Wholesale Price Discrimination in Global Sourcing

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Wholesale Price Discrimination in Global Sourcing

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Past research has found price discrimination in business-to-consumer (B2C) markets, where buyers are end customers. There is limited study on suppliers' price-quoting behaviors and price discrimination in business-to-business (B2B) markets. It is unclear whether certain characteristics of B2B buyers, who are often representatives of firms and not end customers, would influence suppliers' pricing decisions. In this research, we study wholesale price discrimination by collaborating with a global trading company which runs a field experiment on a global sourcing marketplace. We find that there is no significant difference in the wholesale prices quoted to buyers selling in US and South African markets. We also find that suppliers quote significantly higher wholesale prices to White buyers than to Asian and Black buyers regardless of country. However, price discrimination disappears when buyers present market information to suppliers, providing the lowest wholesale price offered by other suppliers in the market, whereas price discrimination remains when buyers present social information to suppliers, indicating the buyer is referred by a previous customer. We also find that market information can help buyers obtain a lower wholesale price because it signals a lower willingness to pay. Social information, however, can reduce price quotes for only Black and White buyers, but not for Asian (particularly Chinese) buyers. Our work can provide guidance to suppliers' pricing strategies, buyers' inquiry strategies, and B2B platforms' information strategies to attract and retain users.

Key words: Wholesale Price, B2B Marketplace, Global Sourcing, Market Information, Social Information

1. Introduction

Since the late 1980s, companies around the world have been implementing global sourcing to procure goods and services across geopolitical boundaries. This practice aims to exploit global efficiency by buying from countries with low-cost skilled labor and cheap raw materials. For example, procuring labor-intensive manufactured products like apparel and consumer electronics from China is cheaper than procuring the same goods from many other countries. Imports and exports account for a large percentage of the gross domestic product (GDP) around the world. For example, in 2016, imports to the US and South Africa accounted for 14.7% and 30.1% of their GDPs, respectively, and exports accounted for 19.7% of China's GDP (World Bank 2018).

In global sourcing, the wholesale price charged by an upstream exporter (the supplier) to a downstream importer—such as a retailer, wholesaler, or trade agent (the buyer)—is a key determinant of each supply chain member's profits. *Buyer* in this paper specifically refers to the individual procurement manager representing the buying company. Wholesale pricing in B2B transactions has received little attention in the empirical literature, primarily because wholesale prices are private information between suppliers and retailers. Current research has largely inferred wholesale prices using retail-price data from B2C markets, which is often publicly accessible and easier for researchers to obtain.

B2B pricing and buying decisions distinguish from those of B2C markets in customer type (retailer vs. end consumer), order quantity (large vs. small), customer relationship (long-term vs. short-term), price (negotiable vs. fixed), and decision type (planned and rational vs. impulsive and emotional). Consequently, B2B buyers spend significant efforts researching the market prior to purchasing. Given that pricing and buying decisions are fundamentally different from the retail context and that the B2B market is double the size of the B2C market in both domestic and global markets (Forrester 2015, Hanover Research 2018), it is important to empirically study wholesale pricing strategies in B2B markets (Cachon 2003, Cachon and Netessine 2006).

In practice, a supplier is motivated to optimally set the price to maximize his profit, so he may tailor the price to buyers of different races or selling countries. Such price discrimination has been identified in various B2C markets (Yinger 1986, Ayres and Siegelman 1995). However, it is not clear if the same phenomenon and mechanisms remain in a B2B context. B2C buyers are end customers whose characteristics directly reflect their ability and willingness to pay for the product, whereas B2B buyers are often procurement managers that acquire products for firms who will then sell to end consumers. That is, B2B buyers' characteristics may neither represent their firms nor resemble their end customers. Thus, one would expect that the procurement manager's characteristics might not influence the supplier's wholesale price decisions.

In this paper, we explore how suppliers' wholesale pricing depends on the buyer's characteristics, including the buyer's country and race, on an online B2B global-sourcing platform. We further study the impact of information strategies—presenting the lowest market-price information to suppliers or indicating the buyer has been referred by previous customers—on suppliers' price quoting and potential price discrimination.

In particular, we study wholesale price discrimination in two countries (the US and South Africa) and what effects the market in which the buying company sells to and the procurement managers' race have on pricing. We chose these two countries for our research because they are large importing countries—the US is the largest importer in the world and South Africa is the largest importer in Africa (Central Intelligence Agency 2018)—and both are multiracial countries. In addition, both

countries have significant inequality in economics, income, and wealth—with the US as a developed country and South Africa as a developing and emerging country—which can be key determinants for suppliers' pricing decisions.

Online B2B platforms serve as essentially information brokers through whom buyers search, compare, and connect to suppliers, quote and negotiate prices with suppliers, and finalize transactions. Information has been shown to play an important role in pricing outcomes (Stigler 1961, Valley et al. 1992). We therefore explore how information strategies influence wholesale pricing and potential discrimination in B2B transactions. Unlike B2C buyers, B2B buyers spend more time researching the product in the purchasing process. Surveys on B2B markets show that buyers spend a significant amount of effort collecting information from the market or peers.

> *Given today's long and winding purchase process—and the sheer amount of research involved— it should come as no surprise that more buyers are turning to trusted sources for advice when choosing between vendors. [...] Almost half (49%) listed their peers and colleagues as a top source of information [...].*
>
> —Demand Gen Report B2B Buyer's Survey (2016, p.11).

This motivates us to investigate the impact of a buyer's market information—providing suppliers the lowest wholesale price offered by other suppliers in the market—and social information— indicating that a buyer is referred by a peer—on suppliers' price quoting and discriminatory behavior.

We collaborate with a global trading company which operates and runs a field experiment on Alibaba.com (Alibaba)—the world's largest online global-sourcing platform. As a canonical platform, Alibaba serves millions of international buyers and suppliers from 190 countries. The trading company's procurement managers of different countries (the US and South Africa) and races (Asian, Black, and White) quote prices from suppliers on Alibaba. Asian, Black and White refer to descendants of Asia, Africa, and Europe, respectively. Specifically, we study Chinese, African, and White buyers in the US and South Africa. We customize the quoting messages to signal market and social information with four information conditions: no information, market information only, social information only, and both market and social information. We record and compare suppliers' quoted wholesale prices for buyers from two countries and three races under the four information conditions.

1.1. Findings

We find that wholesale prices quoted to buyers selling to the US and South African markets are not significantly different. This indicates that there is no wholesale price discrimination based on country in our context, which could be due to the fact that retail prices and the corresponding willingness-to-pay of the studied products are similar in both countries.

We find that quoted wholesale prices vary based on procurement managers' racial status. Specifically, in both countries, suppliers quote a significantly higher wholesale price to White buyers than Black and Asian buyers. This shows the existence of wholesale price discrimination against white buyers. Intuitively, the supplier decides the wholesale price based on his perception of the buyer's willingness-to-pay. A perception of a higher willingness-to-pay would lead to a higher wholesale price. The pricing decision could also depend on the buyer's end-customers' willingness-to-pay. According to the similarity-attraction theory (Byrne 1997), suppliers tend to believe that procurement managers would develop a buyer-seller relationship with people of the same race (Smith 1998). Therefore, suppliers would expect a White buyer's downstream customers to have a similar ethnicity and willingness-to-pay. Consequently, suppliers would charge a higher wholesale price to white procurement managers than others.

We also find that market information and social information can significantly reduce the wholesale price offered by suppliers. That is, when buyers present a market price or a social connection with suppliers, they can obtain a lower price quote. In a B2B global-sourcing platform, the supplier is uncertain about the buyer's exact willingness-to-pay and relies on available information to infer it. The market and social information provided by a buyer signal his *reference price*, which is particularly influential in B2B transaction decisions (Bruno et al. 2012). To be specific, market information explicitly entails the market price offered by competitive suppliers, and social information implicitly signals the historical price offered to previous buyers. As a result, information can update suppliers' beliefs on buyers' willingness-to-pay, anchoring the wholesale price they offer.

In particular, market information unanimously reduces wholesale prices for buyers of any race. Social information, however, can reduce the price quote for only Black and White buyers but not for Asian (specifically Chinese) buyers. Whether a supplier reacts to the social information, which is often private and unverifiable, depends on the supplier's perception of the buyer's trustworthiness (Özer et al. 2011, Gu and Zhu 2018). Given that over 97% of Alibaba suppliers are from China, one possible explanation of this result is the distrust between Chinese sellers and buyers, i.e., Chinese suppliers trust non-Chinese buyers more than they trust Chinese buyers (Özer et al. 2014).

We further investigate whether information can reduce wholesale price discrimination. Price discrimination has been shown to potentially hurt social welfare (Katz 1987) and is therefore banned by regulations in many countries. Our results show that market information can reduce wholesale price discrimination. This is because market information directly signals the product price in the market, which serves as an explicit buyer-independent reference price that suppliers use as an anchor regardless of the buyers' race. However, we find that social information fails to reduce wholesale price discrimination. Social information signals a buyer-dependent reference price which depends on the buyers' race. Because suppliers tend to believe that buyers are referred by

peer buyers of the same race, suppliers anchor to the price offered to a certain racial group, and so, the discrimination remains.

2.   Literature Review

Our work is related to one of the central topics of supply chain management: wholesale price (Cachon 2003). In supply chains, the wholesale price that suppliers charge for downstream buyers is an important determinant of suppliers' profit margins and buyers' prices, which in turn impact profitability. There are two schemes for wholesale pricing: uniform and buyer-specific. In a uniform scheme, the supplier charges an identical wholesale price to all retailers in the market. In a buyer-specific scheme, however, the supplier charges different prices to retailers based on, for instance, order quantity (Zhang et al. 2016), buyer intermediation (Tunca and Zhu 2017, Gu and Zhu 2018), or race (Graddy 1995). Buyer-specific wholesale pricing has been shown to help suppliers optimize profits (DeGraba 1990) and achieve supply chain coordination (Cachon 2003). Our work investigates the existence of buyer-specific pricing in global trading, which could enhance our understanding of profit allocations across supply chain members.

The literature lacks empirical evidence on uniform or buyer-specific wholesale pricing, i.e., whether wholesale price discrimination exists in practice, and if so, how to reduce discrimination. The existing evidence is still largely anecdotal rather than quantitative (Gerstner et al. 1994). This is mainly because of the difficulty in accessing confidential data on wholesale price. Our paper contributes to this literature by providing empirical evidence on wholesale price discrimination based on a buyer' race and selling market as well as exploring strategies to reduce discrimination. To the best of our knowledge, we are the first to empirically investigate wholesale pricing and wholesale price discrimination in the B2B context.

Global sourcing has become a common strategy adopted by a myriad of companies (Antras and Helpman 2004). The literature has theoretically investigated topics including facility networks and dual sourcing (Cohen and Mallik 1997, Cohen and Huchzermeier 1999, Lu and Van Mieghem 2009, Allon and Van Mieghem 2010). Our paper follows the recent interest in empirically quantifying operations strategies arising in global procurement. For example, a recent but influential paper by Jain et al. (2013) analyzes firm-level bill of lading data and shows that an increase in global sourcing leads to an increase in inventory investment. Short et al. (2016) show the importance of auditing suppliers' conduct in mitigating reputational risk and information asymmetry in global supply chains. Wang et al. (2018) study the impact of sub-tier network structures on global high-tech supply chains. We complement this literature by investigating how suppliers set their wholesale prices to different buyers on a global trading platform, and by offering platform suggestions on how to reduce such discrimination.

Our paper is also related to the stream of literature on discrimination. Racial, gender, and origin discrimination have been identified in various markets including labor markets (Oreopoulos 2011), rental markets (Ewens et al. 2014), and sharing economies (Cui et al. 2017, Cui and Hu 2018, Mejia and Parker 2018). We explore discrimination based on the race of purchasing managers as well as their selling country on a global B2B platform. Our observations are consistent with the classic statistical discrimination theory (Phelps 1972) in that a supplier's differential treatment is driven by his rational behavior—maximizing expected utility—in the absence of direct information. As a result, suppliers' discrimination could be effectively reduced by strategies such as information sharing.

Our work is particularly related to the segment of literature on price discrimination. This stream of work mainly studies B2C settings and aims to understand whether certain groups of customers—for example, those of different origins, genders, or race—are able to obtain a lower price than others (Ayres and Siegelman 1995, Castillo et al. 2013, Busse et al. 2017). Information has been pointed out as the key driver for price discrimination (Stigler 1961). Suppliers determine their price based on a belief of the buyer's willingness-to-pay. Buyers would receive a higher price when they signal a higher willingness-to-pay. We extend the scope and theory of this literature to a B2B marketplace. A key differentiator for a B2B setting is that, unlike a B2C setting where buyers are the ones who make the purchase, B2B buyers are often representatives of firms. One would expect that representatives' race would not influence suppliers' price quotes. However, our findings show that racial prejudice is so deep that it extends beyond an individual to the company he represents.

Information sharing has been shown to reduce supply chain inefficiency and enhance supply-demand matching. For example, information sharing has been shown to improve inventory and capacity management (Lee et al. 2000, Cachon and Lariviere 2001, Gaur et al. 2005), help meet product deliveries (Terwiesch et al. 2005), reduce the bullwhip effect (Lee et al. 1997, Bray and Mendelson 2012), and increase forecast accuracy (Cui et al. 2015) in supply chains. We contribute to the literature on double marginalization. Researchers have long known that the wholesale price contract leads to system inefficiency due to double marginalization (Spengler 1950). This literature has largely focused on the impact of information on double marginalization (Cachon 2003). We complement the literature by empirically studying two types of information—market and social information—and finding that both types can reduce the price quote, i.e., information sharing can help mitigate double marginalization. We also contribute to the literature on trust and trustworthiness in supply chains. In particular, we find that market information reduces the quoted price for buyers of difference races, whereas social information does so only for Black and White buyers but not for Chinese buyers. This echoes the findings by Özer et al. (2014) that Chinese suppliers exhibit higher trust toward US retailers than Chinese retailers.

3. Research Hypotheses

We study how suppliers quote their wholesale prices to buyers—usually procurement managers of buying companies—on an online global trade platform, Alibaba.com, where "buyers, who are located in more than 190 countries, are typically trade agents, wholesalers, retailers, manufacturers and SMEs engaged in the import and export business" (Alibaba 2018). Before buying a product, buyers would research its market price by asking for price quotes from suppliers. Suppliers then provide a price quote to buyers based on buyers' characteristics and the inquiry request.

We next develop hypotheses based on the literature on supply chain and price discrimination. We discuss potential mechanisms behind price quoting and wholesale price discrimination, and we propose ways to reduce this discrimination.

3.1. Wholesale Price Discrimination

A unique feature of B2B markets compared to B2C markets is that buyers are not end customers; they sell the purchased products to end customers. When a supplier decides on a wholesale price to charge buyers in a B2B setting, the key decision factor is the willingness-to-pay of buyers' end consumers. Economics theory suggests that buyers with a higher willingness-to-pay will be charged a higher price (Ayres and Siegelman 1995). Thus, the higher the end consumers' willingness-to-pay, the higher wholesale price suppliers will charge.

End consumers' willingness-to-pay can vary across countries. For example, consumers from countries with different wealth levels may have a different willingness-to-pay. Willingness-to-pay for the same product may be lower to those of average wealth than to the rich. Therefore, because the US has a higher average income than South Africa, US consumers tend to have a higher willingness-to-pay than South African consumers. As a result, suppliers will charge a higher price to US buyers.

Hypothesis 1 **(Country)**. *Wholesale price discrimination based on a buyer's country exists in global trading. US buyers will receive a higher price quote than South African buyers.*

End consumers' willingness-to-pay can also vary based on their races (Bergstrom et al. 1982). The literature has documented that, in general, white consumers in B2C markets have a higher willingness-to-pay than other consumers (Ayres and Siegelman 1995). In addition, the theory of similarity-attraction (Kaptein et al. 2014) indicates that managers tend to develop a buyer-seller relationship with people of the same race (Thomas 1990, Smith 1998). In our context, a supplier would expect that the buyer will target or be patronized by consumers of the same race. As a result, the supplier would expect that white buyers have a higher willingness-to-pay and therefore charge them a higher price than Asian or black buyers.

Hypothesis 2 **(Race)**. *Wholesale price discrimination exists in global trading based on a buyer's race. White buyers will receive a higher price quote than non-white buyers.*

3.2. Impact of Information on Price and Discrimination

The supplier attempts to infer a buyer's willingness-to-pay based on available but often limited information about the buyer. Information can help update the supplier's belief and alter the offered wholesale price accordingly. We explore the effects of market information—communicating the lowest wholesale price offered by other suppliers in the market—and social information—indicating that the buyer is referred by a previous customer—on suppliers' price quotes.

Market and social information can be the key determinants for suppliers when quoting the price. Both types of information can generate a *reference price point* based on which the supplier determines the price quote. Reference prices are benchmarks against which the purchase of a product is judged (Mazumdar et al. 2005). Market information signals the price offered by competing firms, while social information signals a connection the buyer has with a previous buyer. For example, the buyer may know the historical price paid by the previous buyer (Mezias et al. 2002).

The reference price is particularly influential in B2B transactions. A number of B2B pricing papers—particularly, Bruno et al. (2012), Zhang et al. (2014), Elmaghraby et al. (2015), Pilehvar et al. (2016)—demonstrate that the reference price affects the pricing outcome in B2B market transactions. In our context, market information contains the lowest market price found by the buyer, and social information implies knowledge of the historical price offered to a previous buyer. That is, the market information explicitly mentions—whereas the social information implicitly hints at—a reference price based on which the supplier determines the wholesale price to quote. As a result, both market and social information can update the supplier's belief on the buyer's willingness-to-pay, and the wholesale price quote will be anchored to the reference price signaled through the information. We hypothesize that market information and social information can reduce the wholesale price quote.

HYPOTHESIS 3 (**Price Reduction**). (*a*) *Market information can reduce the wholesale price quoted by suppliers in global trading.*

(*b*) *Social information can also reduce the wholesale price quoted by suppliers in global trading.*

The impact of market and social information on the wholesale price may vary across buyers of different races. In particular, the market price is a piece of information that can be verified and therefore has a strong signal strength. Suppliers' decisions would rely more on the market information than the information signaled by race. As a result, market information can reduce the wholesale price quoted by buyers of any race.

Whether the supplier reacts to social information depends on the supplier's perception on the buyer's trustworthiness (Gu and Zhu 2018). Past research has shown that Chinese suppliers perceive Chinese buyers to be less trustworthy than other buyers (Özer et al. 2014). Therefore, because over

97% of Alibaba suppliers are from China, we hypothesize that social information can reduce the wholesale price quote for black and white buyers but not for Asian (Chinese) buyers.

HYPOTHESIS 4 **(Price Reduction based on Race)**. (*a*) *Market information can reduce the wholesale price quote for buyers of different races in global trading.*
(*b*) *Social information can only reduce the wholesale price quote for non-Asian (non-Chinese) buyers in global trading.*

Market and social information may affect wholesale price discrimination differently. Market information directly signals the product price in the market, which serves as an explicit buyer-independent reference price. Consequently, market information can reduce price discrimination for all buyers regardless of their race or country.

Social information, however, indirectly signals the historical price charged or quoted to a previous buyer, serving as a buyer-dependent reference price. A previous buyer's historical price can depend on his race (see Hypothesis 2). In particular, a white peer buyer may have received a higher price than a non-white buyer. According to the similarity-attraction theory, the supplier tends to believe that a buyer is referred by a peer buyer of the same race, so the supplier's wholesale price will anchor to a buyer-dependent reference price based on the racial group the buyer belongs to. We thus hypothesize that social information cannot mitigate wholesale price discrimination.

HYPOTHESIS 5 **(Discrimination Reduction)**. (*a*) *Market information can reduce wholesale price discrimination in global trading.*
(*b*) *Social information cannot reduce wholesale price discrimination in global trading.*

4. Research Context

Founded in 1999, Alibaba is the largest online B2B trading platform in the world (Lesonsky 2018). The platform facilitates efficient and reliable trade between millions of buyers and suppliers around the world. Suppliers provide hundreds of millions of products in over 40 major categories, including apparel, household sundries, and machinery. About 97.6% of the suppliers are manufacturers or dealers in mainland China, and the rest are located in Taiwan, Hong Kong, and other regions all over the world (Alibaba 2016). Buyers are located in more than 190 countries, and they exchange more than 100,000 messages with suppliers on the platform every day.

4.1. Selling on Alibaba

On Alibaba, a supplier introduces his company on a profile page and lists product characteristics and transaction details on a product page. A supplier's profile page includes company information (e.g., name, location, size, and product category), capabilities (e.g., historical revenue in different regions, manufacturing capacity, and quality control certificates), and performance on the platform

(e.g., response rate, ratings, and transaction volume), which can help buyers choose reliable suppliers. Suppliers can pay to become gold suppliers—a premium membership on Alibaba that grants members advantages in product promotion and exposure. Most suppliers are gold members. Figure 4 in the appendix shows an example of a supplier's product page where product information is listed on the left and supplier characteristics are displayed on the right. The product page displays product characteristics—e.g., description, picture, price, and color—and transaction details—e.g., shipping fee, lead time, customization, and payment method. Specifically, the supplier sets the wholesale price and the corresponding minimum order quantity.

4.2. Buying on Alibaba

A buyer also creates a personal profile that includes the buyer's name, photo, company name, country, and Alibaba-certified contact information (i.e., phone number, and email address). Buyers can search for a specific product, and the platform will display a list of suppliers to choose from. The buyer can then view product details and contact the supplier as shown in Figure 4. When receiving an inquiry from a buyer, the supplier chooses whether to read and follow up with the inquiry. The buyer can see the status of the inquiry, e.g., whether the message has been read by the supplier. After the transaction details have been settled, the buyer pays the supplier, the supplier delivers the order, and the transaction is completed.

5. Identification Strategy

Our paper studies suppliers' wholesale price discrimination based on buyers' countries (i.e., selling markets), races, and any market and social information that might mitigate the discrimination. Aiming to understand suppliers' pricing behaviors, a global trading company which operates on Alibaba collaborates with us to conduct a field experiment.

5.1. Study Design

The global trading company sells in both US and South Africa markets. The company has multiple procurement representatives, whose routine job is to keep track of market dynamics by collecting wholesale prices. In our study, the procurement representatives follow our scripts and guidelines when quoting wholesale prices from suppliers. Our study tests suppliers' responses to buyers from two countries (the United States and South Africa) of three races (identified as Asian, Black, and White in this study) under four information conditions (no information, market information only, social information only, and both market and social information), i.e., a $2{\times}3{\times}4$ experiment design.

The trading company asks for price quotes via twelve buying representatives—two Chinese, two African American, and two White buyers serving the US market, while two Chinese, two African, and two White buyers serving the South African market. Buyers contact suppliers on Alibaba to

request a price quote. We tailor the message to incorporate market and social information in the latter three information conditions. Each buyer sends messages of four information conditions. We then record and compare suppliers' responses. Table 1 summarizes the study design. Our study was conducted after being approved by the Institutional Review Board, and our experiment was registered by SocialScienceRegistry.org.

Table 1   Study Design

Design	Country × Race × Information							
	USA	White Buyer	Black Buyer	Asian Buyer	RSA	White Buyer	Black Buyer	Asian Buyer
Buyers	No Info				No Info			
	Market Info	2 Buyers	2 Buyers	2 Buyers	Market Info	2 Buyers	2 Buyers	2 Buyers
	Social Info				Social Info			
	Both Info				Both Info			
Experiment Date	June 1, 2019 to July 30, 2019							
Product Category	Computer accessories (i.e., flash drive, hard disk, network card, keyboard, mouse, mouse pad, USB splitter) and electronic devices (i.e., memory card, headset, bluetooth speaker, power bank, modem, wifi extender, wireless presenter)							

Note: The difference between the planned sample size and the actual sample size is due to suppliers' unavailability. In particular, the planned sample size was 3,840, i.e., 160 suppliers per treatment arm. After excluding unavailable listings, buyers sent requests to 3,716 listings, which is the actual sample size.

We select a sample of 3,840 products from 3,840 suppliers selling in the computer accessories sector.[1] Computer accessories have a relatively standard quality and a large number of suppliers. Moreover, electronic equipment is the top export category in China.[2] In our sample, there are twenty-one product subcategories including, for example, flash drive, hard disk, keyboard, and memory card. Each supplier usually offers a wide selection of models for a product with different features, for example, flash drives with storage capacities of 8, 16, or 32 GB and case material of plastic or metal. From each supplier's listed products, we select a product model that is the most common and standard in the market. Suppliers are randomly assigned to one of the twenty-four (2×3×4) treatment arms. As a result, we have 1,920 suppliers per country, 1,280 suppliers per race, 960 suppliers per information condition, and 160 suppliers per treatment arm.

To ensure that suppliers are randomly assigned to treatment arms, we check the randomization across supplier characteristics measured by seven variables prior to the experiment: (1) response rate over the last 30 days, (2) gold supplier status (i.e., the number of years a supplier has had a premium membership on Alibaba), (3) transaction level (i.e., the accumulated score awarded for a supplier's total transaction volume on Alibaba; the greater the transaction volume, the higher the score awarded), (4) number of transactions in the past six months, (5) listed price of the chosen

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[1] The sample size is determined by the statistics power calculation.

[2] https://tradingeconomics.com/china/exports-by-category

product, (6) number of reviews on the supplier's profile page, and (7) review rating based on three dimensions: supplier service, on-time shipment, and product quality. Table 2 shows the summary statistics for these variables across country and race. To show there is no systematic difference in suppliers' characteristics across treatments, we conduct t-tests over the values of the seven variables prior to the treatment. The randomization checks are shown in Table 3.

Table 2   Summary Statistics

		United States	South Africa	United States			South Africa		
				Black (B)	White (W)	Asian (A)	Black (B)	White (W)	Asian (A)
Response Rate (%)	Mean	79.52	79.76	79.43	79.44	79.70	79.96	79.81	79.53
	Std	20.33	19.62	20.61	19.96	20.45	19.45	19.44	20.01
Gold Supplier (years)	Mean	4.55	4.53	4.51	4.58	4.57	4.64	4.49	4.45
	Std	3.23	3.19	3.21	3.24	3.24	3.18	3.25	3.14
Transaction Level	Mean	2.09	2.08	2.07	2.09	2.10	2.10	2.08	2.07
	Std	0.88	0.88	0.89	0.89	0.87	0.89	0.85	0.89
No. of Transactions	Mean	28.06	28.78	27.94	27.30	28.96	28.14	28.84	29.37
	Std	40.19	40.27	39.41	41.19	39.99	34.34	45.78	39.85
Listed Price	Mean	7.07	7.06	7.00	7.07	7.07	7.06	7.08	7.06
	Std	4.09	4.29	4.18	4.03	4.08	4.45	4.17	4.26
No. of Reviews	Mean	7.57	7.24	7.60	7.52	7.60	7.06	7.15	7.51
	Std	12.22	16.19	12.76	11.99	11.93	10.78	23.11	11.36
Review Rating	Mean	4.68	4.68	4.68	4.65	4.70	4.70	4.66	4.69
	Std	0.51	0.50	0.49	0.52	0.52	0.46	0.54	0.50
Observations		1920	1920	640	640	640	640	640	640

Table 3   Randomization Check (p-value)

	USA vs RSA	United States			South Africa		
		B vs W	B vs A	W vs A	B vs W	B vs A	W vs A
Response Rate (%)	0.71	0.99	0.81	0.82	0.88	0.69	0.80
Gold Supplier (years)	0.83	0.68	0.73	0.94	0.39	0.28	0.85
Transaction Level	0.92	0.75	0.63	0.88	0.62	0.58	0.95
No. of Transactions	0.65	0.82	0.72	0.55	0.63	0.57	0.86
Listed Price	0.96	0.98	0.98	0.95	0.94	0.99	0.95
No. of Reviews	0.58	0.93	0.99	0.93	0.94	0.57	0.78
Review Rating	0.85	0.48	0.45	0.16	0.34	0.79	0.50

Note: A, B and W represent the Asian, Black, and White buyers, respectively.

5.2.   Study Procedure

Recall that half of the buyers source products for the US market and the rest for the South African market. The buyer specifies his target market when sending out inquiries. Additionally, US (South African) IP addresses and flag figure are prominently displayed on top of the messages sent by buyers selling to the US (South African) market. Buyers' racial groups (Black, Chinese, or White) are signaled by their names and profile pictures.[3]

Buyers sent messages to suppliers between July 29, 2018 and August 30, 2018. Each message asks a supplier to provide the price quote per unit for 1,000 units of pre-selected product. Our study

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[3] In order to avoid the possible confounders, we adjust the buyer photos using Photoshop and evaluate their attractiveness on AnaFace.com. Based on criteria like facial symmetry, facial structure, and the golden ratio (Hoegele et al. 2016), all profile photos receive a score of 7.9 out of 10, which validates that the photos have similar attractiveness.

focuses on the initial price quote for the following reasons. First, the initial price quote reflects the supplier's perception of the buyer's willingness-to-pay. Second, on an online B2B platform, buyers can send price inquiries to many suppliers without much effort. This means that suppliers could easily lose customers to competitors if they do not offer an attractive initial price. Therefore, the initial price is a good indicator for the final transaction price. Third, the initial price quote, unlike a second price quote or price concession, is not confounded by any bargaining or negotiation techniques. Last, the initial price quote is used as a proxy for the final price in previous studies using field experiments (Ayres and Siegelman 1995, Castillo et al. 2013, Busse et al. 2017) and observational data (Bruno et al. 2012, Zhang et al. 2014).

The message content varies for the different information conditions. In the "no information" condition, i.e., the control group, the buyer includes the most basic information in the inquiry message. The buyer first introduces himself with "Hello, We are exploring supplier options for our business in the United States (or South Africa). We are interested in your product: [the specific product name and hyperlink]," and then requests the price quote for 1,000 units with "Could you please quote us your best price per piece (exw) for an order of 1000 units?" Here, exw, which stands for "Ex Works," is an international trade term by which a supplier makes the product available at a designated location in the supplier's country, and the buyer incurs the transportation cost from therein. In other words, the quoted price does not include any transportation cost and thus is not confounded by transportation cost. Note that under exw, buyers pay all the tariff and related custom costs. Therefore, the tariff of a particular country does not affect the supplier's price-quoting decisions.

In the "market information" condition, the buyer reveals his expected price. The price can signal that the buyer is aware of the prevailing market price. In the message, after introducing himself, the buyer provides the market information "We have searched for the market price, and for this model the lowest price is USD [a specific dollar value]" prior to requesting the price quote. We define the lowest price as follows. A given product model—e.g., a 32-GB plastic flash drive—could have different prices due to quality differences. In our sample, the price gap could be as large as 2 USD. To provide suppliers with a reasonable reference price, for each product subcategory, we group suppliers into eight groups based on the listed prices of the chosen products. We define the bottom tenth percentile of the listed price in each group as the market price. Specially, if a product's listed price is lower than the bottom tenth percentile, we define the lowest price within the group as the market price. This ensures that buyer's revealed market price is not higher than the listed price.

In the "social information" condition, the buyer provides social information: "Your company was recommended to us by a peer." In the "both information" condition, the buyer provides both market and social information in his inquiries.

Within a week after the inquiry, we record the intial price quote and code the responses into four categories: "unread" if the supplier did not read the inquiry, "read but no response" if the supplier read the inquiry without responding, "decline" if the supplier declined the inquiry, and "reply" if the supplier replied, which includes "reply without price" and "reply with price." Out of 3,840 suppliers' products, 3,716 were available. We obtained 3,185 responses from the 3,716 suppliers, 2,676 of which included a price quote.

6. Estimation Results

In this section, we study the reply rate, price discrimination, and the impact of information on the price quote and price discrimination. We first analyze whether buyers from different countries or races would receive a different reply rate from suppliers. Second, we test the existence of price discrimination, i.e., whether buyers from different countries or races would receive different price quotes. Third, we study how market and social information affect the price discount offered by suppliers. Finally, we study whether the information conditions can effectively reduce price discrimination.

6.1. Reply Rate

We record whether each supplier replied to the inquiry, and we use that to compute the reply rate based on countries, races, and information conditions. Table 7 in the appendix summarizes the number of inquiries sent and replied as well as the corresponding reply rate. Panel A shows that the reply rates for US and South African buyers are 86.52% and 84.90%, respectively. We perform a proportion test, and the difference in reply rates across countries is insignificant (p-value=0.17). Panels B and C show that buyers of different races receive a similar reply rate in both US and South Africa (p-values $\geq$ 0.21). Panel D shows that there is no significant difference in reply rate across the four information conditions (p-values $\geq$ 0.15). The results suggest that on the global sourcing platform, suppliers do not discriminate buyers based on their selling country and race in terms of the suppliers' reply rates.

Past research has identified discriminatory behavior reflected in reply rates on platforms such as Airbnb (Edelman et al. 2017 and Cui et al. 2017) and Uber (Mejia and Parker 2018), where hosts and drivers determine whether to serve a customer by replying or responding. In those cases, choosing to serve a specific customer may matter to suppliers' safety and well-being, and thus, they use the replying decision to maximize their utility. On a trading platform, however, suppliers reply to buyers in the hope of negotiating a price and selling commodities to the buyers. Therefore, it is optimal for the suppliers to first reply to buyers, regardless of their origin and race, and then set a price based on buyers' willingness-to-pay.

6.2. Price Discrimination

In our study, there are variations in products' listed prices. Higher-priced products can have a higher absolute discount value than lower-priced products. In order to have a fair comparison in the amount of price discount offered by suppliers, we follow the literature (Goldberg 1996) and compare the discount percentage offered relative to the listed price. For each product, we define its price discount as the difference between the price listed on the webpage[4] and the supplier's quoted price relative to the listed price:

$$Discount = 100\% \times \left(\frac{\text{Listed Price} - \text{Supplier's Quoted Price}}{\text{Listed Price}} \right). \tag{1}$$

6.2.1. Country We first investigate whether suppliers price discriminate against US buyers versus South African buyers. Table 8 in the appendix summarizes the price discount by buyers' countries. In the "no information" condition, we find that buyers from the United States receive an average discount of 7.87%, and buyers from South Africa receive an average discount of 7.84%. There is no statistically significant difference between countries (p-value $= 0.99$). Across all information conditions, the price discounts in the US and South Africa are 12.17% and 12.98% respectively. The result also holds in each information condition—e.g., there is no price discrimination towards buyers from the US versus buyers from South Africa no matter what information is disclosed in the inquiry, which does not support Hypothesis 1.

We formally test price discrimination between two countries,

$$Discount_i = \alpha + \beta Country_i + \gamma Controls_i + \epsilon_i, \tag{2}$$

where $Discount_i$ is the price discount offered on product i; $Country$ is a binary variable indicating the buyer's country, which equals 0 if the buyer is from South Africa and 1 if the buyer is from the US; $Controls$ is a vector of control variables including all observed supplier characteristics: response rate, gold supplier status, transaction level, listed price, and number of reviews. Although the control variables are not required in the regression of a randomization design, we include them to improve the estimation efficiency and show the robustness of our results.

The estimation results are presented in Table 4. The findings are robust: buyers from the United States receive an almost identical price discount as buyers from South Africa in all information conditions, which indicates that there is no wholesale price discrimination between the United States and South Africa on Alibaba. This finding might be driven by the fact that the retail prices of the studied products are quite similar in both countries. We search for the prices of computer

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[4] The listed price is the price shown on the product page in Figure 4, e.g., $7.3 per unit for an order size larger than 120 units. Some products have a price range instead of a price point displayed on the product page. In such cases, we record the minimum and maximum prices and compute the average price as the listed market price.

Table 4   Price Discrimination over Country

	No Information I	Market Information II	Social Information III	Both Information IV	All Data V
	Dependent Variable: Discount				
U.S.	−0.0007	−0.015	0.001	−0.019	−0.008
	(0.019)	(0.015)	(0.018)	(0.016)	(0.009)
Supplier controls	Yes	Yes	Yes	Yes	Yes
Observations	688	655	656	677	2676
R^2	0.006	0.006	0.004	0.009	0.001

accessory products used in our experiment on leading retailers in each country. Table 9 in the appendix shows the prices (in USD) of the same products across the United States and South Africa, which are very close to each other. This indicates that the market price and, thus, the corresponding willingness-to-pay are almost identical across these two countries.

6.2.2.   Race We next investigate whether suppliers price discriminate based on a buyer's race. In this section, we focus on the "no information" condition—i.e., suppliers' price-quoting strategy in the absence of market or social information. Panel A of Table 13 in the appendix summarizes the price discounts for each race without market or social information. We also present the discount offered to each race in Figure 1. We can observe that under the "no information" condition, based on the pooled data across two countries, buyers in the Asian, Black, and White groups receive a price discount of 9.89%, 10.88%, and 2.93%, respectively. Asian and Black buyers receive a lower price quote than White buyers. The difference between White buyers and Black Buyers and the difference between White buyers and Asian buyers are statistically significant (p-value=0.001 and p-value=0.003), while the difference between Black buyers and Asian buyers is not significant (p-value=0.66). The same results hold true for both the US and South Africa. The results indicate that the wholesale price discrimination based on race exists on a global sourcing platform.

Figure 1   Price Discrimination over Race
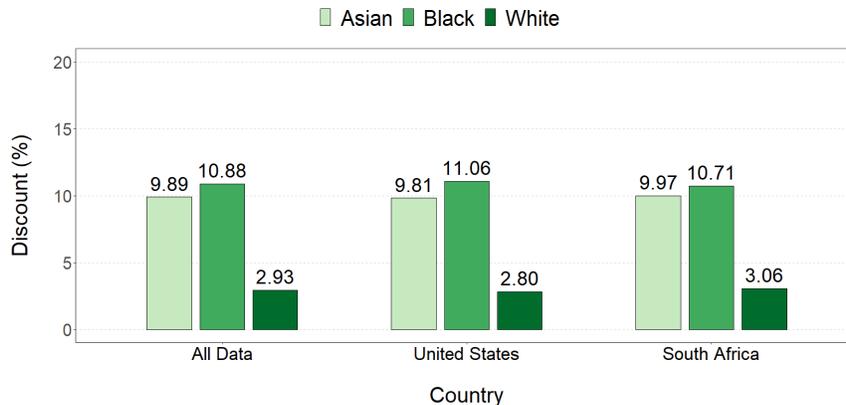
We formally test price discrimination across race using the following equation,

$$Discount_i = \alpha + \beta Race_i + \gamma Controls_i + \epsilon_i, \tag{3}$$

where $Race_i$ is a categorical variable that represents whether a buyer is in the Asian, Black, or White racial group.

Column I of Table 6 shows the estimation results. In the regression, the omitted race is the White group. The coefficients of the Asian and Black groups represent the additional price discount offered to Asian and Black buyers relative to White buyers. The coefficients are positive and statistically significant. This shows the existence of wholesale price discrimination against White buyers, which supports Hypothesis 2. This discrimination might be because the suppliers believe that buyers in the White group have a higher willingness-to-pay. When buyers do not signal that they understand the market price well enough, suppliers would charge buyers in the White group a higher price.

We display the estimation results of all variables including controls of Equation (3) in Table 10. The results show that a higher listed price leads to a larger price discount. This is because high-price suppliers tend to have a larger margin to leverage over, enabling them to use a deeper discount (lower price quote) to attract buyers. We also find that other controls do not impact the price discount offered by suppliers. In other words, a supplier's past transaction volume, experience, responsiveness, and number of reviews do not affect his price-quoting strategy.

We also test whether any supplier or product characteristics have an impact on price discrimination, by including the interaction between a supplier or product characteristic of interest, a $Moderator$, and the buyer's race,

$$Discount_i = \alpha + \beta_1 Moderator_i + \beta_2 Race_i + \beta_3 Moderator_i \times Race_i + \gamma Controls_i + \epsilon_i, \quad (4)$$

where β_3 represents how supplier or product characteristics moderate price discrimination. $Moderator$ represents the supplier's response rate, gold supplier status, transaction level, number of reviews and the product's listed price. $Controls_i$ includes all control variables except for the moderator.

Table 11 shows the estimation results of Equation (4). None of the studied supplier characteristics (except for the listed price) has an impact on price discrimination. The listed price could reduce the price gap between Asian buyers and White buyers, but the price discrimination still remains. This means that all suppliers use price discrimination equally, despite their experience, transaction volume, reputation, or responsiveness.

6.3. Information and Price Quote

We test how suppliers respond to market and social information. Table 14 summarizes suppliers' price discounts for different information conditions. We also plot the discount offered for each information condition in Figure 2. We observe that, across the United States and South Africa, the average price discount is 7.85% when there is no special information presented in the inquiry, 15.53%

with market information, 11.28% with social information, and 15.78% with both information. Compared to the price quote under the "no information" condition, market and social information can effectively reduce suppliers' price quotes (p-values ≤ 0.01). The same results hold in both the US and South Africa.

Figure 2   Price Quote by Information Condition
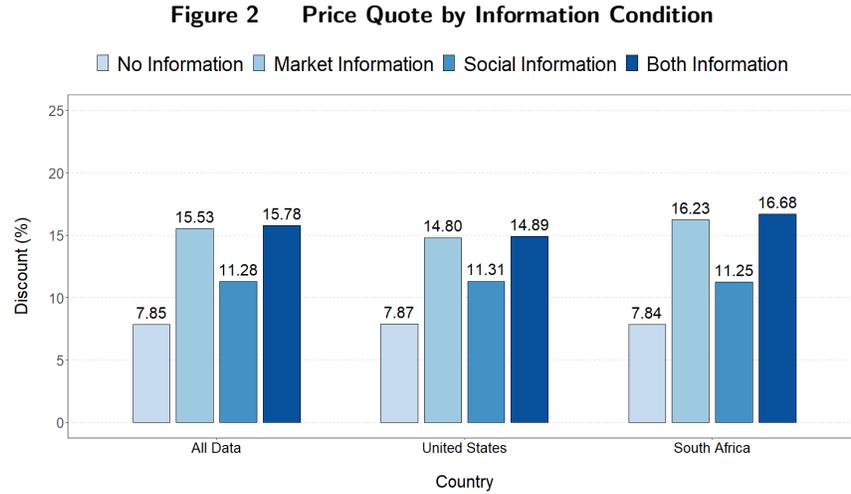
We formally test the impact of market and social information on price quotes,

$$Discount_i = \alpha + \beta Condition_i + \gamma Controls_i + \epsilon_i, \tag{5}$$

where $Condition_i$ is a categorical variable that represents "no information," "market information," "social information," and "both information" conditions.

Table 5   Impact of Information on Price Quotes

	Dependent Variable: Discount		
	All Data	United States	South Africa
	I	II	III
Market Info	0.077***	0.070***	0.084***
	(0.012)	(0.018)	(0.017)
Social Info	0.033***	0.035*	0.033*
	(0.012)	(0.018)	(0.017)
Both Info	0.080***	0.071***	0.090***
	(0.012)	(0.018)	(0.017)
Supplier controls	Yes	Yes	Yes
Observations	2676	1332	1344
R^2	0.022	0.018	0.033

Note: $^*p < 0.1$; $^{***}p < 0.01$.

Table 5 presents the estimation results of Equation (5). In the regression, the omitted information condition is the "no information" condition, and the coefficient of a specific information condition is the additional price discount obtained relative to the "no information" condition. Columns I-III use pooled data, data in the US, and data in South Africa, respectively. The results are highly consistent: market and social information can reduce the price quote, which supports Hypothesis 3. This is because revealing buyers' prior knowledge about the market price signals buyers' lower

willingness-to-pay, thus lowering the price offered by suppliers; showing social connections helps build trust between suppliers and buyers and signals the reference price within that social group. Our results echo the findings in the literature (Busse et al. 2017) that market information can serve as an effective lever in the bargaining process; our results also align with the intuition in the literature (Thomas 1990) that social ties can help smooth and seal a business transaction. We also point out the importance of using information to reduce double marginalization on B2B platforms. By receiving a lower price in a B2B marketplace, buyers, who are oftentimes retailers, can receive a lower cost and thus can afford to offer a lower retail price.

Table 12 shows the price discounts by information conditions across different races. We observe that the market information reduces the wholesale price quotes for all buyers. Social information, however, only reduces the wholesale prices for Black and White buyers but not for Chinese buyers, which supports Hypothesis 4.

6.4. Information and Price Discrimination

We next investigate the impacts of market information and social information on price discrimination—i.e., whether information could reduce price discrimination on the B2B platform. Panels B, C, and D of Table 13 summarize the statistics of price discounts by race under market, social, and both information conditions. We visually present the discounts offered to each race under each information condition using pooled data across two countries in Figure 3. We present the same separately for both the US and South Africa in Figure 5 in the appendix. The price discrimination has almost the same pattern for both countries.

Figure 3   Price Quote by Race and Information Condition Across Two Countries
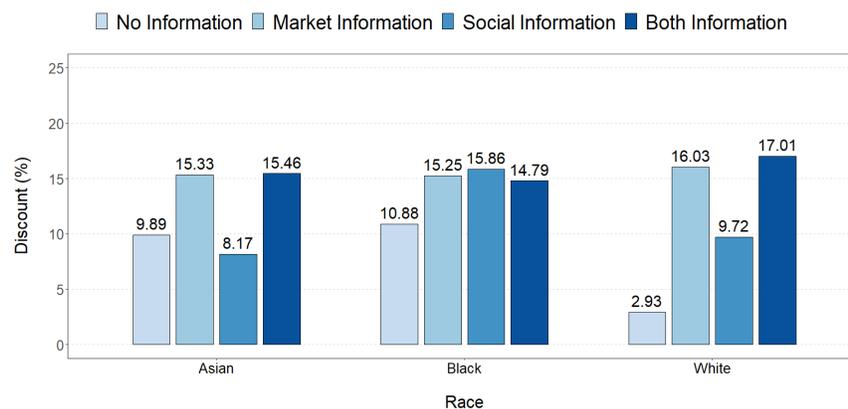
For each information condition, we first test whether suppliers' price discrimination still exists by using Equation (3). The estimation results are presented in Columns II, IV, and VI of Table 6. If an information condition can eliminate price discrimination, the coefficient of *Race* should be insignificant.

We also formally identify whether market and social information can mitigate wholesale price discrimination by estimating how an information condition moderates the price quoting gap,

$$Discount_i = \alpha + \beta_0 Condition_i + \beta_1 Race_i + \beta_3 Condition_i \times Race_i + \gamma Controls_i + \epsilon_i, \qquad (6)$$

where the coefficient β_3 of the interaction term is the moderating effect of information to price discrimination. The regression controls for all observed supplier characteristics. If an information condition can mitigate price discrimination, the coefficient β_3 should be significant. The estimation results are presented in Columns III, V, and VII of Table 6.

Market Information. From Figure 3 and Panel B of Table 13, we can see that in the presence of market information, Asian, Black and White buyers receive a price discount of 15.33%, 15.25% and 16.03%, respectively. The differences across these three groups of buyers are statistically insignificant. The buyers also receive almost identical price discounts in each country. Column II of Table 6 shows that the coefficients of Asian and Black are insignificant, which means that there is no price discrimination between Asian and White buyers and between Black and White buyers. Column III of Table 6 shows that the coefficient of Asian×Condition is significantly negative and the coefficient of Black×Condition is significantly negative, which further confirms the finding that the market information treatment can reduce price discrimination. The estimation results are consistent in both direction and magnitude across the United States and South Africa, which supports Hypothesis 5a.

When presenting the lowest market price to suppliers, buyers signal that they have searched, investigated, and understood the market. More importantly, buyers signal the price point around which they are willing to pay for the product, which serves as a buyer-independent reference price. In response, the suppliers anchor to this reference price for buyers regardless of their race, and thus, wholesale price discrimination vanishes. Our finding shows that B2B platforms should consider providing market information to reduce price discrimination. For example, platforms could collect the prices of similar products and reveal information to buyers as a reference. Improving information transparency could bolster the information symmetry between suppliers and buyers, preventing suppliers from discriminating against buyers of a certain race.

Social Information. From Figure 3 and Panel C of Table 13 , we can see that in the presence of social information, Asian, Black and White buyers receive a price discount of 8.17%, 15.86%, and 9.72%. The differences between Black and White buyers and between Asian and Black buyers are statistically significant. This pattern is consistent across countries.

We first discuss the price quotes between Black and White buyers. Compared to the "no information" condition, social information reduces the quoted prices for both types of buyers. Column IV of Table 6 shows that the coefficients of Black are significant, and Column V of Table 6 shows

Table 6   Price Discrimination over Race

	Dependent Variable: Discount						
	Panel A: All Data						
	No Info	Market Info		Social Info		Both Info	
	I	II	III	IV	V	VI	VII
Asian	0.069***	−0.008	0.069***	−0.016	0.069***	−0.016	0.069***
	(0.024)	(0.019)	(0.021)	(0.022)	(0.023)	(0.020)	(0.022)
Black	0.080***	−0.008	0.080***	0.061***	0.080***	−0.021	0.080***
	(0.023)	(0.018)	(0.021)	(0.022)	(0.022)	(0.020)	(0.022)
Condition			0.131***		0.067***		0.141***
			(0.021)		(0.023)		(0.022)
Asian×Condition			−0.077**		−0.085***		−0.084***
			(0.031)		(0.033)		(0.031)
Black×Condition			−0.088***		−0.018		−0.102***
			(0.030)		(0.032)		(0.031)
Supplier controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	688	655	1343	656	1344	677	1365
R^2	0.026	0.005	0.042	0.025	0.029	0.009	0.041
	Panel B: United States						
	No Info	Market Info		Social Info		Both Info	
	I	II	III	IV	V	VI	VII
Asian	0.069**	−0.008	0.072**	−0.016	0.069**	−0.015	0.071**
	(0.035)	(0.028)	(0.031)	(0.032)	(0.033)	(0.029)	(0.032)
Black	0.079**	−0.025	0.085***	0.056*	0.081**	−0.034	0.084***
	(0.035)	(0.027)	(0.031)	(0.031)	(0.033)	(0.028)	(0.032)
Condition			0.135***		0.068**		0.139***
			(0.031)		(0.034)		(0.032)
Asian×Condition			−0.080*		−0.083*		−0.085*
			(0.046)		(0.047)		(0.046)
Black×Condition			−0.110**		−0.022		−0.119***
			(0.044)		(0.047)		(0.045)
Supplier controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	345	318	663	327	672	342	687
R^2	0.032	0.033	0.039	0.035	0.035	0.016	0.036
	Panel C: South Africa						
	No Info	Market Info		Social Info		Both Info	
	I	II	III	IV	V	VI	VII
Asian	0.069**	−0.012	0.072**	−0.013	0.068**	−0.019	0.067**
	(0.033)	(0.026)	(0.029)	(0.032)	(0.032)	(0.028)	(0.030)
Black	0.080**	0.007	0.080***	0.070**	0.077**	−0.003	0.076***
	(0.031)	(0.025)	(0.028)	(0.033)	(0.031)	(0.028)	(0.029)
Condition			0.136***		0.064**		0.145***
			(0.029)		(0.031)		(0.029)
Asian×Condition			−0.083**		−0.082*		−0.085**
			(0.042)		(0.045)		(0.043)
Black×Condition			−0.072*		−0.009		−0.082*
			(0.040)		(0.045)		(0.042)
Supplier controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	343	337	680	329	672	335	678
R^2	0.033	0.028	0.062	0.029	0.032	0.024	0.057

Note: Column III uses the pooled data from Columns I and II (i.e., pooling data under the "no information" condition and the "market information" condition). Column V uses the pooled data from Columns I and IV (i.e., pooling data under the "no information" condition and the "social information" condition). Column VII uses the pooled data from Columns I and VI (i.e., pooling data under the "no information" condition and the "both information" condition). $^*p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

that the coefficients of Black×Condition are insignificant. The estimations are consistent across the United States and South Africa. The results mean that although social information can reduce price quotes for both Black and White buyers, the price gap between them still remains—wholesale price discrimination between Black and White buyers exists, which supports Hypothesis 5b.

When a buyer says that the supplier was recommended, the buyer signals a social connection with the supplier's previous customers. This social information also signals the recommender's likely racial group and the historical price charged to this group, which serves as a buyer-dependent reference price. In response, the supplier would anchor to this reference price, which is higher for White buyers than Black buyers. As a result, although the supplier lowers the price, the gap between Black and White buyers still remains.

We then discuss the price quotes for Asian (Chinese) buyers. Compared to the "no information" condition, social information does not change the quoted price for Chinese buyers. One explanation could be that suppliers on Alibaba, over 97% of whom are Chinese, might not trust the social information claimed by Chinese buyers. The above results regarding Black and White buyers confirm that sellers trust this information when it is provided by Black or White buyers and react to it by lowering the price. When it comes to Chinese buyers, suppliers choose to not respond to this information. Past research has shown evidence of distrust especially among people coming from the same country (Bond 1986, Buchan and Croson 2004), for example, between Chinese suppliers and retailers in supply chains (Özer et al. 2014).

Both Information. From Figure 3 and Panel D of Table 13, we can see that when both market and social information are presented to suppliers, Asian, Black and White buyers receive a price discount of 15.46%, 14.79%, and 17.01%, respectively, the magnitude of which is consistent with that under the market information condition. There is no statistically significant difference between these buyers. Columns VI and VII of Table 6 also show that there is no wholesale price discrimination under this information condition. The results demonstrate that providing both market and social information can also effectively eliminate wholesale price discrimination.

7.   Concluding Remarks

Price discrimination is pervasive in various B2C markets, whereas it is unclear whether wholesale price discrimination exists in online B2B markets, where buyers are often procurement agents who represent a firm, and are often not end consumers.

In this paper, we study wholesale prices quoted by suppliers to Asian, Black and White buyers selling to the US and South Africa markets. We find price discrimination based on race in global sourcing—suppliers price discriminate against white buyers. We also show that there is no price discrimination based on country—suppliers quote the same price to buyers selling to the US and South African markets. We further show that telling suppliers the market price—i.e., market information—can reduce wholesale price quotes for all buyers and thus reduce wholesale price discrimination. Indicating the buyer is referred by a previous customer—i.e., social information—can reduce the wholesale price quote only for Black and White buyers but not for Chinese buyers, thus failing to reduce wholesale price discrimination.

Our work can provide guidance to suppliers' pricing strategies and buyers' inquiry strategies on B2B platforms. It can also provide guidance for platforms to attract and retain users. For suppliers, in contrast to B2C business, which is often a one-off transaction, B2B business is expected to be a long-term and mutually beneficial relationship. Suppliers' price discrimination would impede the establishment of such relationships by treating buyers unfavorably. For buyers, price inquiry should be exercised with caution. Our results suggest that buyers should do more research to understand the market price and explore potential business referrals, as well as reveal such information to suppliers, as recommended by Demand Gen Report (2016). For platforms, facilitating information sharing can benefit the marketplace. Organizing and presenting information such that customers can easily compare market prices enables buyers to search more effectively, leading to more attractive wholesale prices. This could give platforms competitive edge over other transaction channels. Allowing suppliers and buyers to easily find and present social connections could also lead to lower prices. These strategies can help a platform attract new buyers and retain current customers.

Although retail pricing in B2C markets has been well studied in the literature, pricing in B2B markets lacks the same empirical understanding. Our work is one of the first steps in advancing our understanding of wholesale pricing using randomized field experiments (Terwiesch et al. 2018). Future research could study beyond the scope of this paper by exploring, for example, wholesale pricing order quantity, and lead time. We hope that our paper will serve as a stepping stone for future research on B2B markets and wholesale pricing.

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Appendices

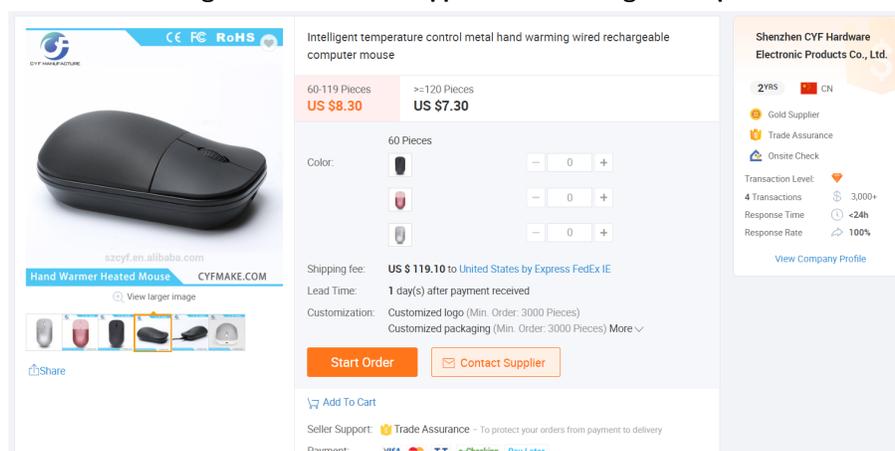**Figure 4   Alibaba Supplier Product Page Example**

Table 7   Summary Statistics of Reply Rate

	No. of Suppliers	No. of Inquiries sent	No. of Inquiries Replied	Prob. of Reply
		Panel A: By Country		
United States	1920	1862	1611	86.52%
South Africa	1920	1854	1574	84.90%
Mean Difference				1.62%
P-value of Proportion Test				0.17
		Panel B: By Race in United States		
Asian	640	614	522	85.02%
Black	640	630	552	87.62%
White	640	618	537	86.89%
	White vs Black	Black vs Asian	White vs Asian	
Mean Difference	−0.73%	2.60%	1.87%	
P-value of Proportion Test	0.76	0.21	0.39	
		Panel C: By Race in South Africa		
Asian	640	619	521	85.78%
Black	640	623	528	84.75%
White	640	612	525	84.17%
	White vs Black	Black vs Asian	White vs Asian	
Mean Difference	−0.58%	−1.03%	−1.61%	
P-value of Proportion Test	0.67	0.84	0.48	
		Panel D: By Information Condition		
No Information	960	938	815	86.89%
Market Information	960	924	780	84.42%
Social Information	960	926	786	84.88%
Both Information	960	928	804	86.64%
	Market Info vs No Info	Social Info vs No Info	Both Info vs No Info	
Mean Difference	−2.47%	−2.01%	−0.25%	
P-value of Proportion Test	0.15	0.24	0.93	

Note: This table reports the reply rate by country, race, and information condition. The difference between the number of suppliers and the number of inquiries sent is due to suppliers' unavailability. The number of inquiries replied includes the number of replies without a price quote and the number of replies with a price quote. In the last column, Prob. of Reply = No. of Inquiries Replied / No. of Inquiries sent. Mean Difference refers to the difference in buyers' reply rate across countries, race, and information conditions.

Table 8   Summary Statistics of Price Discount by Country

	United States	South Africa	No Information		Market Information		Social Information		Both Information	
			USA	RSA	USA	RSA	USA	RSA	USA	RSA
Number	1332	1344	345	343	318	337	327	329	342	335
Mean	12.17%	12.98%	7.87%	7.84%	14.80%	16.23%	11.31%	11.25%	14.89%	16.68%
Std	0.22	0.23	0.27	0.24	0.20	0.19	0.23	0.24	0.22	0.21
Mean Difference		−0.81%		0.03%		−1.43%		0.06%		−1.79%
P-value of T-test		0.36		0.99		0.35		0.98		0.27

Note: This table reports the price discount received by buyers across countries. Number refers to the number of inquiries replied with price quotes.

Table 9   Example of Product Prices in United States and South Africa

	Amazon (United States)	Takealot (South Africa)
Logitech Wirless Mouse (M185, Blue)	$14.99	$15.40
ADATA Flash Drive (AC008-32G-RWE)	$13.10	$12.59
Unitek USB Hub (4-Port, USB 3.0)	$13.99	$13.71
JBL Headphone (T450BT, Blue)	$49.95	$49.16
Remax Bluetooth Speaker (M15, 5W)	$24.00	$24.26

Note: The exchange rate at the time of our study is USD:ZAR=1:14.22.

Table 10   Control Variable Coefficients

	Discount
Asian	0.069***
	(0.024)
Black	0.080***
	(0.023)
Response Rate	0.017
	(0.060)
Gold Supplier (years)	0.0009
	(0.003)
Transaction Level	−0.004
	(0.012)
Listed Price	0.004*
	(0.002)
No. of Reviews	0.0002
	(0.001)
Observations	2676
R^2	0.026

Note: This table reports the estimated coefficients and standard errors (in parentheses) for variables in Equation (3). Significance at $^*p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

Table 11   Moderating Factors

	Dependent Variable: Discount					
	No Moderator	Response Rate	Gold Supplier (years)	Transaction Level	Listed Price	No. of Reviews
Asian	0.069***	0.069***	0.069***	0.069***	0.171***	0.068***
	(0.024)	(0.024)	(0.024)	(0.024)	(0.046)	(0.024)
Black	0.080***	0.080***	0.080***	0.081***	0.098***	0.078***
	(0.023)	(0.023)	(0.023)	(0.023)	(0.045)	(0.023)
Moderator		−0.039	−0.003	−0.008	0.010**	0.0008
		(0.094)	(0.005)	(0.020)	(0.004)	(0.003)
Asian×Moderator		0.109	0.007	0.025	− 0.014***	−0.004
		(0.143)	(0.007)	(0.028)	(0.005)	(0.003)
Black×Moderator		0.077	0.006	−0.014	−0.003	0.002
		(0.133)	(0.007)	(0.028)	(0.006)	(0.003)
Supplier Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	688	688	688	688	688	688
R^2	0.026	0.027	0.028	0.029	0.037	0.033

Note: This table reports the estimated coefficients and standard errors (in parentheses) for moderators as specified in Equation (4). Significance at $^*p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

Table 12   Summary Statistic of Price Discount by Information Condition across Race

	All Data			
	No Information	Market Information	Social Information	Both Information
	Panel A: Asian			
Number	217	198	218	215
Mean	9.89%	15.33%	8.17%	15.46%
Std	0.21	0.18	0.23	0.20
	Market Info vs No Info	Social Info vs No Info	Both Info vs No Info	
Mean Difference	5.44%	−1.72%	5.57%	
P-value of T-test	0.005	0.42	0.006	
	Panel B: Black			
Number	236	237	222	226
Mean	10.88%	15.25%	15.86%	14.79%
Std	0.26	0.21	0.24	0.21
	Market Info vs No Info	Social Info vs No Info	Both Info vs No Info	
Mean Difference	4.37%	4.98%	3.91%	
P-value of T-test	0.04	0.03	0.08	
	Panel C: White			
Number	235	220	216	236
Mean	2.93%	16.03%	9.72%	17.01%
Std	0.27	0.20	0.22	0.22
	Market Info vs No Info	Social Info vs No Info	Both Info vs No Info	
Mean Difference	13.10%	6.79%	14.08%	
P-value of T-test	6.71×10^{-9}	0.004	1.90×10^{-9}	

Note: This table reports the price discounts received by buyers under four different information conditions. Number refers to the number of inquiries replied with price quotes.

Table 13   Summary Statistic of Price Discount by Race

	All Data			United States			South Africa		
	Asian	Black	White	Asian	Black	White	Asian	Black	White
	Panel A: No Information								
Number	217	236	235	115	114	116	102	122	119
Mean	9.89%	10.88%	2.93%	9.81%	11.06%	2.80%	9.97%	10.71%	3.06%
Std	0.21	0.26	0.27	0.22	0.29	0.27	0.21	0.23	0.27
	W vs B	B vs A	W vs A	W vs B	B vs A	W vs A	W vs B	B vs A	W vs A
Mean Difference	−7.95%	0.99%	−6.96%	−8.26%	1.25%	−7.01%	−7.65%	0.74%	−6.91%
P-value of T-test	0.001	0.66	0.003	0.03	0.71	0.03	0.02	0.80	0.03
	Panel B: Market Information								
Number	198	237	220	93	114	111	105	123	109
Mean	15.33%	15.25%	16.03%	15.13%	13.43%	15.94%	15.50%	16.94%	16.11%
Std	0.18	0.21	0.20	0.19	0.21	0.20	0.18	0.21	0.19
	W vs B	B vs A	W vs A	W vs B	B vs A	W vs A	W vs B	B vs A	W vs A
Mean Difference	0.78%	−0.08%	0.70%	2.51%	−1.70%	0.81%	−0.83%	1.44%	0.61%
P-value of T-test	0.68	0.97	0.71	0.36	0.54	0.77	0.75	0.57	0.81
	Panel C: Social Information								
Number	218	222	216	104	119	104	114	103	112
Mean	8.17%	15.86%	9.72%	8.22%	15.51%	9.59%	8.12%	16.26%	9.84%
Std	0.23	0.24	0.22	0.25	0.23	0.20	0.22	0.25	0.24
	W vs B	B vs A	W vs A	W vs B	B vs A	W vs A	W vs B	B vs A	W vs A
Mean Difference	−6.14%	7.69%	1.55%	−5.92%	7.29%	1.37%	−6.42%	8.14%	1.72%
P-value of T-test	0.006	0.0007	0.48	0.04	0.03	0.66	0.06	0.01	0.58
	Panel D: Both Information								
Number	215	226	236	105	120	117	110	105	119
Mean	15.46%	14.79%	17.01%	15.20%	13.07%	16.49%	15.70%	16.75%	17.53%
Std	0.20	0.21	0.22	0.21	0.23	0.21	0.20	0.19	0.24
	W vs B	B vs A	W vs A	W vs B	B vs A	W vs A	W vs B	B vs A	W vs A
Mean Difference	2.22%	−0.67%	1.55%	3.42%	−2.13%	1.29%	0.78%	1.05%	1.83%
P-value of T-test	0.27	0.74	0.44	0.23	0.47	0.65	0.78	0.69	0.53

Note: This table reports the price discounts received by buyers of different race in two countries, where A, B, and W represent the Asian, Black, and White buyers, respectively. Number refers to the number of inquiries replied with price quotes.

Table 14   Summary Statistic of Price Discount by Information Condition

	No Information	Market Information	Social Information	Both Information
		Panel A: All Data		
Number	688	655	656	677
Mean	7.85%	15.53%	11.28%	15.78%
Std	0.25	0.29	0.23	0.21
		Market Info vs No Info	Social Info vs No Info	Both Info vs No Info
Mean Difference		7.68%	3.43%	7.93%
P-value of T-test		6.18×10^{-10}	0.01	4.95×10^{-10}
		Panel B: United States		
Number	345	318	327	342
Mean	7.87%	14.80%	11.31%	14.89%
Std	0.27	0.20	0.23	0.22
		Market Info vs No Info	Social Info vs No Info	Both Info vs No Info
Mean Difference		6.93%	3.44%	7.02%
P-value of T-test		1.55×10^{-4}	0.07	1.52×10^{-4}
		Panel C: South Africa		
Number	343	337	329	335
Mean	7.84%	16.23%	11.25%	16.68%
Std	0.24	0.19	0.24	0.21
		Market Info vs No Info	Social Info vs No Info	Both Info vs No Info
Mean Difference		8.39%	3.41%	8.84%
P-value of T-test		6.07×10^{-7}	0.06	4.24×10^{-7}

Note: This table reports the price discounts under different information conditions in two countries. Number refers to the number of inquiries replied with price quotes.

Figure 5   Price Quote by Race and Information Condition