How Selling Online is Affecting Informal Firms in South Asia

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Understanding how e-commerce platforms are affecting the small, informal firms that sell on them is a question of growing importance to researchers and policymakers in developing countries. This paper examines this question using data from surveys of firms selling on two e-commerce platforms in South Asia. The businesses selling on these platforms range widely in terms of size, degree of formalization, and other characteristics. Their main reason for joining the platforms is to access more customers. After joining, many sellers report (i) an expansion of their business, (ii) an increase in their incentive to formal registration, and (iii) increased visibility to tax authorities. Other less-widespread channels of impact include (i) the adoption of new or improved

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Received November 14, 2023; Published January 17, 2025

Asian Development Review
DOI: 10.1142/S0116110525500064

business practices and technologies, (ii) better access to finance, and (iii) greater flexibility in balancing home and work life. These reported impacts do not vary significantly by firm size or registration status, suggesting that the greater market access brought about by (selectively) joining e-commerce platforms benefits equally large and small (informal) firms. Given size and age, firms selling on the platform for a longer period are more likely to experience these impacts, suggesting that firms learn how to use the platform more effectively over time. Finally, firms on these platforms—even the micro and small ones, which tend to be informal—are from a select group, as they are owned and managed by individuals who are more educated and younger than the owners and managers of more typical firms in this setting.

Keywords: e-commerce platforms, informal and formal firms, South Asia
JEL codes: L81, L88, O17

I. Introduction

Using data collected in cooperation with two e-commerce platforms—Chaldal, which operates in Bangladesh, and Daraz, which is present in several countries in South Asia including Bangladesh, Nepal, Pakistan, and Sri Lanka—this paper investigates whether engagement with e-commerce is linked to increased sales and productivity gains for informal firms in South Asia.

This question is relevant for this region where a stubbornly high share of informality is a key development issue and where the recent expansion of e-commerce is often portrayed as an opportunity to expand market access for informal firms. Excluding agriculture, three-quarters of South Asia's workers were in the informal sector during 2015–2018, the highest share among developing regions. In terms of their number, the share of informal firms is even higher, reaching 99% in India according to data from the Annual Survey of Industries and the National Sample Survey of Unincorporated Enterprises of 2015/16.[1] Remarkably, these shares have not changed much in the last 2 decades (World Bank 2020). In contrast, even if still comparatively small, the e-commerce sector has grown rapidly. In 2015, the share of

[1]Informal employment includes, according to the International Labour Organization (2013) definition, all individuals working in informal enterprises as owners, employees, or contributing family members, as well as those employed in formal firms as casual or temporary workers without a formal contract. In turn, informal enterprises are unincorporated enterprises owned by households, including those consisting of a single-owner worker (the self-employed). A key characteristic of such enterprises is that there is not a clear separation between the unit of production and its owner. Since, in the region, many regulations as well as tax obligations apply only to firms above a certain size threshold, in this paper small firms are considered informal.

online sales in retail sales was only 1.6% in India and 0.7% in Bangladesh, compared to more than 15% in the People's Republic of China (PRC) and the United Kingdom (Kathuria et al. 2019). However, reports in the business media and by industry associations suggest that this share is growing fast. For example, in 2021, e-commerce's share of retail sales in India had already reached 5% and was expected to expand to 20% over the next few years. The coronavirus disease (COVID-19) crisis seems to have accelerated this trend, though it remains to be seen if the momentum will be sustained: According to the e-Commerce Association of Bangladesh, total e-commerce revenues increased by 70%–80% in the space of a few months during 2020 (Hasan 2020).

The expectation that the digital economy can have a broad impact on development by better connecting the informal sector with markets is reflected in the e-commerce expansion plans that governments in many developing countries have recently announced.[2] These plans may produce positive results; however, hard empirical evidence on the connections between the digital economy and informality, and the impact of these connections is, to date, still quite thin.

Informal firms are of many different types—ranging from economic activities run by a single self- employed person with almost no other inputs, to small businesses that exclusively employ family members, to slightly larger firms with a few external employees and some assets—and face quite distinct challenges depending on the sector and market in which they operate. However, behind this heterogeneity, informal firms share some common traits: Their size tends to be small; they have limited access to credit and thus they are not capital intensive; they experience difficulties in employing and retaining skilled workers; they have a restricted geographic reach in terms of both input sources and output destinations; and their use of (even basic) management practices is infrequent. Whether these common traits emerge because of optimizing choices by informal firms or are the results of entry barriers or some other forms of exclusion is an ongoing debate in the literature on informality.[3]

Whatever the ultimate cause, the expansion of the digital economy and, in particular, the growth of e-commerce has the potential to either shift the incentives

[2]Couture et al. (2021) report that the Government of the PRC has featured e-commerce as a means to alleviate poverty in its "No.1 Central Documents" each year since 2014. Likewise, governments in Bangladesh, Egypt, India, and Viet Nam have announced investment plans to boost the digital economy. See also the UN Trade and Development's new technical assistance platform, eTrade for All Initiative, available at https://unctad.org/topic/ecommerce-and-digital-economy/etrade-for-all.

[3]See de Soto (1989) and Djankov et al. (2002) for examples of those who argue for an insider–outsider dualistic view of informality, and Levy (2010) and Maloney (2004) among the proponents of the incentives–choice approach. For a recent excellent survey, see Ulyssea (2020).

behind these choices (e.g., to remain small) or to make the entry barriers less effective and, thus, ultimately to benefit informal firms. On the other hand, this expansion could exacerbate the gap between the formal and informal sectors.

There are potentially four main channels through which the digital economy can positively impact informal firms: (i) facilitate market access, (ii) reduce capital inputs, (iii) reduce matching and verification costs, and (iv) facilitate implementation of management practices. Digital technology, defined by Goldfarb and Tucker (2019) as "the representation of information in bits," affects economic activity fundamentally by reducing costs (and barriers) related to search, replication, transportation, tracking, and verification. A small firm entering an e-commerce platform is potentially reaching a much larger pool of customers without the need for investing in marketing campaigns, and it can also benefit from an already established set of distribution channels.[4] The increased use and accumulation of digital information related to online economic transactions can also facilitate the adoption of management practices such as more frequent and accurate monitoring of costs and revenues, or improved communication with employees, suppliers, and clients. Management practices have been identified as a strong determinant of productivity gains even in small firms (Bloom et al. 2013, 2020). With more online sales, small firms can more easily and transparently document income flows and these, in turn, can provide information to banks about their creditworthiness (Klapper, Miller, and Hess 2019). In general, with more visibility, the costs of verification go down and the reputation of a firm increases.

We present a simple conceptual framework to analyze the impacts of e-commerce platforms on small firms. It draws on recent research on heterogeneous firms and informality (Ulyssea 2020), influenced by the literature on heterogeneous firms and trade (Melitz and Redding 2014). In this framework, the net return from joining a platform and gaining access to new markets depends on initial productivity (or capability), which varies across firms. Only firms with a certain minimum level of productivity find it worthwhile to join the platform. Upon joining, they gain access to new customers and grow. This mechanism results in heterogeneous impacts of e-commerce platforms on small, informal firms.

[4]Note that this is different from selling to standard brick-and-mortar supermarkets. As the case of Chaldal shows, brick-and-mortar supermarkets are supplied by distributors who tend to have an established set of suppliers. A small company needs to hire someone to deliver to each of the supermarkets or enter the books of a distributor. This consists of a large supply chain investment that is often out of reach for a small company. Also, a new product can be more easily visible on a virtual shelf than it would be on a normal physical shelf.

While our framework emphasizes low productivity as the main factor constraining the potential benefits to a firm joining a digital platform, there are other potential constraints as well. Because of the increased visibility, and the higher risk of being audited by the tax authorities, some firms may avoid entering e-commerce. This is because they would not be competitive if they had to pay taxes or comply with other regulations. Moreover, e-commerce platforms can be transformative, but their market power may also polarize countries' industrial structures. Through more intensive use of digital channels, more productive companies can expand their market shares and boost their productivity, but the platforms' pressure to lower prices and innovate can be unsustainable for less capable firms, which may shrink or exit the market.[5]

And even if the logistical barriers are reduced by e-commerce, some "transactional" barriers may remain. Couture et al. (2021, p. 37) define these barriers as those related with "lack of familiarity with navigating online platforms" or "[lack of] trust of transactions that occur before inspecting the product or without interacting with the buyers [or sellers] in person." They refer to the challenges of connecting rural producers to e-commerce in the PRC, but these transactional barriers are likely to be present for small informal firms in other countries and even in urban settings. In fact, in their study of the PRC, they find that the expansion of e-commerce has had no effect on producers and the only positive effects have been for richer and younger consumers who benefited from access to lower-priced goods and services. This is another example of the potential polarization from the digital economy.

In sum, it is not obvious from the existing theory and evidence whether the rise of e-commerce helps level the playing field among firms or increases existing gaps between incumbent larger formal firms and informal ones.

The new empirical evidence from Chaldal and Daraz sellers' data, which are the two case studies included in this paper, is mildly positive. As reported by the firms selling on these platforms, the main reason for joining the platform is to access more customers. Most of these sellers report an expansion in their business after joining the platform. They also report an increase in their incentive to register their business and in their visibility to tax authorities. Other less widespread channels of impact reported by firms include the adoption of new or improved business practices and technologies, better access to finance, and greater flexibility in balancing home and work life.

[5]World Bank (2018) provides several examples of the negative consequences of digital platforms' excessive market power. Iacovone et al. (2015) have a clear analogous example of the entry of Walmart, which polarized the Mexican retail market.

The businesses selling on these platforms range widely in terms of size and other characteristics, and many of them are micro, small, and medium sized. In general, the reported impacts do not vary significantly by firm size and degree of formalization, suggesting that even micro and small informal firms that have joined e-commerce platforms can benefit from the greater market access facilitated by the platforms. However, firms using e-commerce, even the small ones, are from a select group: They are owned and managed by individuals who are more educated and younger than the owners and managers of more typical firms.

The findings of the two case studies discussed in this paper are encouraging as they seem to tilt the balance of evidence toward a positive impact on small, informal firms. That being said, these results cannot be easily generalized given the selective use of e-commerce among firms. While many small firms are using e-commerce platforms to reach a larger consumer base, the vast majority of them are still reliant on traditional brick-and-mortar retailing. Potential causes of this selective adoption of e-commerce include limited access to digital infrastructure among small firms and their target customers, informational barriers to the adoption of new technologies by firms, and limited capability of firms to profit from e-commerce. Understanding these causes better will be important for designing policies to broaden the development impact of e-commerce.

Our paper contributes to the small but growing evidence on how digital platforms are affecting producers and workers in developing countries.[6] In a related research, Liu et al. (2023) study the impact of e-commerce on the returns earned by farmers in the PRC, and Couture et al. (2021) study the impact of the first nationwide e-commerce expansion program on rural households, including small producers. Hjort and Poulsen (2019) find that the arrival of the internet had an impact on firm entry, productivity, and exporting in Africa. Kang and Ramizo (2022) examine the impact of e-commerce on the global value chain performance of Asian countries.

Our study also contributes to the literature that, broadly speaking, examines interventions that help small, informal firms upgrade their performance, grow, and formalize. A major topic addressed in this literature is the impact of facilitating formalization by simplifying business entry procedures or providing entrepreneurs with monetary and advisory assistance in registering their business. The findings of this research have been mixed. While observational and quasi-experimental papers generally suggest that easing formalization improves formalization rates and firm

[6]Unlike this emerging literature from low- and middle-income countries, research from high-income countries has focused on the consumer gains from e-commerce (see, for example, Brynjolfsson, Hu, and Smith [2003]; Bronnenberg and Huang [2021]; and Dolfen et al. [2023]).

performance (see, for example, Fajnzylber, Maloney, and Montes-Rojas [2009]; McKenzie and Seynabou Sakho [2010]; Boly [2018], [2020]; Tanaka [2023]), experimental studies generally report small to negligible impacts of formalization (see, for example, De Giorgi and Rahman [2013]; de Mel, McKenzie, and Woodruff [2013]; Galiani, Meléndez, and Ahumada [2017]; Benhassine et al. [2018]). Another important strand of this literature focuses on the effect of business training on microenterprise performance, with some modestly positive findings (de Mel, McKenzie, and Woodruff 2014; McKenzie and Woodruff 2014; Gine and Mansuri 2021). With its emphasis on understanding how access to e-commerce markets affects producers, our study is also related to the literature that explores the impact of exporting on small business performance (Atkin, Khandelwal, and Osman 2017).

The rest of the paper is organized as follows. Section II describes the two e-commerce platforms examined in this paper and the key descriptive characteristics of the surveyed firms, which sell on them. Section III presents the conceptual framework. Sections IV and V include analysis of the surveys of sellers operating on Chaldal and Daraz. Section VI discusses how the sellers are a select group of firms. Section VII concludes the study.

II. Setting and Data

A. Two Digital Platform Models

Our study is based on surveys of firms that sell on Chaldal and Daraz, two e-commerce platforms operating in South Asia. Table 1 lists and compares the key attributes of these platforms.

Chaldal is an online grocery service operational in four cities in Bangladesh. Established in 2013, it offers 1-hour delivery for over 6,000 products. Chaldal is currently operational in four cities, managing its own warehouse system in each of these cities. It also operates an on-demand delivery service, GoGoBangla, which offers logistics services to small e-commerce businesses, as well as a network to connect farmers directly with retailers (Chaldal Vegetable Network), and plans to open a direct-to-consumer pharmacy. Chaldal is expanding rapidly: As of September 2021, the platform claimed it had grown by 120% over the last year, with about $40 million in revenue; it planned to enter 15 new markets and expand from 8,500 products to 30,000 by the end of 2021 (Shu 2021).

Table 1. **Characteristics of Sellers on Chaldal and Daraz**

Category	Chaldal	Daraz
Platform size	1 million customers	35 million customers
Area of operations	Four cities in Bangladesh	Pakistan, Bangladesh, Myanmar, Nepal, and Sri Lanka
Product categories	Groceries	Fashion, electronic devices, groceries, health, home, sports, automotive, and accessories
Number of suppliers	350	100,000
Type of suppliers	Multinationals, farmers, manufacturers, and small wholesalers	Multinationals, small wholesalers, and self-employed persons (depending on the country)
Support services	Legal department for help with registration	Online training (Daraz University) and site management or packaging

Source: Authors' compilation.

Our study focuses on the firms that supply groceries to Chaldal's core online grocery business. At the time of data collection (mid-2021), Chaldal had over 350 such suppliers. These include large multinationals (e.g., Unilever) with which Chaldal has partnerships. They also include farmers and manufacturers from whom Chaldal sources goods directly. The platform also works with smaller-sized wholesalers to source goods. Chaldal plays an active role in identifying and selecting these suppliers. To meet customer expectations, Chaldal must have certain goods in stock and offer a variety of brands and price points. At the same time, warehousing goods that do not sell is costly. For that reason, Chaldal seeks diverse suppliers and expects them to have a marketing budget and plan. Suppliers must also provide all required licensing and certification, including licenses from the Bangladesh Standards and Testing Institute, an Import Registration Certificate, and value-added tax (VAT) registration. They must deliver the goods to Chaldal's central warehouse, and then wait until the goods are sold before payment. They must also have packaging suitable for the delivery model.

For suppliers, working with Chaldal would be similar to supplying large, modern brick-and-mortar supermarkets, even if the digital model makes it easier for consumers to search by category or brand and compare prices. However, these large brick-and-mortar supermarkets are not common in Bangladesh where most grocery stores are still relatively small and have limited capacity. Chaldal's larger inventory allows it to stock newer or less established brands. Supplying firms also save on the cost of establishing distribution channels by transferring purchased supplies to Chaldal's central warehouse rather than to many small stores. For the smallest firms, however, licensing requirements, marketing costs, and limited access to credit may limit their ability to sell through Chaldal. For firms that have trouble with licensing or marketing,

Chaldal's legal department can provide some advice on how to obtain the required licenses. Chaldal also offers marketing partnerships to firms, which can help them advertise their product via Chaldal's website and social media accounts as well as through Google and Instagram ads.

The second platform included in the study is Daraz, an e-commerce marketplace established in 2015 that operates in Bangladesh, Myanmar, Nepal, Pakistan, and Sri Lanka. Compared to Chaldal, Daraz reaches a much larger market as it reports about 35 million customers and 100,000 vendors. As a separate part of its platform, Daraz operates online grocery stores with same-day delivery. Since 2018, Daraz has also operated its own delivery service, Daraz Express, which manages warehouses and facilitation centers and first- and last-mile delivery. The company estimates that 60% of deliveries through its site use Daraz Express.

Daraz offers multiple advantages for even very small or new businesses. The platform aims to make selling on the site accessible to anyone with a smart phone and provides a quick, three-step online process to create a store on the platform. No office, start-up capital, or employees are needed. Daraz offers vendors short online training videos on all aspects of setting up and running an online store on the platform (Daraz University). Their sales center also provides links to business-to-business (B2B) suppliers who offer support services such as product listing write-up, site management, photography, and packaging (Daraz Vendor Support Center).

B. Data Collection

The sample frame for the Chaldal survey included all of the small and medium-sized firms that had supplied goods through Chaldal in the last 3 months. The survey was implemented by computer-assisted telephone interviews, fielded in June 2021 by the Chaldal call center. The supplier list provided by Chaldal included 346 firms. However, some firms could not be reached or had closed, and 35 refused to participate. The final sample consists of 127 firms with a completed interview. Some 42% of interviews were conducted with the owner of the firm, 34% with a manager, and 51% with someone in the sales department.

Data on Daraz suppliers were collected through an online survey sent to suppliers who had filled at least 50 orders on Daraz during the last 6 months by email. The target sample included 14,660 owners of firms in Bangladesh, Pakistan, Nepal, and Sri Lanka. Data collection took place in July 2021. A total of 1,842 firms responded to at least some questions, with 1,549 continuing to the end of the questionnaire. Interviews were conducted only with firm owners and directors.

The full questionnaires used to collect data from firms supplying Daraz and Chaldal are available in Appendix A.4.[7] Given the different structures of these two e-commerce platforms, the two questionnaires are similar but not identical.

C. Descriptive Statistics: Chaldal Survey

Firms in the Chaldal sample are mostly established manufacturing or trading firms, and they range widely in size (Table 2). The average sample firm has 749 employees, although this number is driven by a few very large firms, with 14 surveyed firms having a workforce of more than 1,000. On average, the firms in the sample have been in operation for 16.5 years, with 90% of them having been in operation for 2–15 years. Most of them describe themselves as manufacturers (54.3%), while a substantial percentage are also traders or wholesalers (39.4%). Farmers and dairy and livestock

Table 2. **Characteristics of Sellers on the Platforms**

	Chaldal		Daraz	
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**
Number of employees	749.2	2,098.38	3.5	14.13
Firm age (years)	16.5	15.13	3.4	5.17
Time on platform (years)	3.2	2.58	1.6	1.31
Owner's age			29.9	8.25
Type of seller:				
Trader or wholesaler	0.4	0.49		
Manufacturer	0.5	0.50		
Farm or dairy	0.1	0.23		
Bachelor's or higher	0.8	0.36		
Seller's assets				
Owns two-wheeler	0.6	0.49	0.6	0.49
Owns car	0.3	0.45	0.3	0.44
Owns phone	1.0	0.09	1.0	0.13
Owns refrigerator	1.0	0.13	0.8	0.37
Owns land	0.9	0.34	0.6	0.50
Formalization:				
Registered			0.7	0.44
VAT registration	0.9	0.27	0.3	0.44
Observations	127		1,842	

VAT = value-added tax.
Source: Authors' compilation.

[7]To view all appendixes, please refer to the supplemental materials that are available at: https://www.worldscientific.com/doi/app/10.1142/S0116110525500064.

producers make up a comparatively small share of the sample (5.5%). Firms supplying to Chaldal have a high level of registration. For example, 92% have VAT registration.

As noted earlier, Chaldal survey respondents were a mix of firm owners, managers, and sales managers. These respondents are on average 35 years old and mostly male. Among the respondents, 84% have at least a bachelor's degree. This is a relatively high number in the context of firms in Bangladesh, as will be discussed later in this paper.

D. Descriptive Statistics: Daraz Survey

Daraz operates in multiple countries: 41.6% of the Daraz supplier sample is from Pakistan, 27.7% from Bangladesh, 21.8% from Sri Lanka, and 8.8% from Nepal.

Data from the Daraz survey highlight some similarities but also important differences with Chaldal. Compared to Chaldal, firms in the Daraz sample are on average younger and smaller in size. The average age of responding firms is 3.4 years, while 51.0% have been operational for 2 years or less, and 18.5% have been operational for 1 year or less (Figure A.1). Firms have an average of 3.5 employees (in addition to the owner). On average, the sample firms have been selling goods on Daraz for 2.6 years. In contrast to the Chaldal sample, many firms in the Daraz sample have low levels of formality: Only 25.9% have VAT registration.[8]

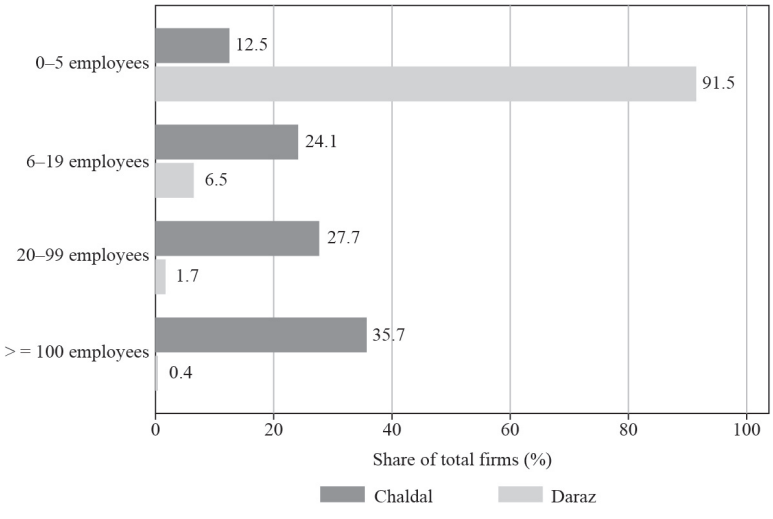
Owners of firms in the Daraz sample tend to be young, male, and have a tertiary education. More than 55% are below 30 years old, while only about 3% are 50 years or older (Figure A.2). Women comprise 10.7% of the sample. A slim majority (50.1%) have completed a vocational program, while about a quarter (25.2%) have completed a bachelor's degree or higher (Figure A.3).

E. Distribution of Seller Size and Platform Share in Total Sales

The majority of sellers on Chaldal and Daraz are small in size; in the case of Daraz, nearly all the sellers are small. Specifically, in the Chaldal sample, 12.5% of firms have 0–5 employees (including the owner), 24.1% have 6–19 employees, 27.7%

[8]While 56 of the Daraz sample firms are registered as sole proprietorships, 25.4% do not have a formal legal structure. Among Daraz firms, 72.7% operate either out of the owner's home or in a separate building on the same lot, and 43.2% have a family involved in the business, including 15.1% who use other family members as unpaid workers. For many business owners, the business is part-time: 53.3% have another job or source of income.

Figure 1. **Share of Firms by Number of Employees and by Platform**



Source: Authors' illustration based on data from the surveys of Chaldal and Daraz.

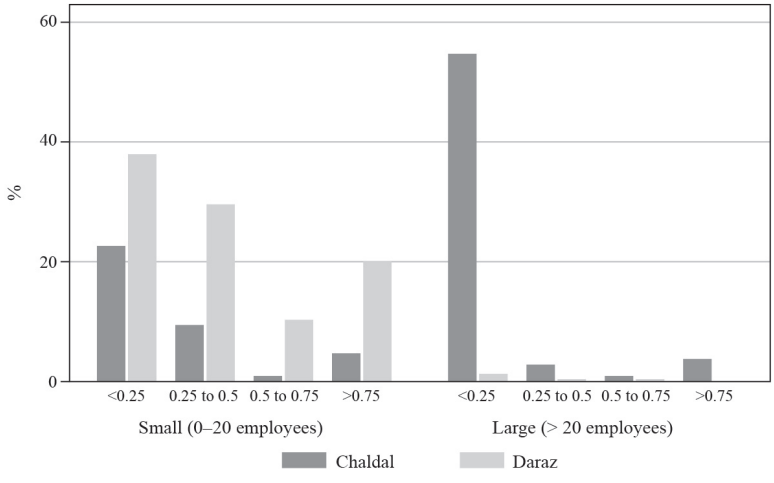
have 20–99 employees, and 35.7% have 100 or more employees (Figure 1). In the Daraz sample, 91.5% of firms have 0–5 employees, and 6.5% have 6–19 employees.

Firms that sell on Chaldal also sell through a variety of other outlets, including brick-and-mortar supermarkets and shops, their own physical and online stores, wholesalers and traders, and digital platforms other than Chaldal. Indeed, sales through Chaldal represent a relatively small share of their total sales. Among large firms (20 or more employees) in the Chaldal sample, almost 75% reported that sales through Chaldal represented less than a quarter of their total sales (Figure 2). Even among small firms (fewer than 20 employees), about 22% say that Chaldal accounted for less than a quarter of their total business sales in the last month, compared with only about 5% who reported that Chaldal represented 76%–100% of their total sales during the same period.[9]

Similarly, the majority of Daraz sellers stated that sales through Daraz made up less than 50% of their total sales in the previous month. However, about 20% of small firms (fewer than 20 employees) in the Daraz sample reported that sales through Daraz represented 76%–100% of their total sales, a share considerably higher than that seen in Chaldal.

[9]This might also be because most firms in the sample had been in operation for some time before they began to sell through Chaldal. On average, the surveyed firms are 16 years old but have been selling on Chaldal for only 3.2 years.

Figure 2. **Share of Total Sales on Chaldal and Daraz by Firm Size**



Source: Authors' illustration based on data from the surveys of Chaldal and Daraz.

III. Conceptual Framework

The conceptual framework of this paper is based on recent research on heterogeneous firms and informality (see, for example, Kanbur [2017]; Ulyssea [2018], [2020]). In the models used in this literature, the net gain from formalizing depends on firm-level total factor productivity (henceforth, productivity). Reflecting differences in entrepreneurial and managerial capabilities, productivity varies across firms, explaining why some firms remain small and informal while others formalize.

A simple version of these models can be summarized as follows. Suppose that firms above a certain size are legally obligated to register and formalize.[10] Formalization entails a fixed cost because of registration fees, the opportunity cost of time spent meeting registration requirements, and the cost of upgrading facilities to comply with regulatory requirements. The benefits of formalization include access to formal sector markets; for example, it could be that only formal firms can participate in government procurement contracts and get access to low-cost loans from formal banks. These potential gains are higher for more productive firms. As a result, only firms with productivity levels above a certain threshold find it worthwhile to formalize. Firms with productivity levels below that threshold choose to remain small so that they are not required to register. A lowering of registration costs induces the most

[10]Such size-dependent formalization requirements are common in South Asia.

productive firms in the informal sector to formalize and expand. The framework of this paper also draws on research on heterogeneous firms and trade (see, for example, Melitz [2003]; Melitz and Redding [2014]). Just as models of informality with heterogeneous firms explain why only some firms formalize, canonical models of heterogeneous firms and trade explain why only some firms enter new markets. Entering a new market entails upfront costs such as investing in new marketing channels and distribution relationships. The gains from market entry are larger for more productive firms. Hence, only firms with productivity levels above a certain threshold enter a new market and expand. A decline in the fixed cost of accessing the new market induces some smaller, less productive firms to enter that market and expand.

Together, these models suggest that the most productive firms are formal, large in size, and sell in multiple markets, while firms with low to medium productivity levels are more likely to be informal, small, and confined to local markets. Formalization and market access are complementary in the sense that registration is more attractive when there is cheaper market access. Registration enables firms to grow and take advantage of cheap market access without violating the law.

This simple framework can be used and applied to e-commerce platforms. Following the research on digital technologies (Goldfarb and Tucker 2019), an e-commerce platform may be conceptualized as a technology that offers access to new markets upon incurring some relatively minor entry costs (e.g., platform sign-up fees and the expense of learning how to use the platform). Firms with productivity above a certain threshold would find it worthwhile to adopt this technology and grow their customer base. Because the upfront cost of e-commerce usage is not high, this threshold may be low enough to include some of the more productive firms in the informal sector. Moreover, if registration is necessary for using the platform, some of the more productive firms in the informal sector may be induced to register just to gain access to the platform.

The framework also suggests that not all informal firms would find it worthwhile to sign up for the e-commerce platform. This is a consequence of the heterogeneity within the informal sector: Not all informal firms are productive enough to experience a net gain from accessing the e-commerce market.

IV. The Impact of Joining E-Commerce Platforms like Chaldal and Daraz

Central to our analysis, we find descriptive evidence that joining an e-commerce platform such as Chaldal or Daraz facilitates business formalization. This happens

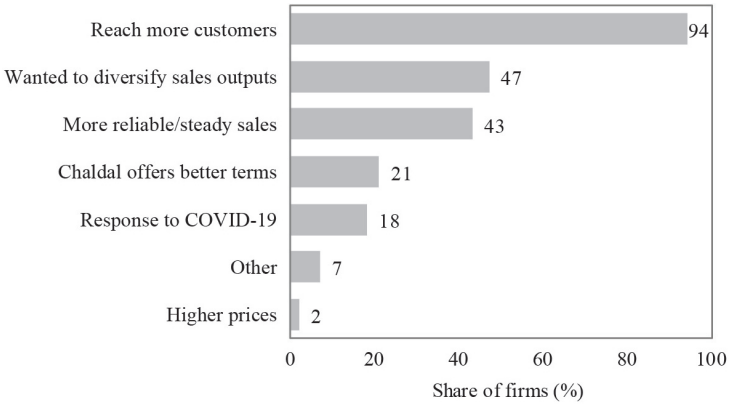
through two main mechanisms: the expansion in the size of the firm and the adoption of formal business practices. A short digression may be needed here. While a standard definition of the formal status of a firm includes information on whether the firm is registered as an incorporated legal entity, complies with regulations, and pays taxes—fundamentally, a firm is formal if it has a relationship with the public administration in accordance to the legal framework—it is not easy to verify this information with a survey. Indeed, firms may be reluctant to provide information about their compliance with taxation and other regulations. Therefore, our questionnaires were designed to encompass a broader, dynamic definition of being (or becoming) a formal firm. In other words, the questionnaires, in addition to documenting whether a firm is registered, capture whether a firm is expanding in terms of sales and employment, whether it starts accessing formal sources of credit, and whether it increases trust by (a larger group of) customers about the quality of its products. In addition, a formalizing firm may also adopt business practices similar to those of larger and already fully formal firms. For example, a formalizing firm may start using more intensive practices in marketing, product quality control, management of inventory, accounting and bookkeeping, and digital technology, among other areas. Data collected on these behaviors, both in terms of impacts on size, registration, or credit access, and in terms of the adoption of business practices, describe more closely a formalization process than a formality status. In fact, the legal framework in most countries also reflects this dynamic process as regulations and other obligations start to apply after firms cross certain minimum size thresholds, and tend to increase with the size of the firms. Moreover, selling on a platform entails becoming more visible to tax and regulatory authorities, increasing the risk of being penalized for regulatory noncompliance.

In sum, for firms joining the platform, formalization, as discussed in the conceptual framework above, happens simultaneously with the expansion of their activity and improvement of their business practices which, in turn, support increases in their productivity and in their further growth.

Considering first the data collected from the survey of Chaldal's sellers, we found that more than 90% report that they joined the platform to reach more customers (Figure 3). Diversifying sales outlets and achieving more steady and reliable sales are also major reasons for joining the platform. Although some sellers also joined Chaldal because it offers better terms than those found on other sales outlets, almost none joined the platform in expectation of receiving higher prices for their goods.

In line with their expectation that working with Chaldal would enable access to more customers, most Chaldal sellers (more than 80%) experienced an increase in

Figure 3. **Reasons to Work with Chaldal**



COVID-19 = coronavirus disease.
Notes: The answers correspond to question g3–q12 in Appendix A.4: "Think back to when this business first decided to work with Chadal: What were the primary reasons this business decided to sell through Chaldal?"
Source: Authors' illustration based on data from the surveys of Chaldal and Daraz.

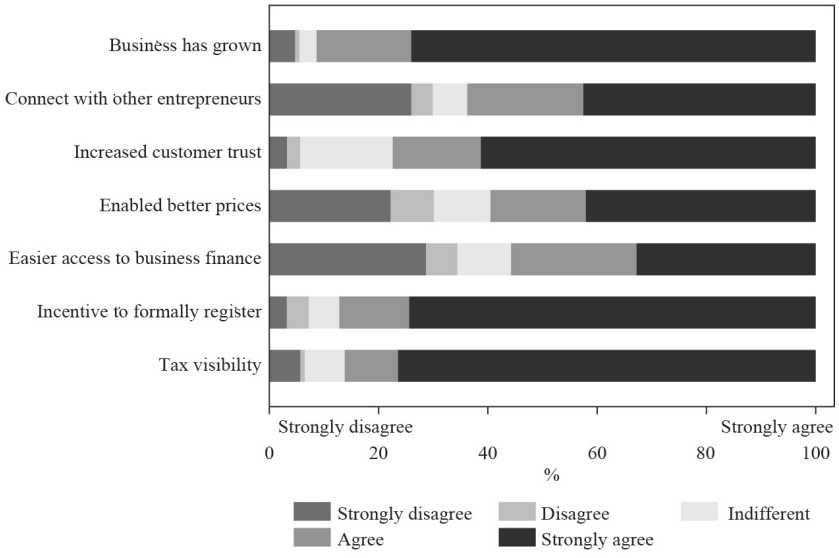
sales revenues after joining the platform. Nearly 40% of them report hiring more workers, including skilled workers, since joining the platform. Moreover, more than 80% of Chaldal sellers agree or strongly agree with the statement that their business has expanded since joining the platform (Figure 4).

More than 85% of the Chaldal survey respondents either agree or strongly agree with the statements that (i) joining a platform such as Chaldal increases the incentive to formally register the business, and (ii) it increases the likelihood of being visible to tax authorities. Note that Chaldal requires its suppliers to comply with requisite business licenses and tax registration, and also offers advisory assistance to promote compliance among its sellers. Some 26% of Chaldal sellers report having changed their legal structure or registration since joining Chaldal.

Joining an e-commerce platform may also enable firms to better signal creditworthiness to banks, improving their access to formal credit. The evidence for this hypothesis in the case of Chaldal is mixed: 33% of Chaldal sellers strongly agree with the statement that joining the platform has helped them get easier access to financing, but 29% strongly disagree with it (Figure 4).

The survey also asked firms if their use of bank loans increased since joining the platforms. Of the respondents, 17% replied in the affirmative to this question. Note that a negative reply to this question could also reflect a lack of demand for credit.

Figure 4. **Impact of Joining Chaldal**

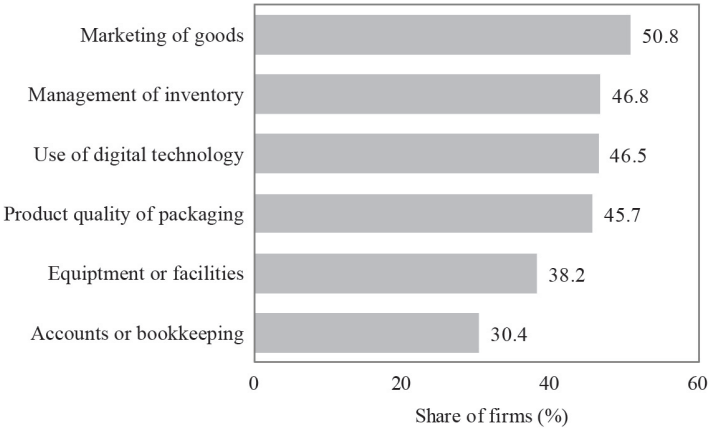


Notes: The answer options were on a scale from 1 (strongly disagree) to 5 (strongly agree) for questions g1–q1 to g1–q7 in Chaldal questionnaire found in Appendix A.4: "This business has grown because of selling to Chaldal."; "Chaldal has enabled me or others I work with to connect with other entrepreneurs and learn from them."; "Customers trust the quality of a product sold by Chaldal more than products sold at other shops or stores."; "Chaldal has enabled this business to obtain better prices for its products."; "Since this business started selling through Chaldal, it is easier to access business financing."; "For businesses like this one, the opportunity to supply goods to Chaldal provides an incentive to formally register the business."; "Businesses selling goods through digital stores like Chaldal are more likely to attract attention from tax authorities."
Source: Authors' illustration based on data from the surveys of Chaldal and Daraz.

Consumer trust is another important issue for firms selling on a digital platform, particularly in settings where formal consumer protection mechanisms are weak. On the one hand, e-commerce platforms may face more consumer distrust than traditional shops because of their newness. On the other hand, e-commerce websites can build consumer trust through quality control, seller feedback mechanisms, and liberal returns or refund policies. Consumer distrust issues seem to have been largely surmounted in the case of Chaldal, given that more than 80% of sellers agree or strongly agree with the statement that consumers trust the quality of a product sold on the platform more than they trust the quality of products sold at other shops or stores.

Turning to business practices, selling on a digital platform could also encourage firms to upgrade these by improving their access to information about technologies and consumer preferences, and by generating the incentive to innovate to capture a large share of the online market. This appears to be true for a sizable portion of

Figure 5. **Share of Firms Reporting New or Improved Business Practices After Joining Chaldal**



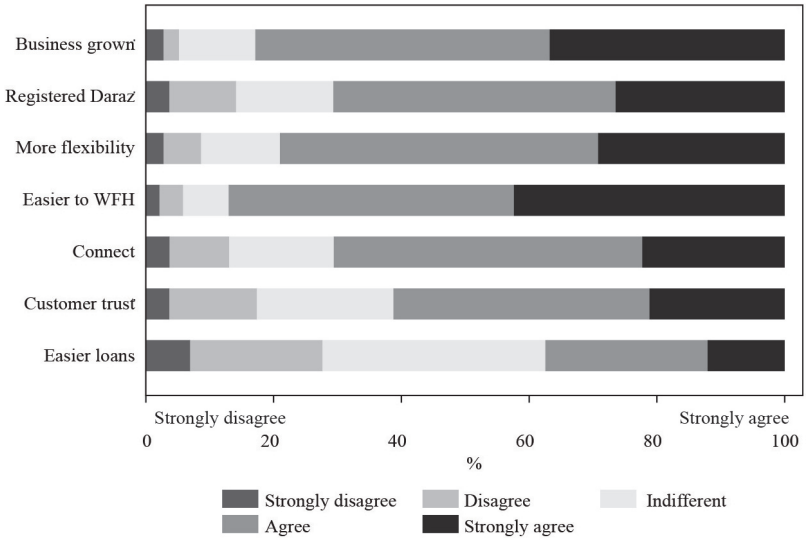
Notes: The answers correspond to question g5–q15 in Chaldal questionnaire found in Appendix A.4: The wording of the questions, all starting with "Since starting to work with Chaldal. . ." are as follows: *Marketing of goods*- "[. . .] has this business made any changes or significant improvements in how it markets its goods?"; *Accounts or bookkeeping*- "[. . .] has this business made any changes or significant improvements in its bookkeeping or how accounts are kept?"; *Product quality or packaging*- "[. . .] has this business made any changes or significant improvements to the quality or packaging of its products?"; *Use of digital technology* - "[. . .] has this business made any changes or significant improvements in its use of digital technology?"; *Management of inventory or logistics* - "[. . .] has this business made any changes or significant improvements in how its inventory or logistics are managed?"; *Equipment or facilities*- "[. . .] has this business made any changes or significant improvements to its equipment or facilities? (e.g., buying new equipment)"
Source: Authors' illustration based on data from the surveys of Chaldal and Daraz.

Chaldal sellers, though generally not for the majority. For example, about 46% of Chaldal sellers report having increased their product quality since joining the platform (Figure 5). About 51% of them state that they have improved how they market products since joining Chaldal, and 47% report having upgraded inventory and logistics management.

Overall, we find similar patterns when examining the data from Daraz sellers. When compared with sellers on Chaldal, those on Daraz tend to be smaller businesses on average, and they are much more likely to be a sole proprietorship and thus more informal.

Figure 6 shows that on average and across the four countries in our sample, firms report significant benefits of participation in the Daraz e-commerce platform. A strong majority of firms either agree or strongly agree that (i) their business has grown since joining Daraz, (ii) they registered the business in order to use Daraz, (iii) their work–life balance has improved since joining Daraz, (iv) they value working from

Figure 6. **Impact of Joining Daraz**



WFH = work from home.
Notes: The answer options were on a scale from 1 (strongly disagree) to 5 (strongly agree) for the questions q4, q11, q8, q9, q5, q6, and q10 in Daraz questionnaire found in Appendix A.4: "My business has grown because of selling on Daraz."; "I registered my business with authorities mainly because I wanted to sell my products on Daraz"; "Daraz makes it easier for me to fulfil my family responsibilities even while managing a business."; "The ability to conduct my business from home is an important reason why I choose to work for Daraz."; "Daraz as enabled me to connect with other entrepreneurs/businesses and learn from them."; "Customers are more likely to trust/rely on the quality of a product they see on Daraz, rather than at a shop or store."; "Since my business started selling on Daraz, it has become easier to get loans/financing for my business."
Source: Authors' illustration based on data from the surveys of Chaldal and Daraz.

home, (v) they can connect with other entrepreneurs, and (vi) they have increased consumer trust on Daraz. In addition, a significant group report that they agree or strongly agree that it is easier to get loans for their business since joining Daraz.

V. Heterogeneity in the Impact of Joining E-Commerce Platforms

This section addresses the main question of the paper from a different angle. It investigates whether the impact of joining an e-commerce platform depends on seller's firm size. It compares the self- reported impacts of joining Chaldal and Daraz by seller size, controlling for other seller attributes. Two sets of outcomes are considered. The first set includes impacts on the direct formalization process of the firm—that is, whether joining the platforms changes the size of the firm in terms of sales and

employment, the incentives to register, visibility to the tax authorities, the trust of its customers, and access to the financial system. The second set deals with impacts on the adoption of business practices.

The analysis also considers the relationship between the seller's registration status and the impact of joining Daraz. Unfortunately, in the case of Chaldal, there is too little variation in the measured registration status of sellers to permit such comparison. Because unmeasured dimensions of formality are likely to covary positively with firm size, it is not easy to distinguish between the impact of size and formality.

Before describing the regression results, it is useful to discuss a relevant econometric issue. Since we are analyzing multiple outcomes (up to 13 with the two sets of impacts), if we were to consider each of the outcomes in isolation from the others, we would incur an enhanced risk of rejecting a true null hypothesis (i.e., claiming that there is an impact when there is none). This risk of "overrejection of the null hypothesis due to multiple inference" (Anderson 2008; Gibson, McKenzie, and Stillman 2011) has been pointed out and routinely corrected by researchers in medical sciences and, only more recently, it has been systematically addressed in social sciences. Anderson (2008), among others, recommends two main adjustments to remedy this issue: (i) reduce the number of outcomes, basically by grouping outcomes into indexes; and (ii) adjust the p-values with the false discovery rate control approach (also dubbed Anderson q-values, see Anderson [2008] for details). In what follows, we report results by considering both of these adjustments.

A. Heterogeneity in the Impact of Joining Chaldal

A regression analysis of the survey data suggests that the impact of joining Chaldal is not different between large and small firms—that is, firm size does not seem to matter. Consider first the impact on the direct formalization process, as defined above. The difference in the share of smaller Chaldal sellers, those with 20 or fewer employees, and larger ones who report that their sales increased after joining the platform is statistically not significantly different from zero. This is also true for other self-reported outcomes such as employment increase, incentives to register, tax visibility, customer trust, access to finance, and bank loans.

The regressions whose results are reported in the tables below are variants of the following specification:

$$\text{Outcome} = \alpha + \beta_0\ (\text{size or registration status dummy}) + \beta_1\ \text{Control}_1 + \cdots + \beta_n\ \text{Control}_n + u.$$

Table 3. **Chaldal: Impacts by Firm Size**

Panel A: Impacts on the Direct Formalization Process							
	(1) Sales Increased	**(2) Employment Increased**	**(3) Incentive to Register**	**(4) Tax Visibility**	**(5) Customer Trust**	**(6) Access to Finance**	**(7) Bank Loans**
≤20 employees	0.014	−0.081	−0.027	−0.057	0.13	0.012	−0.12
	(0.071)	(0.095)	(0.066)	(0.063)	(0.082)	(0.099)	(0.077)
	[1]	[0.663]	[1]	[0.663]	[0.438]	[1]	[0.438]
Observations	112	112	111	108	110	109	99
Panel B: Impacts on Business Practices							
	(8) Marketing	**(9) Accounting**	**(10) Packaging**	**(11) Digital Technology**	**(12) Logistics**	**(13) Facilities**	
≤20 employees	−0.15	−0.0093	−0.071	−0.30***	−0.12	−0.23**	
	(0.098)	(0.092)	(0.098)	(0.094)	(0.098)	(0.095)	
	[0.438]	[1]	[0.713]	[0.022]	[0.562]	[0.112]	
Observations	111	111	112	112	111	109	

Notes: Standard errors in parentheses. **$p < 0.05$ and ***$p < 0.01$. Anderson q-values in square brackets. The regression outcomes in this table are represented by dummy variables. These variables are coded as 1 if certain conditions are met. For instance, if there is an increase in sales or employment, or if respondents agree or strongly agree to statements regarding the impact on the firm characteristics (e.g., registration, tax, customer trust, access to finance, and bank loans) or business practices (e.g., marketing, accounting, packaging, digital technology, logistics, and facilities). Anderson q-values are jointly estimated for all 13 columns (outcomes).
Source: Authors' calculations.

The estimated coefficients on a dummy for small firm size (i.e., 20 or fewer employees) for the relevant outcomes of the direct formalization process are presented in panel A of two tables: Table 3, which has no controls, and Table 4, which includes firm age and tenure on Chaldal as additional controls.

The only outcome for which the size dummy is statistically significant is customer trust, but even this is not robust to controlling for other firm owner–manager characteristics such as education and asset ownership.[11] When using a continuous measure of firm size (the log of its total employment) instead of a binary size categorization, it appears that smaller firms are more likely to experience an increase in sales after joining Chaldal.[12] This sensitivity of the regression results to the way that

[11]See Appendix Table A.1.

[12]See Appendix Table A.2.

Table 4. **Chaldal: Impacts by Firm Size (with controls)**

Panel A: Impacts on Direct Formalization Process							
	(1) Sales Increased	**(2) Employment Increased**	**(3) Incentive to Register**	**(4) Tax Visibility**	**(5) Customer Trust**	**(6) Access to Finance**	**(7) Bank Loans**
≤20 employees	0.0074	−0.016	0.0067	−0.039	0.21**	0.064	−0.093
	(0.076)	(0.099)	(0.071)	(0.069)	(0.088)	(0.11)	(0.081)
	[1]	[1]	[1]	[1]	[0.255]	[1]	[0.596]
Firm age (years)	0.00072	−0.0040	−0.0017	0.0022	0.0019	0.0026	−0.0048*
	(0.0026)	(0.0034)	(0.0024)	(0.0024)	(0.0030)	(0.0037)	(0.0028)
	[1]	[0.596]	[1]	[0.824]	[1]	[1]	[0.289]
Time on Chaldal (years)	−0.0036	0.071***	0.031**	−0.0045	0.038**	0.0071	0.037**
	(0.016)	(0.020)	(0.015)	(0.014)	(0.018)	(0.022)	(0.017)
	[1]	[0.026]	[0.255]	[1]	[0.255]	[1]	[0.255]
Observations	109	109	108	105	107	106	97
Panel B: Impacts on Business Practices							
	(8) Marketing	**(9) Accounting**	**(10) Packaging**	**(11) Digital Technology**	**(12) Logistics**	**(13) Facilities**	
≤20 employees	−0.12	0.020	−0.022	−0.19*	−0.0087	−0.20*	
	(0.11)	(0.099)	(0.11)	(0.099)	(0.10)	(0.10)	
	[0.596]	[1]	[1]	[0.255]	[1]	[0.255]	
Firm age (years)	−0.0037	−0.0017	−0.0023	0.0059*	0.0023	0.00058	
	(0.0037)	(0.0034)	(0.0036)	(0.0034)	(0.0035)	(0.0035)	
	[0.764]	[1]	[1]	[0.289]	[1]	[1]	

Continued.

Table 4. *Continued*.

Panel B: Impacts on Business Practices

	(8) Marketing	(9) Accounting	(10) Packaging	(11) Digital Technology	(12) Logistics	(13) Facilities
Time on Chaldal (years)	0.034	0.030	0.043*	0.039*	0.061***	0.025
	(0.022)	(0.020)	(0.022)	(0.020)	(0.021)	(0.021)
	[0.384]	[1]	[0.255]	[0.255]	[0.089]	[0.596]
Observations	108	108	109	109	109	108

Notes: Standard errors in parentheses. *$p < 0.10$, **$p < 0.05$, and ***$p < 0.01$. Anderson q-values in square brackets. The regression outcomes in this table are represented by dummy variables. These variables are coded as 1 if certain conditions are met. For instance, if there is an increase in sales or employment, or if respondents agree or strongly agree to statements regarding the impact on the firm characteristics (e.g., registration, tax, customer trust, access to finance, and bank loans) or business practices (e.g., marketing, accounting, packaging, digital technology, logistics, and facilities). Anderson q-values are jointly estimated for all 13 columns (outcomes).
Source: Authors' calculations.

firm size is measured could be because there is considerable size variation among Chaldal sellers with more than 20 employees.

We next consider the impact on business practices. The regression results are presented in panel B of both Tables 3 and 4. It appears that smaller Chaldal sellers experience a smaller impact with respect to the adoption of new business practices. Sellers with 20 or fewer employees are significantly less likely to report an increase in the use of digital technologies and improved or new equipment or facilities after joining the platform. This pattern is robust to controlling for other seller attributes.[13]

However, a few significant results that we have highlighted until now disappear when one considers the Anderson *q*-values reported in the tables in square brackets.[14] Customer trust, digital technology, and facilities are no longer significant, with all three having *q*-values of 0.255. As anticipated, the other possible adjustment to deal with the multiple hypotheses testing is to group outcomes in indexes. We created two main indexes, one for the direct formalization process—which groups impact on the size of the firm in terms of sales and employment, the incentives to register, and visibility to the tax authorities, the trust of its customers, and access to the financial system—and one for the business practices.[15] The results of regressing these two outcomes' indexes on the dummy for small seller (with and without the controls) are shown in Table 5. The main conclusion stands: Even when we reduce the number of hypotheses to just two, joining an e-commerce platform does not seem to have a heterogeneous impact across formal and informal (proxied by being small) firms.

B. Heterogeneity in the Impact of Joining Daraz

In the case of Daraz, the initial results also show patterns suggesting that smaller firms benefit at least equally and potentially more than larger (and likely formal) firms from participation on the e-commerce platform. A series of regressions compare Daraz sellers with fewer than five employees to larger sellers.[16] As with the case of Chaldal,

[13]The regression results with further controls are shown in Appendix Table A.3.

[14]In each table, the Anderson *q*-values are estimated jointly for regressions on all 13 outcome variables.

[15]The indexes are created as weighted averages of the standardized individual outcomes, and the weights are proportional to the covariances between outcomes. The intuition is that weights are smaller for grouping outcome variables that have strong correlation (i.e., variables that provide similar information) and larger for grouping outcome variables with low correlation, as these are providing new valuable information. For example, in the direct formalization index, the variable bank loans correlate less than 10% with any of the other variables and thus has the highest weight of about 20%.

[16]The size threshold (five employees) is different from that chosen in the case of Chaldal (20 employees) because of the difference in the size distribution of Chaldal and Daraz sellers. There are very few Chaldal sellers with five or fewer employees.

Table 5. **Indexes by Firm Size**

	(1) Direct Formalization	(2) Direct Formalization	(3) Business Practices	(4) Business Practices
<20 employees	−0.12	0.053	−0.39**	−0.22
	(0.19)	(0.21)	(0.19)	(0.20)
Firm age (years)		−0.0026		−0.00083
		(0.0071)		(0.0069)
Time on Chaldal (years)		0.12***		0.11***
		(0.042)		(0.041)
Observations	112	109	112	109

Notes: Standard errors in parentheses. **$p < 0.05$ and ***$p < 0.01$. The regression outcomes in this table are the direct formalization index (columns [1] and [2]) and the business practice index (columns [3] and [4]). These summary indexes are constructed according to Anderson (2008) and Schwab et al. (2020). The direct formalization index combines the following variables: sales increased, employment increased, incentive to register, tax visibility, customer trust, access to finance, and bank loans. The business practices index combines the following variables: marketing, accounting, packaging, digital technology, logistics, and facilities.
Source: Authors' calculations.

the results are shown in two tables: one with the raw associations with the size (Table 6) and one with variables controlling for time on Daraz in years, firm age in years, and country fixed effects (Table 7). As before, the tables are organized in two panels. In Table 7, the coefficient on fewer than five employees is marginally significant only for the outcome of more flexibility after joining Daraz. For this particular outcome, smaller firms appear to benefit more than larger firms from joining Daraz.

There is also no evidence for differential effects of firm size on the use of Daraz features such as product management features, order management features, reviews, customer messenger, financial statements, and promotion tools (panel B of Table 7). These features mirror the business practices that were analyzed in the case of Chaldal.

In terms of directly looking at registration status as the variable identifying formal and informal firms, we find that registered firms are less likely to value the flexibility and ability to work from home associated with Daraz (Tables 8 and 9). Put otherwise, unregistered firms benefit more from participation on the Daraz e-commerce platform in terms of flexibility and the ability to work from home. This result is robust to the inclusion of controls for time on Daraz in years, firm age in years, and country fixed effects.

When adjusting for the potential over-rejection of the null hypotheses by estimating the Anderson q-values, we obtain the same results as those of the case of

Table 6. **Daraz: Impacts by Firm Size**

Panel A: Impacts on Direct Formalization Process							
	(1) Business Grown	**(2) Registered for Daraz**	**(3) More Flexibility**	**(4) Easier to WFH**	**(5) Connect with Entrepreneurs**	**(6) Customer Trust**	**(7) Easier Loans**
≤5 employees	0.027	0.18**	0.16**	0.22***	0.084	0.12	0.077
	(0.074)	(0.087)	(0.078)	(0.075)	(0.084)	(0.090)	(0.090)
	[1]	[0.204]	[0.204]	[0.05]	[0.762]	[0.499]	[0.762]
Observations	1,302	1,292	1,298	1,300	1,299	1,299	1,294
Panel B: Adoption of Daraz's Features (Business Practices)							
	(8) Product Management	**(9) Order Management**	**(10) Reviews**	**(11) Customer Messenger**	**(12) Financial Statements**	**(13) Promotion Tools**	
≤5 employees	−0.018	−0.093	−0.038	−0.018	0.010	0.059	
	(0.064)	(0.059)	(0.056)	(0.050)	(0.062)	(0.071)	
	[1]	[0.401]	[0.81]	[1]	[1]	[0.762]	
Observations	1,301	1,294	1,296	1,293	1,296	1,294	

WFH = work from home.

Notes: Standard errors in parentheses. **$p < 0.05$ and ***$p < 0.01$. Anderson q-values in square brackets. The regression outcomes in this table are represented by dummy variables. These variables are coded as 1 if respondents agree or strongly agree with statements regarding the impact on the direct formalization process (e.g., changes of business growth, registration, flexibility, work from home, connection, customer trust, and ease of obtaining loans) or adoption of business practices (e.g., product management, order management, reviews, customer messenger, financial statements, and promotion tools). Anderson q-values are jointly estimated for all 13 columns (outcomes).

Source: Authors' calculations.

Table 7. **Daraz: Impacts by Firm Size (with controls)**

Panel A: Impacts on Direct Formalization Process							
	(1) Business Grown	**(2) Registered for Daraz**	**(3) More Flexibility**	**(4) Easier to WFH**	**(5) Connect with Entrepreneurs**	**(6) Customer Trust**	**(7) Easier Loans**
≤5 employees	0.027	0.18**	0.16**	0.22***	0.084	0.12	0.077
	(0.074)	(0.087)	(0.078)	(0.075)	(0.084)	(0.090)	(0.090)
	[1]	[0.204]	[0.204]	[0.05]	[0.762]	[0.499]	[0.762]
Time on Daraz (years)	0.066***	0.014	0.027	−0.013	−0.036	0.0073	0.024
	(0.020)	(0.024)	(0.022)	(0.021)	(0.023)	(0.025)	(0.025)
	[0.009]	[0.85]	[0.576]	[0.85]	[0.428]	[0.85]	[0.591]
Firm age (years)	−0.0063	−0.021***	−0.0064	−0.020***	−0.015***	−0.013**	−0.0093
	(0.0052)	(0.0060)	(0.0055)	(0.0053)	(0.0059)	(0.0063)	(0.0063)
	[0.576]	[0.007]	[0.576]	[0.003]	[0.054]	[0.185]	[0.441]
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,291	1,281	1,287	1,289	1,288	1,288	1,283

Panel B: Adoption of Daraz's Features (Business Practices)						
	(8) Product Management	**(9) Order Management**	**(10) Reviews**	**(11) Customer Messenger**	**(12) Financial Statements**	**(13) Promotion Tools**
≤5 employees	−0.018	−0.093	−0.038	−0.018	0.010	0.059
	(0.064)	(0.059)	(0.056)	(0.050)	(0.062)	(0.071)
	[1]	[0.401]	[0.81]	[1]	[1]	[0.762]

Continued.

Table 7. *Continued.*

Panel B: Adoption of Daraz's Features (Business Practices)						
	(8) Product Management	**(9) Order Management**	**(10) Reviews**	**(11) Customer Messenger**	**(12) Financial Statements**	**(13) Promotion Tools**
Time on Daraz (years)	−0.011	0.026	0.025	0.046***	0.077***	0.033*
	(0.018)	(0.016)	(0.016)	(0.014)	(0.017)	(0.019)
	[0.85]	[0.428]	[0.428]	[0.007]	[0.001]	[0.428]
Firm age (years)	−0.0032	0.0041	0.0016	0.0044	−0.00039	−0.0000033
	(0.0045)	(0.0041)	(0.0039)	(0.0035)	(0.0043)	(0.0049)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
	[0.837]	[0.591]	[0.85]	[0.576]	[0.949]	[0.95]
Observations	1,290	1,283	1,285	1,282	1,285	1,283

FE = fixed effects, WFH = work from home.

Notes: Standard errors in parentheses. *$p < 0.10$, **$p < 0.05$, and ***$p < 0.01$. Anderson q-values in square brackets. The regression outcomes in this table are represented by dummy variables. These variables are coded as 1 if respondents agree or strongly agree to statements regarding the impact on the direct formalization process (e.g., changes of business growth, registration, flexibility, work from home, connection, customer trust, and ease of obtaining loans) or adoption of business practices (e.g., product management, order management, reviews, customer messenger, financial statements, and promotion tools). Anderson q-values are jointly estimated for all 13 columns (outcomes).

Source: Authors' calculations.

Table 8. **Impacts by Registration Status**

	(1) Business Grown	(2) Registered for Daraz	(3) More Flexibility	(4) Easier to WFH	(5) Connect with Entrepreneurs	(6) Customer Trust	(7) Easier Loans
Registered	0.0055	0.049	−0.19***	−0.17***	−0.039	−0.020	−0.044
	(0.057)	(0.068)	(0.059)	(0.056)	(0.064)	(0.067)	(0.068)
	[1]	[1]	[0.01]	[0.01]	[1]	[1]	[1]

WFH = work from home.
Notes: Standard errors in parentheses. ***$p < 0.01$. Anderson q-values in square brackets. The regression outcomes in this table are represented by dummy variables. These variables are coded as 1 if respondents agree or strongly agree with statements regarding the impact on firm characteristics (e.g., business growth, registration, flexibility, work from home policies, connectivity, customer trust, and ease of obtaining loans). Anderson q-values are jointly estimated for all seven columns (outcomes).
Source: Authors' calculations.

Chaldal. Initially significant variables, such as the outcomes for "Registered for Daraz" and "More flexibility," lose their significance (Table 6). Moreover, we also group the outcomes in an impact index. Table 10 shows the results for both main variables of interest: small firms and registration status. While the impact index is significant for small firms, this significance disappears when standard controls are used (column [2]).

C. Heterogeneity by Tenure: Learning on E-Commerce Platforms?

The surveys suggest that sellers who have been on the platform for a longer period of time are more likely to experience its impacts. Given firm size and age, an additional year of tenure on Chaldal is associated with a 6%–7% higher probability of having expanded employment since joining the platform (panel A of Table 4). Firms that have been on a platform for more years are also more likely to report incentives to register, an increase in bank loans, and an improvement in logistics (panel B of Table 4). These patterns suggest that firms learn how to use the platform better over time. An alternative explanation is that sellers who are unable to benefit from being on the platform selectively exit the platform. However, employment and logistics are the only two outcomes that remain significant even after the adjustment for multiple hypotheses testing by using the Anderson q-values. While tenure on the platform is more important for firms on Chaldal, the results show that firm age is a more important factor for firms using Daraz (Table 7). Even when looking at the more restrictive Anderson q-values, there seems to be an impact on the direct formalization process for the firms.

Table 9. **Daraz: Impacts by Registration Status**

	(1) Business Grown	(2) Registered for Daraz	(3) More Flexibility	(4) Easier to WFH	(5) Connect with Entrepreneurs	(6) Customer Trust	(7) Easier Loans
Registered	−0.024	0.059	−0.19***	−0.11*	−0.060	0.016	−0.069
	(0.059)	(0.068)	(0.062)	(0.058)	(0.066)	(0.069)	(0.071)
	[0.843]	[0.453]	[0.009]	[0.132]	[0.453]	[0.844]	[0.453]
Time on Daraz (years)	0.067***	0.0072	0.037*	0.00083	−0.028	0.016	0.018
	(0.020)	(0.023)	(0.021)	(0.020)	(0.022)	(0.023)	(0.024)
	[0.006]	[0.844]	[0.143]	[0.913]	[0.355]	[0.525]	[0.51]
Firm age (years)	−0.0056	−0.025***	−0.0045	−0.021***	−0.015***	−0.014**	−0.012**
	(0.0049)	(0.0056)	(0.0051)	(0.0048)	(0.0055)	(0.0057)	(0.0058)
	[0.375]	[0.001]	[0.453]	[0.001]	[0.025]	[0.042]	[0.098]
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,376	1,366	1,375	1,375	1,376	1,374	1,370

FE = fixed effects, WFH = work from home.

Notes: Standard errors in parentheses. Anderson q-values in square brackets. *$p < 0.10$, **$p < 0.05$, and ***$p < 0.01$. The regression outcomes in this table are represented by dummy variables. These variables are coded as 1 if respondents agree or strongly agree with statements regarding the impact on firm characteristics (e.g., business growth, registration, flexibility, work from home policies, connectivity, customer trust, and ease of obtaining loans). Anderson q-values are jointly estimated for all seven columns (outcomes).

Source: Authors' calculations.

Table 10. **Daraz Business Index: Impact by Firm Size and Registration Status**

	(1) Impact Index	(2) Impact Index	(3) Impact Index	(4) Impact Index
<5 employees	0.19**	0.12		
	(0.081)	(0.084)		
Registered			−0.081	−0.070
			(0.062)	(0.064)
Time on Daraz (years)		0.020		0.026
		(0.022)		(0.022)
Firm age (years)		−0.020***		−0.022***
		(0.0056)		(0.0053)
Country FE	Yes	Yes	Yes	Yes
Observations	1,302	1,291	1,389	1,377

FE = fixed effects.
Notes: Standard errors in parentheses. **$p < 0.05$ and ***$p < 0.01$. The regression outcome in this table is the business impact index. The index is constructed according to Anderson (2008) and Schwab et al. (2020). The business impact index combines the following variables: business grown, registered for Daraz, more flexibility, easier to work from home, connectivity customer trust, and easier to obtain loans.
Source: Authors' calculations.

In Table A.4, we look at the impact of tenure on Daraz on registration status as a rough test of the hypothesis that participation in digital platforms induces firms to register their businesses. We find that time on Daraz is positively correlated with business registration—that is, firms on Daraz are less likely to report being unincorporated—but has little impact on VAT registration. This result is robust to the inclusion of controls for firm age and country fixed effects.

VI. E-commerce Sellers Are a Select Group of Firms

The Chaldal and Daraz surveys reveal that while the firms selling on these e-commerce platforms may vary substantially in terms of size and other key characteristics, they are a select group of firms. Specifically, their owners or senior managers have above average levels of education and are also comparatively young.

Consider the case of Chaldal. Since the average size of Chaldal sellers is quite large, it would be misleading to compare Chaldal sellers to typical small and micro firms in Bangladesh. A recent World Bank survey of small to large Bangladeshi manufacturing firms provides a more useful comparison point (Gu, Nayyar, and Sharma 2021). The sample of the World Bank manufacturing sector survey is tilted toward large firms compared to the Chaldal seller sample: 86% of the firms in the

former have more than 20 employees, compared to only 60% in the latter. And yet, only 54% of the senior managers of the firms in the Bangladesh manufacturing sector survey have a bachelor's or higher degree, as opposed to 79% of the owners and managers of the businesses selling on Chaldal. More than 90% of the firms in the Bangladesh manufacturing sector survey are managed by the owner or their family, in comparison to 82% of Chaldal sellers. Thus, firms selling on Chaldal have higher levels of managerial education and a lower prevalence of family management than typical manufacturing firms in Bangladesh.

Given the small average size of Daraz sellers, a recent representative survey of family business in India may provide an appropriate comparison sample for the Daraz survey.[17] In India, among family businesses with at least one hired worker, only 25% of the owners have more than a senior secondary education. In comparison, the majority of Daraz sellers have a tertiary education. The average age of the owners of Indian family businesses is about 45 years, compared to 30 years in the case of Daraz sellers. Daraz sellers may be small, but they are a highly educated and youthful subset of small business owners in South Asia.

VII. Conclusions

The quantitative case studies presented in this paper have contributed to the scant evidence base on the ways in which selling on e-commerce platforms impacts small informal firms in developing countries. The main channel of impact highlighted by the surveys is the greater access to product markets enabled by the reduction in transaction costs. This finding is significant in light of the growing evidence that there are important demand-side constraints to firm growth, such as the high costs of gaining initial market access (Atkin, Khandelwal, and Osman 2017) and slowly building a customer base (Foster, Haltiwanger, and Syverson 2016). The case studies also suggest that this easing of demand-side constraints to growth increases e-commerce sellers' incentives to formalize and undertake complementary changes to business practices and technologies. Strikingly, micro and small-sized firms from the informal sector report these benefits to the same extent as do medium-sized and large formal firms.

The case study approach used in this paper has helped assess the potential mechanisms through which firms are able to reap benefits from using e-commerce platforms. But being based on the subjective reports of e-commerce sellers and lacking

[17]The World Bank COVID Module of the Center for Monitoring the Indian Economy Consumer Pyramids Household Survey (January–April 2021 wave).

a control group, this approach is not suitable for causal impact evaluation. Our findings thus highlight the need for more quasi-experimental or experimental research into estimating the impacts of e-commerce on firms in developing countries. The selective use of e-commerce by firms in South Asia is also worth stressing. This issue is not limited to e-commerce platforms. Interviews with other types of digital platforms that facilitate B2B transactions also suggest that for a number of reasons, their usage is concentrated at the upper end of the spectrum of small firms. For example, Power2SME, a B2B platform in India that aggregates orders of raw materials for small firms, requires firms to have a turnover of at least 50 million rupees, a threshold well above the revenue of most small informal firms. This is because aggregating orders when each order size is very small is prohibitively costly even with the digital platform technology. In addition, a key reason highlighted for the lack of use of the platform is that a majority of small firms prefer to purchase their raw materials through informal networks. This would remain a (transactional) barrier even if a platform such as Power2SME were to offer subsidized logistics, delivery services, and access to financing. In fact, Power2SME has an active strategy of outreach to small and medium-sized enterprises (SMEs) and microenterprises: It identifies industrial belts in the country and reaches out to their industrial cluster associations to offer them its services and support.[18] These outreach efforts from private digital platforms signal the scope for many complementary public policy interventions ranging from improving access to digital infrastructure, efficient postal and parcel service, and access to finance, to information and support campaigns to make online economic transactions more familiar and trustworthy to the informal sector. In sum, governments' backing for these complementary factors and an active approach to the regulation of the digital economy will remain necessary.

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[18]Power2SME outreach initiatives include (i) SME Transformation Camps, which aim to empower SMEs digitally and educate SMEs on technological means to address the issues related to raw material procurement, research and innovation, taxation, working capital loans and more; (ii) webinars that have reached thousands of SMEs; and (iii) links with the Wadhwani Foundation to bring to its clients the Sahayata Business Stability program, which provides up to 10,000 SMEs with transformational business consulting at a highly subsidized rate, equipping them with the expertise necessary to survive, stabilize, and grow in the face of market challenges.

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Appendix

To view all appendixes, please refer to the supplemental materials that are available at: https://www.worldscientific.com/doi/app/10.1142/S0116110525500064.