)	(1.52)
Constant	-3.008***	-2.700***	-1.262**	-1.821***	-5.305***	-1.697**
	(-7.08)	(-8.36)	(-1.96)	(-3.25)	(-7.58)	(-2.12)
Pseudo R2	0.194	0.114	0.083	0.090	0.318	0.148
Number of observations	916	916	807	807	806	806

Notes: (i) t-statistics in parentheses. *** significant at 1%; ** significant at 5%; * significant at 10%. (ii) Def. 1: Having the own website or being listed on any app or website; Def. 2: Having online buying or selling.
Source: ERF, SED, calculated and presented by the authors.

Figure 5.1 presents the links between the industries and e-commerce participation. In Jordan, firms in the industries "Non-metal products", "Transportation & storage; accommodation & food services" and "Information and communication, IT", have a higher propensity to participate in e-commerce, regardless of the definition. The link between "Construction or utilities" and "Retail,

wholesale, services of motor vehicles" and e-commerce participation is also positive, but less accentuated. The links between "Agriculture, fishing or mining; industry of food" and e-commerce participation is significant only in the first regression in which the e-firm is defined by "website", implying that, in this industry, having the own website is common, but online transactions are rare. The participation rate in e-commerce is relatively low in the industries "Textile & garments; leather products", "Mechanics, electronics, vehicles, metal products", "Other manufacturing or services", as well as "Education; health" (reference).

Figure 5.1. Effect of industry on participation in e-commerce
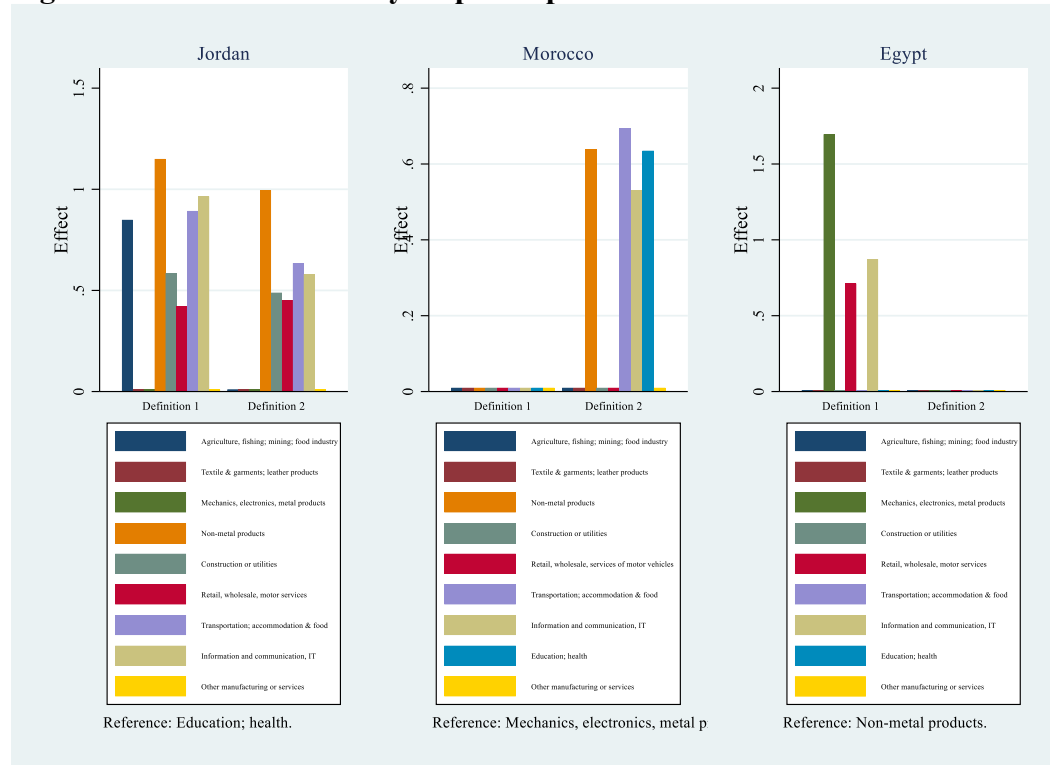
Notes: (i) Definition1: Having the own website or being listed on any app or website; Definition2: Having online buying or selling; Definition 3: Meet one of the criteria. (ii) The value of non-significant coefficients is imposed at 0. Source: ERF, SED, calculated and presented by the authors.

In Morocco, the links between industry and e-commerce participation are not significant if the e-firm is defined by "website". In other words, there is no difference between firms in various industries whether they have a website or not. As for Definition 2 ("online transactions"), the links between "Non-metal products", "Transportation & storage; accommodation & food services", "Information and communication, IT; finance, real estate" and "Education; health" and e-commerce participation are positive, which suggests that firms in these industries are more likely to have online transactions.

In Egypt, firms in "Mechanics, electronics, vehicles, metal products", "Retail, wholesale, services of motor vehicles", "Information and communication, IT; finance, real estate" are more likely to

have their website. But the links between industry and e-commerce participant are not significant in the second regression ("online transactions"); in other words, there is no difference between firms in various industries whether they have online transactions or not. However, this may be due to the low percentage of Egyptian firms involved in online transactions.

As we have seen earlier, "Retail, wholesale, services of motor vehicles" ranks first in terms of numbers in the firms surveyed. The firms in this industry mainly operate in the form of brick-and-mortar physical stores. However, among these firms, participation in e-commerce in Morocco and Egypt is mostly reflected in owning a website. Online transactions are only significant among Jordanian firms; in other words, only Jordanian retail firms are actively involved in e-commerce in the strict sense. In the other two countries, "Agriculture, fishing or mining; industry of food", "Textile & garments; leather products" and "Mechanics, electronics, vehicles, metal products" are industries in which e-commerce is relatively backward; however, these industries represent a small share of firms. However, the results are to be interpreted with caution due to the limited number of firms in some industries.

The location of head office in urban areas is positively associated with e-commerce participation only in Jordan, regardless of the definition. In Jordan and Egypt, the share of female workers in e-firms is positively associated with participation in e-commerce, which corroborates findings of some other studies: e-commerce platforms promote female employment (The World Bank, 2019). However, this difference is not significant in Morocco. A possible explanation is that the proportion of female employees in Moroccan firms is generally high.

As to owner/CEO's characteristics, gender is not associated with e-commerce participation; in fact, most business owners are men. Educational level overall plays a positive role in e-commerce participation, especially in Jordan and Egypt. Finally, the share of educated workers favors e-commerce participation in all three countries, that confirms the important role of human capital in the development of e-commerce.

6. Association between of e-commerce participation and firm performance
6.1. E-commerce and firm performance

In this section, we use econometric models to analyze the association between e-commerce participation and firm performance, while controlling for firms' characteristics. Firm performance is measured by annual sales per employee (productivity), total annual sales (production), export and/or import, and innovation activities. Independent variables include firm's basic characteristics (such as size, age, industry, location…), owner/CEO's characteristics, and e-commerce participation.

Table 6.1 presents the association between e-commerce participation and firm's productivity[17]. Productivity is independent of firm size in Jordan and Egypt. As for Morocco, although the estimated coefficients give an inverted U-shaped quadratic relationship between firm size and productivity, but the average size is much lower than the value at which the probability of participation reaches the minimum; thus, productivity actually decreases with firm size. These results suggest that the advantage of economies of scale is insignificant among firms in the three countries. Overall, the association between firm age and productivity is not significant.

Figure 6.1 presents the association between industry and firm productivity. In Jordan, "Construction or utilities" has the highest productivity. "Textile & garments; leather products", "Non-metal products" and "Retail, wholesale, motor services" also have relatively higher productivity. In Morocco, firms in "Construction or utilities" and "Information and communication, IT" are the most productive. The productivity of firms in the non-metallic industry is relatively high. In Egypt, compared to "Education; health", all other industries have a significantly positive effect, with "Non-metallic" industry having the highest productivity.

Table 6.1. Association between e-commerce participation and firm productivity (OLS model, weighted values)

Dependent variable: Logarithm of annual sales per worker

	Jordan		Morocco		Egypt	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Firm size	-0.009	-0.011	-0.064***	-0.061***	-0.002	-0.002
	(-0.38)	(-0.44)	(-4.25)	(-4.01)	(-0.67)	(-0.66)
Squared firm size (/1000)	0.015	0.057	0.481***	0.450**	0.001	0.001
	(0.07)	(0.26)	(2.76)	(2.54)	(0.59)	(0.59)
Firm's age (Ref.: 20 years or above)						
1-2 years	0.251	0.275	-0.041	-0.108	-0.421	-0.420
	(0.84)	(0.90)	(-0.11)	(-0.29)	(-0.98)	(-0.97)
3-5 years	0.395	0.444	0.270	0.264	0.002	0.016
	(1.10)	(1.24)	(0.74)	(0.73)	(0.00)	(0.02)
6-9 years	0.591*	0.582*	0.094	0.093	-0.325	-0.315
	(1.74)	(1.72)	(0.27)	(0.26)	(-0.67)	(-0.66)
10-19 years	-0.106	-0.027	0.046	0.045	-0.002	0.006
	(-0.24)	(-0.06)	(0.10)	(0.09)	(-0.00)	(0.01)
Don't know			0.846*	0.845	-0.530	-0.516
			(1.75)	(1.63)	(-0.81)	(-0.78)
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Located in urban area	0.762***	0.780***	0.701	0.789	0.261	0.273
	(2.60)	(2.64)	(1.09)	(1.21)	(0.44)	(0.46)
Share of female workers	-0.006	-0.005	-0.008*	-0.007	0.012	0.011
	(-1.11)	(-0.90)	(-1.79)	(-1.61)	(1.21)	(1.15)
Owner/CEO's characteristics						
Male	0.724*	0.752*	0.043	0.086	1.907***	2.030***
	(1.75)	(1.75)	(0.18)	(0.37)	(3.38)	(3.65)
Educational level (Ref.: Less than secondary)						
Secondary Technical or intermediate institute	0.373	0.397	0.490	0.407	0.847**	0.856**
	(1.04)	(1.07)	(1.10)	(0.87)	(2.39)	(2.45)

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[17] As the analysis is based on 22.9%-32.1% valid values of total sales, the results must be interpreted with caution.

Table 6.2. Association between e-commerce participation and firm productivity (contd.)

University or above	0.872**	0.941**	0.628	0.556	1.464***	1.443***
	(2.28)	(2.37)	(1.41)	(1.18)	(3.30)	(3.18)
Don't know	0.509	-8.883	0.330	0.357	0.585	0.607
	(0.01)	(-0.21)	(0.65)	(0.67)	(0.70)	(0.71)
Participation in e-commerce						
Having the own website or being listed on any app or website	0.686**		0.321		0.050	
	(2.30)		(1.21)		(0.11)	
Having online buying or selling		0.480*		0.380*		0.242
		(1.81)		(1.78)		(0.56)
Constant	5.927***	5.868***	6.903***	6.850***	2.024**	1.906*
	(9.13)	(8.77)	(7.61)	(7.52)	(2.08)	(1.93)
R^2	0.256	0.215	0.240	0.240	0.386	0.387
Number of observations	266	266	265	265	190	190

Notes: t-statistics in parentheses. *** significant at 1%; ** significant at 5%; * significant at 10%.
Source: ERF, SED, calculated and presented by the authors.

Figure 6.1. Association between industry and firm productivity
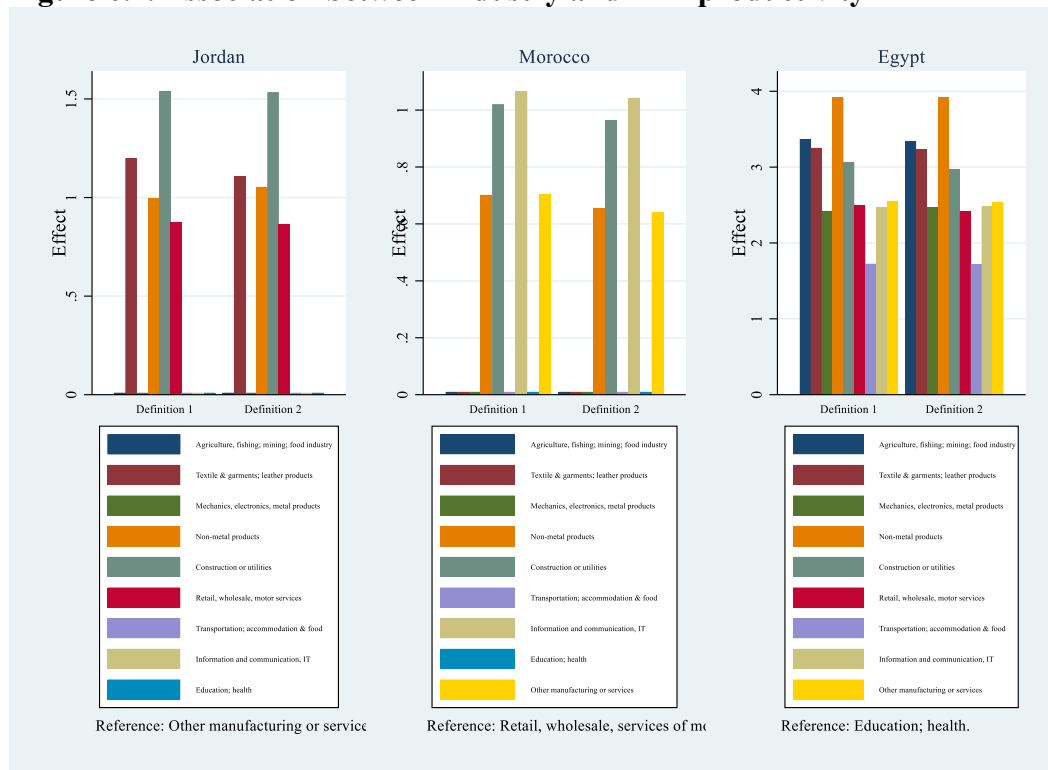
Notes: (i) Definition1: Having the own website or being listed on any app or website; Definition2: Having online buying or selling; Definition 3: Meet one of the criteria. (ii) The value of non-significant coefficients is imposed at 0.
Source: ERF, SED, calculated and presented by the authors.

Head firm location in urban area is positively associated productivity only in Jordan. The share of female workers has little association with productivity. Owner/CEO's characteristics are not associated with productivity in Morocco. In Jordan and Egypt, male-owned businesses have higher productivity, and owner/CEO's education level is significantly associated with productivity.

In the case of Jordan, participation in e-commerce is positively associated with the productivity of Jordanian firms, whatever its definition. For Moroccan firms, the difference in terms of productivity between e-firms and non-e-firms is not significant under the first definition ("website"); however, the productivity is significantly higher in firms that have online transactions than in other firms, which confirms the important role of online transactions in improving firms' productivity. In Egypt, e-commerce participation is not associated with productivity in a significant manner.

We also take production, export and/or import, innovation and R&D, respectively, as dependent variable, and estimate the corresponding models. Figure 6.2 summarizes the estimated coefficients of e-commerce participation in the various regressions. E-commerce participation is positively associated with total sales in all three countries; however, it should be noted that the results are not comparable between the three countries due to different groupings (or categories) of sales as discussed earlier in this paper. As for export and/or import, innovation and R&D, almost all the estimated coefficients are significantly positive among all three countries, regardless of definition of e-commerce.

Figure 6.2. Effect of e-commerce on firm performance
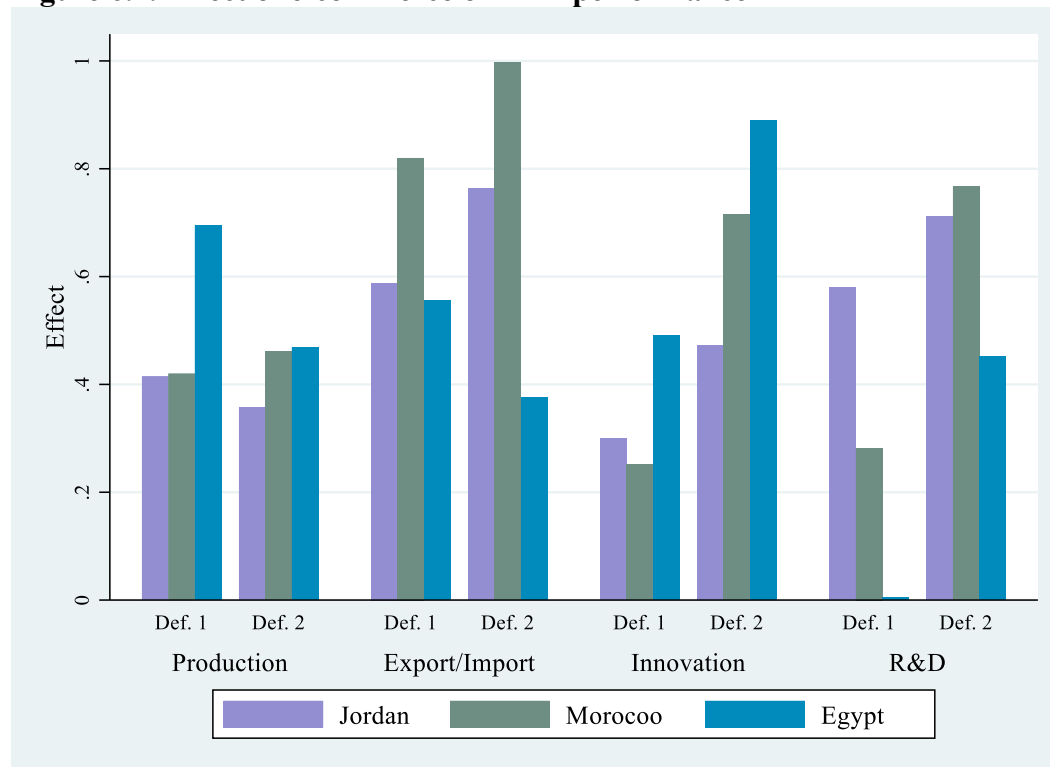
Notes: (i) Def. 1: Having the own website or being listed on any app or website; Def. 2: Having online buying or selling. (ii) The value of non-significant coefficients is imposed at 0. (iii) The full results are presented in Appendix, Tables A2.1, A2.2, A2.3, and A2.4.
Source: ERF, SED, calculated and presented by the authors.

6.2. Sources of performance differences between e-firms and non-e-firms

In this section, we analyze the sources of the difference in performance between e-firms and non-e-firms. On the one hand, it is possible that e-firms do not have the same characteristics (e.g. size, age, industrial composition, education level of employees…) as non-e-firms, which would affect their performance. On the other hand, e-firms may receive different returns to the attributes than non-e-firms on these characteristics due to unobservable factors. To determine the share of each, we use the decomposition method proposed by Oaxaca and Blinder (Blinder, 1973; Oaxaca, 1973). It is widely applied to the analysis of the difference in performance between various groups.

For a given firm's performance (e.g. productivity, export and/or import, participation in innovation…), the difference between e-firms and non-e-firms can be decomposed into two parts: (i) that due to differences in average characteristics of the groups (the effect of firm attributes) and, (ii) that due to differences in the return to these attributes (the effect of the return of firm attributes), caused by unobservable factors[18].

There is one prerequisite for using this decomposition: the difference between the two groups must be statistically significant. Otherwise, it can be considered that there is no difference between the two groups, and the decomposition is not necessary. Therefore, we only conduct the decomposition for cases where the performance difference is significant (see Table A2.5).

Table 6.2 presents the results of the decomposition for firm productivity. We find that productivity difference between e-firms and non-e-firms in Jordan is larger than that in the two other countries. This result means that the positive association of e-commerce and firm productivity is the greatest in Jordan. This may be because e-commerce is relatively mature in Jordan.

In Jordan, productivity gap between e-firms and non-e-firms is significant for both definitions. When the productivity gaps are decomposed, the distribution between attributes and returns to attributes is different for the first and the second definitions. For the first definition ("website"), most of the difference is explained by the contribution of the difference in returns to attributes (88.1 percent). That is to say: the two types of firms are not very different in their intrinsic endowments, but once firm participates in e-commerce (having the own website or being listed on any app or website), it is expected to significantly increase productivity. According to the second definition (online transactions), the contribution of the difference in attributes (56.5 percent) is slightly higher than that of the difference in returns to attributes (43.5 percent). This result means that e-firms are those with better intrinsic endowment and higher productivity, and participation in online transactions further improves their productivity. One possible explanation is that participating in online transactions requires overcoming certain barriers to entry, and only better qualified firms can cross this threshold.

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[18] The details of this method are presented in Appendix A4.

Table 6.3. Decomposition of productivity difference between e-firms and non-e-firms

	Logarithm of annual sales per worker			Decomposition	
	E-firms	Non-e-firms	Difference	Difference in attributes	Difference in returns to attributes
Jordan					
Definition 1: Having the own website or being listed on any app or website					
Difference	9.40	8.55	0.84	0.10	0.74
Percentage			100.0	11.9	88.1
Definition 2: Having online buying or selling					
Difference	9.29	8.60	0.69	0.39	0.31
Percentage			100.0	56.5	44.9
Morocco					
Definition 2: Having online buying or selling					
Difference	8.28	7.73	0.55	0.06	0.49
Percentage			100.0	10.9	89.1

Source: ERF, SED, calculated and presented by the authors.

In Morocco, productivity difference between e-firms and non-e-firms is significant only under the second definition ("online transactions"). This result suggests that participation in online transactions significantly improves the returns to attributes in Moroccan firms, which is consistent with the results of the previous section.

Figure 6.3 illustrates the results of Oaxaca decomposition for other indicators of firm performance (export and/or import, innovation and R&D). As these indicators are binary variables, the difference between the two types of firms is measured by logarithm of the ratio between probability of participating and probability of not participating (see Annex A.4). As the estimate of some probit models is not convergent if e-firms are defined as having online transactions, we use only the first definition in this analysis: e-firms are defined as having the own website or being listed on any app or website having the own website.

Figure 6.3. Decomposition of permanence differences between e-firms and non-e-firms
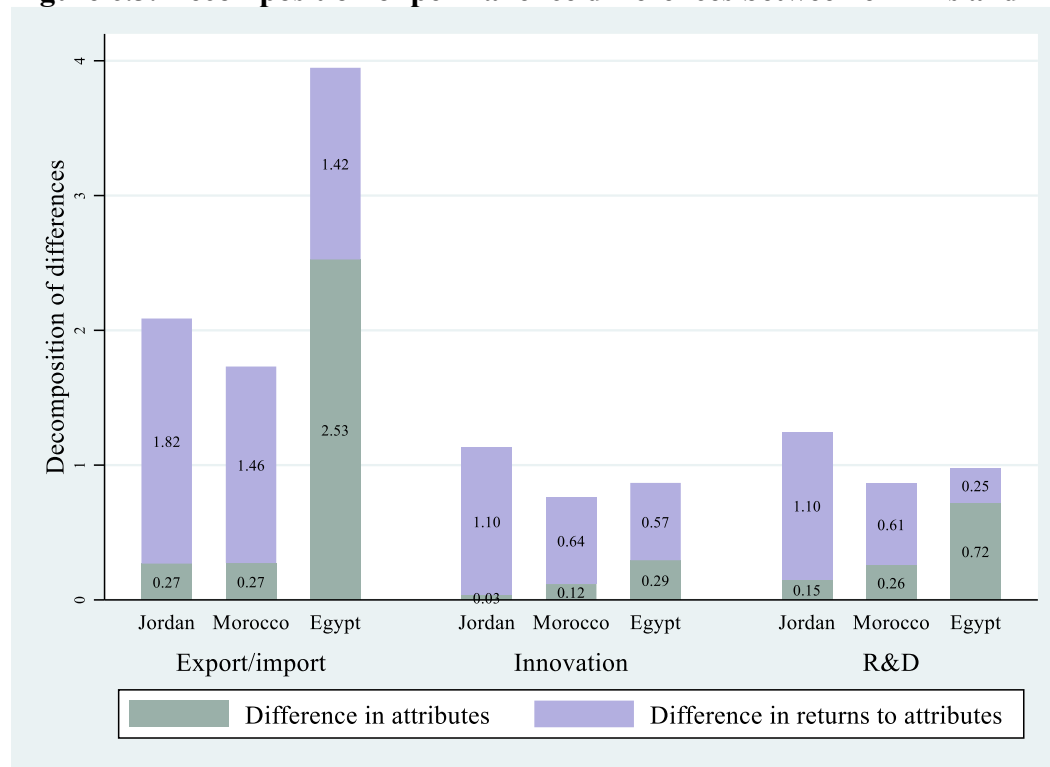
Notes: E-firms are defined as having the own website or being listed on any app or website having the own website (Definition 1).
Source: ERF, SED, calculated and presented by the authors.

For exports and/or imports, the difference between e-firms and non-e-firms is essentially explained by the difference in attributes in Jordan and Morocco. E-commerce enables firms to conduct international trade using electronic platforms on Internet, which greatly improves the efficiency of production, inventory, circulation and capital, and brings higher returns to attributes. In Egypt, two-thirds of the difference is explained by that in attributes. That is, e-firms themselves possess certain attributes that facilitate participation in exports and/or imports, and e-commerce further enhances these advantages.

Regarding introduction of new products, services, or process, most of the difference between e-firms and non-e-firms is explained by that in returns to attributes in all three countries, especially in Jordan. As for spent on R&D, in Jordan, the difference in attributes predominates in the gap between e-firms and non-e-firms; in Morocco, most of the difference is explained by that in attributes; in Egypt, the difference is essentially explained by that in attributes.

7. E-firm vs non-e-firm performance during COVID-19

The COVID-19 pandemic has dealt an unprecedented shock to firms and has had a very adverse impact on production capacity. Digitalization is increasingly considered as a key pathway to mitigate the economic losses due to the pandemic and to support recovery (Abidi et al., 2022).

Abidi et al (2021) find that during the pandemic, digitally-enabled firms in Middle East and Central Asia region faced a lower decline in sales (by about 4 percentage points) compared to digitally-constrained firms. Firms facing digital constraints are often less resilient to supply shocks. In this section, we try to answer a question: in Jordan, Morocco, and Egypt can e-commerce participation mitigate economic losses due to the pandemic?

During the pandemic, the World Bank continued to conduct ESFC (2020-2021) in some countries, but using simplified questionnaires and adding questions on the impacts of the COVID-19. These surveys allow us to study the role of e-commerce in firms' functioning. However, these surveys have not been conducted in all countries. Among our three countries studied, data from these surveys are available only for Jordan and Morocco, with four and three waves respectively in these two countries. In addition, the content of the questionnaire varies from one wave to another, and from one country to another.

In this section, e-firms are defined as having the own website. First, we analyze how the e-firms and non-e-firms operate during the COVID-19 pandemic. Table 7.1 presents the differences between the two types of firms at different periods. In Jordan, the proportion of e-firms that remain in operation is significantly higher than that of non-e-firms; that is, participation in e-commerce can strengthen firms' ability to withstand the shock of the epidemic, and reduce the risk of closure. For the firms that remained open in July 2020, only 11.3 percent of firms maintained their pre-pandemic sales level; this proportion was significantly higher in e-firms than in non-e-firms. A large proportion of firms have experienced a reduction in working hours, demand and supply; however, e-firms were relatively less affected by the pandemic. The results support that e-commerce promotes exports and innovation activities. Overall, impact of the pandemic on firms' workforces is insignificant, and the differences between e-firms and non-e-firms are not significant.

Table 7.1. Firms' operation during the COVID-19 pandemic: difference between e-firms and non-e-firms

	Jordan				Morocco		
	Wave 1: July 2020	Wave 2: December 2020	Wave 3: June 2021	Wave 4: December 2020	Wave 1: July 2020	Wave 2: February 2021	Wave 3: June 2021
Open (%)	13.7 ***	5.5 *	…	1.9	-2.2	-0.8	-1.4
Number of weeks closed due to the COVID-19 (week)	-0.5				…		
Compared to the same month of the previous year,							
the sales increased or remained the same (%)	7.8 **	7.0 **	15.1 *	18.4 **	2.5	-1.3	10.4 **
the total hours worked per week decreased (%)	-12.8 ***	-22.7 ***	-9.1	-6.8	0.8	-2.4	0.4
the demand for products and services decreased (%)	-8.4 **	-15.0 ***	-14.5	-13.1	-7.2 **	1.3	-10.4 **
the supply of inputs, raw materials, or finished goods and materials purchased to resell decreased (%)	-8.4 *	-15.5 ***	-17.2 *	-16.4 **	-4.9	0.8	-16.7 ***
Introduced new or improved products or services since the previous period/wave (%)			7.2	12.6 ***		7.7 *	7.92 **

Table 7.2. Firms' operation during the COVID-19 pandemic: difference between e-firms and non-e-firms (contd.)

Discontinued the production of some goods or the offering of any services since the previous period/wave (%)			2.7	12.8 ***		1.6	8.05 **
Having indirect & direct exports (%)	17.6 ***	23.9 ***	34.8 ***	18.0 **	4.6	10.1 ***	5.6 *
Growth rate of the number of employees since the previous period/wave (%)	-1.2	-2.2	7.6	-7.7	-0.8	4.0	0.6
Change in the proportion of female employees since the previous period/wave (%)	-1.1	1.5	-1.7	-1.6	1.8	-5.0 **	0.3
Started or increased business activity online since the previous period/wave (%)	22.2 ***	11.8 ***	47.8 ***	43.9 ***	8.1 **	16.9 ***	6.63
Started or increased remote work arrangement since the previous period/wave (%)	15.4 ***				1.5		
Share of workforce working remotely (%)	4.5 ***	2.4 ***	14.4 ***		0.3	1.7 ***	0.3
Used online technology (internet, online social media, specialized apps, or digital platforms, etc.) in response to COVID-19 outbreak (%)	9.1 **						
Having external digital platforms (apps, own website…) sales (%)	1.0				10.6 ***	19.8 ***	7.67 *

Notes: (i) *** significant at 1%; ** significant at 5%; * significant at 10%. "…" signifies that the absolute value is inferior to 0.01. (ii) At the first wave, e-firms are defined as those that had their own website before COVID-19; in the last three waves, e-firms are defined as those that started or increased business activity online since the previous wave. (iii) The difference is that in the proportion of e-firms and non-e-firms in various waves.
Source: The World Bank, ESFC, various waves (Jordan and Morocco), calculated and presented by the authors.

Since the outbreak of COVID-19, a large portion of Jordanian firms have started or increased their business activities online and have increased remote working and use of online technology. Compared to non-e-firms, e-firms have better infrastructure and richer experiences in online business activities. We also find that as the outbreak subsided, firms' production and sales gradually recovered, and the differences between e-firms and non-e-firms were less significant in waves 3 and 4.

In the case of Morocco, the differences between e-firms and non-e-firms are less significant. As we have seen in previous sections, e-commerce in Morocco is not as developed as in Jordan. Therefore, the role of e-commerce in epidemic resistance is relatively limited. Moreover, it is also possible that epidemic's severity and evolution are not the same in the two countries. However, e-firms still perform better than non-e-firms.

According to the results, there is little association between e-commerce and the change in number of employees. A possible explanation is that the survey sample is mainly composed of SMEs. The scope for personnel change is relatively limited. The impact of COVID-19 is primarily on firm survival.

We further examine the role of e-commerce in firm performance during the COVID-19 pandemic, using econometric regressions. The header of Table 7.2 presents the dependent variables. As we explained in Section 4.2, the dependent variables take their value at the survey moment (or the corresponding wave), the independent variables take their value at the previous wave. For example, in the estimation of wave 1 models, the dependent variables take their value at wave 1 in July 2020,

and the independent variables (or firm's characteristics) their value before the pandemic (December 2019). This strategy allows us to address the problem of endogeneity and/or causality. As the questionnaires used in the different waves are not the same, the dependent variables also change from one wave to another.

In the first wave (July 2020), having the own website – e-firms – significantly promotes firms' survival probability, sales level and exports in Jordan; while in Morocco, the effect of the own website does not influence performance at all.

In the second wave (the end of 2020 and the beginning of 2021), firms that have started or increased business activity online since COVID-19 outbreak are more likely to remain open in Jordan. In both countries, online business activities have a significantly positive effect on exports and introduction of new products and services.

In the third wave (June 2021), e-commerce no longer affects firm survival in the two countries. However, online business activities strengthen exports in Jordan, and promote the maintenance of sales level and the introduction of new products and services in Morocco. In addition, sales on external digital platforms significantly improve firm performance.

Table 7.3. Role of e-commerce in firm performance during the COVID-19 pandemic

		Dependent variables				
	Open	Sales increased or remained the same compared to the same month of the previous year (for open firms)	Having indirect & direct exports (for open firms)	Introduced new or improved products or services (for open firms)	Growth rate of the number of employees (for open firms)	Change in the proportion of female employees (for open firms)
Wave 1						
Jordan:						
Firms with the own website	0.272*	0.368*	0.362**			
	(1.92)	(1.70)	(2.17)			
Morocco:						
Firms with the own website	-0.220	0.096	0.077			
	(-1.17)	(0.77)	(0.66)			
Wave 2						
Jordan:						
Started or increased business activity online since COVID-19 outbreak	0.341*	0.294	0.406**	0.406**	0.102	0.371
	(1.90)	(1.41)	(2.45)	(2.45)	(0.02)	(0.27)
Morocco:						
Started or increased business activity online since COVID-19 outbreak	0.011	-0.023	0.420**	0.255*	8.812	-5.547**
	(0.10)	(-0.16)	(2.52)	(1.84)	(1.63)	(-2.34)

Table 7.4. Role of e-commerce in firm performance during the COVID-19 pandemic (contd.)

Wave 3				
Jordan:				
Started or increased business activity online since Wave 1	-0.118 (-0.50)	0.266 (1.04)	0.810*** (2.88)	
Morocco:				
Started or increased business activity online since Wave 1	0.048 (0.34)	0.323*** (2.67)	0.148 (0.86)	0.304** (2.23)
Having external digital platforms (apps, own website…) sales	-0.033 (-0.27)	0.431*** (3.86)	0.348** (2.25)	0.346*** (2.74)

Notes: t-statistics in parentheses. *** significant at 1%; ** significant at 5%; * significant at 10%. The full estimation results are presented in Appendix, Tables A3.1, A3.2, A3.3, A3.4, A3.5 and A3.6.
Source: The World Bank, ES, ESFC – various waves (Jordan and Morocco), calculated and presented by the authors.

8. E-commerce development: experience from China[19]

China has one of the fastest growing e-commerce markets in the world. It stands out among digital applications relevant to development because of its ability to instantly link sellers with buyers, lower transaction costs, and create new niche markets tailored to consumer demand. It has started reshaping the production and consumption patterns as well as changing people's daily lives.

China's experience offers useful lessons of how to harness digital technologies to aid growth and expand employment opportunities through e-commerce development. The participation in e-commerce has a positive association and with household welfare improvement, especially in rural China. Beneficiaries include vulnerable populations: women and youth. The development of e-commerce is associated with higher household consumption and reduced inequality, bringing to people in rural areas the convenience, variety, and low prices enjoyed by urban dwellers.

8.1. E-commerce development in China

E-commerce has developed rapidly in China in the recent years. According to McKinsey, China accounted for more than 40 percent of the value of e-commerce transactions worldwide. In the past fifteen years, total e-commerce trade volume increased thirty times, from less than 1,000 billion yuan in 2004 to nearly 30,000 billion yuan in 2017.

E-commerce can create jobs directly as well as through forward and backward linkages in the e-commerce ecosystem, such as express delivery, e-shop design, and e-modeling, as well as supporting more flexible entrepreneurship. Nearly 50 million people, or 5 percent of total employment, worked in e-commerce, as of 2017. Women and the youth are strong beneficiaries. The ratio of women to men entrepreneurs in e-commerce is at or near parity, compared to 1:3 in all business. 3 out of4 rural e-tailers are 20-29 years old.

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[19] This section is drawn from the World Bank report, E-commence Development: Experience from China (World Bank, 2019).

E-commerce can improve household welfare by offering a wider variety of products, potentially at lower price and better after-sales service. According to a McKinsey report, online retailing may have lowered China's average retail price. The saving in search costs and the increase in variety of products accessible online compared with traditional brick-and-mortar stores can be particularly large for people in remote areas. E-tailing is not just a replacement of purchases that would otherwise take place but could spur incremental consumption particularly in small cities and towns. A recent paper shows that nearly two thirds of goods bought through Alibaba's Rural Taobao platform were not available in the village.

Despite the apparent scale of e-commerce development, the growth of e-commerce has been unevenly distributed among provinces and between urban and rural areas. In Shanghai 49 percent and in Beijing 44 percent of total retail sales of consumer goods were purchased online in 2017, but the share was much lower (less than 2 percent) in seven inland provinces. There is room for e-commerce to grow in the less developed regions.

8.2. Taobao Villages

Taobao villages are special phenomena of e-commerce development in China. According to AliResearch, the formal definition of Taobao Village is an administrative village with a cluster of e-tailers and total annual e-commerce transaction volume of more than RMB 10 million (about US$1.5 million). The villages have at least 10 percent of households actively engaged in e-commerce or at least 100 active online shops operated by villagers, primarily using the Taobao.com platform. The number of Taobao Villages increased from 212 in 2014 to 1,311 in 2016, and to 3202 in 2018, and to over 4000 this year. Over 95 percent of the Taobao villages cluster in the eastern region, particularly in Zhejiang, Guangdong, and Jiangsu.

The World Bank-Alibaba joint research team, in collaboration with Peking University and Nankai University, conducted a survey in rural China, covering 1,400 households and 80 Taobao villages, to gather information of the characteristics of the Taobao villages in a systematic manner. From the Taobao village survey, we see that most Taobao villages are near markets with good infrastructure both on the hard side and the soft side. Firstly, all Taobao Villages have access to broadband Internet and a mobile communication network. Secondly, nearly all Taobao Villages have package pickup and express delivery services, with a wide range of logistics service providers. Thirdly, most Taobao Villages have good access to preschool education and compulsory education institutions.

Taobao villages are typically richer than non-Taobao villages. In Taobao villages, households that participate in e-commerce tend to be richer than others. Per capita income of e-households is 80 percent higher than that of other households. Three-quarters of e-households have cars compared to one-third of other households. Most people in Taobao villages perceived their social status as equal to or higher than it was 5 years ago, and they believe they will have equal or higher social status 2 years in the future. E-shop owners tend to be younger and better educated. Nearly three-quarters of

e-shop owners are between 26-35 years old; and nearly one-third have vocational high school or regular high school education. Many e-shop owners are returned migrants and women. One third of local e-shop owners have worked in cities; and one third are women. Most e-shops are small. Two-thirds are self-employed without employee; 30 percent have less than 5 employees.

8.3. Targeted support programs

The successful stories in Taobao villages sparked strong interest among researchers, policy- makers, and private sectors to explore using e-commerce as a tool for poverty alleviation and rural vitalization. The government and private sector have implemented several targeted interventions to support e-commerce development.

The Rural E-commerce Demonstration Program was launched jointly by Ministry of Finance and Ministry of Commerce in 2014. The main objective of the program is to contribute to the reduction of poverty and modernization of rural areas through the promotion of e-commerce. The main activities include establishing and improving rural e-commerce public service, fostering rural e-commerce supply chains, promoting connectivity between agriculture and commerce, and enhancing e-commerce training. The Rural E-commerce Demonstration Program expanded rapidly. By 2018, the program had supported over 1,000 demonstration counties, covering nearly 90 percent of the poverty-stricken counties.

In 2014, Alibaba Group launched the Rural Taobao Program, in collaboration with the government, and planned to invest RMB 10 billion ($1.5 billion) over the next three to five years to build an e-commerce service system reaching 1,000 counties and 100,000 villages to encourage shopping-commerce activities in rural areas. The stated objectives of the Rural Taobao Program are to enable rural residents to have a greater access to a broader variety of goods and services and help farmers to earn more by selling agricultural products directly to urban consumers using the online platforms. The Rural Taobao program expanded very rapidly, from 212 villages in 12 counties in 2014 to over 30,000 villages in 1,000 counties in 2018, spreading from the coast to inland.

The Rural Taobao Program includes four main activities. (i) Set up county and village level e-commerce service network: This activity seeks to build "incubators" by developing partners in e-commerce at the village level. These partners introduce the Alibaba online platforms to villagers, help villagers navigate the e-commerce platforms to select products and services online, and use their online payment account to place orders for villagers and collect payment when villagers are satisfied with their purchase. (ii) Improve logistical connections for villages and promote two-way circulation of goods and services. With "two-stage delivery," building out the Cainiao network using local logistics providers to deliver packages from counties to villages, Alibaba works with more than 20 local providers across the country provide secondary distribution and warehouse services, as well as subsidizing cooperatives that run distribution from the county level to villages connecting the "last-kilometer" to develop the e-commerce ecosystem. (iii) Provide training in e-commerce and promote entrepreneurship. Taobao University has built e-commerce training bases

across the country and has produced a series of online e-commerce training courses for self-learning by entrepreneurs. (iv) Provide rural financial services through AntFinancial. This include provide loans drawing from the online transaction data and offline "insider" information collected by Rural Taobao Partners; provide online payment support, including helping villagers pay utility bills, buy travel tickets, etc.; and provide online insurance support.

8.4. Experience learned

As elaborated in the World Bank report (The World Bank, 2019), three pre-conditions are pre-requisites for e-commerce development, or the "analog complements".

First, skills and entrepreneurship. The rapid development of e-commerce in rural China has built on tremendous improvements in human capital, including compulsory nine-year education as well as the experience and entrepreneurial spirits the returned migrants bring home. Measured by the Human Capital Index, China ranks 46th in the world and 6th among all upper middle-income countries in 2019.

Second, Infrastructure and logistics. The rapid development of infrastructure in China in past years, including both roads and other built infrastructure as well as logistics networks, has provided a foundation for e-commerce development. Measured by the Logistics Performance Index, China ranks 26th in the world and first among all upper-middle-income countries.

Third, an enabling business environment. China performs well overall in Doing Business metrics, but some lagging indicators need improvement. In 2019, China ranks in top quarter (46 out of 190) economies in the world in terms of ease of doing business and in the top 20 percent (11 out of the 51) among upper-middle-income economies.

9. Conclusions

E-commerce has become an emerging trend in economic development. With the right conditions, the emergence and popularization of this new business model provide an unprecedented opportunity for firms, including small and medium-sized enterprises, to expand their markets and improve their competitiveness. An effective e-commerce platform can help firms to expand sales, improve productivity, develop export and/or import, and achieve product upgrades. As indicated in Atiyas and Dutz (2021), in MENA region, overcoming the constraints of low affordability, high data prices and high income inequality, and strengthening other complementary assets, including education and skills and public infrastructure services, especially electricity, are crucial to enhance the uptake and the use of digital technology in productive activities and support economic growth and employment creation.

In this study, we use data from an original survey conducted by ERF to analyze the association of e-commerce participation and firm performance in the MENA region, taking Jordan, Morocco and Egypt as case studies. The results show that firm's e-commerce participation is relatively low in

these three countries. The proportion of firms that have the own website or have been listed on any app or website is less than a quarter, and that of participation in online transactions (e-commerce in the strict sense) is only 16 percent. Among the three countries, the level of e-commerce of Egyptian firms is significantly lower than that of the other two countries. The ERF survey primarily targets small and micro enterprises, that are essentially labor intensive, and have been concentrated in retail, wholesale, services of motor vehicles, accommodation and food services, and small manufacturing and services. These businesses play an important role in alleviating employment pressures and stimulating economic vitality. Promoting the depth and breadth of digitization of these SME can help realize their labor absorption potential and improve their competitiveness, which will contribute economic inclusion of these countries.

Firms' participation in e-commerce depends on two factors: motivation and capability, that are closely related to firm internal characteristics. We therefore analyze the factors associated with firms' participation in e-commerce from micro-economic perspective. The results show that large firms and young firms are more likely to engage in e-commerce. On the one hand, the marketing of large firms depends on a larger customer base, which encourages firms to use e-commerce to expand markets furthering the economy of scale; on the other hand, participation in e-commerce may require capital or technical investments, so large firms are in a more advantageous position to overcome barriers to entry. Also, new firms/young firms are more likely to be influenced by modern marketing fads and technologies, and thus are more receptive to adopt e-commerce. The role of industry varies from country to country. Generally speaking, firms in "Information and communication, IT; finance, real estate" are the most active in participating in e-commerce. The effect of industries "Non-metal products" and "Transportation & storage; accommodation & food services" are also significant. In addition, e-commerce platforms promote female employment to a certain extent. Our study also confirms the important role of human capital in e-commerce participation: firms with more educated owner/CEO and employees are more likely to engage in e-commerce.

According to our results, e-commerce participation is positively associated with annual sales per employee (productivity) in Jordan, using both definitions of e-firms. In fact, Jordanian e-firms are the most developed of the three countries studied. For Moroccan firms, the productivity is significantly higher in firms that have online transactions than in other firms. In Egypt, e-commerce participation is not associated with productivity in a significant manner. However, total annual sales volume (production) is always positively related to e-commerce participation in the three countries. E-commerce can reduce information asymmetries between (often low-tech) service firms and consumers, and also enable firms to access wider markets, giving productive firms more opportunities to grow.

Our analyses reveal that participation in e-commerce is positively associated with firms' exports and imports in all three countries. E-commerce has brought important changes to transaction patterns of international trade. On the one hand, e-commerce shortens transaction distance and

trading time, so that transaction is not limited by geographical location, which creates more business opportunities for enterprises of various countries; on the other hand, e-commerce simplifies transaction process and improves efficiency. In particular, e-commerce allows SMEs to export and/or import directly via Internet platforms, which lowers barriers to enter into international trade and promotes its diversification. MENA countries' participation in GVCs is low compared to other countries. Trade growth driven by e-commerce can make it easier for these countries to link their domestic markets and international trade based on GVCs, with the right conditions, it can be impactful in reducing poverty and creating productive jobs.

Our results also show that e-commerce participation is positively associated with innovation activities, namely introduction of new products/services/process ant expenditure on R&D. On the one hand, e-commerce increases the demand for products in market, as well as the demand for product diversification. This trend is increasing competition in market. Therefore, firms need to continuously improve their competitiveness that largely depends on innovation activities. On the other hand, e-commerce allows firms to extend their horizon and broaden the sources of information, promoting innovation. Thus, e-commerce reinforces both firms' motivation and capacity for innovation.

In the decomposition of difference in performance between e-firms and non-e-firms, we find that, in the case where e-commerce is more developed (e.g. in Jordan), the difference is mainly determined by the differences in returns to attributes. Conversely, if e-commerce is not yet developed (e.g. in Egypt), firm characteristics play a more important role than the returns to attributes.

The COVID-19 pandemic has caused an unprecedented shock to businesses, with adverse consequences for production capacity, markets, supply chains and employment. At the same time, digitalization is increasingly being touted as a key avenue to mitigate economic losses from the pandemic. We analyzed survey data from Jordan and Morocco to examine whether digital activities can mitigate economic losses resulting from the pandemic. We find that firms involved in e-commerce are performing better than others during the pandemic. During the early stage of the epidemic, e-commerce improved the viability of enterprises and enhanced their ability to maintain the level of sales. Furthermore, online business activities also have played a positive role in firms' exports and introduction or improvement of new products or services. Closing the digital gap and accelerate digital transformation for all firms, including SMEs, can play an important role in supporting the recovery post the pandemic.

The experience of China's e-commerce development can provide reference for MENA countries. First, the success of e-commerce development in rural China shows that the benefits of digital technology are not necessarily limited to high-income countries and urban areas. With the right conditions, it can flourish in developing countries, in rural areas, and can be a powerful instrument for rural vitalization and poverty reduction. Second, the rapid development of e-commerce should

build on improvement in human capital as well as logistics and transport infrastructure. Third, creating an enabling business environment and developing a beneficial collaboration between the public and private sectors are keys to success.

As indicated in many studies, strengthening the institutional and regulatory framework is crucial for the MENA countries to support access to and use of digital technologies and market platforms by all business (Hoekman, 2021). This is particularly important for SMEs, which stand for the majority of firms and provide a large share of employment. There is no one-size-fits-all approach as countries face their own unique challenges. Increasing the investment in the human capital and physical capital and as well as improving business environment are important to support the participation in e-commerce and enhance the benefits and the inclusiveness of such participation. Appropriate policies and regulatory frameworks both from the supply- and demand- sides are critical to support greater uptake and use of the technology (Atiyas and Dutz, 2021). To support universal access to digital technologies and the use of digital technologies for economic purposes, it is important to overcome the digital paradox, including increasing the availability and use of mobile money and digital payments, and strengthening the enabling regulatory framework for e-commerce transactions, to accelerate the digital economy transformation (Cusolito et al., 2021).

Some limitations of this study are worth mentioning here. First, the ERF survey was conducted over phone from April to September 2022. Due to the epidemic and other factors, the refusal rate in the survey was relatively high. Moreover, as the interviews were conducted by telephone, questionnaires were simplified, which greatly limited the depth of this study. Second, the proportion of missing values in the responses to certain sensitive questions (such as annual sales/revenue, fixed assets, labor cost, etc.) is relatively high. On the one hand, the high missing values resulted in dropping some variables in the analysis; on the other hand, to some extent they risk biasing the statistical results. Therefore, the results should be interpreted with caution. Third, e-commerce is an emerging business activity that is very rich in content and continues to evolve over time. To our knowledge, ERF survey is the first in these countries on e-firms, and our study is therefore a pioneering initiative. We have defined e-firms in two different ways in our analysis. But each definition has its limits, which to some extent affects the relevance of the results. Therefore, further research is needed in the future. Forth, this study analyzes the relationship between e-commerce and firm performance from a microeconomic perspective at firm-level. However, the depth and breadth of participation in e-commerce depends on both intrinsic firm characteristics and external digital environment, such as digital infrastructure, digital payment system, regulatory framework, as well as industrial development strategy, human capital, etc. In the future, it would be useful to carry out a conjunctural analysis by examining the interactions between firms' individual characteristics and macro-economic factors. Finally, as the ERF survey includes only one-year cross-sectional data and the limited number of variables does not allow us to perform a very rigorous econometric analysis. Some results should be interpreted with caution, particularly related to endogeneity and causality. However, we believe that the value of these data lies essentially in their originality, because this is the first firm-level survey on e-commerce in these

three countries. Although there is room to improve the survey in the future, the survey largely sheds light on the development of firms' e-commerce in the case study countries.

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Appendix

A1. Measurement of total annual sales/revenue
In the survey, total annual sales/revenue is measured by the following two questions:

FIR27: What was this establishment's total annual sales/revenue in 2021?

FIR28: What category was the establishment's total annual sales/revenue in 2021?

The categories of FIR28 vary by country due to different currency units, and are detailed in Table A1.1.

Table A1.1. Categories of total annual sales/revenue in 2021: original variable

Value	Jordan	Morocco	Egypt
1	1000000 JOD or more	20000000 dirham or more	5000000 EGP or more
2	150000-1000000 JOD	4000000-20000000 dirham	1000000-5000000 EGP
3	30000-150000 JOD	500000-4000000 dirham	200000-1000000 EGP
4	15000-30000 JOD	250000-500000 dirham	100000-200000 EGP
5	0-15000 JOD	0-250000 dirham	0-100000 EGP

Source: ERF, SED.

The response to FIR27 allows to calculate firm's productivity, i.e. annual sales per employee. However, given difficulty of answering exact sales' value, a large part of firms have chosen to answer this question by sales range, i.e. FIR28. In the analysis, we merge the two questions.in order to expand the number of observations. We first put the valid values of total sales to the 4 categories by creating a new variable which is derived from the original variable FIR27 (see Table A1.2). Then we merge this derived variable with FIR28.

Table A1.2. Categories of total annual sales/revenue in 2021: derived variable

Value	Category	Jordan	Morocco	Egypt
1	Low	0-15000 JOD	0-250000 dirham	0-100000 EGP
2	Medium	15000-30000 JOD	250000-500000 dirham	100000-200000 EGP
3	High	30000-150000 JOD	500000-4000000 dirham	200000-1000000 EGP
4	Very high	150000 JOD or more	4000000 dirham or more	1000000 EGP or more

Source: ERF, SED.

Table A1.3 summarizes the numbers of missing values for the original variable FIR27 and the derived variable.

Table A1.3. Number of valid values in the response to total annual sales/revenue in 2021

	Jordan		Morocco		Egypt	
	Frequency	%	Frequency	%	Frequency	%
Original variable (FIR27)	274	29.9	269	33.3	611	24.2
Completed by the categories (FIR28)	745	81.3	651	80.7	588	73.0
Total number of observations	916	100.0	807	100.0	806	100.0

Source: ERF, SED, calculated and presented by the authors.

A2. Analysis of Survey of Enterprises' Digitization data

Table A2.1. Association between e-commerce participation and volume of sales (Ordered probit model, weighted values)

Dependent variable: Category of annual sales: Very high=4; High=3; Medium=2; Low=1

	Jordan		Morocco		Egypt	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Firm size (/100)	0.018***	0.018***	0.010*	0.012**	0.009***	0.011***
	(3.09)	(3.18)	(1.69)	(2.01)	(2.88)	(3.34)
Squared firm size (/10000)	-0.026***	-0.027***	0.037	0.022	-0.005**	-0.006***
	(-3.04)	(-3.14)	(1.02)	(0.62)	(-2.38)	(-2.79)
Firm's age (Ref.: 20 years or above)						
1-2 years	0.403**	0.402**	0.070	0.046	-0.169	-0.146
	(2.55)	(2.53)	(0.25)	(0.17)	(-0.61)	(-0.52)
3-5 years	0.346*	0.352*	0.228	0.281	0.522	0.534
	(1.90)	(1.94)	(0.85)	(1.07)	(1.55)	(1.62)
6-9 years	0.549***	0.553***	0.212	0.270	0.265	0.272
	(3.35)	(3.35)	(0.78)	(0.99)	(0.99)	(1.01)
10-19 years	0.319*	0.335*	0.105	0.146	-0.095	-0.026
	(1.73)	(1.81)	(0.34)	(0.47)	(-0.32)	(-0.09)
Don't know	0.222	0.242	-0.109	-0.031	-0.901*	-0.825*
	(0.76)	(0.79)	(-0.36)	(-0.10)	(-1.92)	(-1.71)
Industry						
Agriculture, fishing or mining; industry of food	1.228**	1.231***	Ref.	Ref.	1.790***	1.573***
	(2.55)	(2.62)			(4.03)	(3.34)
Textile & garments; leather products	0.983*	0.952*	0.097	0.103	1.738***	1.455***
	(1.89)	(1.86)	(0.28)	(0.29)	(4.29)	(3.26)
Mechanics, electronics, vehicles, metal products	Ref.	Ref.	-0.193	-0.066	1.508***	1.471***
			(-0.47)	(-0.16)	(3.68)	(3.09)
Non-metal products	0.836*	0.863*	0.279	0.352	1.235***	0.986**
	(1.84)	(1.94)	(0.93)	(1.13)	(2.97)	(2.19)
Construction or utilities	1.180***	1.173***	0.021	0.045	0.730	0.306
	(2.81)	(2.85)	(0.05)	(0.11)	(1.33)	(0.50)
Retail, wholesale, services of motor vehicles	0.936**	0.911**	-0.022	0.013	1.453***	1.201***
	(2.42)	(2.41)	(-0.07)	(0.04)	(4.39)	(3.25)
Transportation & storage; accommodation & food services	0.917**	0.927**	0.119	0.122	1.406***	1.202***
	(2.14)	(2.19)	(0.45)	(0.45)	(3.47)	(2.77)
Information and communication, IT; finance, real estate	1.045**	1.092**	0.224	0.293	1.744***	1.674***
	(2.41)	(2.56)	(0.73)	(0.94)	(4.37)	(4.01)
Education; health	1.032**	1.010**	-0.089	-0.112	Ref.	Ref.
	(2.42)	(2.42)	(-0.29)	(-0.36)		
Other manufacturing or services	0.755*	0.753*	-0.245	-0.209	1.389***	1.171***
	(1.69)	(1.72)	(-0.69)	(-0.59)	(3.84)	(2.99)
Urban	0.235	0.256	0.240	0.174	0.064	0.073
	(1.44)	(1.56)	(0.96)	(0.72)	(0.23)	(0.27)
Share of female workers	-0.001	-0.001	0.002	0.002	0.001	0.001
	(-0.41)	(-0.37)	(0.54)	(0.57)	(0.32)	(0.21)
Owner/CEO's characteristics						
Male	0.328*	0.309*	0.645***	0.649***	0.690	0.983**
	(1.84)	(1.67)	(3.98)	(4.04)	(1.36)	(2.12)
Educational level (Ref.: Less than secondary)						
Secondary Technical or intermediate institute	0.397**	0.408**	-0.183	-0.278	0.595**	0.616**
	(2.22)	(2.26)	(-0.44)	(-0.67)	(2.27)	(2.34)
University or above	0.754***	0.764***	0.029	-0.001	1.165***	1.204***
	(3.92)	(3.97)	(0.07)	(-0.00)	(4.06)	(4.17)
Don't know	-0.149	-0.184	0.114	0.141	0.324	0.503
	(-0.31)	(-0.39)	(0.27)	(0.33)	(0.69)	(1.02)
Share of highly educated workers (Ref.: 25% or less)						
26% to 50%	-0.042	-0.017	0.354**	0.371**	0.304	0.325
	(-0.25)	(-0.10)	(2.39)	(2.50)	(1.30)	(1.39)
51% to 75%	0.415**	0.470**	0.185	0.165	-0.429	-0.420
	(2.07)	(2.31)	(1.01)	(0.88)	(-1.56)	(-1.52)
More than 75%	-0.178	-0.136	0.226	0.263	-0.337	-0.305
	(-1.20)	(-0.93)	(1.06)	(1.21)	(-1.38)	(-1.31)

Table A2.1. Association between e-commerce participation and volume of sales (contd.)

	Jordan		Morocco		Egypt	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Participation in e-commerce						
Having the own website or being listed on any app or website	0.415***		0.420***		0.695***	
	(3.30)		(3.24)		(3.03)	
Having online buying or selling		0.358***		0.461***		0.469**
		(3.26)		(3.92)		(2.27)
Constant	2.842***	2.846***	1.383***	1.358***	3.517***	3.619***
	(5.74)	(5.82)	(2.79)	(2.72)	(5.29)	(5.46)
	3.227***	3.230***	2.129***	2.102***	3.997***	4.095***
	(6.48)	(6.56)	(4.25)	(4.18)	(5.91)	(6.08)
	3.842***	3.841***	3.158***	3.127***	4.643***	4.726***
	(7.56)	(7.65)	(6.11)	(6.05)	(6.57)	(6.75)
Pseudo R^2	0.110	0.108	0.086	0.085	0.181	0.173
Number of observations	745	745	651	651	588	588

Notes: t-statistics in parentheses. *** significant at 1%; ** significant at 5%; * significant at 10%.

Source: ERF, SED, calculated and presented by the authors.

Table A2.2. Association between e-commerce participation and export & import (Probit model, weighted values)

Dependent variable: Category of annual sales: Very high=4; High=3; Medium=2; Low=1

	Jordan		Morocco		Egypt	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Firm size (/100)	0.674**	0.756**	0.878**	0.952**	1.001***	1.155***
	(2.12)	(2.41)	(2.30)	(2.45)	(3.73)	(4.35)
Squared firm size (/10000)	-0.106*	-0.117**	-0.035	-0.051	-0.200***	-0.225***
	(-1.86)	(-2.06)	(-0.29)	(-0.41)	(-2.98)	(-3.33)
Firm's age (Ref.: 20 years or above)						
1-2 years	0.000	-0.007	-0.356	-0.426	0.050	0.113
	(0.00)	(-0.04)	(-1.15)	(-1.34)	(0.21)	(0.48)
3-5 years	0.577***	0.633***	-0.329	-0.300	0.333	0.379
	(2.94)	(3.17)	(-1.10)	(-0.98)	(1.42)	(1.62)
6-9 years	0.374**	0.391**	-0.188	-0.063	0.399*	0.453**
	(2.09)	(2.14)	(-0.63)	(-0.21)	(1.85)	(2.11)
10-19 years	0.400**	0.492**	-0.341	-0.204	0.473**	0.531**
	(2.02)	(2.44)	(-1.02)	(-0.60)	(2.22)	(2.48)
Don't know	-0.407	-0.469	-0.810**	-0.565	0.266	0.267
	(-0.83)	(-0.93)	(-2.33)	(-1.60)	(0.78)	(0.78)
Industry						
Agriculture, fishing or mining; industry of food	4.872	5.031	Ref.	Ref.	1.525***	1.522***
	(0.03)	(0.04)			(3.93)	(3.93)
Textile & garments; leather products	5.613	5.667	1.031**	0.916**	1.217***	1.014**
	(0.04)	(0.04)	(2.34)	(2.07)	(2.72)	(2.22)
Mechanics, electronics, vehicles, metal products	Ref.	Ref.	1.020**	0.949**	0.885**	0.966**
			(2.28)	(2.12)	(2.00)	(2.17)
Non-metal products	5.209	5.230	1.128***	0.997**	1.123***	1.038***
	(0.04)	(0.04)	(2.70)	(2.39)	(2.98)	(2.75)
Construction or utilities	4.938	4.994	0.460	0.362	0.526	0.338
	(0.03)	(0.04)	(0.88)	(0.69)	(1.00)	(0.65)
Retail, wholesale, services of motor vehicles	4.992	5.040	1.077***	0.917**	1.185***	1.124***
	(0.03)	(0.04)	(2.68)	(2.28)	(3.66)	(3.44)
Transportation & storage; accommodation & food services	4.189	4.224	0.394	0.208	0.721*	0.669*
	(0.03)	(0.03)	(1.00)	(0.53)	(1.92)	(1.75)
Information and communication, IT; finance, real estate	4.521	4.615	0.634	0.498	0.305	0.247
	(0.03)	(0.03)	(1.50)	(1.18)	(0.81)	(0.65)
Education; health	4.166	4.142	0.719*	0.472	Ref.	Ref.
	(0.03)	(0.03)	(1.70)	(1.12)		
Other manufacturing or services	3.942	3.995	0.154	-0.032	0.796**	0.775**
	(0.03)	(0.03)	(0.31)	(-0.06)	(2.33)	(2.25)
Urban	0.710**	0.742**	0.576	0.431	-0.231	-0.187
	(2.46)	(2.49)	(1.43)	(1.12)	(-1.01)	(-0.82)
Share of female workers	0.004	0.003	0.000	0.000	0.005*	0.006**
	(1.48)	(1.27)	(0.11)	(0.16)	(1.89)	(2.12)
Owner/CEO's characteristics						
Male	0.437**	0.498**	0.216	0.262	-0.071	0.041
	(2.04)	(2.29)	(1.24)	(1.47)	(-0.35)	(0.20)
Educational level (Ref.: Less than secondary)						
Secondary Technical or intermediate institute	0.501*	0.512*	0.608	0.440	4.077	4.241
	(1.93)	(1.91)	(1.54)	(1.17)	(0.04)	(0.03)
University or above	0.974***	0.955***	0.447	0.410	4.423	4.608
	(3.70)	(3.53)	(1.16)	(1.11)	(0.05)	(0.03)
Don't know	0.586	0.665	0.540	0.606	4.594	4.871
	(1.36)	(1.53)	(1.35)	(1.58)	(0.05)	(0.03)
Share of highly educated workers (Ref.: 25% or less)						
26% to 50%	0.443**	0.461**	0.164	0.235	-0.239	-0.178
	(2.44)	(2.51)	(1.08)	(1.52)	(-1.20)	(-0.91)
51% to 75%	0.277	0.274	0.319*	0.251	-0.175	-0.110
	(1.28)	(1.24)	(1.81)	(1.38)	(-0.81)	(-0.51)
More than 75%	0.227	0.286*	0.059	0.087	0.160	0.236
	(1.38)	(1.74)	(0.29)	(0.42)	(0.87)	(1.32)

Table A2.2. Association between e-commerce participation and export & import (contd.)

	Jordan		Morocco		Egypt	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Participation in e-commerce						
Having the own website or being listed on any app or website	0.588***		0.820***		0.555***	
	(4.70)		(6.84)		(4.07)	
Having online buying or selling		0.763***		0.997***		0.375***
		(6.37)		(8.04)		(2.80)
Constant	-8.287	-8.567	-3.168***	-3.055***	-6.765	-7.065
	(-0.06)	(-0.06)	(-4.28)	(-4.32)	(-0.07)	(-0.05)
Pseudo R^2	0.226	0.249	0.170	0.197	0.206	0.194
Number of observations	916	916	807	807	806	806

Notes: t-statistics in parentheses. *** significant at 1%; ** significant at 5%; * significant at 10%.
Source: ERF, SED, calculated and presented by the authors.

Table A2.3. Association between e-commerce participation and innovation (Probit model, weighted values)

Dependent variable: Category of annual sales: Very high=4; High=3; Medium=2; Low=1

	Jordan		Morocco		Egypt	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Firm size (/100)	0.346	0.328	0.457	0.509	-0.024	0.029
	(1.10)	(1.04)	(1.05)	(1.16)	(-0.11)	(0.14)
Squared firm size (/10000)	-0.046	-0.043	0.011	0.008	0.010	0.009
	(-0.81)	(-0.75)	(0.09)	(0.06)	(0.63)	(0.58)
Firm's age (Ref.: 20 years or above)						
1-2 years	0.632***	0.607***	-0.324	-0.318	-0.218	-0.295
	(3.54)	(3.37)	(-0.95)	(-0.93)	(-0.80)	(-1.12)
3-5 years	0.582***	0.561***	0.006	-0.067	-0.297	-0.345
	(3.51)	(3.36)	(0.03)	(-0.30)	(-1.17)	(-1.40)
6-9 years	0.650***	0.628***	0.018	0.017	-0.187	-0.215
	(3.45)	(3.33)	(0.08)	(0.08)	(-0.71)	(-0.80)
10-19 years	0.567***	0.557***	-0.293	-0.262	-0.189	-0.204
	(3.19)	(3.11)	(-1.37)	(-1.21)	(-0.86)	(-0.92)
Don't know	-0.363	-0.400	-0.249	-0.175	-1.961***	-2.008***
	(-0.94)	(-1.02)	(-1.04)	(-0.72)	(-5.44)	(-5.22)
Industry						
Agriculture, fishing or mining; industry of food	0.381	0.408	0.304	0.331	0.309	0.390
	(0.98)	(1.03)	(1.13)	(1.21)	(0.81)	(1.02)
Textile & garments; leather products	0.961**	0.943**	0.240	0.189	0.405	0.409
	(2.04)	(2.02)	(0.82)	(0.65)	(1.16)	(1.20)
Mechanics, electronics, vehicles, metal products	Ref.	Ref.	0.426	0.483	0.460	0.654*
			(1.36)	(1.51)	(1.22)	(1.73)
Non-metal products	0.188	0.170	0.305	0.274	0.086	0.050
	(0.51)	(0.46)	(1.20)	(1.08)	(0.23)	(0.14)
Construction or utilities	0.203	0.196	0.216	0.216	0.148	-0.098
	(0.60)	(0.59)	(0.59)	(0.59)	(0.21)	(-0.17)
Retail, wholesale, services of motor vehicles	0.221	0.209	Ref.	Ref.	0.159	0.145
	(0.75)	(0.72)			(0.67)	(0.61)
Transportation & storage; accommodation & food services	0.238	0.247	0.413**	0.345*	0.247	0.127
	(0.71)	(0.74)	(2.17)	(1.78)	(0.63)	(0.33)
Information and communication, IT; finance, real estate	0.369	0.402	0.829***	0.819***	0.675*	0.665*
	(1.10)	(1.21)	(3.59)	(3.46)	(1.89)	(1.84)
Education; health	0.313	0.327	0.691***	0.625**	0.491	0.447
	(0.93)	(0.99)	(2.69)	(2.37)	(1.12)	(1.02)
Other manufacturing or services	0.205	0.223	0.158	0.127	Ref.	Ref.
	(0.60)	(0.66)	(0.55)	(0.42)		
Urban	0.349**	0.350**	0.203	0.230	-0.130	-0.136
	(2.10)	(2.08)	(0.75)	(0.86)	(-0.52)	(-0.54)
Share of female workers	0.005**	0.005*	-0.005*	-0.004	0.000	-0.001
	(2.10)	(1.96)	(-1.73)	(-1.55)	(0.05)	(-0.15)
Owner/CEO's characteristics						
Male	0.267	0.266	-0.200	-0.188	-0.072	0.088
	(1.50)	(1.50)	(-1.17)	(-1.07)	(-0.19)	(0.24)
Educational level (Ref.: Less than secondary)						
Secondary Technical or intermediate institute	0.092	0.080	0.395	0.315	0.053	0.027
	(0.57)	(0.48)	(1.19)	(0.94)	(0.23)	(0.12)
University or above	0.306*	0.273	0.261	0.243	0.236	0.286
	(1.76)	(1.57)	(0.82)	(0.77)	(0.82)	(1.01)
Don't know	0.442	0.427	0.295	0.316	0.359	0.553
	(1.25)	(1.20)	(0.87)	(0.93)	(0.66)	(1.05)
Share of highly educated workers (Ref.: 25% or less)						
26% to 50%	0.187	0.189	0.088	0.079	0.147	0.108
	(1.19)	(1.20)	(0.58)	(0.53)	(0.63)	(0.45)
51% to 75%	0.134	0.142	0.171	0.070	0.078	0.060
	(0.69)	(0.73)	(0.96)	(0.39)	(0.26)	(0.20)
More than 75%	-0.090	-0.074	0.382**	0.348*	-0.244	-0.241
	(-0.65)	(-0.54)	(1.97)	(1.73)	(-0.97)	(-0.97)

Table A2.3. Association between e-commerce participation and innovation (contd.)

	Jordan		Morocco		Egypt	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Participation in e-commerce						
Having the own website or being listed on any app or website	0.299**		0.252*		0.490**	
	(2.49)		(1.88)		(2.33)	
Having online buying or selling		0.472***		0.715***		0.890***
		(4.36)		(5.20)		(4.20)
Constant	-2.280***	-2.266***	-0.976**	-1.028**	-0.734	-0.906*
	(-5.63)	(-5.60)	(-1.99)	(-2.10)	(-1.42)	(-1.81)
Pseudo R^2	0.080	0.089	0.073	0.099	0.091	0.121
Number of observations	916	916	807	807	806	806

Notes: t-statistics in parentheses. *** significant at 1%; ** significant at 5%; * significant at 10%.
Source: ERF, SED, calculated and presented by the authors.

Table A2.4. Association between e-commerce participation and R&D (Probit model, weighted values)

Dependent variable: Category of annual sales: Very high=4; High=3; Medium=2; Low=1

	Jordan		Morocco		Egypt	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Firm size (/100)	0.522*	0.576*	1.132*	1.231*	0.789*	0.936**
	(1.74)	(1.91)	(1.66)	(1.81)	(1.67)	(1.99)
Squared firm size (/10000)	-0.064	-0.073	-0.620	-0.635*	-0.109	-0.132
	(-1.18)	(-1.34)	(-1.63)	(-1.68)	(-1.17)	(-1.41)
Firm's age (Ref.: 20 years or above)						
1-2 years	0.387**	0.327*	-0.639*	-0.720**	0.004	-0.051
	(2.27)	(1.85)	(-1.77)	(-2.02)	(0.01)	(-0.18)
3-5 years	0.567***	0.517***	0.320	0.235	-0.372	-0.385
	(3.47)	(3.07)	(1.23)	(0.89)	(-1.35)	(-1.43)
6-9 years	0.476**	0.423**	0.138	0.135	-0.227	-0.244
	(2.53)	(2.23)	(0.55)	(0.51)	(-0.75)	(-0.79)
10-19 years	0.299*	0.268	0.265	0.314	-0.157	-0.165
	(1.71)	(1.49)	(1.04)	(1.18)	(-0.66)	(-0.69)
Don't know	0.709**	0.710**	0.073	0.150	-0.847*	-0.857*
	(2.43)	(2.22)	(0.27)	(0.53)	(-1.73)	(-1.76)
Industry						
Agriculture, fishing or mining; industry of food	0.792**	0.862**	1.062**	1.116***	0.425	0.511
	(2.13)	(2.29)	(2.57)	(2.65)	(0.96)	(1.11)
Textile & garments; leather products	1.150**	1.142**	0.877**	0.866**	-0.249	-0.146
	(2.44)	(2.49)	(2.07)	(2.01)	(-0.53)	(-0.29)
Mechanics, electronics, vehicles, metal products	Ref.	Ref.	0.509	0.566	0.525	0.717
			(1.17)	(1.30)	(1.09)	(1.49)
Non-metal products	0.677*	0.691*	0.931**	0.913**	0.272	0.306
	(1.92)	(1.91)	(2.21)	(2.13)	(0.70)	(0.75)
Construction or utilities	0.547*	0.555*	Ref.	Ref.	0.866	0.764
	(1.70)	(1.76)			(1.21)	(1.14)
Retail, wholesale, services of motor vehicles	0.368	0.366	0.844**	0.899**	0.554*	0.606*
	(1.29)	(1.30)	(2.23)	(2.30)	(1.69)	(1.76)
Transportation & storage; accommodation & food services	0.599*	0.642**	1.163***	1.118***	Ref.	Ref.
	(1.82)	(1.97)	(3.22)	(3.01)		
Information and communication, IT; finance, real estate	0.523	0.608*	1.542***	1.583***	0.758*	0.785*
	(1.60)	(1.89)	(3.85)	(3.86)	(1.76)	(1.78)
Education; health	0.359	0.378	1.617***	1.612***	0.302	0.323
	(1.07)	(1.15)	(4.11)	(3.95)	(0.63)	(0.68)
Other manufacturing or services	0.430	0.461	0.726*	0.708	0.647*	0.686*
	(1.31)	(1.43)	(1.71)	(1.61)	(1.75)	(1.78)
Urban	0.153	0.165	0.141	0.154	-0.184	-0.173
	(1.04)	(1.10)	(0.42)	(0.49)	(-0.68)	(-0.63)
Share of female workers	0.007***	0.007***	-0.004	-0.004	0.007*	0.007*
	(2.97)	(2.76)	(-1.60)	(-1.45)	(1.73)	(1.73)
Owner/CEO's characteristics						
Male	0.057	0.033	-0.421**	-0.419**	-0.040	0.057
	(0.31)	(0.18)	(-2.53)	(-2.54)	(-0.10)	(0.15)
Educational level (Ref.: Less than secondary)						
Secondary Technical or intermediate institute	-0.061	-0.074	0.231	0.122	0.237	0.220
	(-0.40)	(-0.47)	(0.58)	(0.31)	(0.89)	(0.82)
University or above	-0.244	-0.278	0.155	0.108	0.376	0.391
	(-1.44)	(-1.62)	(0.42)	(0.30)	(1.21)	(1.25)
Don't know	0.055	0.060	-0.219	-0.251	0.485	0.571
	(0.17)	(0.18)	(-0.56)	(-0.64)	(0.88)	(1.07)
Share of highly educated workers (Ref.: 25% or less)						
26% to 50%	0.056	0.070	-0.058	-0.072	0.006	0.006
	(0.36)	(0.45)	(-0.35)	(-0.42)	(0.02)	(0.02)
51% to 75%	-0.116	-0.089	0.200	0.087	0.240	0.253
	(-0.59)	(-0.46)	(1.05)	(0.44)	(0.80)	(0.84)
More than 75%	0.155	0.208	0.183	0.130	-0.057	-0.013
	(1.14)	(1.51)	(0.87)	(0.61)	(-0.23)	(-0.05)

Table A2.4. Association between e-commerce participation and R&D (contd.)

	Jordan		Morocco		Egypt	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Participation in e-commerce						
Having the own website or being listed on any app or website	0.580***		0.282**		0.366	
	(4.78)		(2.05)		(1.59)	
Having online buying or selling		0.712***		0.767***		0.451**
		(6.49)		(5.42)		(2.14)
Constant	-1.762***	-1.730***	-1.986***	-2.041***	-1.585***	-1.746***
	(-4.56)	(-4.47)	(-3.38)	(-3.48)	(-2.58)	(-2.84)
Pseudo R^2	0.088	0.098	0.110	0.143	0.130	0.133
Number of observations	916	916	807	807	806	806

Notes: t-statistics in parentheses. *** significant at 1%; ** significant at 5%; * significant at 10%.
Source: ERF, SED, calculated and presented by the authors.

Table A2.5. Differences between e-firms and non-e-firms

	Definition 1: Having the own website or being listed on any app or website			Definition 2: Having online buying or selling		
	Yes	Non	Difference	Yes	Non	Difference
Jordan						
Logarithm of annual sales per employee	9.32	8.56	0.75 *** (3.10)	9.21	8.56	0.65 *** (2.79)
Export & import (%)	34.4	10.2	24.2 *** (9.16)	34.7	9.2	25.4 *** (9.91)
Having introduced innovation (%)	46.9	24.5	22.3 *** (6.72)	49.5	22.7	26.8 *** (8.35)
Having spent on R&D (%)	54.7	27.0	27.7 *** (8.18)	57.0	25.0	32.0 *** (9.81)
Morocco						
Logarithm of annual sales per employee	8.03	7.73	0.30 (1.57)	8.04	7.73	0.31 * (1.66)
Export & import (%)	33.2	10.1	23.1 *** (8.45)	35.3	9.1	26.2 *** (9.67)
Having introduced innovation (%)	52.0	34.7	17.3 *** (4.80)	59.1	31.2	27.9 *** (7.88)
Having spent on R&D (%)	37.6	21.6	16.0 *** (4.90)	44.6	18.2	26.4 *** (8.28)
Egypt						
Logarithm of annual sales per employee	7.69	7.57	0.12 (0.51)	7.72	7.53	0.19 (0.86)
Export & import (%)	30.2	9.0	21.2 *** (8.06)	26.6	11.9	14.7 *** (5.36)
Having introduced innovation (%)	38.4	24.0	14.4 *** (4.40)	42.1	22.7	19.4 *** (5.85)
Having spent on R&D (%)	35.4	18.8	16.6 *** (5.38)	38.5	18.0	20.5 *** (6.54)

Notes: t-statistics in parentheses. *** significant at 1%; ** significant at 5%; * significant at 10%.
Source: ERF, SED, calculated and presented by the authors.

A3. Analysis of World Bank Enterprise Survey data

Table A3.1. Role of e-commerce participation in firm performance: Jordan, July 2020 (Probit model, weighted values)

	Dependent variable (in July 2020)					
	Open		Sales increased or remained the same compared to the same month in 2019 (for open firms)		Having indirect & direct exports (for open firms)	
Firm's characteristics in 2019						
Logarithm of firm size	0.071	(1.25)	0.198***	(2.79)	0.294***	(5.15)
Firm's age (Ref.: More than 30 years)						
Less than 10 years	-0.374*	(-1.86)	0.110	(0.48)	0.363**	(1.99)
10-19 years	0.093	(0.47)	0.108	(0.43)	0.145	(0.72)
20-29 years	0.172	(0.80)	-0.378	(-1.21)	-0.440*	(-1.85)
Industry (Ref.: Other Services)						
Food	0.209	(1.03)	0.448	(1.61)	1.255***	(5.13)
Garments	-0.073	(-0.34)	-0.693*	(-1.78)	1.084***	(4.21)
Other Manufacturing	0.273	(1.38)	-0.122	(-0.44)	1.107***	(4.91)
Retail	0.322*	(1.78)	0.035	(0.13)	1.012***	(4.73)
Percentage of highly Skilled production workers	0.015	(0.09)	0.004	(0.73)	-0.003	(-0.82)
Percentage of female employees	0.247	(1.62)	-0.016*	(-1.90)	-0.010**	(-2.19)
Percentage of employees with a university degree	-0.004	(-1.00)	-0.002	(-0.50)	0.001	(0.23)
Owned by individuals	-0.003	(-0.93)	0.023	(0.11)	-0.033	(-0.20)
Owned by the same family	0.002	(0.68)	0.024	(0.13)	-0.058	(-0.37)
Use technology licensed from a foreign-owned company (%)	-0.045	(-0.30)	-0.333*	(-1.78)	0.080	(0.50)
Compete against unregistered or informal firms (%)	-0.025	(-0.19)	-0.039	(-0.22)	-0.059	(-0.40)
Firms with the own website	0.272*	(1.92)	0.368*	(1.70)	0.362**	(2.17)
Constant	0.372	(1.17)	-1.832***	(-4.50)	-2.390***	(-6.78)
Pseudo R^2	0.076		0.129		0.219	
Number of observations	594		465		465	

Notes: t-statistics in parentheses. *** significant at 1%; ** significant at 5%; * significant at 10%. The online technology includes internet, online social media, specialized apps, or digital platforms, etc.

Source: The World Bank, ES (Jordan, October 2020), ESFC – Wave 1 (Jordan, July 2020), calculated and presented by the authors.

Table A3.2. Role of e-commerce participation in firm performance: Morocco, July 2020 (Probit model, weighted values)

	Dependent variable (in July 2020)					
	Open		Sales increased or remained the same compared to the same month in 2019 (for open firms)		Having indirect & direct exports (for open firms)	
Firm's characteristics in 2019						
Logarithm of firm size	0.041	(0.52)	0.087*	(1.72)	0.178***	(3.89)
Firm's age in 2019 (Ref.: More than 30 years)						
Less than 10 years	-0.276	(-1.03)	0.219	(1.39)	0.019	(0.13)
10-19 years	-0.010	(-0.04)	-0.026	(-0.14)	0.104	(0.64)
20-29 years	0.107	(0.38)	0.385**	(2.20)	-0.252	(-1.40)
Industry (Ref.: Food)						
Garments	-0.017	(-0.05)	0.558***	(3.12)	0.117	(0.66)
Other Manufacturing	0.068	(0.20)	-0.361	(-1.49)	0.602***	(3.25)
Retail	0.546*	(1.68)	0.133	(0.70)	0.109	(0.63)
Other Services	0.645**	(2.44)	0.545***	(3.00)	0.096	(0.53)
Percentage of highly Skilled production workers	0.002	(0.22)	0.004	(1.18)	0.004	(1.25)
Percentage of female employees	-0.002	(-0.58)	0.000	(0.10)	-0.002	(-0.71)
Percentage of employees with a university degree	0.004	(1.14)	-0.002	(-0.74)	-0.001	(-0.41)
Owned by individuals	0.117	(0.58)	0.021	(0.16)	-0.106	(-0.86)
Owned by the same family	0.220	(1.11)	-0.207	(-1.43)	0.163	(1.25)
Use technology licensed from a foreign-owned company (%)	-0.401*	(-1.68)	0.049	(0.30)	-0.174	(-1.11)
Compete against unregistered or informal firms (%)	0.209	(1.12)	-0.042	(-0.33)	0.035	(0.30)
Firms with the own website in December 2019	-0.220	(-1.17)	0.096	(0.77)	0.077	(0.66)
Constant	-0.153	(-0.36)	-1.677***	(-6.21)	-1.544***	(-6.35)
Pseudo R^2	0.054		0.060		0.087	
Number of observations	1084		706		706	

Notes: t-statistics in parentheses. *** significant at 1%; ** significant at 5%; * significant at 10%.

Source: The World Bank, ES (Morocco, December 2019), ESFC – Wave 1 (Morocco, July 2020), calculated and presented by the authors.

Table A3.3. Role of e-commerce participation in firm performance: Jordan, February 2021 (Probit model, weighted values)

	Firm's characteristics in Wave 2 (January 2021)				
	For open firms				
	Open	Sales increased or remained the same compared to the same month in 2019 (Probit)	Having indirect & direct exports (Probit)	Growth rate of the number of employees since Wave 1 (OLS)	Change in the proportion of female employees since Wave 1 (OLS)
Firm's characteristics in Wave 1 (July 2020)	0.049	0.201***	0.270***	-3.369**	0.959*
Logarithm of firm size	(0.84)	(2.86)	(4.59)	(-2.01)	(1.95)
Firm's age in 2019 (Ref.: More than 30 years)	0.174	-0.071	0.200	10.861*	-1.252
Less than 10 years	(0.82)	(-0.28)	(0.95)	(1.90)	(-0.75)
	-0.012	-0.252	0.025	11.344*	-2.471
10-19 years	(-0.06)	(-0.87)	(0.11)	(1.80)	(-1.34)
	0.234	-0.152	-0.189	10.120	-6.061***
20-29 years	(0.85)	(-0.46)	(-0.73)	(1.40)	(-2.88)
Industry (Ref.: Garments)					
Food	0.464	0.425	-0.254	5.424	2.696
	(1.53)	(1.16)	(-0.91)	(0.62)	(1.06)
Other Manufacturing	0.753**	0.147	0.171	-12.380	5.370**
	(2.48)	(0.40)	(0.66)	(-1.51)	(2.25)
Retail	0.487*	0.681*	-0.203	-7.617	3.606
	(1.71)	(1.88)	(-0.75)	(-0.90)	(1.46)
Other Services	0.458*	0.114	-1.304***	-15.624*	7.976***
	(1.68)	(0.29)	(-4.03)	(-1.89)	(3.31)
Owned by individuals	-0.068	0.043	-0.077	4.297	-2.016
	(-0.34)	(0.21)	(-0.46)	(0.88)	(-1.42)
Owned by the same family	0.020	-0.263	-0.053	1.450	0.065
	(0.11)	(-1.19)	(-0.31)	(0.30)	(0.05)
Started or increased business activity online since COVID-19 outbreak	0.341*	0.294	0.406**	0.102	0.371
	(1.90)	(1.41)	(2.45)	(0.02)	(0.27)
Constant	0.471	-2.304***	-1.308***	1.962	-4.755
	(1.24)	(-4.72)	(-3.72)	(0.18)	(-1.53)
Pseudo R^2	0.045	0.101	0.261	0.042	0.064
Number of observations	460	410	410	402	399

Notes: t-statistics in parentheses. *** significant at 1%; ** significant at 5%; * significant at 10%.
Source: The World Bank, ESFC – Wave 1 (Jordan, July 2020), ESFC – Wave 2 (Jordan, February 2021), calculated and presented by the authors.

Table A3.4. Role of e-commerce participation in firm performance: Morocco, January 2021 (Weighted values)

		Firm's characteristics in Wave 2 (January 2021)				
	Open (Probit model)	Sales increased or remained the same compared to the same month in 2019 (for open firms)	Having indirect & direct exports (for open firms)	Introduced new or improved products or services since Wave 1 (for open firms)	Growth rate of the number of employees since Wave 1 (for open firms)	Change in the proportion of female employees since Wave 1 (for open firms)
Firm's characteristics in Wave 1 (July 2020)						
Logarithm of firm size	-0.044	0.057	0.213***	0.092*	-13.969***	0.261
	(-1.11)	(1.07)	(3.39)	(1.79)	(-6.94)	(0.30)
Firm's age in 2019 (Ref.: More than 30 years)						
Less than 10 years	0.105	-0.030	0.004	0.349*	-4.062	-3.525
	(0.81)	(-0.16)	(0.02)	(1.95)	(-0.64)	(-1.26)
10-19 years	0.203	0.447**	-0.082	0.451**	-1.010	-4.191
	(1.34)	(2.31)	(-0.34)	(2.29)	(-0.14)	(-1.31)
20-29 years	0.255	0.381**	0.084	0.499**	8.073	-3.685
	(1.63)	(1.98)	(0.35)	(2.54)	(1.10)	(-1.15)
Industry (Ref.: Garments)						
Food	0.110	0.531**	-0.054	0.340	-1.184	0.463
	(0.69)	(2.57)	(-0.22)	(1.62)	(-0.15)	(0.14)
Other Manufacturing	-0.232	-0.329	0.589**	0.368	22.313**	2.510
	(-1.36)	(-1.15)	(2.40)	(1.56)	(2.48)	(0.63)
Retail	0.123	0.518**	-0.315	0.558***	-8.995	-3.308
	(0.74)	(2.44)	(-1.16)	(2.62)	(-1.15)	(-0.97)
Other Services	0.186	0.187	-0.454*	0.222	1.499	2.180
	(1.25)	(0.94)	(-1.87)	(1.13)	(0.21)	(0.70)
Owned by individuals	-0.077	-0.084	-0.412**	0.022	-3.841	-1.736
	(-0.69)	(-0.61)	(-2.44)	(0.16)	(-0.74)	(-0.76)
Owned by the same family	0.139	-0.153	0.032	-0.182	-0.080	4.130*
	(1.12)	(-0.98)	(0.17)	(-1.19)	(-0.01)	(1.67)
Started or increased business activity online since COVID-19 outbreak	0.011	-0.023	0.420**	0.255*	8.812	-5.547**
	(0.10)	(-0.16)	(2.52)	(1.84)	(1.63)	(-2.34)
Constant	0.581***	-1.382***	-1.831***	-1.780***	62.397***	6.191
	(2.84)	(-4.95)	(-5.88)	(-6.31)	(6.27)	(1.42)
Pseudo R^2	0.017	0.060	0.161	0.044	0.097	0.025
Number of observations	714	518	518	518	518	518

Notes: t-statistics in parentheses. *** significant at 1%; ** significant at 5%; * significant at 10%.
Source: The World Bank, ESFC – Wave 1 (Morocco, July 2020), ESFC – Wave 2 (Morocco, January 2021), calculated and presented by the authors.

Table A3.5. Role of e-commerce participation in firm performance: Jordan, July 2021 (Weighted values)

	Firm's characteristics in Wave 3 (July 2021)					
	Open		Sales increased or remained the same compared to the same month in 2020 (for open firms)		Having indirect & direct exports (for open firms)	
Firm's characteristics in Wave 2 (February 2021)						
Logarithm of firm size	0.063	(1.24)	0.133**	(2.40)	0.206***	(3.62)
Firm's age (Ref.: More than 30 years)						
Less than 10 years	0.628***	(2.80)	0.164	(0.64)	-0.097	(-0.37)
10-19 years	0.563***	(2.82)	-0.075	(-0.32)	0.157	(0.65)
20-29 years	0.228	(1.10)	-0.183	(-0.72)	0.052	(0.20)
Industry (Ref.: Garments)						
Food	-0.171	(-0.63)	-0.383	(-1.19)	-0.485	(-1.52)
Other Manufacturing	0.318	(1.21)	0.292	(1.02)	-0.046	(-0.16)
Retail	0.225	(0.84)	0.144	(0.49)	-0.452	(-1.53)
Other Services	0.321	(1.21)	-0.155	(-0.54)	-0.602**	(-2.09)
Owned by individuals	-0.024	(-0.16)	0.177	(1.05)	-0.155	(-0.93)
Owned by the same family	-0.069	(-0.44)	0.025	(0.14)	-0.032	(-0.18)
Started or increased business activity online since Wave 1	-0.118	(-0.50)	0.266	(1.04)	0.810***	(2.88)
Constant	0.014	(0.04)	-1.006**	(-2.55)	-0.461	(-1.18)
Pseudo R^2	0.036		0.051		0.136	
Number of observations	424		322		322	

Notes: t-statistics in parentheses. *** significant at 1%; ** significant at 5%; * significant at 10%.
Source: The World Bank, ESFC – Wave 2 (Jordan, February 2021), ESFC – Wave 3 (Jordan, July 2021), calculated and presented by the authors.

Table A3.6. Role of e-commerce participation in firm performance: Morocco, May 2021 (Weighted values)

	Open		Sales increased or remained the same compared to the same month in 2020		Having indirect & direct exports		Introduced new or improved products or services since Wave 2	
			Dependent variables (Wave 3, May 2021)					
Model 1								
Firm's characteristics in Wave 2 (February 2021)								
Logarithm of firm size	-0.153***	(-2.76)	-0.142***	(-2.59)	0.304***	(3.96)	-0.077	(-1.21)
Firm's age (Ref.: More than 30 years)								
Less than 10 years	-0.291	(-1.59)	0.149	(0.98)	-0.128	(-0.56)	0.136	(0.79)
10-19 years	-0.120	(-0.57)	-0.073	(-0.42)	-0.270	(-1.04)	-0.094	(-0.45)
20-29 years	-0.259	(-1.26)	0.070	(0.40)	-0.012	(-0.05)	-0.016	(-0.08)
Industry (Ref.: Garments)								
Food	0.131	(0.58)	0.182	(1.00)	0.487	(1.64)	-0.102	(-0.49)
Other Manufacturing	-0.321	(-1.30)	0.051	(0.21)	1.059***	(3.25)	0.117	(0.43)
Retail	0.248	(1.08)	-0.055	(-0.30)	0.419	(1.40)	-0.164	(-0.76)
Other Services	-0.077	(-0.39)	0.110	(0.64)	0.013	(0.04)	0.074	(0.39)
Owned by individuals	-0.056	(-0.39)	0.037	(0.30)	-0.331*	(-1.83)	0.191	(1.30)
Owned by the same family	0.205	(1.25)	0.035	(0.26)	0.027	(0.13)	0.154	(1.03)
Started or increased business activity online since Wave 1	0.048	(0.34)	0.323***	(2.67)	0.148	(0.86)	0.304**	(2.23)
Constant	1.735***	(6.91)	0.085	(0.40)	-2.494***	(-7.20)	-0.918***	(-3.76)
Pseudo R2	0.053		0.027		0.170		0.030	
Number of observations	569		486		486		486	
Model 2								
Firm's characteristics in Wave 2 (February 2021)								
Logarithm of firm size	-0.118**	(-2.47)	-0.123**	(-2.56)	0.369***	(5.66)	-0.055	(-0.99)
Firm's age (Ref.: More than 30 years)								
Less than 10 years	-0.052	(-0.34)	0.143	(1.02)	-0.044	(-0.22)	0.072	(0.45)
10-19 years	0.135	(0.75)	-0.058	(-0.36)	-0.231	(-1.04)	-0.121	(-0.63)
20-29 years	-0.042	(-0.24)	0.011	(0.07)	-0.137	(-0.59)	0.064	(0.35)
Industry (Ref.: Garments)								
Food	-0.004	(-0.02)	0.207	(1.24)	0.115	(0.45)	-0.076	(-0.39)
Other Manufacturing	-0.520**	(-2.41)	0.131	(0.62)	0.632**	(2.34)	0.275	(1.17)
Retail	-0.016	(-0.08)	0.006	(0.04)	0.203	(0.82)	-0.166	(-0.82)
Other Services	-0.217	(-1.18)	0.029	(0.18)	-0.315	(-1.22)	0.050	(0.28)
Owned by individuals	-0.045	(-0.35)	0.024	(0.20)	-0.181	(-1.10)	0.133	(0.99)
Owned by the same family	0.132	(0.92)	-0.022	(-0.17)	-0.076	(-0.40)	0.128	(0.91)
Having external digital platforms (apps, own website…) sales	-0.033	(-0.27)	0.431***	(3.86)	0.348**	(2.25)	0.346***	(2.74)
Constant	1.571***	(6.95)	0.024	(0.12)	-2.589***	(-8.39)	-0.977***	(-4.31)
Pseudo R^2	0.041		0.030		0.190		0.030	
Number of observations	683		574		574		574	

Notes: t-statistics in parentheses. *** significant at 1%; ** significant at 5%; * significant at 10%. The online technology includes internet, online social media, specialized apps, or digital platforms, etc.

Source: The World Bank, ESFC – Wave 2 (Morocco, February 2021), ESFC – Wave 3 (Morocco, May 2021), calculated and presented by the authors.

A4. Oaxaca Decomposition

Take firm productivity as an example. Suppose there are two productivity regimes, one for e-firms (a) and another for non-e-firms (b):

$$logy_{a,i} = \beta_a X_i + \varepsilon_{a,i} \qquad \text{for e-firms} \tag{a1}$$

$$logy_{b,i} = \beta_b X_i + \varepsilon_{b,i} \qquad \text{for non-e-firms} \tag{a2}$$

where $y_{a,i}$ and $y_{b,i}$ are the productivity of e-firms and that of non-e-firms, respectively; X_i is the vector that characterizes firm attributes.

The productivity gap between the two groups can be decomposed as follows:

$$log\tilde{y}_a - log\tilde{y}_b = \hat{\beta}_a(\overline{X}_a - \overline{X}_b) + (\hat{\beta}_a - \hat{\beta}_b)\bar{X}_b \tag{a3}$$

Where $\tilde{y}_a$ and $\tilde{y}_b$ are the geometric means of estimated productivity of the two groups. The productivity gap is thus decomposed into two parts: (i) that due to differences in average characteristics of the groups, $\hat{\beta}_a(\overline{X}_a - \overline{X}_b)$ – the effect of firm attributes and, (ii) that due to differences in the parameters of the productivity function, $(\hat{\beta}_a - \hat{\beta}_b)\bar{X}_b$ – the effect of the return of firm attributes, caused by unobservable factors.

This decomposition technique also applies to the case where dependent variable is binary (for example probability of participating in innovation). Instead of probit model, we use the logit model to estimate the participation equation:

$$\hat{P}_i = prob(P_i = 1) = e^{\hat{\alpha}Z_i}/(1 + e^{\hat{\alpha}Z_i}) \tag{a4}$$

We can get a linear form after a transformation:

$$logR_i = \hat{\alpha}Z_i \qquad \text{where } R_i = \hat{P}_i/(1 - \hat{P}_i) \tag{a5}$$

Equation (a5) allows us to study the difference in the relative probability of participating in innovation between the two groups of firms.