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The Impact of Foreign Competition on Domestic Firms' Product Quality: Evidence from a Quasi-natural Experiment in the US

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Abstract:

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Keywords: foreign competition, product quality, import tariff, quasi-natural experiment, difference-in-differences estimation

1. Introduction

The quality of goods and services, or product quality in general, is an important research topic in Operations Management (OM). OM researchers have investigated various factors related to internal operations (e.g., plant utilization) and supply chain management (e.g., buyer-supplier proximity) that explain the variation in product quality across firms (Steven et al., 2014; Bray et al., 2019; Gray et al., 2011; Shah et al., 2017). However, the extant OM literature has largely

overlooked the possible product quality impact of competition from companies located in other countries (i.e., foreign competition). Competition is a multi-dimensional concept (Karuna, 2007), suggesting that the nature of foreign competition could be quite different from that of domestic competition. In particular, due to the difference in comparative advantages (e.g., labor and production costs) across countries (Deardorff, 1980), the kind of foreign competition domestic firms have to face may depend on the comparative advantages of those foreign firms entering the domestic markets. By contrast, domestic competition with firms from the same country with a similar comparative advantage should be more "leveled" (Meza-González and Sepulveda, 2019, p. 12). Moreover, compared with domestic firms, foreign firms encounter a different set of barriers or liabilities such as tariff, culture, and language when entering the domestic markets (Luo and Mezias, 2002), which may also influence the level of foreign competition domestic firms have to face. The uniqueness of foreign competition has motivated researchers to examine the crucial role it plays in affecting domestic firms' decisions and practices, such as diversification strategies, managerial disclosures, and acquisition activities (Bowen and Wiersema, 2005; Huang et al., 2017; Srinivasan, 2020). However, there is still limited empirical evidence on how foreign competition may affect domestic firms' product quality.

Foreign competition in general, and the recent US-China trade war in particular, has attracted much attention from news media and the public, but practitioners still hold conflicting views on its potential impact on domestic firms' product quality (Divounguy, 2019; Goodman, 2020; Regole, 2018). Although it is generally agreed that the US-China trade war, with a focus on raising import tariffs on Chinese products sold to the US, should lower the foreign competition faced by domestic firms in the US markets, it is unclear how such reduced competition might affect the product quality of these US firms. While the reduced competition may imply less pressure for US firms to compete on price and more resources for them to improve product quality, there may be lower need and incentive for US firms to improve product quality in a less competitive environment. Therefore, whether foreign competition affects domestic firms' product quality positively or negatively remains an empirical research question.

It is challenging to answer this question empirically, as foreign competition's relationship with product quality may be endogenous. For example, some unobserved firm characteristics

may explain firms' product quality performance and their choices of operating industries that face different levels of foreign competition, inflating foreign competition's relationship with product quality. In addition, foreign competition and product quality may co-determine each other such that domestic firms' product quality affects foreign firms' decision to enter the domestic markets, leading to reverse causality concerns. Therefore, a correlation between foreign competition and product quality does not guarantee a causal interpretation.

We overcome these challenges by conducting a quasi-natural experiment in the US, in which large reductions in import tariff rates, or LRIITR in short, represent an exogenous increase in foreign competition for US firms (Flammer, 2015; Huang et al., 2017; Srinivasan, 2020). This is because, as prior research has demonstrated, lowering import tariff rates significantly should motivate foreign companies to enter domestic markets, increasing the competitive pressure for domestic firms (Autor et al., 2020; Flammer, 2015). Empirically, we obtain import tariff rates across all industries (three-digit Standard Industrial Classification (SIC) codes) in the US from 1991 to 2016 and identify the industry-years in which there are LRIITR. We then perform a difference-in-differences (DID) estimation to examine the difference in product quality changes between US treatment firms that face LRIITR and US control firms without facing LRIITR. This estimation strategy enables us to address the endogeneity concerns and quantify foreign competition's effect on the product quality of domestic firms in the US context.

Our DID test results suggest that increased foreign competition negatively affects the product quality of the US firms concerned. This finding remains consistent across various robustness checks with alternative estimation and measurement approaches. Our research further shows that the negative impact is less significant for those US firms with high levels of operational slack and R&D intensity. US firms pursuing product differentiation rather than cost leadership strategies are also less affected by foreign competition.

Our research makes several contributions. First, we reveal the overlooked yet critical role that foreign competition plays in affecting domestic firms' product quality. This investigation direction may inspire OM researchers to further examine foreign competition's effect on other operational outcomes. The quasi-natural experimental design employed in our research also provides a solid empirical foundation for future OM studies on foreign competition. Our research

also contributes to the current debate on the US-China trade war by highlighting the product quality implications of changing import tariff rates. Moreover, our research offers new insights for firms to mitigate the negative effects of increased foreign competition. In particular, we emphasize the important mitigating roles that firms' operational resources and strategies play when facing intensified foreign competition. These findings also enrich the extant literature on foreign competition that has been dominated by non-OM perspectives.

2. Literature and Hypotheses

2.1 Product quality

Firms' product quality performance has attracted much attention from OM researchers over the past few decades. Quality in general, and product quality in particular, is commonly viewed as a fundamental operations performance objective for firms and even a "pivotal, strategic weapon" (Handfield and Melnyk, 1998, p. 328) for them to beat competitors. Prior research has suggested that superior product quality enables firms to improve customers' satisfaction, loyalty, and purchase intentions, ultimately leading to higher sales growth, market share, and firm profitability (Yee et al., 2008; Devaraj et al., 2001; Archer and Wesolowsky, 1996). These findings demonstrate the importance of product quality for firms to gain competitive advantage.

OM researchers have also examined various factors that explain the variation in product quality across firms (e.g., Pil and Rothenberg, 2003; Gray et al., 2011; Bray et al., 2019; Steven et al., 2014; Steven and Britto, 2016; Shah et al., 2017; Phillips and Sertsios, 2013). Earlier studies on the antecedents of product quality focus on firm-level characteristics, such as firms' financial conditions (Phillips and Sertsios, 2013), environmental performance (Pil and Rothenberg, 2003), and plant-level variety and utilization (Shah et al., 2017). For instance, Pil and Rothenberg (2003) show how firms' efforts to enhance environmental performance can drive superior product quality, while Shah et al. (2017) identify several plant-level operational characteristics (e.g., plant variety and utilization) as the causes of product quality issues. Moving beyond the single-firm context, a growing literature has investigated the antecedents of product quality performance in a supply chain setting (Steven et al., 2014; Bray et al., 2019; Gray et al., 2011). For example, Steven et al. (2014) examine how firms' supply chain strategies including outsourcing and offshoring are related to product quality recalls. By contrast, Bray et al. (2019)

suggest that product defect rates can be reduced if supply chain members are located closer in distance, resulting in shorter supply chains with increased coordination and knowledge sharing.

Although these supply chain studies do consider the product quality impacts of firms' international supply chain activities such as outsourcing and offshoring (Steven and Britto, 2016; Steven et al., 2014; Gray et al., 2011), they have largely ignored firm competition across national borders. In fact, our extensive search of the literature on product quality could not identify any empirical OM research documenting foreign competition's effect on domestic firms' product quality. However, as the recent US-China trade war has demonstrated, foreign competition should have important implications for domestic firms' operational performance, and product quality particularly (Divounguy, 2019; Goodman, 2020; Regole, 2018). Thus, our research aims to explore trade-induced foreign competition as a potential driver of domestic firms' product quality improvement or deterioration.

2.2 Foreign competition

Following previous studies (e.g., Autor et al., 2020; Bowen and Wiersema, 2005; Srinivasan, 2020), we view foreign competition as the competition faced by domestic firms as a result of "rising imports of foreign produced goods, and hence a rising share of imports in the domestic markets" (Bowen and Wiersema, 2005, p. 1154). This phenomenon is due, at least in part, to trade barrier reductions and free trade agreements among countries over the past few decades (Autor et al., 2020; Flammer, 2015). Researchers in Economics, especially International Economics, have well examined how trade-induced foreign competition affects various outcomes at the individual, industry, and economy levels (Utar, 2018; Traiberman, 2019; Auer et al., 2010; Autor et al., 2013; McManus et al., 2016). A popular research theme focuses on how import competition originating from low-income countries influences the domestic labor markets in high-income countries (Utar, 2018; Autor et al., 2013; Traiberman, 2019). For instance, Utar (2018) documents the negative effect of low-wage competition from China on individual-level employee earnings and employment trajectories in Denmark's manufacturing sector. Autor et al. (2013) further show that the effect can extend beyond the manufacturing industry. They find that, as a result of the rising Chinese import competition, US labor markets experience not only declined employment rates in the manufacturing sector but also reduced wages outside the

manufacturing sector and increased use of unemployment, disability, and income assistance transfer benefits. These studies demonstrate a general negative labor market impact in high-income countries as a result of import competition originating from low-income countries.

In addition to labor markets, researchers have investigated foreign competition's effects on firm-level decisions and outcomes, such as firms' debt choice, managerial disclosure, labor productivity, corporate investments, mergers and acquisitions, innovation activities, and social and environmental performance, to name but a few (Boubaker et al., 2018; Srinivasan, 2020; Duanmu et al., 2018; Bloom et al., 2016; Flammer, 2015; Huang et al., 2017; Jiang et al., 2015; Autor et al., 2020). Although researchers have investigated the implications of foreign competition for domestic firms in different national contexts, the findings are not always consistent and sometimes even conflicting. For example, regarding the impact on domestic firms' innovation activities, while Bloom et al. (2016) show that import competition from China leads to technology upgrading of domestic firms in Europe, Autor et al. (2020) document that such competition has a negative effect on patenting activities in the US context. Autor et al. (2020) attribute the discrepancy to the differences in market competitive structure and rigidity of labor markets between the US and Europe. Another example is firms' social and environmental performance. Flammer's (2015) research on the US markets suggests that US domestic firms increase their social performance when facing heightened foreign competition, but Duanmu et al. (2018) find that intensified foreign competition in China reduces Chinese manufacturing firms' environmental performance. These contradictory findings highlight the contingent role of institutional contexts, characterized by the preferences of consumers in the domestic markets as well as firms' incentives to use social and environmental performance as a differentiation strategy.

These firm-level analyses of foreign competition suggest that the impact of foreign competition on domestic firms' product quality may be more ambiguous than expected and worth empirical investigation. Such ambiguity is in line with the diverse views held by practitioners regarding how the US-China trade war might affect domestic firms in the US markets (Divounguy, 2019; Goodman, 2020; Regole, 2018). Although prior studies have focused on indicators other than firms' product quality performance, the theoretical arguments formulated

in these studies, whether explaining the positive or negative impacts, should form a useful theoretical foundation for our research. Therefore, informed by the empirical findings and theoretical arguments shown in prior studies, we develop two competing hypotheses regarding how foreign competition affects domestic firms' product quality in the US context.

2.3 The impact of foreign competition on product quality

We first consider how foreign competition may enable US firms to improve product quality. This positive prediction is based on the "escape competition" perspective formulated in the foreign competition literature (Hombert and Matray, 2018; Autor et al., 2020). Specifically, LRIITR expose US firms to greater overseas competition, especially from low-income developing countries with a cost advantage. As countries are abundant in different types of resources, it will be most efficient for countries to align the productive activities with their relative resource endowment (Flammer, 2015). When facing import competition originating from low-income countries with a cost advantage, it is very difficult for US firms to compete on price, so competing on quality is one of the few options in this setting. Furthermore, since US firms have comparative advantages in capital and skills as opposed to labor costs over their foreign competitors (Bernard et al., 2006; Pierce and Schott, 2016), they are likely to leverage the resources and capabilities to compete on quality to recover the lost market shares. In particular, given price endogeneity, quality improvement enables US firms to differentiate their products in the markets and attract more sophisticated customers with a higher willingness to pay for high-quality products. Prior studies have also suggested that, in contrast to their counterparts in emerging markets that are more sensitive to price, consumers in developed countries like the US are more willing to pay more for high-quality products (Ball et al., 2018; Duanmu et al., 2018), benefiting firms competing on quality. In summary, high-quality products are less vulnerable to price wars and enable US firms to charge a higher relative price to compensate for the lost market shares, helping them "escape" from the low-cost import competition and gain a competitive advantage. As a result, we expect an increase in foreign competition to lead to better product quality performance for US firms and propose our first competing hypothesis.

H1a: Foreign competition has a positive impact on US firms' product quality.

However, the above discussion assumes that there are sufficient rents and resources

available for US firms to improve product quality and escape from foreign competition. Such an assumption is questionable, as rents and resources may be affected by foreign competition as well. In fact, prior research has demonstrated that import competition from China dissipates US firms' resources and capacities by "reducing US and global sales, diminishing book and stock values, curtailing purchases of labor and capital inputs, and proportionally reducing R&D investment" (Autor et al., 2020, p. 358). The Schumpeterian view on competition also suggests that competition should reduce price-cost margins, thus lowering the potential rents that US firms could capture from quality improvement (Bloom et al., 2016; Shu and Steinwender, 2019). Moreover, the negative effects of foreign competition on domestic labor markets (Autor et al., 2013; Utar, 2018) may reduce individuals' ability and willingness to pay more for high-quality products and shift their preference to low-price products. As a result, it is challenging for US firms to compete on quality because of the reduced resources and capacities for quality improvement as well as the increased uncertainty of capturing rents and profits from such improvement. Therefore, instead of improving product quality to "escape competition," US firms may have to "cut corners" and reduce costs in order to survive in the low-price competition. The focus on cost reduction is also reflected in a dominant trend over the past few decades in which US firms relocate their operations and production to developing countries via outsourcing (Autor et al., 2020; Dong and Kouvelis, 2020), which potentially increases product quality risks (Steven et al., 2014; Gray et al., 2011). This "cut corners" view (Ball et al., 2018; Duanmu et al., 2018) leads to a negative prediction regarding foreign competition's impact: an increase in foreign competition should lower the product quality performance of US firms. We thus propose our second competing hypothesis.

H1b: Foreign competition has a negative impact on US firms' product quality.

2.4 The roles of operational resources and strategies

We have discussed two opposing views on the impact of foreign competition on US firms' product quality: one emphasizing the bright side of foreign competition that motivates US firms to improve product quality and escape from the competition, whereas the other stressing the dark side of foreign competition that forces US firms to cut corners and reduce costs at the expense of product quality. However, it is unlikely that US firms' product quality will be affected to the

same extent by foreign competition, motivating us to further investigate how the impact of foreign competition on product quality varies across US firms. In other words, we aim to identify factors that make US firms less likely to "cut corners" at the expense of product quality or more likely to improve product quality to "escape competition." Taking an OM perspective, we consider the possible roles that US firms' operational resources and strategies play in moderating the impact of foreign competition on product quality.

In general, we expect that US firms with more operational resources should be in a better position to buffer the reduced resources and narrowed profit margins induced by foreign competition, supporting them to at least maintain their product quality and escape from the low-price competition. By contrast, US firms with limited operational resources should be even more frightened of foreign competition and, thus, more likely to cut corners and put their quality investments on hold. Empirically, we focus on firms' operational slack and R&D capital, two important operational resources whose relevance to superior quality performance or the avoidance of quality issues have been well examined in the OM literature (Tan and Netessine, 2014; Wiengarten et al., 2017; Yiu et al., 2020; Shah et al., 2017). For example, firms with high levels of operational slack usually have more surplus production capacities, spare inventories, and/or slack labors (Azadegan et al., 2013), providing them with buffering resources to maintain and improve product quality (Tan and Netessine, 2014). By contrast, previous research has suggested that highly-utilized firms with little operational slack are more likely to encounter product quality problems (Shah et al., 2017).

The buffering role of operational slack becomes even more crucial for firms facing intensified foreign competition. In particular, foreign competition reduces domestic firms' market shares and dissipates the resources available in the domestic markets (Autor et al., 2020). While all domestic firms operating in the same environment are expected to face such a resource dissipation, this may not be the case for foreign firms from other countries with a different operating environment. As a result, it is critical for domestic firms to have sufficient operational slacks when the operating environment becomes unstable and hostile (Kovach et al., 2015), in order to compete with foreign firms that may not have to operate in a similar environment in their own home countries. Moreover, different from the more leveled domestic competition

(Meza-González and Sepulveda, 2019), foreign competition is more uncertain and depends on those foreign firms entering the domestic markets. Operational slack thus provides domestic firms with the flexibility of learning from the foreign firms and adjusting products and services accordingly to gain a competitive advantage. Therefore, we expect operational slack to reduce the negative impact arising from foreign competition, leading to the following hypothesis.

H2: The impact of foreign competition on product quality is more positive (or less negative) for US firms with high levels of operational slack.

R&D has been well recognized as a critical resource for firms to develop new products and improve product quality (Yiu et al., 2020; Hombert and Matray, 2018). The role of R&D becomes even more important in the context of foreign competition, as it determines US firms' ability to compete on quality and escape from foreign competition. Over the past few decades, foreign competition faced by US firms has been dominated by importers from developing countries with an obvious cost advantage (Autor et al., 2013; 2020). As a result, "competing on costs is bound to fail" (Hombert and Matray, 2018, p. 2003) for US firms but superior product quality may enable them to escape from the low-cost foreign competition. Thus, it is important for US firms to have sufficient R&D resources to support their product quality improvement and gain a quality advantage over the low-cost foreign competitors. By contrast, as domestic competition is more diversified (Ito and Pucik, 1993), it is less likely that all US firms will choose to compete with domestic peers on quality only. As a result, R&D may play a more vital role in quality improvement when US firms face intensified foreign (rather than domestic) competition.

Moreover, compared with developing countries, the US is a relatively capital- and skill-abundant country with more highly-educated workers and technically-sophisticated equipment (Pierce and Schott, 2016; Bernard et al., 2006). This enables R&D-intensive US firms to leverage these capital and skill resources to improve product quality, which is more difficult to achieve for foreign competitors from developing countries without such a comparative advantage. This national difference further motivates US firms to invest in R&D to improve product quality and escape from foreign competition. Therefore, we expect R&D resources to make US firms more likely to "escape competition," leading to the following hypothesis.

H3: The impact of foreign competition on product quality is more positive (or less

negative) for US firms with high levels of R&D intensity.

US firms' operational strategies with different competitive emphases such as product differentiation and cost leadership may also explain the extent to which their product quality will be affected by foreign competition. This is because firms' decisions to compete on quality or price when facing intensified foreign competition should not be a random choice but may instead depend on competitive advantages as enabled by their own operational strategies. For example, firms pursuing product differentiation strategies emphasize their products' uniqueness, lowering customers' sensitivity to product prices and charging a price premium to compensate for the costs of differentiation (Duanmu et al., 2018). Although there are various avenues through which firms may differentiate, superior product quality is one of the most adopted approaches (Phillips et al., 1983). Therefore, these firms are more likely to appreciate the importance of maintaining good product quality rather than low product prices when facing intensified foreign competition. The competitive advantage enabled by product differentiation also helps these firms to avoid or soften the low-cost foreign competition given their different target markets and customers. Therefore, the product quality of those US firms adopting product differentiation strategies should be less negatively affected by foreign competition, leading to the following hypothesis.

H4: The impact of foreign competition on product quality is more positive (or less negative) for US firms pursuing product differentiation strategies.

Cost leadership strategies, on the other hand, focus on reducing various costs ranging from production to distribution costs associated with a firm's products, allowing the firm to offer a lower product price to customers (Phillips et al., 1983). To enable cost leadership, instead of prioritizing quality improvement, firms usually produce basic products with cheaper components and standard processes (Reitsperger et al., 1993). Therefore, it is more likely for these firms to compete on price rather than quality when facing exacerbated foreign competition. However, as foreign firms from developing countries have an obvious cost advantage, these US firms may have to further cut corners at the expense of product quality to maintain their cost leadership. Consequently, the product quality of these firms should be more negatively affected by foreign competition, leading to the following hypothesis.

H5: The impact of foreign competition on product quality is more negative (or less

positive) for US firms pursuing cost leadership strategies.

3. Methodology

3.1 Data and measurements

We collect and combine data from different sources to analyze foreign competition's impact on US firms' product quality (H1) and the role played by US firms' operational resources and strategies (H2-H5). First, we obtain US import data from Peter Schott's website (http://faculty.som.yale.edu/peterschott/) to identify LRIITR as the source of exogenous foreign competition shocks (Pierce and Schott, 2012). Second, we use product quality data from the KLD database to measure the annual product quality performance of US firms. Third, we retrieve annual accounting data from the Compustat database to measure US firms' operational resources and strategies as well as other control variables. Lastly, we merge the firm-level data with LRIITR at the industry-year level based on a firm's industry affiliation and the year of LRIITR. The combination of data from different sources limits our sample period to 1991-2016 because the data from the KLD database is only available for this period. We describe the detailed data processing and measurement procedures below.

Following previous research on foreign competition (e.g., Flammer, 2015; Huang et al., 2017; Srinivasan, 2020), we identify the exogenous increase in foreign competition faced by US firms using LRIITR because large import tariff reductions should lead to lower entry barriers for foreign products sold into the US markets and thus intensify the competition pressure for US firms. Although LRIITR usually follow multilateral trade agreements, it is less common to use a trade agreement's effective date to determine the exogenous increase in foreign competition for different industries because the actual tariff reductions may take place in different years for different industries following the trade agreement. For instance, after the North American Free Trade Agreement (NAFTA) came into effect on 1st January 1994, gradual tariff eliminations for some qualifying products took place over a 15-year period (Lustig, 2001). As a result, it is more appropriate to use an industry's year of LRIITR to identify the increased foreign competition in this industry (Huang et al., 2017; Flammer, 2015).

We identify LRIITR based on Peter Schott's dataset, which contains the duties collected at the US Customs and the Free-On-Board custom value of imports. US imports have been

classified based on the Harmonized System (HS) developed by the World Customs Organization, but Peter Schott's dataset converts them from the HS level to the SIC level (Pierce and Schott, 2012), enabling us to compute the import tariff rate at the industry level (three-digit SIC code). Specifically, we divide the duties collected at US Customs in each industry (three-digit SIC code) and year (1991-2016) by the Free-On-Board custom value of imports in the same industry and year to obtain an industry-year level measure of import tariff rate. We then calculate the yearly change in import tariff rate as the difference in import tariff rate (industry-year level) between the current year and the previous year. Finally, consistent with the threshold commonly used in previous research (e.g., Jiang et al., 2015; Flammer, 2015; Huang et al., 2017), we view the tariff rate reduction in a particular industry-year as "large" only if its magnitude is at least three times higher than the absolute average tariff rate reduction (excluding tariff rate increases) in the same industry across our sample period. To address the concern that the large reductions may be transitory, we further exclude those large reductions preceded or followed by a tariff rate increase larger than 80% of the reductions. The above process results in 160 LRIITR at the industry-year level, as shown in Figure 1. It suggests that LRIITR occurred more frequently in the mid-1990s, consistent with previous studies (e.g., Flammer, 2015; Huang et al., 2017). We also find that most of the LRIITR shown in Figure 1 are in line with the multilateral trade agreements (e.g., NAFTA) identified from the United States International Trade Commission's database, confirming our expectation that LRIITR usually follow multilateral trade agreements.

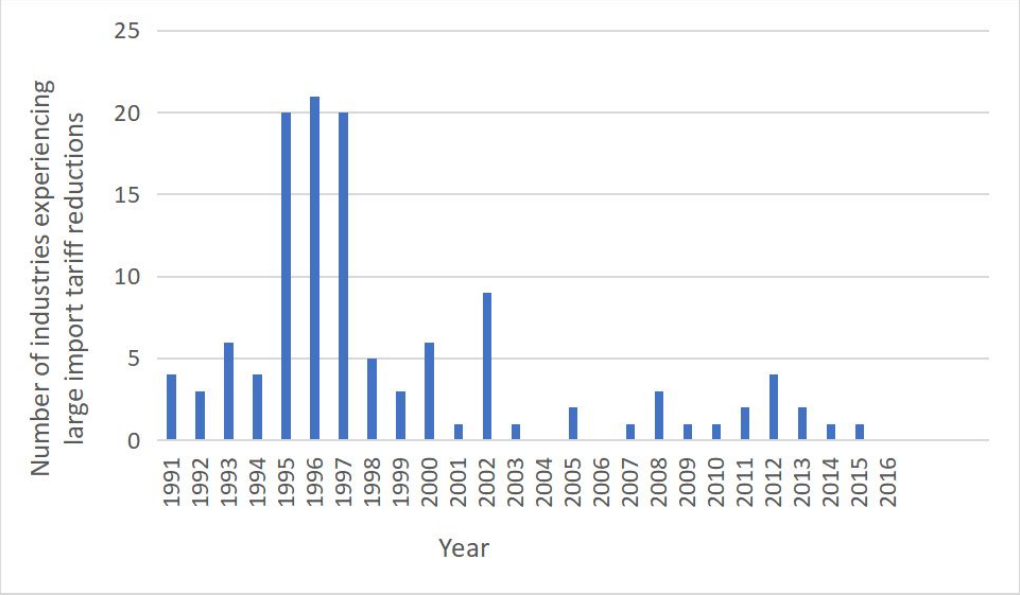

Figure 1 Distribution of LRIITR between 1991 and 2016

We measure firm-level product quality performance based on data from the KLD database that has been widely used in recent studies (Li et al., 2021; Kashmiri and Brower, 2016; Zhang et al., 2021). Unlike other databases such as the Fortune Reputation Survey that "relied on respondents' subjective evaluation of each firm's overall performance on innovativeness and quality" (Cho and Pucik, 2005, p. 561), KLD collects objective secondary data from various sources, including media reports, company disclosures, and datasets from academics, governments, and non-governmental organizations, to assess the annual non-financial performance of about 3000 publicly listed US firms (MSCI, 2016). KLD classifies firms' non-financial performance into different dimensions, such as environmental performance, corporate governance, human rights, employee relations, community relationships, and product quality and safety. Our research focuses on the product quality and safety dimension. In each year, KLD uses the secondary data collected from different sources to quantify the performance of firms in each dimension in terms of (positive) strengths and (negative) concerns. For instance, in the product quality and safety dimension, the strength measure indicates whether a firm manages its product quality and safety proactively by, for example, "achieving certification to widely acceptable standards, undertaking extensive product testing and building processes to track raw materials or components" (MSCI, 2016, p. 35). By contrast, the concern measure is "designed to assess the severity of controversies related to the quality and safety of a firm's products and services" (Zhang et al., 2021, p. 503) such as "product recalls, service disruptions, and the use of chemicals of concern in company products" (MSCI, 2016, p. 38). The consideration of both strength and concern is particularly important in our research context because the incidence of product quality strength for a firm such as receiving quality certifications or winning quality awards does not necessarily imply the absence of product quality concern for the same firm such as having product recalls or facing service disruptions. This measurement approach thus provides a more balanced and complete view on a firm's product quality performance than previous studies that have focused on either the positive or negative dimensions of product quality such as product awards (Xia et al., 2016) or product recalls (Ball et al., 2018). KLD uses "1" to indicate the incidence of the strength or concern for a firm in a particular year, and "0" otherwise. Consistent with the common practice adopted in prior research (Wang et al., 2009; Cronqvist

and Yu, 2017), we subtract a firm's concern score from its strength score in each year to represent the firm's overall annual product quality performance. While the strength and concern scores are dummy variables with the values of 0 and 1 only, the resultant product quality measure, i.e., the difference between the strength and concern scores, ranges from -1 to 1, with a higher value indicating better product quality. This also suggests that the product quality measure should be negatively (rather than positively) correlated with product recalls.

The reliability of the KLD measures in the product quality and safety dimension has been validated by Kashmiri and Brower (2016) based on data obtained from other sources. As a robustness check, we adopt an alternative measure of firms' product quality performance based on product recalls and obtain consistent test results. We also find a significant correlation between the KLD data and product recalls, demonstrating the validity of our measure based on the KLD data. It should also be noted that the KLD database, compared with other industry-specific quality measures such as mortality rates in the healthcare industry (Bloom et al., 2015) and product recalls in the manufacturing industry (Ball et al., 2018), better fits our research context as it provides a universal product quality measure covering firms from different industries and over a long investigation period.

We measure firms' operational resources and strategies as well as other control variables based on data obtained from Compustat. For operational resources, we measure a firm's operational slack based on production resource efficiency from Modi and Mishra (2011). Modi and Mishra (2011) measure production resource efficiency as the ratio of sales to property, plant, and equipment (PPE), with a larger value indicating higher efficiency but lower slack. As our research focuses on slack and to ease the interpretation of our test results, we measure operational slack as the ratio of PPE to sales (i.e., the inverse of production resource efficiency), so that a larger value indicates higher slack. In line with Modi and Mishra (2011), we then normalize a firm's operational slack based on three-digit SIC code to account for industry differences. R&D intensity is computed as the ratio of a firm's R&D expenses to sales (Ball et al., 2018; Yiu et al., 2020). Consistent with our operational slack measure, we also normalize a firm's R&D intensity based on three-digit SIC code to account for industry differences (Modi and Mabert, 2010).

Regarding operational strategies, we measure a firm's level of product differentiation

based on advertising expenses divided by sales (Duanmu et al., 2018). This is because a firm spending more on advertising should place greater emphasis on distinguishing its products from that of competitors as well as differentiating among its own products (Iyer et al., 2015). We measure cost leadership based on the cost of goods sold that has been widely accepted in the strategic management literature (Nair and Filer, 2003; Berman et al., 1999). According to Compustat User's Guide, the cost of goods sold data item used in our research covers various costs related to, for example, production, transportation, warehouse, distribution, maintenance, rent, and labor, which better represents the overall cost for the sale of products and suits our research focusing on products sold across national borders. Therefore, cost leadership is measured as cost of goods sold divided by sales, with a smaller value indicating stronger cost leadership. Following past studies (e.g., Duanmu et al., 2018; Gao et al., 2010), we normalize a firm's product differentiation and cost leadership based on three-digit SIC code to capture its competitive position relative to industry peers and ensure comparability across industries.

We include 11 firm-level and two industry-level control variables in this research, which are return on assets (a firm's operating income divided by its total assets), firm size (natural logarithm of a firm's total assets), market-to-book ratio (a firm's market value of equity divided by its book value of equity), liquidity ratio (a firm's current assets divided by its current liabilities), leverage ratio (a firm's total debt divided by its total assets), export orientation (a firm's overseas sales divided by its total sales), past quality change (a firm's product quality in current year minus its product quality in last year), market share (a firm's sales divided by the sales of all firms in the same industry), firm age (natural logarithm of a firm's number of years since its initial public offering), number of product segments (natural logarithm of a firm's total number of product segments), age of product segments (natural logarithm of the average number of years of a firm's product segments), industry munificence (slope coefficient obtained by regressing industry sales over a five-year period divided by the average industry sales in the same period), and industry dynamism (standard error of the slope coefficient obtained by regressing industry sales over a five-year period divided by the average industry sales in the same period). We control for these variables because they may be related to firms' product quality performance in the foreign competition context. Specifically, we expect firms with high

levels of return on assets, liquidity ratio, market-to-book ratio, export orientation, past quality change, number of product segments, and industry munificence to be less likely to suffer from resource constraints and more likely to invest in quality improvement programs (Gray et al., 2011; Duanmu et al., 2018; Jiang et al., 2015; Shah et al., 2017; Flammer, 2015). By contrast, firm age and industry dynamism are expected to be negatively associated with product quality because older firms and firms operating in dynamic environments may face higher uncertainty in maintaining good product quality performance (Shah et al., 2017, Terjesen et al., 2011). The expected effects of firm size, leverage ratio, market share, and age of product segments are less clear. Larger firms may have access to slack resources and thus have better product quality, but firm size may also negatively affect product quality due to greater complexity (Steven and Britto, 2016; Shah et al., 2017). Highly leveraged firms may have lower product quality because they may have to cut investments in quality to increase current cash flows (Kini et al., 2017; Duanmu et al., 2018). These firms may also increasingly invest in quality because higher leverage forces them to be more competitive in the markets (Kini et al., 2017). While dominant firms with large market shares may benefit from slack resources, they are also exposed to a greater chance of quality issues as they have more products in the markets (Shah et al., 2017; Ball et al., 2018). Older products may be more susceptible to quality issues as some parts may be worn and defective over the years, but the opposite can be true because they are developed with more established technologies (Shah et al., 2017; Ball et al., 2018).

3.2 Identification strategy

We use DID specification to estimate the effect of exogenous foreign competition shocks on US firms' product quality performance. Different industries in the US experience exogenous foreign competition shocks induced by LRIITR at different times, creating an ideal setting to cancel out the unobserved confounding effect by differencing. To implement the DID method, we first identify the treatment group as firms whose industries (three-digit SIC codes) have experienced LRIITR during our investigation period. For treatment firms from a specific industry (three-digit SIC code), we identify their control firms as those with the same two-digit SIC code as the treatment firms but not experiencing LRIITR during the analyzing period. For example, if the treatment firms are from the Motor Vehicles & Equipment industry (three-digit SIC code = 371)

and experienced LRIITR in 2000, the control firms to be matched to these treatment firms are firms whose two-digit SIC code is 37 (Transportation Equipment) and did not experience any LRIITR from 1995 to 2015 (i.e., an analyzing period of (-5, +5); further explained below). This matching approach helps ensure that the treatment and control firms are comparable as they have the same two-digit SIC code (Swink and Jacobs, 2012; Hendricks and Singhal, 2008). We then compare the difference in product quality before and after the treatment of the treatment group with the corresponding difference of the control group. The baseline model specification is:

$$Quality_{i,j,t} = \beta_0 + \beta_1 Post_t \times Treat_j + \alpha X_{i,j,t} + \gamma Z_{j,t} + \eta_t + \delta_j + \varepsilon_{i,j,t},$$

where the subscripts i, j, and t refer to firm i, industry j, and year t, respectively. $Quality_{i,j,t}$ indicates the product quality performance of firm i in industry j and year t. $Post_t$ equals 1 for every year after a specific industry experiences LRIITR and 0 otherwise. We set (-5, +5) years relative to the year of LRIITR as our analyzing period. We include at most five years after the LRIITR to alleviate the concern that the impact of import competition may diminish over time. Additionally, including a long period before the LRIITR increases the probability of being contaminated by other pre-shock events, so we include at most five years prior to the LRIITR, which also ensures a sufficiently long pre-shock period as a benchmark. $Treat_j$ equals 1 for treatment firms and 0 for matched control firms. Therefore, the interaction term $Post_t \times Treat_j$ is an indicator variable that equals 1 if firm i's affiliated industry j has experienced LRIITR by year t and 0 otherwise. The corresponding coefficient β_1 captures the change in product quality after LRIITR for the treatment firms relative to the change over the same period for the control firms. This is the standard specification commonly adopted in the literature to deal with multiple shock time points (e.g., Huang et al., 2017). $X_{i,j,t}$ and $Z_{j,t}$ represent vectors of control variables at the firm and industry levels, respectively, as discussed in Section 3.1. η_t and δ_j indicate the year and industry (three-digit SIC code) fixed effects, respectively. $\varepsilon_{i,j,t}$ is the error term. It should be noted that it is unnecessary to include $Post_t$ and $Treat_j$ separately in the model, as we have controlled for year (t) and industry (j) fixed effects.

Our identification strategy relies on two key assumptions. First, the LRIITR identified in our study should lead to substantial increases in foreign competitive pressure that US firms face in domestic markets. The rationale is that import tariffs represent the costs of foreign competitors

exporting products into the US markets, so lowered import tariffs imply reduced export costs for these foreign competitors and, as a result, increased competition intensity in the US markets. Historical data from the World Bank shows that the US weighted average import tariff rates of all products displayed an overall decreasing trend over the past three decades, especially between 1991 and 2007 (World Bank, 2021). Specifically, the import tariff rate decreased by approximately 60% from 3.95% in 1991 (the highest point in the last three decades) to 1.55% in 2007 (the lowest point in the last three decades). During the same period, previous research has shown that import competition originating from low-income countries has increased remarkably (Autor et al., 2013; 2020). While low-income countries represented only 9% of US manufacturing imports in 1991, it increased to 28% in 2007, corresponding to a 211% increase (Autor et al., 2013). These findings demonstrate a significant correlation between the decrease in import tariff rates and the increase in import competition, especially from low-income countries. Moreover, our use of a high threshold (i.e., at least three times the average reduction rate) to identify LRIITR also makes this assumption more likely to hold.

The second assumption is the exogeneity of import tariff reductions. In particular, a major concern is whether decisions to reduce import tariff rates are based on the characteristics of industries. For example, policymakers may tend to lower import tariffs in industries with low competitive advantages as they give up on these industries, or by contrast they may tend to lower import tariffs in industries with high competitive advantages as they are optimistic about these industries (Flammer, 2015). As a result, there may be a significant pre-reduction difference in product quality between industries with and without LRIITR, which would bias our estimation. To address this concern, we perform a parallel trend test to compare the difference in product quality between the treatment and control groups over time. Specifically, we compute the interaction between the year dummy variable and the treatment group indicator (i.e., $Year_t \times Treat_j$) with the control group serving as the appropriate counterfactual of the trend that the treatment group would have followed if they had not been treated. The model specification is:

$$Quality_{i,j,t} = \beta_0 + \sum_t \beta_t Year_t \times Treat_j + \alpha X_{i,j,t} + \gamma Z_{j,t} + \eta_t + \delta_j + \varepsilon_{i,j,t},$$

where t indicates the number of years relative to the year of LRIITR (for example, if the LRIITR occurred in 2006, then $t = -1$ for 2005 and $t = 1$ for 2007). $Year_t$ is an indicator variable which

is 1 in year t and 0 otherwise. $Treat_j$ equals 1 if firm i's affiliated industry j has experienced LRIITR in the analyzing period and 0 otherwise. If there is no difference in pre-trends across the treatment and control firms, the coefficient β_t should not be significant before the year of LRIITR (i.e., for $t < 0$). Figure 2 plots the estimated β_t with 90% confidence intervals against the number of years relative to the year of LRIITR. As the year of LRIITR serves as the reference year (i.e., $t = 0$), it is not shown in Figure 2. For years ranging from -5 to -1 (i.e., the pre-reduction years), the point estimators of β_t are around the zero-horizontal line with the corresponding 90% confidence intervals including both positive and negative values. Therefore, there is no evidence of a significant difference in pre-trends between the treatment and control firms. As a robustness check, we further perform propensity score matching (PSM) to match treatment firms to control firms that have similar propensities to be treated, making our analysis even less relevant to the self-selection concern.

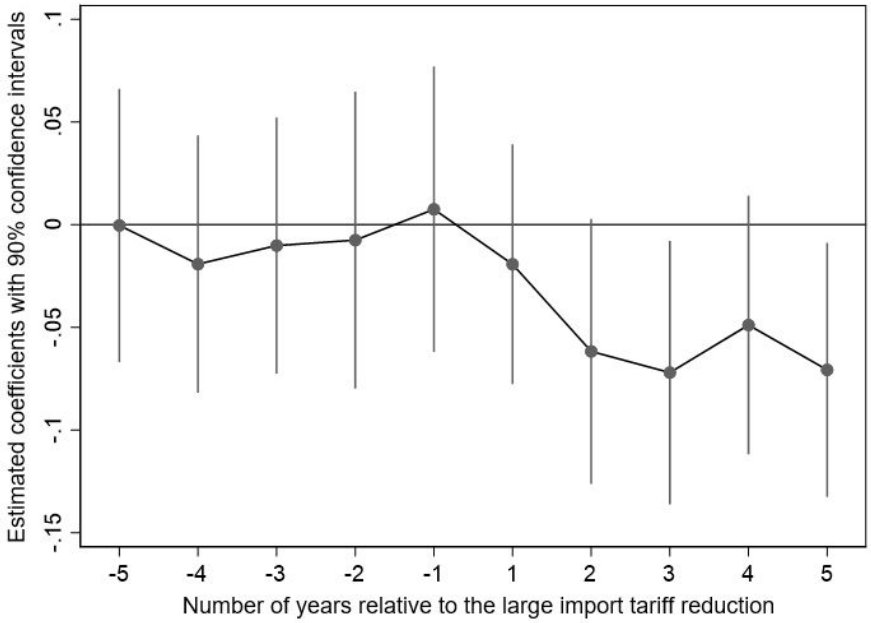

Figure 2 Parallel trend test plot

4. Test Results

4.1 The impact of foreign competition on product quality

After combining the data from multiple sources and applying the identification strategy described above, we obtain a full sample of 4,719 firm-year observations, corresponding to 948 firms over the period 1991-2016. The descriptive statistics and correlations of the variables included in the subsequent DID analysis are documented in Table 1. It indicates that *Quality*

ranges from -1 to 1, with a mean of 0.030 and a standard deviation of 0.385, suggesting that high- and low-quality firms account for a similar portion in our sample, without a particular subgroup dominating over the other. *Post*×*Treat* is a binary indicator with a mean of 0.211, showing that about 21% of the firm-year observations have LRIITR in our analyzing period. The largest Variance Inflation Factor value for all independent variables is 2.44, which is well below the threshold of 10 and indicates multicollinearity is not a major concern (Kennedy, 2003).

Table 2 documents the DID test results. In Column 1, only the explanatory variable (*Post*×*Treat*) and industry and year fixed effects are included in the regression model. Columns 2 and 3 add firm-level and industry-level control variables, respectively, to the regression model. The full model shown in Column 3 suggests that firms with higher levels of past quality change, return on assets, leverage ratio, liquidity ratio, number of product segments, and industry munificence have better product quality performance, in line with the argument that these firms have better access to slack resources and higher incentives to invest in product quality (Flammer, 2015; Jiang et al., 2015; Kini et al., 2017; Gray et al., 2011). In contrast, older firms, firms with larger market shares, and firms in dynamic industries have lower product quality performance, supporting the view that these firms face greater uncertainties in maintaining good product quality (Steven and Britto, 2016; Shah et al., 2017).

The coefficient of *Post*×*Treat* is negative and significant ($p < 0.05$) across different models from Columns 1 to 3, meaning that the product quality of the treatment firms drops significantly from the pre-treatment period to the post-treatment period, after controlling for the product quality change of the control firms over the same period. Thus, it demonstrates a negative effect of foreign competition on the product quality of the US firms concerned, supporting H1b but rejecting H1a. Therefore, our test results are more consistent with the "cut corners" view (Ball et al., 2018; Duanmu et al., 2018) rather than the "escape competition" perspective (Autor et al., 2020; Hombert and Matray, 2018) regarding the implications of foreign competition for domestic firms in the US context.

Table 1 Correlations and descriptive statistics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
1. *Quality*	1.000														
2. *Post×Treat*	0.026	1.000													
3. *Past Quality Change*	0.389	-0.021	1.000												
4. *Return on Assets*	-0.022	0.033	0.008	1.000											
5. *Firm Size*	-0.038	0.093	0.020	0.518	1.000										
6. *Leverage Ratio*	-0.008	0.009	-0.017	0.073	0.377	1.000									
7. *Liquidity Ratio*	0.057	0.010	0.011	-0.325	-0.470	-0.432	1.000								
8. *Market-to-Book Ratio*	0.063	0.021	0.009	-0.090	-0.082	-0.050	0.097	1.000							
9. *Export Orientation*	-0.018	0.028	0.017	0.278	0.412	0.138	-0.227	0.005	1.000						
10. *Market Share*	-0.087	-0.028	-0.008	0.342	0.624	0.287	-0.490	-0.088	0.232	1.000					
11. *Firm Age*	-0.049	-0.024	0.019	0.345	0.442	0.124	-0.310	-0.137	0.216	0.436	1.000				
12. *Age of Product Segments*	0.007	-0.099	0.021	0.065	-0.003	-0.099	0.055	0.050	0.012	-0.026	0.363	1.000			
13. *Number of Product Segments*	-0.075	0.058	0.015	0.109	0.212	0.117	-0.123	-0.170	0.093	0.128	0.144	-0.334	1.000		
14. *Industry Dynamism*	-0.091	-0.094	-0.018	0.224	0.196	0.120	-0.268	-0.152	0.054	0.386	0.158	-0.022	0.120	1.000	
15. *Industry Munificence*	-0.024	0.022	-0.044	0.232	0.099	-0.001	-0.153	-0.108	0.079	0.138	0.073	-0.091	0.079	0.186	1.000
Mean	0.030	0.211	0.009	0.074	6.640	0.192	2.960	3.321	0.175	0.029	2.829	2.148	1.646	0.100	0.047
Standard deviation	0.385	0.408	0.269	0.188	1.405	0.170	1.806	2.130	0.207	0.032	0.696	0.572	0.555	0.041	0.072
Minimum	-1	0	-2	-0.710	1.556	0	0.788	-0.082	0	0	1.099	1.030	0.693	0.042	-0.257
Maximum	1	1	2	0.217	8.228	0.621	6.974	7.399	0.500	0.078	3.526	2.890	2.398	0.314	0.461

Note: Correlations with absolute values higher than 0.033 are significant at 0.01 level.

Table 2 DID test results

	(1)	(2)	(3)
Post×Treat	-0.038**	-0.040**	-0.044**
	(0.019)	(0.021)	(0.021)
Past Quality Change		0.564***	0.562***
		(0.018)	(0.018)
Return on Assets		0.109***	0.107***
		(0.036)	(0.036)
Firm Size		-0.012*	-0.009
		(0.007)	(0.007)
Leverage Ratio		0.085**	0.082**
		(0.036)	(0.036)
Liquidity Ratio		0.008**	0.007*
		(0.004)	(0.004)
Market-to-Book Ratio		0.001	0.001
		(0.003)	(0.003)
Export Orientation		0.009	0.009
		(0.028)	(0.028)
Market Share		-0.386	-0.596*
		(0.318)	(0.319)
Firm Age		-0.038***	-0.039***
		(0.010)	(0.010)
Age of Product Segments		0.013	0.013
		(0.011)	(0.011)
Number of Product Segments		0.031**	0.034**
		(0.014)	(0.014)
Industry Dynamism			-2.495***
			(0.459)
Industry Munificence			0.273***
			(0.101)
Constant	0.038***	0.101*	0.327***
	(0.006)	(0.054)	(0.070)
Industry fixed effects	Included	Included	Included
Year fixed effects	Included	Included	Included
Number of observations	6,517	4,719	4,719
R-squared	0.139	0.308	0.313
Adjusted *R*-squared	0.125	0.292	0.297

Notes: ***$p < 0.01$, **$p < 0.05$, and *$p < 0.1$ (two-tailed tests). Standard errors in parentheses.

4.2 The roles of operational resources and strategies

To analyze the roles played by US firms' operational resources and strategies, we follow previous research (e.g., Das and Joshi, 2007; Schoenherr and Swink, 2012) and split the full sample into different sub-samples based on the four hypothesized variables including operational slack, R&D intensity, product differentiation, and cost leadership. Specifically, for each of these four variables, we split the full sample into two sub-samples based on its average value in each industry (three-digit SIC code), with one sub-sample consisting of firms whose values are higher than the industry average and another sub-sample including all other firms. We then perform the DID analysis for each sub-sample individually and document the test results in Table 3. An

advantage of this approach is that the sub-sample test results clearly show the magnitude and significance of foreign competition's impact on product quality under different conditions (e.g., high operational slack). This is particularly important in our research context because our full sample analysis suggests that foreign competition has a negative impact on US firms' product quality. Thus, we are interested in not only whether US firms' operational resources and strategies can make the impact less negative but also, more importantly, whether these operational resources and strategies can really "offset" the negative impact. The sub-sample analyses provide direct answers to these questions.

The sub-sample test results documented in Table 3 show that foreign competition still has a negative effect on the product quality of US firms with low operational slack ($p < 0.05$; Column 1), low R&D intensity ($p < 0.05$; Column 3), weak product differentiation ($p < 0.05$; Column 5), and strong cost leadership ($p < 0.1$; Column 8). Moreover, the magnitudes of the impact under these conditions range from -0.052 to -0.078, which are more negative than that of the impact for the full sample (-0.044). By contrast, foreign competition does not have a significant effect on the product quality of US firms with high operational slack ($p > 0.1$; Column 2), high R&D intensity ($p > 0.1$; Column 4), strong product differentiation ($p > 0.1$; Column 6), and weak cost leadership ($p > 0.1$; Column 7). It thus demonstrates the ability of US firms' operational resources and strategies to "offset" the negative impact induced by foreign competition. Overall, our sub-sample analyses suggest that US firms with more operational resources in terms of operational slack and R&D intensity suffer less from foreign competition, supporting H2 and H3. Firms adopting operational strategies with an emphasis on product differentiation rather than cost leadership are also less affected by foreign competition. Both H4 and H5 are supported.

4.3 Robustness tests

We perform several tests to check the sensitivity of our findings to alternative analyzing period, variable measurement, sample size, matching approach, and additional control. The corresponding test results are documented in Table 4. Overall, these tests provide consistent evidence that foreign competition as induced by LRIITR does negatively affect the product quality of the US firms concerned, demonstrating the robustness of our research findings. Detailed procedures for conducting these tests are discussed below.

Table 3 Sub-sample test results

	(1) Low operational slack	(2) High operational slack	(3) Low R&D intensity	(4) High R&D intensity	(5) Weak product differentiation	(6) Strong product differentiation	(7) Weak cost leadership	(8) Strong cost leadership
Post×*Treat*	-0.056**	-0.007	-0.058**	-0.039	-0.078**	-0.041	-0.022	-0.052*
	(0.024)	(0.046)	(0.025)	(0.042)	(0.038)	(0.025)	(0.030)	(0.029)
Control variables	Included	Included	Included	Included	Included	Included	Included	Included
Industry fixed effects	Included	Included	Included	Included	Included	Included	Included	Included
Year fixed effects	Included	Included	Included	Included	Included	Included	Included	Included
Number of observations	3,703	1,010	3,548	1,165	1,385	3,331	2,088	2,624
R-squared	0.301	0.423	0.313	0.410	0.397	0.314	0.344	0.378
Adjusted *R*-squared	0.283	0.366	0.293	0.360	0.351	0.294	0.311	0.352

Notes: ***$p < 0.01$, **$p < 0.05$, and *$p < 0.1$ (two-tailed tests). Standard errors in parentheses. Full test results of control variables are shown in Table A1 (online appendix).

Table 4 Robustness test results

	(1) Use (-5, +10) as analyzing period	(2) Include all years in analyzing period	(3) Use product recalls as dependent variable	(4) Focus on high-severity recalls	(5) Focus on low-severity recalls	(6) Focus on firms with SIC = 36	(7) Identify control firms using PSM	(8) Control domestic competition
Post×*Treat*	-0.060***	-0.059***	0.006**	0.006***	0.010	-0.179**	-0.056***	-0.041**
	(0.018)	(0.017)	(0.003)	(0.002)	(0.037)	(0.084)	(0.019)	(0.021)
Domestic Competition								0.300*
								(0.173)
Control variables	Included	Included	Included	Included	Included	Included	Included	Included
Industry fixed effects	Included	Included	Included	Included	Included	Included	Included	Included
Year fixed effects	Included	Included	Included	Included	Included	Included	Included	Included
Number of observations	6,203	8,910	1,071	1,071	1,071	555	8,499	4,719
R-squared	0.336	0.279	0.506	0.617	0.469	0.290	0.280	0.313
Adjusted *R*-squared	0.315	0.269	0.470	0.590	0.431	0.230	0.269	0.297

Notes: ***$p < 0.01$, **$p < 0.05$, and *$p < 0.1$ (two-tailed tests). Standard errors in parentheses. Full test results of control variables are shown in Table A2 (online appendix).

We first check whether our test results are sensitive to alternative analyzing periods. Specifically, instead of using the years of (-5, +5) as our analyzing period, we conduct the DID analysis based on two alternative periods: one is (-5, +10) which extends the post-treatment period from 5 years to 10 years, while the other includes all the years available without limiting the lengths of the pre-treatment and post-treatment periods. The corresponding test results shown in Columns 1 and 2, respectively, suggest that foreign competition has a qualitatively similar negative impact on US firms' product quality across different analyzing periods.

We then measure a firm's annual product quality performance alternatively as its number of product recalls in each year, with a higher number of recalls indicating lower product quality. Following previous OM research (e.g., Steven and Britto, 2016; Steven et al., 2014), we obtain product recall data from the US Consumer Product Safety Commission (CPSC). Compared with other federal agencies that regulate product recalls, CPSC covers product recalls from a more diverse range of industries (Steven et al., 2014; Chen et al., 2009), enabling us to apply the same DID estimation approach to analyze CPSC's product recall data and ensure the comparability between the robustness and main test results. Moreover, CPSC also reports whether there are any injuries and deaths associated with each recall, enabling us to classify these recalls into high-severity recalls (i.e., recalls with injuries only, recalls with deaths only, and recalls with both injuries and deaths) and low-severity recalls (i.e., recalls without injuries and deaths) and further examine whether foreign competition leads to more high- or low-severity recalls (Ball et al., 2018). Column 3 documents the impact of foreign competition on a firm's number of product recalls. As the coefficient of *Post*×*Treat* is significantly positive ($p < 0.05$), foreign competition increases the number of product recalls for US firms, consistent with our main analysis which shows that foreign competition has a negative impact on product quality. Columns 4 and 5 further show foreign competition's impact on a firm's number of high- and low-severity recalls, respectively. The test results suggest that foreign competition leads to more high-severity recalls ($p < 0.01$) but does not have a significant impact on the number of low-severity recalls ($p > 0.1$). As high-severity recalls are less subject to managerial discretion and represent a more objective indication of poor product quality (Ball et al., 2018), our test results further highlight the seriousness of product quality risks induced by intensified foreign competition.

We also find that the alternative measure based on the number of product recalls is negatively correlated with our original product quality measure based on the KLD data ($p < 0.1$), consistent with the expectation that more product recalls should indicate lower product quality. We further check and confirm a significantly positive correlation ($p < 0.05$) between this alternative recall-based measure and the concern dimension of our original product quality measure, in line with the fact that KLD's concern dimension has covered product recalls as well as other product quality issues. Taken together, these significant and consistent correlation and regression results demonstrate the validity of measuring a firm's product quality performance based on the KLD data.

As mentioned above, our sample includes firms from different industries. Although we have required that the treatment and control firms should have the same two-digit SIC codes and industry fixed effects are included in all regression models, there are still some concerns about the possible noise introduced by including many industries in the sample. To reduce the potential noise, we construct a new sample by focusing on a single two-digit SIC code, which is 36 (Electronic & Other Electric Equipment). We choose this SIC code due to data availability across our research variables but also because of its importance in the US context. The DID test results based on firms with two-digit SIC code equal to 36 are documented in Column 6, which still shows a negative effect of foreign competition on product quality, consistent with our analysis based on the full sample.

Although our parallel trend test has shown no significant *ex-ante* difference in product quality between the treatment and control groups, we conduct PSM to further address possible self-selection concerns. PSM enables us to match each treatment firm to a control firm that had a similar propensity as the treatment firm to be treated but was eventually assigned to the control group (Rosenbaum and Rubin, 1983; Huang et al., 2017). Empirically, we construct a binary logistic regression model, in which the dependent variable indicates the occurrence of LRIITR and the independent variables include product quality and other firm-level controls from the full DID model. Obtaining the predicted probabilities or propensity scores from the logistic regression analysis, we apply the nearest neighbor matching with replacement to match each treatment firm to a control firm with the closest propensity score. Finally, we perform the DID

analysis based on the PSM-matched treatment and control firms and obtain consistent test results as shown in Column 7.

We have argued that the nature of foreign competition is different from that of domestic competition, raising the concern that whether foreign competition's impact on product quality is beyond that explained by domestic competition. We thus further control for the impact of domestic competition in our DID analysis. Specifically, we first measure domestic competition as one minus the Herfindahl-Hirschman Index (Jacobs et al., 2015; Flammer, 2015), which is obtained by first squaring the market share of each US firm in the same industry (three-digit SIC code) and then adding these squared market shares together. We include domestic competition as an additional control variable in the DID regression model and document the test results in Column 8. It shows that the impact of foreign competition remains negative and significant ($p < 0.05$) after controlling for domestic competition's impact.

Moreover, the coefficient of domestic competition is significantly positive ($p < 0.1$), meaning that domestic competition in fact enables firms to improve product quality, which is different from foreign competition's impact. This difference supports the multi-dimensional view on competition (Karuna, 2007) and highlights the importance of distinguishing foreign competition from domestic competition. In particular, the foreign competition faced by US firms over the past few decades has been dominated by firms from developing countries with a cost advantage (Autor et al., 2013; 2020), forcing US firms to cut corners and reduce costs at the expense of product quality. By contrast, competition with domestic peers operating in the same environment is more leveled and diversified (Meza-González and Sepulveda, 2019; Ito and Pucik, 1993), which is less likely to be dominated by low-cost competition, especially in a well-developed country like the US. This suggests that some US firms may choose to compete on quality (among other options) when facing increased domestic competition, leading to a positive effect on product quality as observed in our study. We notice that this finding is different from the negative effect of domestic competition on product quality documented in Ball et al.'s (2018) research. A possible explanation is that Ball et al.'s (2018) research is focused on the US pharmaceutical industry in which "all products, and particularly NDA and ANDA comparables, are perceived as having equivalent quality by consumers, providing little incentive for

pharmaceutical companies to compete on quality" (p. 62). However, our research includes firms from various industries, making it unlikely that all products in these industries "are perceived as having equivalent quality by consumers" and all firms from these industries do not compete on quality. Such a difference further indicates the danger of viewing all kinds of competition, whether foreign or domestic, as equal.

Finally, we conduct a placebo test by performing the DID analysis based on randomly generated "false" years of LRIITR. If the product quality changes as documented in our research are due to "true" LRIITR, the falsified *Post*×*Treat* term's estimated coefficients should be insignificant for most "false" years of LRIITR. Following the steps suggested by Liu and Lu (2015) and La Ferrara et al. (2012), we first generate random years of LRIITR during our sample period (i.e., 1991-2016). We then perform the DID analysis 1,000 times based on the "false" years of LRIITR. Finally, we plot the distributions of the estimated coefficients and *t*-values of the falsified *Post*×*Treat* in Figure 3. As expected, the left panel indicates that the estimated coefficients based on the "false" years of LRIITR are centered around zero and distant from the "true" coefficient, which is -0.044 as shown in Table 2 and marked as the vertical dashed line in Figure 3 (left panel). The right panel shows that most of the "false" *t*-values are within the range of -2 to 2, suggesting that most coefficients of the falsified *Post*×*Treat* are not statistically significant. The placebo test results increase our confidence that our findings are not spurious.

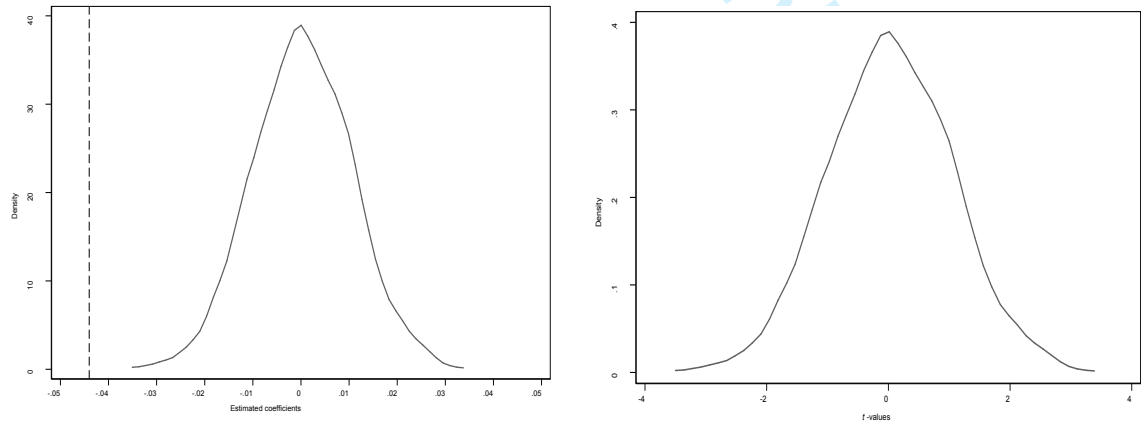

Figure 3 Density plots of the estimated coefficients (left panel) and *t*-values (right panel)

5. Discussion and Conclusion

Our DID test results and robustness checks consistently suggest that increased foreign competition as induced by LRIITR negatively affects the product quality of the US firms

concerned. However, the negative effect is less significant for firms with high levels of operational slack and R&D intensity. Firms pursuing product differentiation rather than cost leadership strategies are also less affected by foreign competition. The implications of these findings for research and practices are discussed below.

5.1 Implications for research

Our research contributes to the OM literature on product quality. Although OM researchers have studied the antecedents of firms' product quality performance at both the firm and supply chain levels (Shah et al., 2017; Steven et al., 2014; Bray et al., 2019; Gray et al., 2011), the product quality implications arising from foreign competition have been largely overlooked. This is the first OM research to explore the effect of foreign competition on firms' product quality performance. The significant impact documented in this study suggests that OM researchers might need to take a more global view on the management of product quality, taking the interactions and dynamics across national borders into account. Such a global view becomes even more relevant in today's operating environments with increasing uncertainties in trade policies, international relations, and resultant foreign competition (Dong and Kouvelis, 2020). Indeed, as pointed out by Yeung et al. (2019) in their call for papers, OM researchers need to pay attention to "how the dynamics of international relations affect the efficiency, effectiveness, consistency, and flexibility of global operations and supply chain management" (p. 1). Our research responds to this call by revealing the negative product quality impact of trade-induced foreign competition, which in turn offers new insights into making sense of the findings documented in previous studies. For example, it has been shown that firms' practices to move their operations and production to developing countries via outsourcing and offshoring lead to various product quality issues such as product recalls (Steven and Britto, 2016; Steven et al., 2014; Gray et al., 2011). As firms' decisions to relocate their operations and production are not a random choice but depend on other factors such as competition from overseas peers, the effects of outsourcing and offshoring on product quality can be better understood in the context of foreign competition. Specifically, intensified foreign competition forces firms to cut corners and reduce costs, as reflected in, for example, the dominant trend of outsourcing and offshoring over the past few decades, increasing firms' product quality risks and resulting in lower product

quality performance. These insights further highlight the importance of bringing international relations in general and foreign competition particularly into the study of firms' product quality performance. Relatedly, other national and international factors such as exchange rates, interest rates, employment rates, and political stability that are less explored in the OM literature may also have important implications for the management of product quality and are worth further investigation. Such investigations can complement our research focused on foreign competition and prior studies concerned with firm- and supply chain-level factors, together providing a more comprehensive explanation of the variation in product quality performance.

It is challenging to quantify foreign competition's effect on product quality because of the potential endogeneity issues as discussed in the Introduction section. This may explain why, at least in part, relevant research in the OM literature is lacking. We overcome this difficulty by using LRIITR to represent an exogenous increase in foreign competition, offering a more rigorous estimation of foreign competition's causal impact on product quality. This quasi-natural experimental design provides a solid empirical foundation for future OM research on foreign competition. For example, OM researchers can adopt this experimental design to investigate how foreign competition affects other operational outcomes beyond product quality such as plant utilization, production flexibility, and forecast accuracy (Shah et al., 2017; Yeung et al., 2019).

Our research also enriches the foreign competition literature. Prior research has examined foreign competition's impact on various firm-level decisions and outcomes (Huang et al., 2017; Srinivasan, 2020; Flammer, 2015), but the OM implications of foreign competition are less explored. Our research, however, puts firms' product quality, an important OM performance indicator, at the heart of foreign competition. The trade-off between product price and quality has been well recognized in the literature, as reflected in, for example, the use of (high) price as a signal of (high) quality (Devaraj et al., 2001). The price-quality trade-off becomes even more prominent in the context of foreign competition, in which US firms face low-price competition from overseas peers located in developing countries. Therefore, it is important and natural to study domestic firms' product quality decisions when facing such competition. The consideration of the price-quality trade-off also enables us to question the "escape competition" perspective formulated in the literature (Autor et al., 2020; Hombert and Matray, 2018). In

particular, our research rejects the assumption that resources and rents are stable under low-price foreign competition. Instead, we believe it is more reasonable to expect foreign competition to dissipate resources and rents, forcing domestic firms to cut corners and reduce costs at the expense of product quality. The consideration of the price-quality trade-off as well as the stability of resources and rents may help explain the mixed results regarding foreign competition's impact on other firm-level indicators (e.g., innovation activities) as documented in the literature (Bloom et al., 2016; Autor et al., 2020). Specifically, whether foreign competition affects domestic firms positively or negatively may depend on the nature of the competition (e.g., competing on price or quality) and the stability of the resources and rents available to domestic firms.

Our focus on the roles of firms' operational resources and strategies in mitigating foreign competition's negative impact is also in line with the resource constraint and price-quality trade-off arguments. Our research proposes that US firms with more operational resources such as operational slack and R&D capital should be more capable of buffering the reduced resources due to foreign competition. US firms pursuing operational strategies with a competitive emphasis on product differentiation rather than cost leadership are more likely to compete on quality rather than price when facing intensified foreign competition. These explanations enable us to provide a more comprehensive view on how foreign competition affects operational performance (e.g., product quality) and how operational resources and strategies can play a crucial role in reducing the negative effect. This OM perspective is different from previous research that has focused on the moderating roles of other factors such as corporate governance, capital liquidity, and predation risk (Jiang et al., 2015; Srinivasan, 2020; Boubaker et al., 2018). Our research does not doubt the importance of these non-OM factors but instead balances the extant literature with an OM perspective, which may inspire researchers to consider the roles of OM-related factors in their future research. For example, in addition to the factors identified in Srinivasan's (2020) research, firms' propensity to engage in acquisition activities when facing increased foreign competition may depend on the operational resources of the acquiring and target firms as well as the synergy of operational strategies between these firms, which is worth further investigation.

5.2 Implications for practices

Our research provides a more positive view on the recent US-China trade war. A key focus on

the trade war is the significant increase in import tariff rates imposed on Chinese products sold to the US markets, triggering substantial debates among practitioners about the implications of this striking change in trade policy (Divounguy, 2019; Goodman, 2020; Regole, 2018). Our research suggests that the increase in import tariff rates may benefit US domestic firms in terms of product quality performance because it implies less pressure for these firms to compete on price and more resources and rents for them to invest in quality. Although there are some concerns that such protectionism may also indicate lower need and incentive for US firms to improve product quality, prior research has suggested that US consumers value high-quality products and are willing to pay more for these products (Ball et al., 2018; Duanmu et al., 2018), which may offset the protectionism concern and encourage product quality improvement. Moreover, high import tariff rates also mean that it becomes more difficult for Chinese firms to compete on price given the significant increase in trade costs. Instead, Chinese firms may have to improve product quality to be competitive in the US markets, which in turn may further motivate US firms to invest in quality improvement. Therefore, we expect increased import tariff rates to result in better product quality performance for US firms in the domestic markets.

Although trade-induced foreign competition shows a negative effect on US firms' product quality, it seems impractical and irresponsible to suggest stopping trade liberalization for the sake of product quality protection. Trade liberalization, with a focus on removing trade barriers (e.g., tariffs) on the exchange of products between countries, has been the norm over the past few decades and shown to bring numerous benefits ranging from reduced consumer costs to improved economic growth (Cernat et al., 2018; Wacziarg and Welch, 2008). Therefore, stopping trade liberalization alone may do more harm than good. In fact, the US-China trade war might just add some noise to the trade liberalization trend but cannot stop or halt it, as reflected in, for example, the recent US-China agreement to "roll back tariffs in stages" (Fortune, 2019). As a result, instead of suggesting a significant increase in import tariff rates to prevent foreign competition, we believe it is more important for policymakers to be aware of the possible dark side (e.g., product quality deterioration) of intensified foreign competition and design appropriate policies to enable US domestic firms to "escape competition." A key insight from our research is that US domestic firms may have to cut corners at the expense of product quality

when facing intensified foreign competition because of the reduced resources for product quality improvement and the increased uncertainty of capturing rents from such improvement. Therefore, policymakers can focus on policies that can provide more resources for product quality improvement (e.g., tax cuts for domestic firms) and reduce the rent-capturing uncertainty associated with the improvement (e.g., priority and incentive to buy US-made products) (CNBC, 2020; Shalal et al., 2020). Those policies may also motivate US firms to move their production and operations back to the US, reducing the product quality risks related to outsourcing and offshoring (Steven et al., 2014; Gray et al., 2011).

Moving beyond the policy implications, our research findings regarding the role played by firms' operational resources and strategies have important implications for companies facing intensified foreign competition. There is much debate about whether firms should maintain a low or high level of slack in operations. While reducing operational slack implies better resource utilization and improved efficiency (Modi and Mishra, 2011), prior research has shown that it also results in more product recalls and safety issues (Shah et al., 2017; Wiengarten et al., 2017). Therefore, low operational slack could lead to even more product quality issues in an environment with limited resources due to foreign competition. By contrast, the buffering role of high operational slack in unstable, disruptive environments has been highlighted in the OM literature (Kovach et al., 2015), suggesting that firms should hold a higher level of operational slack to buffer the negative impact of foreign competition. The contribution of R&D to innovation and quality has been well understood, but R&D's role may be even more critical in the context of foreign competition. This is because R&D equips firms with the ability to compete on quality rather than price when facing low-cost foreign competition. Therefore, our research encourages firms to invest in R&D to "escape competition" (Hombert and Matray, 2018).

Although both strong product differentiation and cost leadership can enable firms to gain a competitive advantage, they have different implications for firms facing intensified foreign competition. For firms pursuing product differentiation, it is relatively easy for them to escape from the low-cost foreign competition because these firms should value higher quality over lower prices. Similarly, because of strategic persistence and path dependency, firms adopting cost leadership strategies are more likely to continue their competitive emphasis on cost reduction

rather than quality improvement, even when facing exacerbated low-cost foreign competition. Although cost leadership strategies enable these US firms to gain a competitive advantage over other domestic firms, they may put the same firms in a disadvantageous position when compared with firms from developing countries with an obvious cost advantage (e.g., low labor and production costs) (Autor et al., 2013; Auer et al., 2010). However, firms may assume that their strategies that worked in the past will also be effective in the future, ignoring environmental changes and leading to "the paradox of success" (Audia et al., 2000, p. 837). Therefore, a key takeaway for firms adopting cost leadership strategies is that they may need to re-evaluate their competitive positions when facing intensified foreign competition and initiate strategic changes if their existing strategies give them a competitive disadvantage rather than an advantage.

5.3 Research limitations

There are a few limitations of our study. First, the measures used in our research are not perfect. For instance, although KLD is the best database available to measure the product quality of US firms across industries and over years, its strength and concern scores are binary measures, limiting the ability to capture the continuity of quality performance. Admitting this limitation, we have adopted an alternative quality measure based on product recalls and obtain consistent test results. Another limitation of the KLD database is that it only covers publicly listed US firms, making it impossible to investigate how foreign competition affects the product quality of US private firms. As private firms are expected to have even fewer resources for product quality improvement and face higher uncertainty in capturing rents from the improvement, they may be affected more significantly by foreign competition, which is worth further investigation.

Owing to data limitations, we only consider firms' operational resources in terms of operational slack and R&D intensity, and operational strategies emphasizing product differentiation and cost leadership. We acknowledge that other operational resources and strategies may also help mitigate the negative impact of foreign competition and can be examined in future research based on other databases. For example, as it has been argued that "supply chains compete, not companies" (Christopher, 1992), firms' supply chain relationships and supply chain integration strategies may determine the extent to which firms respond to and thus are affected by foreign competition. It is also worth mentioning that the findings of our research

may not be applicable to all national contexts. Prior studies have suggested that the effects of foreign competition on domestic firms vary across countries (Autor et al., 2020; Bloom et al., 2016). Similarly, foreign competition may induce a positive (rather than negative) effect on the product quality of domestic firms in developing countries (e.g., China and India) because of the differences in resource availability, economic growth, and competition focus between these countries and the US. It would be interesting to reveal such possible variations across countries.

Technically, our research only investigates the product quality impact of increased foreign competition (induced by LRIITR), but not decreased foreign competition. We focus on increased foreign competition because import tariff rates show a general decreasing trend over the past few decades (World Bank, 2021) and the KLD data available are up to 2016, unable to cover the recent US-China trade war with a significant rise in import tariff rates. Although this focus is in line with prior foreign competition studies (e.g., Srinivasan, 2020; Huang et al., 2017) and consistent with the event study thinking well accepted in the OM literature (Ding et al., 2018), it cannot tell whether the relationship between foreign competition and product quality is linear or symmetric. Therefore, we encourage future research to take advantage of the recent "trade protectionism" with increased import tariff rates, complementing our research and enabling a more complete view on the foreign competition-product quality relationship.

5.4 Conclusion

To conclude, our research shows that foreign competition has a negative impact on US firms' product quality, but the impact is less negative for US firms having high levels of operational slack and R&D intensity and adopting product differentiation rather than cost leadership strategies. These findings suggest that US firms may have to "cut corners" at the expense of product quality when facing intensified foreign competition, but appropriate operational resources and strategies enable them to "escape competition." Our research draws policymakers' attention to the dark side of foreign competition and provides practical implications for US firms to mitigate the negative impact arising from such competition. By demonstrating the relevance and importance of foreign competition to OM, we urge OM researchers to take account of the competition across national borders when studying OM topics but also to enrich the foreign competition literature with an OM perspective.

References

Archer, N. P., & Wesolowsky, G. O. (1996). Consumer response to service and product quality: A study of motor vehicle owners. *Journal of Operations Management*, *14*(2), 103-118.

Audia, P. G., Locke, E. A., & Smith, K. G. (2000). The paradox of success: An archival and a laboratory study of strategic persistence following radical environmental change. *Academy of Management Journal*, *43*(5), 837-853.

Auer, R., & Fischer, A. M. (2010). The effect of low-wage import competition on US inflationary pressure. *Journal of Monetary Economics*, *57*(4), 491-503.

Autor, D. H., Dorn, D., & Hanson, G. H. (2013). The China syndrome: Local labor market effects of import competition in the United States. *American Economic Review*, *103*(6), 2121-68.

Autor, D. H., Dorn, D., Hanson, G. H., Pisano, G., & Shu, P. (2020). Foreign competition and domestic innovation: Evidence from US patents. *American Economic Review: Insights*, 2(3), 357-74.

Ball, G. P., Shah, R., & Wowak, K. D. (2018). Product competition, managerial discretion, and manufacturing recalls in the US pharmaceutical industry. *Journal of Operations Management*, *58*, 59-72.

Berman, S. L., Wicks, A. C., Kotha, S., & Jones, T. M. (1999). Does stakeholder orientation matter? The relationship between stakeholder management models and firm financial performance. *Academy of Management Journal*, *42*(5), 488-506.

Bernard, A. B., Jensen, J. B., & Schott, P. K. (2006). Survival of the best fit: Exposure to low-wage countries and the (uneven) growth of US manufacturing plants. *Journal of International Economics*, *68*(1), 219-237.

Bloom, N., Draca, M., & Van Reenen, J. (2016). Trade induced technical change? The impact of Chinese imports on innovation, IT and productivity. *The Review of Economic Studies*, *83*(1), 87-117.

Bloom, N., Propper, C., Seiler, S., & Van Reenen, J. (2015). The impact of competition on management quality: evidence from public hospitals. *The Review of Economic Studies*, *82*(2), 457-489.

Boubaker, S., Saffar, W., & Sassi, S. (2018). Product market competition and debt choice. *Journal of Corporate Finance*, *49*, 204-224.

Bowen, H. P., & Wiersema, M. F. (2005). Foreign-based competition and corporate diversification strategy. *Strategic Management Journal*, *26*(12), 1153-1171.

Bray, R. L., Serpa, J. C., & Colak, A. (2019). Supply chain proximity and product quality. *Management Science*, *65*(9), 4079-4099.

Cernat, L., Gerard, D., Guinea, O., & Isella, L. (2018). *Consumer Benefits from EU Trade Liberalisation: How Much Did We Save Since the Uruguay Round?*. European Commission, Brussels, Belgium.

Chen, Y., Ganesan, S., & Liu, Y. (2009). Does a firm's product-recall strategy affect its financial value? An examination of strategic alternatives during product-harm crises. *Journal of Marketing*, *73*(6), 214-226.

Cho, H. J., & Pucik, V. (2005). Relationship between innovativeness, quality, growth, profitability, and market value. *Strategic Management Journal*, *26*(6), 555-575.

Christopher, M. (1992). *Logistics and Supply Chain Management: Strategies for Reducing Costs and Improving Services*. Pitman Publishing, London.

CNBC (2020). *Joe Biden Proposes a $700 Billion-plus 'Buy American' Campaign*. https://www.cnbc.com/2020/07/09/biden-proposes-a-700-billion-plus-buy-american-campaign.html.

Cronqvist, H., & Yu, F. (2017). Shaped by their daughters: Executives, female socialization, and corporate social responsibility. *Journal of Financial Economics*, *126*(3), 543-562.

Das, S. R., & Joshi, M. P. (2007). Process innovativeness in technology services organizations: Roles of differentiation strategy, operational autonomy and risk-taking propensity. *Journal*

of Operations Management, *25*(3), 643-660.
Deardorff, A. (1980). The general validity of the law of comparative advantage. *Journal of Political Economy*, *88*(5), 941-57.
Devaraj, S., Matta, K. F., & Conlon, E. (2001). Product and service quality: the antecedents of customer loyalty in the automotive industry. *Production and Operations Management*, *10*(4), 424-439.
Ding, L., Lam, H. K. S., Cheng, T. C. E., & Zhou, H. (2018). A review of short-term event studies in operations and supply chain management. *International Journal of Production Economics*, *200*, 329-342.
Divounguy, O. (2019). *Trade Wars Slow Economic Growth, Harm Welfare, and Push Assets Abroad*. https://www.ifcreview.com/articles/2019/april/trade-wars-slow-economic-growth-harm-welfare-and-push-assets-abroad/.
Dong, L., & Kouvelis, P. (2020). Impact of tariffs on global supply chain network configuration: models, predictions, and future research. *Manufacturing & Service Operations Management*, *22*(1), 25-35.
Duanmu, J. L., Bu, M., & Pittman, R. (2018). Does market competition dampen environmental performance? Evidence from China. *Strategic Management Journal*, *39*(11), 3006-3030.
Flammer, C. (2015). Does product market competition foster corporate social responsibility? Evidence from trade liberalization. *Strategic Management Journal*, *36*(10), 1469-1485.
Fortune (2019). *Trump Reaches Trade Deal with China; U.S. to Roll Back Tariffs in Stages*. https://fortune.com/2019/12/13/trump-trade-deal-china-us-roll-back-tariffs/.
Gao, G. Y., Murray, J. Y., Kotabe, M., & Lu, J. (2010). A "strategy tripod" perspective on export behaviors: Evidence from domestic and foreign firms based in an emerging economy. *Journal of International Business Studies*, *41*(3), 377-396.
Goodman, P. (2020). *The Pros and Cons of Import Tariffs and Trade Protectionism*. https://soapboxie.com/economy/Pros-and-Cons-of-Trade-Protectionism.
Gray, J. V., Roth, A. V., & Leiblein, M. J. (2011). Quality risk in offshore manufacturing: Evidence from the pharmaceutical industry. *Journal of Operations Management*, *29*(7-8), 737-752.
Handfield, R. B., & Melnyk, S. A. (1998). The scientific theory-building process: A primer using the case of TQM. *Journal of Operations Management*, *16*(4), 321-339.
Hendricks, K. B., & Singhal, V. R. (2008). The effect of product introduction delays on operating performance. *Management Science*, *54*(5), 878-892.
Hombert, J., & Matray, A. (2018). Can innovation help US manufacturing firms escape import competition from China?. *Journal of Finance*, *73*(5), 2003-2039.
Huang, Y., Jennings, R., & Yu, Y. (2017). Product market competition and managerial disclosure of earnings forecasts: Evidence from import tariff rate reductions. *The Accounting Review*, *92*(3), 185-207.
Ito, K., & Pucik, V. (1993). R&D spending, domestic competition, and export performance of Japanese manufacturing firms. *Strategic Management Journal*, *14*(1), 61-75.
Iyer, G., Soberman, D., & Villas-Boas, J. M. (2005). The targeting of advertising. *Marketing Science*, *24*(3), 461-476.
Jacobs, B. W., Swink, M., & Linderman, K. (2015). Performance effects of early and late Six Sigma adoptions. *Journal of Operations Management*, *36*, 244-257.
Jiang, F., Kim, K. A., Nofsinger, J. R., & Zhu, B. (2015). Product market competition and corporate investment: Evidence from China. *Journal of Corporate Finance*, *35*, 196-210.
Karuna, C. (2007). Industry product market competition and managerial incentives. *Journal of Accounting and Economics*, *43*(2-3), 275-297.
Kashmiri, S., & Brower, J. (2016). Oops! I did it again: Effect of corporate governance and top management team characteristics on the likelihood of product-harm crises. *Journal of Business Research*, 69(2), 621-630.

Kennedy, P. (2003). *A Guide to Econometrics*, 5th ed. MIT Press, Cambridge, MA.
Kini, O., Shenoy, J., & Subramaniam, V. (2017). Impact of financial leverage on the incidence and severity of product failures: Evidence from product recalls. *The Review of Financial Studies*, *30*(5), 1790-1829.
Kovach, J. J., Hora, M., Manikas, A., & Patel, P. C. (2015). Firm performance in dynamic environments: The role of operational slack and operational scope. *Journal of Operations Management*, *37*, 1-12.
La Ferrara, E., Chong, A., & Duryea, S. (2012). Soap operas and fertility: Evidence from Brazil. *American Economic Journal: Applied Economics*, *4*(4), 1-31.
Li, K., Mai, F., Shen, R., & Yan, X. (2021). Measuring corporate culture using machine learning. *The Review of Financial Studies*, *34*(7), 3265-3315.
Liu, Q., & Lu, Y. (2015). Firm investment and exporting: Evidence from China's value-added tax reform. *Journal of International Economics*, *97*(2), 392-403.
Luo, Y., & Mezias, J. M. (2002). Liabilities of foreignness: Concepts, constructs, and consequences. *Journal of International Management*, *8*(3), 217-221.
Lustig, N. (2001). Life is not easy: Mexico's quest for stability and growth. *Journal of Economic Perspectives*, *15*(1), 85-106.
McManus, T. C., & Schaur, G. (2016). The effects of import competition on worker health. *Journal of International Economics*, *102*, 160-172.
Meza-González, L., & Sepulveda, J. M. (2019). The impact of competition with China in the US market on innovation in Mexican manufacturing firms. *Latin American Economic Review*, *28*(1), 1-21.
Modi, S. B., & Mabert, V. A. (2010). Exploring the relationship between efficient supply chain management and firm innovation: an archival search and analysis. *Journal of Supply Chain Management*, *46*(4), 81-94.
Modi, S. B., & Mishra, S. (2011). What drives financial performance–resource efficiency or resource slack?: Evidence from US based manufacturing firms from 1991 to 2006. *Journal of Operations Management*, *29*(3), 254-273.
MSCI (2016). *MSCI ESG KLD STATS: Methodology*. MSCI, New York.
Nair, A., & Filer, L. (2003). Cointegration of firm strategies within groups: A long-run analysis of firm behavior in the Japanese steel industry. *Strategic Management Journal*, *24*(2), 145-159.
Phillips, G., & Sertsios, G. (2013). How do firm financial conditions affect product quality and pricing?. *Management Science*, *59*(8), 1764-1782.
Phillips, L. W., Chang, D. R., & Buzzell, R. D. (1983). Product quality, cost position and business performance: a test of some key hypotheses. *Journal of Marketing*, *47*(2), 26-43.
Pierce, J. R., & Schott, P. K. (2012). A concordance between ten-digit US Harmonized System Codes and SIC/NAICS product classes and industries. *Journal of Economic and Social Measurement*, *37*(1-2), 61-96.
Pierce, J. R., & Schott, P. K. (2016). The surprisingly swift decline of US manufacturing employment. *American Economic Review*, *106*(7), 1632-62.
Pil, F. K., & Rothenberg, S. (2003). Environmental performance as a driver of superior quality. *Production and Operations Management*, *12*(3), 404-415.
Regole, R. (2018). *Trump Tariffs & Product Development: What to Know.* https://www.iconnsystems.com/blog/trump-tariffs-what-to-know.
Reitsperger, W. D., Daniel, S. J., Tallman, S. B., & Chismar, W. G. (1993). Product quality and cost leadership: compatible strategies?. *MIR: Management International Review*, *33*, 7-21.
Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, *70*(1), 41-55.
Schoenherr, T., & Swink, M. (2012). Revisiting the arcs of integration: Cross-validations and extensions. *Journal of Operations Management*, 30(1-2), 99-115.

Shah, R., Ball, G. P., & Netessine, S. (2017). Plant operations and product recalls in the automotive industry: An empirical investigation. *Management Science*, *63*(8), 2439-2459.

Shalal, A., Alper, A., & Zengerle, P. (2020). *U.S. Mulls Paying Companies, Tax Breaks to Pull Supply Chains from China*. https://www.reuters.com/article/us-usa-china-supply-chains-idUSKBN22U0FH.

Shu, P., & Steinwender, C. (2019). The impact of trade liberalization on firm productivity and innovation. *Innovation Policy and the Economy*, *19*(1), 39-68.

Srinivasan, S. (2020). Foreign competition and acquisitions. *Journal of Corporate Finance*, *60*, 101484.

Steven, A. B., & Britto, R. A. (2016). Emerging market presence, inventory, and product recall linkages. *Journal of Operations Management*, *46*, 55-68.

Steven, A. B., Dong, Y., & Corsi, T. (2014). Global sourcing and quality recalls: An empirical study of outsourcing-supplier concentration-product recalls linkages. *Journal of Operations Management*, *32*(5), 241-253.

Swink, M., & Jacobs, B. W. (2012). Six Sigma adoption: Operating performance impacts and contextual drivers of success. *Journal of Operations Management*, *30*(6), 437-453.

Tan, T. F., & Netessine, S. (2014). When does the devil make work? An empirical study of the impact of workload on worker productivity. *Management Science*, *60*(6), 1574-1593.

Terjesen, S., Patel, P. C., & Covin, J. G. (2011). Alliance diversity, environmental context and the value of manufacturing capabilities among new high technology ventures. *Journal of Operations Management*, *29*(1-2), 105-115.

Traiberman, S. (2019). Occupations and import competition: Evidence from Denmark. *American Economic Review*, *109*(12), 4260-4301.

Utar, H. (2018). Workers beneath the floodgates: Low-wage import competition and workers' adjustment. *Review of Economics and Statistics*, *100*(4), 631-647.

Wacziarg, R., & Welch, K. H. (2008). Trade liberalization and growth: New evidence. *The World Bank Economic Review*, *22*(2), 187-231.

Wang, H. C., He, J., & Mahoney, J. T. (2009). Firm-specific knowledge resources and competitive advantage: The roles of economic-and relationship-based employee governance mechanisms. *Strategic Management Journal*, *30*(12), 1265-1285.

Wiengarten, F., Fan, D., Lo, C. K. Y., & Pagell, M. (2017). The differing impacts of operational and financial slack on occupational safety in varying market conditions. *Journal of Operations Management*, *52*, 30-45.

World Bank (2021). *Tariff rate, applied, weighted mean, all products (%) - United States*. https://data.worldbank.org/indicator/TM.TAX.MRCH.WM.AR.ZS?end=2007&locations=US&start=1991.

Xia, Y., Singhal, V. R., & Zhang, G. P. (2016). Product design awards and the market value of the firm. *Production and Operations Management*, *25*(6), 1038-1055.

Yee, R. W. Y., Yeung, A. C. L., & Cheng, T. C. E. (2008). The impact of employee satisfaction on quality and profitability in high-contact service industries. *Journal of Operations Management*, *26*(5), 651-668.

Yeung, A. C. L., Tang, C. S., Fan, D., Lo, C. K. Y., & Zhou, Y. (2019). *Special Issue Call for Papers of the Journal of Operations Management: Global Operations and Supply Chain Management in the Context of Dynamic International Relations*. https://onlinelibrary.wiley.com/journal/18731317.

Yiu, L. M. D., Lam, H. K. S., Yeung, A. C. L., & Cheng, T. C. E. (2020). Enhancing the Financial Returns of R&D Investments through Operations Management. *Production and Operations Management*, *29*(7), 1658-1678

Zhang, S., Jiang, L., Magnan, M., & Su, L. N. (2021). Dealing with ethical dilemmas: A look at financial reporting by firms facing product harm crises. *Journal of Business Ethics*, *170*(3), 497-518.