

Foreign Rivals Are Coming to Town: Responding to the Threat of Foreign Multinational Entry[†]

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How do domestic firms respond to the threat of foreign competition? This paper quantifies foreign competition threats by exploiting news of potential multinational investments from over 35,000 media outlets around the world. Using firm-specific measures of foreign competition threat, the analysis shows that domestic firms respond by upgrading productivity, raising innovation, and altering product composition. However, there is a U-shape relationship between initial productivity and productivity growth where the right and left tails upgrade productivity through innovation and product dropping, respectively. These responses constitute an economically important source of gains and convey new implications for the timing of economic policies. (JEL D24, F23, L25, L82, O30)

How do domestic firms respond to the *threat* of foreign competition? An extensive body of research assesses the impact of competition from globalization on the productivity and organization of domestic firms, emphasizing the market reallocation or spillover effects of actual foreign competition. However, relatively little analysis has investigated the response of domestic firms to the threat of foreign competition, a distinctively different mechanism through which domestic firms could be influenced by globalization. A central challenge in investigating this mechanism—as distinct from responses to actual foreign competition—is the difficulties of identifying the threat separately from actual competition.¹

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¹How entry threat affects incumbent firm innovation and productivity is a topic of considerable theoretical and policy debate (see, for example, Aghion et al. 2005; 2009). A central empirical issue widely noted in the literature (e.g., Aghion et al. 2009) is that entry threat is usually unobservable and cannot simply be proxied by actual entry. One of the main reasons is that actual entry deviates from entry threat systematically when entrants may lose against incumbents; as a result, whether entry threat will eventually become actual entry and the ultimate impact of actual entry are largely dependent on how incumbents respond to entry threat.

In this paper, we examine domestic firm responses to the threat of foreign multinational competition. We quantify multinational competition threats by exploring news of potential multinational firm investments from over 35,000 newspapers, business presses, magazines, newswires, television and audio transcripts, websites and social media in 200 countries in 2000–2007. We identify and collect foreign direct investment (FDI) news by searching in Factiva, the largest global digital business intelligence in the world. For each piece of news, we record the publishing date of a potential foreign investment to identify the time at which a threat emerges. We also document detailed characteristics of each potential investment—such as expected investment size, expected output and employment, and investment motive—and characteristics of each news report—such as news content and publisher information—by carefully reading each text and extracting related information.

Exploring this unique data, we examine how domestic firms behave when faced with the threat of foreign multinational competition. For example, an October 2007 article in *Shanghai Daily* reported that Continental AG plans to “invest US \$216 million to build its first Chinese tire-making plant in Hefei, Anhui Province... The new facility, awaiting approval from the central government, will be able to produce four million passenger tires a year in the long term... Construction will start in the middle of next year and production is due to begin in early 2010.” In another example, an automotive online news portal (just-auto.com) published an article around the same period noting that “Goodyear is reportedly considering plans to invest in a new tyre production plant in the Yaroslavl region north of Moscow. According to local media reports, Goodyear executives met with the regional governor in the Yaroslavl region in April to discuss a land acquisition for the new plant. Goodyear has reportedly also asked Russian President Dmitry Medvedev to provide the company with incentives to support the project.” The news source also noted that Goodyear’s plans were likely to meet with resistance down the road from local tire makers. These news events enable us to quantify threats of foreign multinational entry and identify a time window between the news event and the occurrence of foreign competition (if foreign competition actually occurs). Investigating domestic firm behavior during this time window—when product and factor markets have not been exposed to actual foreign competition—allows us to distinguish firm responses to foreign competition threats from the potential market reallocation and spillover effects of actual competition.

We merge the constructed foreign investment news data with a large cross-country firm panel dataset drawn from Bureau van Dijk’s Orbis and Chinese National Bureau of Statistics’ (NBS) Annual Census of Enterprises, which contains rich time-series financial, operation, and ownership information, and enables us to assess domestic firms’ reactions in a variety of dimensions including not only productivity but also innovation, investment, wage, and product composition decisions. We construct a time-variant, firm-specific measure of foreign multinational competition threat as well as a time-variant, firm-specific measure of actual foreign multinational competition by linking city-industry-year specific foreign investment news and actual foreign investments to each domestic firm based on the firm’s initial product composition. This measure enables us to explore within-firm variation in exposure to foreign multinational threats as well as actual foreign competition, and

to control for all time-variant, city-industry-specific shocks and trends. To further account for unobserved investment-related trends and shocks, we also quantify and include news of investments by domestic firms similarly at the firm level.

Our analysis shows that domestic firms respond significantly to the threat of foreign multinational competition. Domestic firms upgrade productivity when faced with the threat of foreign competition and the degree of productivity upgrading increases with the size of threat. In exploiting the underlying mechanisms of productivity response, we find that domestic firms raise innovation, investment, and wage rate after the arrival of foreign competition news. In addition, domestic firms are more likely to drop products and switch primary products when exposed to foreign multinational competition threats. The arrival of actual foreign multinational competition, in contrast, is shown to lead to product churning only. The insignificant productivity effect of actual FDI echoes the extensive existing evidence finding actual FDI to exert little or even a negative productivity effect on domestic firms.

Our analysis further shows that responses to foreign multinational threats exhibit substantial heterogeneity. Within each country and industry, firms at both the right and the left tails of the TFP distribution upgrade TFP, while firms in the middle do not change productivity significantly. But the mechanisms of productivity upgrading are sharply different: the most productive domestic firms—those closest to the productivity frontier—improve TFP by increasing innovation, while the least productive domestic firms—those furthest behind the frontier—enhance TFP by dropping and switching products.

Given our goal to establish the role of information in firm behavior, we also explore the detailed content of each news text and find that the substance of news significantly affects firm behavior. For instance, we identify whether each piece of news contains information on the credibility of the threat by revealing any uncertainty or ambiguity (such as contingencies on government approval) about the potential foreign investment. Domestic firms are shown to respond more strongly to more credible foreign multinational threats whose investments are described with less ambiguity.

We also pursue several empirical strategies to further establish the robustness of the results. First, we consider a series of placebo tests by exploiting the specific timing of FDI news and assuming that each piece of FDI news had been published slightly earlier or later. If FDI news events capture local or domestic-firm-specific productivity and economic trends or simply reflect actual FDI trends, the slight backward or forward adjustment in the timing of news events should lead to relatively little change in the estimated effects of FDI news. If, instead, the concern does not apply, FDI news, when assumed to have been published before the actual publication date, should not result in any responses from domestic firms; similarly, when assumed published after the actual publication date, the aged FDI news should result in little or more moderate reactions. Our placebo tests show that domestic firms do not react to the placebo events.

Second, we employ an instrumental variable strategy by exploiting the interdependence between FDI news and other news events in the supply decisions of news media. For example, the volume of FDI news could be influenced by domestic political news, with readers' interests in globalization (including FDI) issues rising

during political debates. Conversely, FDI news (and economic news in general) could be crowded out by sports news, as readers' interests in those issues subside during major sports events. This crowding-out effect has been used in Eisensee and Strömberg (2007) as a strategy to identify the effect of news coverage on government responses to disasters. They find that media coverage of disasters is lower when the disaster occurs at the same time as other newsworthy events, such as the Olympic Games, and this, in turn, affects government responses. Our analysis similarly shows that newsworthy events in politics or sports, which are unlikely to be correlated with domestic firms' productivity shocks, affect news coverage on FDI, providing us a relatively exogenous source of variation.

Our findings suggest that in 2001–2007 responses to FDI threats account for 5 percent of firm productivity growth across all sample countries and 10 percent of firm productivity growth in developing nations. These estimates are comparable to the estimated firm productivity gains from (actual) foreign competition that have been documented in the literature, suggesting that responses to the threat of foreign multinational competition constitute an economically important mechanism through which foreign multinational competition could affect domestic firms, and represent a source of productivity gains that could be equally important as the effects of actual foreign competition resulting from either FDI or trade liberalization.

These results have direct implications for the policy debate on industrial policy, foreign investment deregulations, and trade liberalization. Policies to foster domestic firms' innovation and productivity growth should not be delayed until after actual foreign competition arrives, but instead be introduced as soon as the threat of foreign competition emerges. The specific form of the policies should also evolve over time with the development of foreign competition threats as domestic firms respond differently at different stages of competition. Further, the finding that firms closest to the productivity frontier respond to the threat of foreign competition differently than firms farthest behind the frontier, as well as firms in between, suggests that differential policy interventions as well as policies to facilitate resource reallocation might be needed.

Our paper is directly related to a broad empirical trade literature on the ex post effects of foreign multinational competition stressing, in particular, two main mechanisms. First, an important literature, spurred by Aitken and Harrison (1999) and Javorcik (2004), evaluates the effect of FDI on domestic firm productivity through productivity spillover (a spillover channel). Extensive evidence suggests positive productivity spillovers between industries with vertical production linkages, but little within-industry productivity spillovers. For example, Aitken and Harrison (1999) find that FDI negatively affects the productivity of domestically owned plants in Venezuela. Javorcik (2004) and many subsequent studies show that multinational production generates positive spillovers via backward production linkage, but little effects on the productivity of domestic firms in the same industry.² A recent study

²Fernandes and Paunov (2012) find relatively weak evidence for horizontal spillovers in the case of Chile. Guadalupe, Kuzima, and Thomas (2012) find that in Spain, while foreign ownership leads to productivity improvement in acquired plants, it raises productivity dispersion within the industry. Fons-Rosen et al. (2013), similarly using cross-country data, find the productivity impact of FDI to be either insignificant or relatively small, mostly

focusing on China (Lu, Tao, and Zhu 2017) explores the relaxation of FDI regulations upon China's WTO accession to evaluate the spillover effect of horizontal FDI. The analysis, also based on the NBS data, finds again either a negative or an insignificant effect on the productivity of domestic firms.³ In another strand of literature, studies have focused on the impacts of FDI on labor and capital market reallocations (a market reallocation channel). Both Aitken, Harrison, and Lipsey (1996) and Feenstra and Hanson (1997) find an increase of industry wages, especially for skilled (non-production) workers. Harrison and McMillan (2003) show that the presence of foreign firms exacerbates domestic firms' credit constraints. Recently, Alfaro and Chen (2018) find market reallocation to account for the majority of aggregate productivity gains from foreign multinational competition.

Our paper contributes to the above literature by highlighting a third and least stressed channel through which foreign multinational competition could influence the productivity and organization of domestic firms: that is, domestic firms could respond to the threat of foreign multinational competition by undertaking strategic actions and upgrading productivity with the aim to escape competition (a threat channel). Unlike the spillover and market reallocation channels, responses to the threat of foreign multinational competition can arise as soon as the threat emerges—without the presence of actual competition—and when final-good and factor markets have not been exposed to actual foreign competition and the demand, supply and prices of final goods and factors have not changed. The motive of these responses is also distinctively different. Responses to the threat of foreign competition are aimed to strengthen domestic firms' own competitiveness and to either deter foreign rivals or weaken their competitiveness after entry. Consequently, these responses could ultimately alter the economic impacts, including the productivity spillover and market reallocation effects, or even the occurrence of actual FDI. However, because it is difficult to identify threat separately from actual competition and pinpoint when the threat of competition arises, there is little existing evidence on whether and how domestic firms strategically respond to foreign threat and how the responses differ from the effects of actual competition. Our paper explores a new approach to quantify the threat of foreign competition and offers one of the first evidence on how foreign multinational threats could stimulate innovation, investment, product churning, and productivity growth even in the absence of actual competition. We show that the strategic, self responses to competition threats constitute a central source of firm productivity gains from multinational competition that has not previously been accounted for.

Our paper is also related to a growing literature in industrial organization evaluating incumbent responses to the threat of entry. An important study, Goolsbee and Syverson (2008), examines how incumbent airlines respond to the threat of entry

between related industries within the same sector. An exception is Keller and Yeaple (2009) who find that both imports and FDI in the United States have led to productivity gains for domestic firms in 1987–1996.

³In contrast to the ambiguous link documented between FDI and domestic firm productivity in the same industry, a separate strand of literature shows that trade liberalization could have an unambiguously positive effect on domestic firm productivity through channels including import competition (Pavcnik 2002; Bloom, Draca, and Van Reenen 2016), export market access (Lileeva and Trefler 2010; Bustos 2011), and imported intermediate inputs (Topalova and Khandelwal 2011).

by competitors. Exploring the evolution of Southwest Airlines' route network, the study finds Southwest's competitors to cut air fares for threatened routes. Tenn and Wendling (2014) exploit the regulatory environment of the pharmaceutical industry and also find incumbents to cut prices in small markets in response to new potential competition. Snider and Williams (2015) investigate the effect of a legislation aimed at increasing competition at concentrated US airports and again find fares decrease in response. Examining the impact of entry threat on innovation, Aghion et al. (2009) find that an entry threat could encourage incumbent innovation in sectors close to the technological frontier and discourage innovation in sectors behind the frontier. Our work complements these studies by exploring threats of foreign competition and providing new empirical evidence on how the threat of entry by foreign rivals influences incumbent firms' innovation, production, and productivity. We show that responses to foreign threats yield significant productivity gains even before the arrival of actual competition and represent an underemphasized but crucially important mechanism through which globalization affects domestic economies.

The rest of the paper is organized as follows. Section I discusses theoretical hypotheses emerging from existing studies. Section II describes the methodology for constructing the news data, and Section III discusses the cross-country, firm-level panel data. Sections IV and V report the baseline econometric evidence and the sensitivity analysis, respectively. Section VI concludes.

I. Theoretical Hypotheses

An extensive number of studies have offered theoretical rationales on how incumbent firms should respond to the threat of new competition, starting with Dixit's (1979) capacity commitment story, the strategic learning-by-doing of Spence (1981), and Milgrom and Roberts' (1982) cost signaling theory. In this section, we focus on theoretical hypotheses on how the threat of competition, especially in the context of foreign competition, would affect the innovation and product composition decisions of incumbent firms.

A. Innovation

First, theoretical studies show that the threat of competition affects the innovation incentive of incumbent firms. Aghion et al. (2009), for example, show that the threat of entry affects the innovative effort of incumbent firms. The paper predicts that a higher threat of technologically advanced entry should encourage innovation by incumbents in sectors that are initially close to the technological frontier, with the aim to escape entry and competition. Incumbents that are further behind the frontier, in contrast, have no hope to win against a potential entrant and therefore the effect of an increased entry threat is to reduce the incumbents' expected payoff from investing in R&D. The paper also predicts that the effects of entry threat on incumbent productivity growth in sectors near and further behind the technological frontier should mirror the heterogeneous pattern of entry effects on innovation incentives.

Innovation responses to the threat of competition are particularly essential in the context of foreign competition. As established in Melitz (2003) and Helpman, Melitz, and Yeaple (2004), foreign firms participating in international activities, including both foreign exporters and foreign multinational firms, are generally more productive than average domestic firms. Preemptive actions like increased innovation thus could be especially important for helping domestic firms gain cost advantages, survive, and better compete with foreign rivals after the foreign rivals actually arrive and ultimately influence the economic impacts of actual foreign competition.

B. Product Composition

The threat of foreign competition could also affect domestic incumbent firms' product composition decisions and result in within-firm reallocation and subsequently productivity improvement. Several studies—including, for example, Bernard, Redding, and Schott (2010); Eckel and Neary (2010); Mayer, Melitz, and Ottaviano (2014, 2016); and Nocke and Yeaple (2014)—investigate how trade liberalization could affect the product composition of multiproduct firms and show that the threat of increased competition can motivate firms to change their product mix by dropping their least competitive products and specializing in their most competitive products. Their analysis suggests that product switching contributes to a reallocation of resources within firms toward their most efficient use and represents an important channel of productivity gain. Bloom et al. (2013) develop a novel “trapped-factor” model of trade-induced innovation where firms can allocate a factor of production either to produce old goods or innovate and produce new goods. Increased import competition reduces the profitability of old goods and consequently the opportunity cost of innovating and producing new goods, thereby increasing firms' incentives to innovate and introduce new goods.

The above product-composition responses also apply to the context of this paper. In anticipation of future competition from foreign multinational firms, domestic firms have strong incentives to drop their least competitive products or the products facing future competition before actual foreign competition occurs. Such changes in product composition could lead to an increase in the firm's overall productivity.

Our empirical analysis will incorporate the above theoretical literature and investigate how domestic firms respond to anticipation of foreign multinational entry through innovation and production decisions. We will also investigate—following the theoretical predictions—how the effects could vary across firms depending on, for example, each firm's distance to the productivity frontier.

II. Quantifying Foreign Multinational Threats

As described earlier, a central challenge in assessing firm responses to the threats of foreign competition is the difficulties of identifying foreign competition threats separately from actual foreign competition. It is widely noted in the literature that entry threat is usually unobservable and cannot be proxied by actual entry. Different from the effect of actual competition, responses to entry threat can arise before as well as without the presence of actual competition and actual demand and supply

shifts in final-good, factor, and input markets. These responses exhibit the strategic motive to deter future rivals or—when deterrence is unlikely—weaken the competitiveness of future rivals after their actual entry. Consequently, how incumbents respond to entry threat will directly determine whether entry threat will eventually lead to actual entry and the ultimate impacts of actual entry.

In this paper, we quantify threats of foreign competition by exploring news of potential foreign multinational investments. Compared to other types of international competition such as exports and imports, the foreign investment activity of multinational firms has always received considerably more media attention. Many newspapers, industry journals, and magazines closely monitor and report the latest news and rumors about multinationals' future investments. This offers us an opportunity to measure the threat of foreign multinational competition—through the channel of news.⁴ In this section, we describe the source and the process used to construct a database of foreign investment news and the detailed information collected in the data.

A. *Factiva*

The primary source of our news information is Factiva, founded by Dow Jones and Reuters. Factiva is one of the largest global digital business intelligence aggregators and archives in the world. Factiva delivers the world's news and business information with access to more than 35,000 news sources, including newspapers, trade press, consumer magazines, newswires, press releases, television and audio transcripts, digital video and audio clips, web media, and social media, from 200 countries in 28 languages.⁵ Top examples in each category include the *Wall Street Journal* and the *New York Times* (newspapers); the *Oil and Gas Journal* and the *Automotive News* (trade presses); Dow Jones Newswire and AFP (newswires); PR Newswire and Business Wire (press releases); ABC News—Good Morning America and Deutsche Welle (TV and audio transcripts); WSJ Live (multimedia); *Gazzetta di Parma Online News*, *L'Unione Sarda Online News*, and Sina Corp (web media). Factiva's combination of global content, business search, and monitoring technologies offers users timely, reliable, and relevant knowledge.

Two other sources, namely LexisNexis Academic and ABI/Inform Complete Plus, were also considered. LexisNexis Academic News, published by Reed Elsevier,

⁴ We recognize that FDI news is only one of the channels through which information about future multinational competition might dissipate across firms and countries. Information might also be transmitted through informal channels like business connections. However, compared to the informal channels, formal FDI news has several distinct advantages, namely, (i) a much broader audience coverage that includes people/firms without access to the informal channels; (ii) greater reliability and higher quality; and (iii) systematically available and quantifiable information. In contrast, information access through informal channels depends greatly on the extent of a person's/firm's informal connections and can be less reliable and accountable. More crucially, information transmitted through such channels is infeasible to quantify systematically. Further, we note that even if informal channels constitute an important source of business information, as long as business news can promptly capture this information FDI news will still be a good proxy for the threat of competition, if not the channel through which information spreads. In cases of omitted information, our estimation results focusing on formal FDI news would likely be biased downwards.

⁵ While Factiva is the largest business news archive in the world, its coverage still varies across countries. In the online Appendix, we examine the robustness of our analysis by focusing on countries with the most comprehensive news coverage.

gives access to major newspapers from around the world as well as industry and market news sources in 16 languages. Its main advantage, however, is access to US and international law documents that are outside of our research interest. A comparison of Factiva and LexisNexis suggests that 84 percent of Factiva's news titles are unique and not covered in LexisNexis Academic News. Factiva has more comprehensive coverage by including both major and local newspapers, industry journals, trade publications, and multimedia, whereas LexisNexis Academic News focuses on major newspapers and law documents only. Similar to LexisNexis Academic News, ABI/Inform Complete Plus consists of primarily the largest publications specifically in the United States and Europe. Given our goal of collecting news information from not only prime but also local channels and from not only the United States and Europe but also other regions (especially developing countries), we adopt Factiva as the primary data source. In our final FDI news sample, only 33 percent of FDI news events were collected from major (international or national) news publications and 51 percent of FDI news events were published in the United States and western Europe.

B. Methodology

The following specifications are employed in our data search process. A more detailed description of the data construction process is provided in Section 1 of the online Appendix. We limit the search to the period of January 1, 2000–December 31, 2007.⁶ The search includes all types of sources, all regions, and companies in manufacturing industries including food, beverages, tobaccos, automobiles, chemicals, clothing and textiles, computers, electronics, machinery, telecommunications, and other industrial and consumer products.

Our data collection process proceeds in three steps. First, we collect all investment related news from Factiva by searching the string “invest” (as either a whole word or part of whole words such as “invested” and “investment”) in the text (including headlines and lead paragraphs). The search results in 146,663 investment-related news articles, which constitute about 12 percent of all corporate and industrial news.⁷

In the second step, we manually screen each article, in particular, the text around the keywords to identify news about possible future investments. Investment news with expressions such as “plan to,” “agree to,” “say they will,” “sign an agreement,” “expect,” and “consider” when describing the investment activity were considered as news of future investments.⁸ We also identify the companies involved in the investments and perform a background check on each company using business intelligence sources such as Hoover's to distinguish between domestic and foreign investments and to identify the headquarters country of each firm as most news

⁶The time frame is selected primarily due to the availability of firm-level financial data.

⁷In Section 5 of the online Appendix, we discuss a broader search methodology to include more M&A-related news events. We notice that most of the M&A news events, as discussed below, concern completed M&A deals.

⁸The list of words discussing a future investment that we have come across is included in Section 1 of the online Appendix. We also recorded news of current foreign investments and used the information as an alternate measure of actual FDI activity in the analysis to examine the robustness of the results.

articles do not indicate the source country of investments. The vast majority of news articles also do not report the stake share of the MNCs; those that do all report more than 10 percent. We separately record news of foreign multinational investments and news of domestic firm investments, the latter of which is included in the empirical analysis to control for local industry-specific investment shocks and trends. This step yields 20,432 pieces of foreign investment news.

In the third step, we collect detailed investment and news characteristics by carefully reading each news text. The main characteristics recorded are described in the next sub-section.

In Section 2 of the online Appendix, we describe in detail the data verification and audit procedures used to ensure the accuracy of the data.

C. *Investment and News Characteristics*

The following list of information is recorded about each piece of investment news. The first group is information about the potential investment and the second group includes characteristics of the news reports.

Investment Information.—

- (i) *Multinational firm*: the firm that would undertake the foreign investment. We identify each firm's name, home country, primary industry, and ultimate owner (if the firm is a subsidiary of another firm). In most cases, only one firm engages in the investment. In cases where more than one firm is involved, each firm's information is recorded separately.
- (ii) *Publishing date*: the date on which the news report was published.
- (iii) *Possible start year*: the potential production starting year.
- (iv) *Investment country*: the country where the multinational firm might invest. There are 138 host countries in the final data.
- (v) *Investment state/province*: the state or province where the multinational firm might invest.
- (vi) *Investment city/town*: the city where the multinational firm might invest. The city information is reported in most investment news. There are 2,463 cities in the final sample. In cases in which only investment states and provinces are reported, we use the largest city to proxy for investment city/town.
- (vii) *Entry or expansion*: whether the potential investment is a new entry or an expansion of an existing investment.
- (viii) *Investment industry*: the primary industry in which the subsidiary would operate. Based on the description of the news report, we identify the 4-digit

US SIC code of the industry and later aggregate it to the 3-digit level to merge with the financial data. In relatively few cases where the industry information is not given, we search company information from other sources to identify the primary industry.

- (ix) *Investment value and currency*: the expected amount of investment value and its currency. We convert all investment values to current US dollars based on daily exchange rates.
- (x) *Expected employment, output, and revenue*: the expected employment, output, and revenue from the investment.
- (xi) *Subsidiary name*: the name of the prospective subsidiary.
- (xii) *Investment form*: whether the potential investment is greenfield, M&A, or joint venture.
- (xiii) *Investment contingency*: the contingency of the potential investment such as “*subject to government approval*.”
- (xiv) *Investment motive*: the motive of the potential investment such as “*to meet the local demand*” and “*to use it as an export hub*.” We separately identify local-market seeking FDI and export-platform FDI.
- (xv) *Expected consumer market*: related to the investment motive, the targeted consumer market of the potential investment, namely, domestic or foreign market (and share of exports if available).

News Characteristics.—

- (i) *Publication title*: the name of the news source. Our final sample consists of 832 news sources from 67 countries.
- (ii) *Publisher*: the publisher company of the news source.
- (iii) *Publisher country*: the headquarters country of the news source.
- (iv) *Publication location*: the location where the news report was published.
- (v) *Word count*: the number of words in the news text.
- (vi) *Type of news sources*: the type of news sources. Our final sample consists of four major types of news sources, including newspapers, journals, and magazines; news agency or news service; websites; broadcast. The majority of news reports are from the former two.

- (vii) *Circulation*: the circulation volume of the publication. For newspapers, journals, and magazines, we separately collect circulation data to measure their influences. The circulation data are obtained from Ulrich: Global Periodicals, News bank: Access World News, and Audit Bureau of Circulations.
- (viii) *Online*: whether the publications have an online version.
- (ix) *Frequency*: the annual frequency of publications.
- (x) *News agency reputation*: whether the news agency is an established national or international news agency.

D. Foreign Investment News: Stylized Facts

Our final sample consists of 20,432 pieces of foreign investment news. In this subsection, we describe a number of stylized facts that emerge from the data. First, we notice that host countries including China, India, Russia, the United States, and Thailand and industries such as transportation, electrical products, chemicals, and computers appear most frequently in the news. Further, 56 percent of FDI reported in the news was expected to occur from OECD countries to non-OECD countries and about 30 percent of FDI was expected to occur between OECD countries.

Second, we identify three main types of investment motive, including local market access (FDI seeking to serve local markets), export-platform (FDI seeking to serve export markets), and comparative advantage (FDI seeking lower production costs), and find the three motives constitute, respectively, 39, 59, and 8 percent of total FDI news.⁹ The composition of investment motive, specifically the concentration of FDI news on export-platform FDI, is consistent with the observation that North-South FDI accounts for over half of the news.

Third, greenfield FDI, M&As, and joint venture account for, respectively, 68, 7, and 14 percent of FDI news.¹⁰ The low share of M&As in the data is partly due to the fact that most M&A news events concern completed M&A deals. According to Zephyr, a database reporting M&A news (along with IPO, private equity, and venture capital news), over 75 percent of the cross-border M&A news events are about completed M&A deals; and only less than 25 percent are M&A rumors. Even when rumors are circulated before the formal announcement, the time lag between rumors and formal announcements is usually very short. According to Zephyr, the average time window between a rumor and a completed deal is 28 days, leaving very little preparation time for domestic firms. In contrast, greenfield FDI is usually reported well in advance, with an average of 25 months ahead of the actual investment, allowing domestic firms significant time to react to the news.

⁹ Note that the three types of motive are not mutually exclusive in the data. Compared to information on expected markets, which is reported in most news reports, information on cost motives is more limited. Examples of texts that describe each of these motives are provided in the online Appendix.

¹⁰ These three forms of FDI do not add up to one as the form is not described in some news reports.

Fourth, there are large variations in the size distribution of potential investments. While the maximum expected investment value and the maximum expected output are over \$100 billion and 80,000, respectively, the minimum investment value is less than \$1,000 and the minimum expected employment is 8.¹¹

Next, we separate FDI news described with certainty from those that reveal uncertainty or ambiguity about the foreign investment. We define uncertainty in several ways, including, for example, investments with reported contingencies (government approval, board-of-directors approval, and so on) and investments described with phrases such as “could invest,” “want to invest,” “may invest,” “expect to invest,” “intend to invest,” and “consider to invest.”¹² We consider threats of FDI involving uncertainty to be less credible than the others. We find investments described with uncertainty to account for about 48 percent of total FDI news. It is worth noting even FDI news that are “confirmed” or provide a clear start date could still be subject to changes down the road, as we observed in the data.

Finally, we compare the news data with actual FDI data obtained from various sources including Orbis and UNCTAD and find a positive and significant correlation (around 0.4) at the aggregate host-country level. This suggests that there exists significant variations in the patterns of FDI news and actual FDI. A number of factors could explain the variations. For example, it could be due to the fact that some countries, cities, and industries attract disproportionately high media attention. China and India, for instance, are two host countries that appear in FDI news more frequently than in actual FDI.¹³ We also attempt to track the reported FDI activities in Orbis based on the MNC name, investment city, industry, and expected start year of production and find that around 60 percent of foreign multinational entry described in the news can be matched with the Orbis data, suggesting that a large share of FDI news events are likely not materialized. The different patterns of FDI news and actual FDI offer us an important source of variation for establishing their respective effects on domestic firms.¹⁴

III. Cross-Country Firm Financial and Operation Data

We merge the investment news dataset with cross-country, firm-level financial and operation data. The datasets and the related firm financial and operation information are described next.

A. Firm Data Sources

Orbis.—Orbis, published by Bureau van Dijk, is a leading source of company information and business intelligence, containing comprehensive financial, operation, and ownership information for public and private companies in over 100 countries.

¹¹ In the online Appendix, we investigate the potential concern of large FDI news bias and address its implications for our analysis.

¹² See Section 3 of the online Appendix for more details.

¹³ The media attention bias toward China and India was present not just in FDI news but also in general news. As a robustness check, we excluded China and India from the analysis and found the results remain similar.

¹⁴ In the online Appendix, we further dissect the correlations and the underlying factors.

Orbis combines information from around 100 sources and information providers. Primary sources include tax authorities, Ministry of Statistics, Provincial Bureau of Legal Entities, securities and investments commissions, national banks, municipal chambers of commerce, and State Registry of Accounts. Over 99 percent of the companies included in the database are private. The database reports at the firm level: (i) detailed 10-year financial information including 26 balance sheet items such as total asset, fixed asset, current asset, long-run investment; and total liability and income sheet items such as total revenue, value added, material cost, labor cost, and profit; (ii) industries and activities including primary and secondary industry codes in both local and international classifications; (iii) corporate structure including board members and management; and (iv) ownership information including shareholders and subsidiaries, direct and indirect ownership, ultimate owner, and all companies with the same ultimate owner as the subject company.

Orbis provides several unique advantages that are central to our analysis. First, the financial and operation data in Orbis consist of a rich array of time-series information, enabling us to examine firm responses over time in, for example, total factor productivity and product composition. Second, a notable strength of Orbis is its ownership information, which covers over 30 million shareholder/subsidiary links and is known for its scope and accuracy. The information is collected from a variety of sources including official registries, annual reports, research, and newswires. The data show full lists of direct and indirect subsidiaries and shareholders, its ultimate owner, and other companies in the same corporate family. We explore the ownership information to identify actual multinational activity across countries and compare the effects of anticipated and realized foreign investment. Third, Orbis contains a cross-country panel dataset of patent applications and citations including information on the date and location, the inventor, and the outcome of patent applications as well as citations between patents. This information enables us to explore firm patenting activities as a proxy of innovation responses. Fourth, Orbis reports top direct competitors for a subset of firms, most of which are multinational firms. We exploit this information to assess how FDI news events affect the behavior of global competitors differently than average domestic firms.¹⁵

While we believe that Orbis is a very informative and useful data source for answering the question raised in our paper, we are also aware of its limitations. Like most other datasets that rely on public registries and proprietary sources, Orbis does not cover the population of businesses across countries. An ideal alternative would be national census data that include the entire population of firms. However, such census data are either hard to obtain (usually subject to location and nationality restrictions and requirements) or nonexistent in many developing countries due to high costs and institutional restrictions that prevent frequent collections of economic census for all the businesses in a country. To assess the extent of coverage, in particular, with respect to small businesses, we compare the data against several benchmarks including, for example, the OECD Structural and Demographic Business Statistics (SDBS) and the US Census. We find that Orbis provides satisfactory

¹⁵ See Kalemli-Ozcan et al. (2015) for a detailed discussion of the Orbis database and instructions on the data gathering process.

coverage on small firms in most OECD countries (with a few exceptions such as Spain and Portugal) and some developing countries such as Argentina and Latvia.¹⁶

Compared to the coverage of domestic firms that might be biased toward large and medium firms in some countries, multinational firms are well represented in Orbis. A firm is considered domestically owned if it is a stand-alone domestic firm or its majority ultimate owner is based in the same country, and foreign owned if its majority ultimate owner is based in a different country. To examine the coverage of the MNC establishment data, we compared Orbis with UNCTAD's Multinational Corporation Database. For the United States and other major FDI source countries, the two databases report very similar numbers of multinational firms, while Orbis contains more multinational establishments.

Chinese Annual Census of Enterprises.—China is the top host country in the news data accounting for over half of the FDI news. However, one of the key variables for estimating TFP, material cost, is largely missing in Orbis for Chinese firms. To overcome this issue, we obtain Chinese firms' financial and operation information separately from the Annual Census of Enterprises published by the Chinese National Bureau of Statistics (NBS). The Annual Census of Enterprises contains both state-owned and private manufacturing firms with sales above 5 million RMB, covering 95 percent of Chinese GDP as of 2007.

Similar to Orbis, the NBS data reports at the firm level: (i) detailed financial information including balance sheet and income sheet items such as total assets, fixed assets, current assets, long-run investment, total revenue, value added, material cost, labor cost, and profit; (ii) industries and activities including primary and secondary products; and (iii) ownership information including, for example, state ownership and foreign ownership. The financial data are converted to US dollars based on yearly exchange rates to be consistent with Orbis and deflated using the deflator from LEUVEN. Compared to Orbis, however, the NBS data have better coverage for Chinese firms especially in terms of material cost and investment information, allowing us to estimate TFP for Chinese firms. Further, the NBS data also report additional information that is not available from Orbis but interesting to explore including, in particular, R&D expenditure. Even though the financial variables are defined with comparable definitions in Orbis and the Chinese NBS data, we perform the main TFP analysis—where we draw from both datasets—both jointly and separately for the two sources.

¹⁶For France, for example, the SDBS dataset reports that 84 and 91 percent of the enterprises have fewer than 10 and 20 employees, respectively, in 2007, while Orbis reports 80 and 86 percent, respectively. In the coverage for some countries such as Norway and Sweden, SDBS reports close to 88 and 93 percent, respectively, of the enterprises have fewer than 20 employees, while Orbis shows 85 and 95 percent, respectively. For some other countries, Orbis tends to have a lower share of small firms. For Spain and Portugal, for example, the percentage of enterprises with fewer than 20 employees in SDBS is 91 and 89 percent, respectively, while in Orbis it is 80 and 77 percent. The SDBS data does not include data for developing countries, but the numbers in Orbis seem comparable for some of the countries. For Argentina, for example, the share of enterprises with fewer than 20 employees was close to 90 percent (with INDEC showing 82 percent for Buenos Aires). For Latvia, it was close to 78 percent in Orbis, while Eurostat reports 85 percent. In the online Appendix, we further address the potential data coverage issue by re-performing our analysis for subsets of countries with the best data coverage.

B. Key Variables

Our empirical analysis explores four main categories of firm-level information: (i) firm financial information including revenue, employment, fixed asset, material cost, and investment (sources: Orbis for non-Chinese firms and Chinese NBS for Chinese firms); (ii) product information including the 4-digit SIC codes of the primary and secondary products in which each firm produces (source: Orbis); (iii) patent application (source: Orbis); and (iv) R&D activity (source: Chinese NBS for Chinese firms only).¹⁷ We describe in more detail below each of the key variables used in our analysis.

FDI Threat and Actual FDI.—We construct a time-variant, firm-specific measure of foreign competition threat. We link city-industry-year specific foreign investment news to each domestic firm based on the firm's location and lagged SIC 4-digit product composition to compute the level of FDI threat facing each firm given the firm's unique product mix.¹⁸ A key advantage of the firm-specific measure of FDI threats is that it enables us to explore firm-time-specific variation in exposure to FDI threat and control for all time-variant local industry-specific shocks with a city-industry-year fixed effect and all firm-specific shocks with a firm fixed effect.¹⁹ Specifically, we have, for each firm, the set of SIC 4-digit goods the firm produces. We use this information (taken from the first available year or a lagged year) to construct the level of FDI threat each firm is exposed to given its products and location, measured by the unweighted average number of FDI news a domestic firm faces across its products.²⁰ Given that some FDI plans/projects are reported more than once in the news, we consider both counts of all FDI news events (including duplicate news reporting the same FDI plan/project) and counts of unique FDI news events.

Similarly, we also measure the level of actual FDI competition and domestic investment news facing each domestic firm by matching the actual FDI entry data and the domestic investment news data with domestic firms' city and product code information. We identify actual entry of foreign multinational firms by examining the birth year of each foreign multinational establishment reported in Orbis. Identifying entry based on establishment dates offers a more accurate account of entry than counting foreign multinational subsidiaries newly appearing in the dataset because of data censoring and churning issues. According to the data, 21,930 new foreign multinational subsidiaries were established in 92 host countries and 149 manufacturing industries in 2000–2007.

¹⁷ The final sample size and the number of countries included vary with the dependent variables examined. The sample size is the largest when the dependent variables consider product adjustments and patent applications, smaller when the dependent variable is TFP, and the smallest when examining Chinese firms only.

¹⁸ In a similar spirit, Lileeva and Trefler (2010) construct a firm-specific measure of tariff cuts by linking the tariff-cut data to a firm's product data to compute the average tariff cut experienced by the firm.

¹⁹ We also used the city-industry-year specific measure and found similar results.

²⁰ We also considered the sum of FDI news across each firm's products and found similar results. We prefer the measure using the mean number of FDI news since the sum of FDI news could be correlated with firm characteristics such as firm size and product scope.

TFP.—To measure firm productivity, we estimate production functions using firms' financial data in 2001–2007.²¹ We estimate production functions separately for each country group and industry; five country groups, namely, high income, upper middle, middle, lower middle, and low income, classified following World Bank's definition are considered.

A key challenge in the measurement and identification of productivity relates to the endogeneity of the firm's optimal choice of inputs. Different estimation measures exhibit different advantages and limitations. As shown by Akerberg, Caves, and Frazer (2015), the use of instruments based on lagged input decisions as the source of identification in structural estimation methods such as Olley and Pakes (1996) and Levinsohn and Petrin (2003) may be associated with collinearity problems.

We considered a variety of productivity estimation methodologies, including Olley and Pakes (1996), Levinsohn and Petrin (2003), Akerberg, Caves, and Frazer (2015), and Gandhi, Navarro, and Rivers (2016). Gandhi, Navarro, and Rivers (2016), one of the recent developments, use a transformation of the firm's first-order condition for flexible inputs that does not require finding instruments for the flexible inputs or subtracting them from output. The transformation enables a non-parametric regression of the flexible input revenue share against all observed inputs to nonparametrically identify the flexible input's production elasticity and the ex post shocks.²² We further adapt the estimation code following De Loecker (2013) to include FDI news in the TFP law of motion. We report our primary results based on productivity estimates obtained using Gandhi, Navarro, and Rivers (2016) technique, but confirm as well that the estimated effects of FDI news are qualitatively similar when other estimation methods are used.²³

Innovation and Product Adjustment.—In addition to TFP, several other response variables measuring innovation, investment, wage, and product composition are considered, including:

- (i) *Patent (Orbis)*: the number of patents applied for by a firm.

²¹ In some countries such as China, the financial data are available for a shorter time period. When estimating the production functions, we deflated revenue, asset, and material cost with industry-level revenue, asset, and material-cost deflators obtained from a variety of sources including the EU KLEMS, OECD STAN, LEUVEN (China), and Taiwan national statistics. For countries without industry-level deflators, we used national income and capital deflators.

²² We thank Amit Gandhi for kindly providing the program and refer the readers to the paper for more details about the technique.

²³ As in most empirical work that exploits productivity estimates, we do not observe firm-level physical output quantities and prices. This information is especially difficult to obtain for the large panel of countries considered in the paper. It is, hence, plausible that the productivity estimates are, to some extent, positively correlated with prices and markups. However, our prediction on the direction in which anticipated competition might affect prices and markups is opposite to the positive effect we show on productivity; competition threats should induce domestic firms to lower, instead of raise, prices and markups. Another potential concern is that the productivity measure might reflect product quality instead. To mitigate this concern, we re-performed our empirical analysis for industries that are classified as relatively homogeneous (traded on an organized exchange) by Rauch (1999) and obtained similar findings.

- (ii) *Investment* (Orbis and NBS): the amount of long-term investment made by a firm.
- (iii) *Wage* (Orbis and NBS): average labor cost per employee.
- (iv) *Add product, drop product, switch primary product* (Orbis): whether a firm adds a product, drops a product, and switches its primary product based on each firm's product code data.
- (v) *R&D* (NBS/Chinese firms only): an indicator of positive R&D expenditure.
- (vi) *New product* (NBS/Chinese firms only): an indicator of whether a firm reports introduction of new products.

Final Sample.—After merging the firm-level data with the FDI news data, we have about 750,000 manufacturing firms from around 30 countries and 120 SIC 3-digit industries where there are both news and firm-level productivity data. In all country-industry-year cells, over 5 percent of the cells have positive FDI news and about 14 percent of the cells have actual FDI entry. The coverage of FDI news is mostly driven by industries as about one-third of the industries do not have any news in the sample period, while almost all countries appear in the news. At the firm level, 16 percent of the firms face at least one FDI news in their city and primary industry in 2001–2007, with the mean number of news being 0.6; 24 percent of the firms face at least one foreign multinational entry in their city and primary industry, with the mean number of entry being 0.4. Table A.1 in the Appendix reports the summary statistics and the sources of the main variables.

IV. Main Empirical Analysis

In this section, we present our main econometric results on how domestic firms respond to foreign competition threats and actual foreign competition, respectively. We first present baseline results on productivity, innovation, investment, and product decisions and then explore heterogeneous responses and the magnitudes of the economic impacts.

A. Productivity

We start with the following baseline empirical specification:

$$\begin{aligned}
 (1) \quad y_{i,city,K,t} = & \alpha + \beta_1 FDI\ News_{city,K,t-1} + \beta_2 Actual\ FDI_{city,K,t-1} \\
 & + \beta_3 Domestic\ News_{city,K,t-1} + \gamma Z_{i,city,K,t-1} \\
 & + \delta_i + \delta_{city,t} + \delta_{city,K} + \varepsilon_{i,city,K,t},
 \end{aligned}$$

where $y_{i,city,K,t}$ is the outcome of interest, log productivity change in the baseline case, of firm i in a given city, industry, and year t ; $FDI\ News_{city,K,t-1}$ is the

TABLE 1—TFP RESPONSE TO LOCAL FDI NEWS

Dependent variable	TFP growth	TFP growth	TFP growth	TFP growth	TFP growth
Sample	All	All	All	All	All
	(1)	(2)	(3)	(4)	(5)
FDI news (all)	0.003 (0.001)		0.004 (0.001)	0.002 (0.001)	
FDI news (unique)					0.008 (0.003)
Actual FDI		-0.002 (0.002)	-0.003 (0.002)	-0.003 (0.002)	-0.003 (0.002)
Domestic news				-0.001 (0.002)	-0.002 (0.002)
Domestic sales growth				-0.054 (0.002)	-0.054 (0.002)
Domestic sales growth squared				0.009 0.000	0.009 0.000
Size				0.011 (0.001)	0.011 (0.001)
Capital intensity				0.004 (0.001)	0.004 (0.001)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
City-year fixed effects	Yes	Yes	Yes	Yes	Yes
City-industry fixed effects	Yes	Yes	Yes	Yes	Yes
Source	Full	Full	Full	Full	Full
Observations	1,651,624	1,651,624	1,651,624	1,446,413	1,446,413
R^2	0.003	0.246	0.003	0.003	0.003

Notes: This table examines domestic firms' TFP responses to local FDI threats and actual FDI. The dependent variable is a domestic firm's log change of TFP. The variables "FDI news (all)" and "FDI news (unique)" are, respectively, the number of all or unique FDI news events a firm is exposed to in its industry and city. The variable "actual FDI" is the number of actual entry a firm faces across its industry and city. All variables on the right-hand side are lagged by one year. All regressions include firm and city-industry-year fixed effects. Standard errors are clustered at the city-industry level and reported in the parentheses.

number of (all or unique) FDI news events in a given city, industry, and year; $Actual\ FDI_{city,K,t-1}$ is the number of actual foreign multinational entry; and, similarly, $Domestic\ News_{city,K,t-1}$ is the number of domestic investment news events.²⁴ In addition, a vector of firm dummies is included to control for all firm-specific characteristics and trends, a vector of city-year dummies is included to control for all time-variant local factors and shocks, and a city-industry fixed effect is used to control for all city-industry-specific factors such as natural location advantages.

We report the results in Table 1. We find significant productivity upgrading by domestic firms in response to local threats of foreign multinational competition. If a domestic firm is exposed to an FDI news event in year $t - 1$, the firm's TFP would grow, on average, by 0.3 percent in year t . As some future FDI activities are reported in more than one piece of news, we also examine how the number of unique news events, measured by the number of foreign multinationals appearing in the news in a given city, industry, and year, affects domestic firm responses. As shown in

²⁴ While the main analysis considers city-level news, we also considered country level and found similar results.

column 5 of Table 1, each unique FDI news event is associated with a 0.8 percent increase in domestic firms' TFP.²⁵ The effect of actual multinational entry, in contrast, is statistically insignificant.²⁶ This result is independent of whether we control for FDI news, and echoes the overwhelming existing evidence described earlier showing an insignificant or a negative productivity effect from actual FDI.²⁷

Next, we introduce firm-specific measures of FDI threats and examine the specification given below:

$$(2) \quad y_{i,city,K,t} = \alpha + \beta_1 FDI\ News_{i,city,K,t-1} \\ + \beta_2 Actual\ FDI_{i,city,K,t-1} + \beta_3 Domestic\ News_{i,city,K,t-1} \\ + \gamma Z_{i,city,K,t-1} + \delta_i + \varphi_{city,K,t} + \varepsilon_{i,city,K,t},$$

where $FDI\ News_{i,city,K,t-1}$ is the domestic-firm-specific measure of exposure to FDI news, measured by the average number of FDI news events across a domestic firm's products, constructed based on each domestic firm's city location and initial product mix; $Actual\ FDI_{i,city,K,t-1}$ is the domestic-firm-specific measure of actual FDI, measured by the average count of actual foreign multinational entry across a domestic firm's products; and, similarly, $Domestic\ News_{i,city,K,t-1}$ is the domestic-firm-specific measure of domestic investment news. This specification enables us to explore cross-firm variations in exposure to FDI threats and control for all time-varying local factors and shocks with a vector of city-industry-year dummies and all firm-specific factors with a firm fixed effect. A city-industry cluster is also used to avoid serial correlation in the error term across years within a city and industry.²⁸

The results are reported in Table 2. Again, we find significant productivity upgrading by domestic firms and the degree of responses increases with the level

²⁵ We also examined domestic firms' TFP responses to greenfield FDI and M&A news, respectively, and found that greenfield FDI news events exert a significant effect, while M&A has little impact. This is consistent with the fact that most M&A news included in either our data or alternate sources, such as Zephyr and SDC Platinum, have a very short time window between the rumor/announcement date and the actual deal date with an average of less than 30 days.

²⁶ The above results remained robust when we included the news or the actual entry variable alone. To ensure that the result is not driven by the measurement of actual entry relative to the measurement of FDI news, we also measured actual entry based on information from the same news sources. This, by measuring both anticipated FDI and actual FDI from news, also helps us address the concern that the FDI news variable captures only large FDI activities, whereas the actual entry variable from Orbis includes FDI activities of all scales. We found that the results remain similar.

²⁷ In the online Appendix, we also used other alternate productivity estimates that have been considered in the literature and found that anticipated foreign multinational competition always exerts a significant and positive effect on domestic firm TFP, while actual foreign multinational competition usually has an insignificant impact. Several explanations have been suggested including measures of productivity, mediating factors in productivity spillover, and timing of the effect. First, most empirical work in the literature, including ours, rely on revenue-based productivity measures which estimate firm productivity based on the output value (instead of physical output) produced by each firm given its inputs. If (actual) foreign multinational competition reduces domestic firm markups, the estimated effects on revenue measured TFP could be biased downward. A second explanation offered is that the magnitude of the spillover effect could be conditional on factors such as the absorptive capacity of countries and firms, forms of FDI, and domestic policies. For example, countries and firms with a stronger absorptive capacity would be more likely to experience productivity spillovers. Third, the timing when the effect of actual foreign multinational competition will be realized can also be ambiguous and might, for example, depend on whether the entry is anticipated.

²⁸ There are in total 144,508 city-industry clusters where there are multiple observations.

TABLE 2—FIRM-SPECIFIC EXPOSURE TO FDI NEWS AND TFP RESPONSE: BASELINE RESULTS

Dependent variable	TFP growth	TFP growth	TFP growth	TFP growth
Sample	All	All	All	All
	(1)	(2)	(3)	(4)
FDI news (all)	0.004 (0.002)		0.006 (0.002)	
FDI news (unique)				0.049 (0.017)
Actual FDI		0.002 (0.007)	-0.003 (0.007)	-0.003 (0.007)
Domestic news			0.013 (0.011)	0.014 (0.011)
Size			0.116 (0.001)	0.116 (0.001)
Capital intensity			0.035 (0.001)	0.035 (0.001)
Firm fixed effects	Yes	Yes	Yes	Yes
City-industry-year fixed effects	Yes	Yes	Yes	Yes
City-industry cluster	Yes	Yes	Yes	Yes
Source	Full	Full	Full	Full
Observations	1,653,699	1,653,699	1,609,542	1,609,542
R ²	0.336	0.336	0.350	0.350

Notes: This table examines domestic firms' TFP responses to firm-specific measures of FDI threats and actual FDI. The dependent variable is a domestic firm's log change of TFP. The variables "FDI news (all)" and "FDI news (unique)" are, respectively, the average number of all or unique FDI news events a firm is exposed to across its products. The variable "Actual FDI" is the average number of actual entry a firm faces across its products. All variables on the right-hand side are lagged by one year. All regressions include firm and city-industry-year fixed effects. Standard errors are clustered at the city-industry level and reported in the parentheses.

of exposure. If a domestic firm is exposed to an FDI news event in year $t - 1$, the firm's TFP would grow, on average, by 0.6 percent in year t . Each unique FDI news event is associated with a 4.9 percent increase in domestic firms' TFP. The effect of actual multinational entry, again, is statistically insignificant.²⁹

Next, we account for the size of threat. Most investment news report the expected size of the future investment, including either expected output, expected local labor employment, or investment value. Hence, we estimate the following equation:

$$\begin{aligned}
 (3) \quad y_{i,city,K,t} = & \alpha + \beta_1 FDI\ News_{i,city,K,t-1} \\
 & + \beta'_1 FDI\ News_{i,city,K,t-1} \times Threat\ size_{i,city,K,t-1} \\
 & + \beta_2 Actual\ FDI_{i,city,K,t-1} + \beta_3 Domestic\ News_{i,city,K,t-1} \\
 & + \gamma Z_{i,city,K,t-1} + \delta_i + \varphi_{city,K,t} + \varepsilon_{i,city,K,t}
 \end{aligned}$$

²⁹ We also considered an alternative measure of FDI news by normalizing the count of FDI news and scaling it by host country population. We show in the online Appendix (Section 7) that a 1 percentage point increase in the normalized ratio of FDI news is associated with 0.96 percent increase in TFP.

TABLE 3—TFP RESPONSE TO FDI NEWS: THE SIZE OF THREAT

Dependent variable Sample	TFP growth All (1)	TFP growth All (2)	TFP growth All (3)
FDI news	-0.016 (0.034)	0.023 (0.019)	0.028 (0.020)
× Average investment value	0.008 (0.003)		
× Average expected employment		0.016 (0.009)	
× Average expected output			0.004 (0.005)
Actual FDI	-0.003 (0.007)	-0.003 (0.007)	-0.003 (0.007)
Domestic news	0.013 (0.011)	0.014 (0.011)	0.012 (0.011)
Size	0.116 (0.001)	0.116 (0.001)	0.116 (0.001)
Capital intensity	0.035 (0.001)	0.035 (0.001)	0.035 (0.001)
Firm fixed effects	Yes	Yes	Yes
City-industry-year fixed effects	Yes	Yes	Yes
City-industry cluster	Yes	Yes	Yes
Source	Full	Full	Full
Observations	1,609,535	1,609,480	1,609,507
R ²	0.350	0.350	0.350

Notes: This table examines domestic firms' TFP responses to FDI threats taking into account the size of threat. The dependent variable is a domestic firm's log change of TFP. The variable "FDI news" is the average number of unique FDI news events a firm is exposed to across its products. The variable "Actual FDI" is the average number of actual entry a firm faces across its products. All variables on the right-hand side are lagged by one year. All regressions include firm and city-industry-year fixed effects. Standard errors are clustered at the city-industry level and reported in the parentheses.

where $Threat\ size_{i,city,K,t-1}$ is the average expected output, employment, or investment value of investments described in the news.³⁰

As reported in Table 3, we find the response of domestic firms to increase significantly with the size of threats. Future multinational competition with a greater investment value or a greater expected employment motivates a steeper productivity upgrading by domestic firms. For example, a 100 percent increase in future competitors' anticipated local employment leads to 1.6 percent greater TFP improvement by domestic firms.

³⁰ A plausible concern is that news might have the tendency to report large investments or investments undertaken by large companies, which could then introduce an upward bias in our estimated effects of FDI news. We addressed the issue and its potential implications in the Appendix in several ways, including measuring actual FDI entry also based on news sources and and separately focusing on FDI news with less-than-median expected investment value, output, or employment.

TABLE 4—INNOVATION, INVESTMENT, AND WAGE RESPONSES TO FDI NEWS

Dependent variable	Patent growth	Investment growth	Wage growth
Sample	All	All	All
	(1)	(2)	(3)
FDI news	0.014 (0.008)	0.105 (0.047)	0.010 (0.006)
Actual FDI	-0.002 (0.002)	-0.068 (0.085)	0.005 (0.005)
Domestic news	-0.006 (0.010)	0.041 (0.031)	0.005 (0.004)
Size	-0.002 (0.000)	-0.097 (0.005)	0.103 (0.001)
Capital intensity	-0.002 (0.000)	-0.057 (0.005)	-0.072 (0.001)
Firm fixed effects	Yes	Yes	Yes
City-industry-year fixed effects	Yes	Yes	Yes
City-industry cluster	Yes	Yes	Yes
Source	Full	Full	Full
Observations	1,824,538	929,367	2,179,540
R^2	0.128	0.165	0.272

Notes: This table examines domestic firms' innovation, investment and wage responses to FDI news. The dependent variables are the log changes of patent applications, investment, and average wage rate, respectively. The variable "FDI news" is the average number of unique FDI news events a firm is exposed to across its products. The variable "Actual FDI" is the average number of actual entry a firm faces across its products. All variables on the right-hand side are lagged by one year. All regressions include firm and city-industry-year fixed effects. Standard errors are clustered at the city-industry level and reported in the parentheses.

B. Innovation

Next, we explore the underlying mechanisms of productivity upgrading, specifically how domestic firms respond to the threat of foreign competition through innovation and investment decisions.

First, we use a cross-country patent application and citation dataset obtained from Orbis that reports information such as patent name, international patent classification (IPC) code, patent application date, citing document, cited document, application outcome, current owner country code, and inventor country code. We compute the number of patent applications filed by each domestic firm in a given year and use it as a proxy for innovation as in many previous studies such as Aghion et al. (2009), Bloom et al. (2013), and Bloom, Draca, and Van Reenen (2016). As shown in Table 4, we find that FDI news events exert a positive and significant effect on domestic firms' patenting activities. Domestic firms raise patenting by, on average, 1.4 percent in response to firm-specific FDI threats. Actual FDI, in contrast, does not exert a significant effect on patents. The positive innovation response to the threat of FDI is consistent with existing theoretical predictions by, for example, Spence (1981) and Aghion et al. (2009), suggesting that incumbent firms should take preemptive innovation actions before new competition arrives to weaken the

TABLE 5—PRODUCT COMPOSITION RESPONSES TO FDI NEWS

Dependent variable	Add product	Drop product	Switch
Sample	All	All	All
	(2)	(3)	(4)
FDI news	0.011 (0.028)	0.285 (0.029)	0.094 (0.029)
Actual FDI	0.002 (0.013)	0.174 (0.013)	0.128 (0.017)
Domestic news	-0.009 (0.014)	-0.016 (0.014)	0.007 (0.019)
Size	0.003 (0.000)	0.006 (0.000)	-0.001 (0.000)
Age	0.0001 (0.000)	0.0001 (0.000)	0.0001 (0.000)
Product count fixed effects	Yes	Yes	Yes
City-industry-year fixed effects	Yes	Yes	Yes
City-industry cluster	Yes	Yes	Yes
Source	Full	Full	Full
Observations	4,047,684	4,047,684	4,047,684
R ²	0.485	0.453	0.518

Notes: This table examines domestic firms' product composition responses to FDI news. The dependent variables are indicators of whether a firm adds a product, drops a product, and switches its primary product, respectively. The variable "FDI news" is the average number of unique FDI news events a firm is exposed to across its products. The variable "Actual FDI" is the average number of actual entry a firm faces across its products. All variables on the right-hand side are lagged by one year. All regressions include firm and city-industry-year fixed effects. Standard errors are clustered at the city-industry level and reported in the parentheses.

competitiveness of new rivals.³¹ This incentive should be stronger than the incentive to innovate after the actual arrival of competition, confirmed in the results above, as ex ante actions tend to be more effective and less costly.

Second, we find that domestic firms also tend to increase investments after being exposed to the threat of FDI. Each unique FDI news event is associated with a 10.5 percent increase in domestic firms' investment. Third, a similar pattern emerges when we examine the average wage paid by domestic firms. Domestic firms are found to raise average wage rates by 1 percent in response to each unique FDI news event, implying increased demand for skilled labor in anticipation of foreign threats.

C. Product Composition

Now we examine how domestic firms might respond to the threat of foreign competition by adjusting product composition, including adding and dropping products

³¹ Similar to our findings, Bloom, Draca, and Van Reenen (2016) document prompt patenting responses to import competition from China and find a 10 percentage point increase in Chinese import penetration is associated with a 3.2 percent increase in patenting in the same year. An alternative interpretation of the result is that firms may simply be applying for more patents to protect their existing knowledge in anticipation of greater foreign competition. If that is the case, the average quality of patents is likely to fall. To examine this effect, we followed Bloom, Draca, and Van Reenen (2016) by looking at average citations per patent and did not find that is the case.

TABLE 6—RESPONSES TO FDI NEWS IN CHINESE DATA SAMPLE

Dependent variable Sample	RD growth China (1)	Add product China (2)
FDI news	0.020 (0.007)	0.022 (0.005)
Actual FDI	-0.013 (0.013)	-0.016 (0.010)
Domestic news	0.018 (0.005)	0.007 (0.004)
Size	0.068 (0.001)	0.053 (0.000)
Capital intensity	0.036 (0.001)	0.027 (0.000)
Firm fixed effects	Yes	Yes
City-industry-year fixed effects	Yes	Yes
City-industry cluster	Yes	Yes
Source	NBS	NBS
Observations	590,448	818,690
R^2	0.065	0.048

Notes: This table examines domestic firms' innovation and product responses to FDI news using Chinese NBS data. The dependent variables are an indicator of whether a firm performs new RD and an indicator of whether a firm reports adding new products, respectively. The variable "FDI news" is the average number of unique FDI news events a firm is exposed to across its products. The variable "Actual FDI" is the average number of actual entry a firm faces across its products. All variables on the right-hand side are lagged by one year. All regressions include firm and city-industry-year fixed effects. Standard errors are clustered at the city-industry level and reported in the parentheses.

and switching primary goods, using the firm product data from Orbis.³² As shown in Table 5, we find that domestic firms are, on average, 28 percent more likely to drop products and 9 percent more likely to switch primary products when facing FDI threats on their products. In contrast to its effects on innovation, the actual entry of multinational firms is found to exert a similar effect on product composition. Domestic firms are 17 percent more likely to drop products and 13 percent more likely to switch their primary products after the actual arrival of FDI. This result is consistent with theories outlined in Section I (e.g., Bernard, Redding, and Schott 2010; Eckel and Neary 2010; Bloom et al. 2013; Nocke and Yeaple 2014; Mayer, Melitz, and Ottaviano 2014, 2016), suggesting that both the threat of foreign competition and actual foreign competition can lead domestic firms to change product mix by dropping and switching products.

The above results remain robust when we explore the information reported by Chinese NBS Survey on R&D decision and new product introduction. We find in Table 6 that Chinese firms raise R&D expenditure significantly when facing FDI threats. The probability of increased R&D rises by, on average, 2 percent when

³² Here, the analysis constructs the product adjustment variables by comparing each firm's product composition in 2005 and 2007, the two years that offer the best product data coverage, and as a result the firm fixed effect is not included.

TABLE 7—HETEROGENEOUS TFP RESPONSES TO FDI NEWS ACROSS FIRMS

Dependent variable Sample	TFP growth	TFP growth	TFP growth
	All (1)	Non-China (2)	China (3)
FDI news	0.100 (0.017)	-0.016 (0.046)	0.038 (0.019)
× Lagged TFP	-0.123 (0.016)	-0.053 (0.027)	-0.049 (0.022)
× Lagged TFP squared	0.026 (0.004)	0.019 (0.007)	0.029 (0.009)
Lagged TFP	-0.808 (0.001)	-0.737 (0.001)	-1.187 (0.003)
Actual FDI	0.004 (0.005)	0.001 (0.005)	0.074 (0.025)
Domestic news	0.002 (0.003)	-0.015 (0.021)	0.002 (0.009)
Size	0.002 (0.001)	0.001 (0.001)	0.001 (0.002)
Capital intensity	-0.015 (0.001)	-0.031 (0.001)	-0.014 (0.002)
Firm fixed effects	Yes	Yes	Yes
City-industry-year fixed effects	Yes	Yes	Yes
City-industry cluster	Yes	Yes	Yes
Source	Full	Orbis	NBS
Observations	1,595,142	1,209,394	385,748
R ²	0.616	0.543	0.809

Notes: This table reports domestic firms' heterogeneous TFP response to FDI news across firms. The dependent variable is a domestic firm's log change of TFP. The variable "FDI news" is the average number of unique FDI news events a firm is exposed to across its products. The variable "Actual FDI" is the average number of actual entry a firm faces across its products. All variables on the right-hand side are lagged by one year. All regressions include firm and city-industry-year fixed effects. Standard errors are clustered at the city-industry level and reported in the parentheses.

domestic firms are threatened by future FDI competition across their products. Chinese firms are also more likely to report the introduction of new products after exposure to FDI news.

D. Heterogeneous Firm Response

Next, we examine how domestic firm responses to the threats of multinational competition might vary within each industry, depending on their productivity level and distance to the frontier. We find in Table 7 a non-monotonic, U-shape pattern: domestic firms at the right and left tails of the TFP distribution tend to upgrade TFP in response to the news, while domestic firms with intermediate TFP levels show little reactions. Specifically, we show in Figure 1 that when divided into 5 bins, domestic firms in the top bin and the bottom bin of each industry in each country both upgrade TFP in response to FDI news. Specifically, the top-bin domestic firms upgrade TFP by, on average, 5 percent and the bottom-bin domestic firms by 12 percent, in response to FDI threats. In contrast, domestic firms in the middle three bins of each country and industry do not change their TFP significantly.

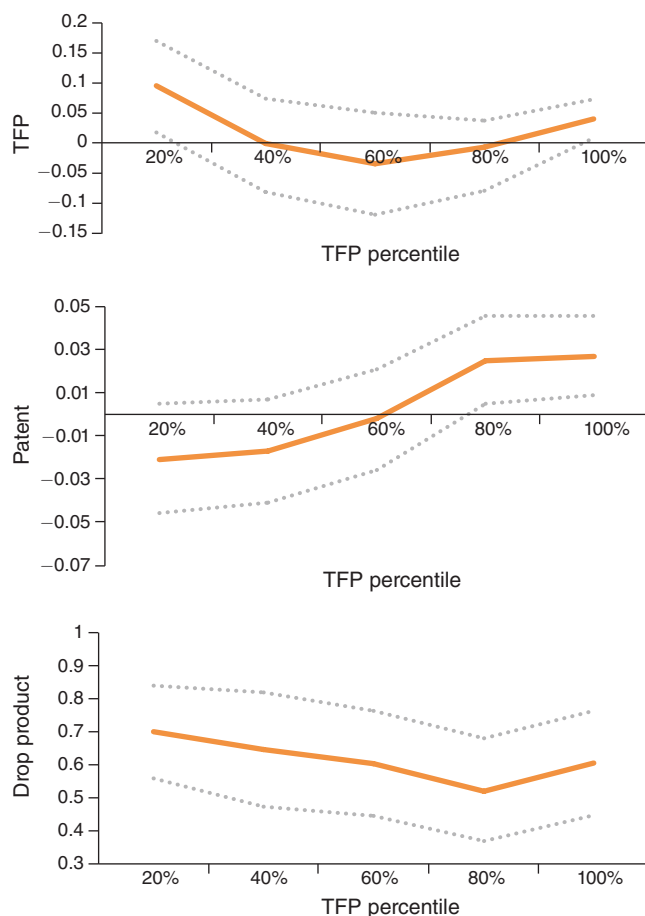


FIGURE 1

Notes: Heterogeneous TFP, innovation, and product responses to FDI news by TFP percentile. (Solid curve represents the coefficients; dash curves represent 95 percent confidence intervals.)

A natural question now is: do the most productive and the least productive firms upgrade TFP in the same way? We find that the mechanisms underlying the TFP response are sharply different. Our analysis in Table 8 and Figure 1 shows that only the most productive domestic firms—firms closest to the frontier—respond to FDI news with more patenting. The top two bins of domestic firms increase patenting by about 3 and 2 percent, respectively, when exposed to FDI threats, while the other, less productive firms exhibit insignificant responses. This result is similarly seen for Chinese firms, where we find that more productive Chinese firms are more likely to increase R&D in response to FDI news.³³ In sharp contrast, the result is opposite

³³ Incorporating a unique dataset from Orbis reporting top direct competitors of MNCs, we also investigated how news of an MNC's new FDI activity (e.g., Toyota's new investment in China) might affect the behavior of the MNCs' top competitors. Given that top competitors are firm-specific, this also offers us an additional dimension of firm variation to identify the effect of FDI news. The analysis shown in the online Appendix (Section 6) shows that top competitors respond to the news by increasing local advertising expenses rather than innovation. In a separate

TABLE 8—HETEROGENEOUS INNOVATION AND PRODUCT COMPOSITION RESPONSES TO FDI NEWS ACROSS FIRMS

Dependent variable	Patent growth	Drop product	Switch product
Sample	All	All	All
	(1)	(2)	(3)
FDI news	-0.020 (0.013)	0.423 (0.034)	0.141 (0.046)
× Lagged TFP	0.002 (0.001)	-0.009 (0.002)	-0.003 (0.003)
Lagged TFP	0.0004 (0.0006)	0.005 (0.000)	0.003 (0.000)
Actual FDI	-0.006 (0.003)	0.239 (0.013)	0.149 (0.047)
Domestic news	-0.022 (0.007)	-0.004 (0.014)	-0.000 (0.018)
Size	-0.002 (0.000)	0.008 (0.000)	-0.001 (0.000)
Firm fixed effects	Yes	No	No
City-industry-year fixed effects	Yes	Yes	Yes
City-industry cluster	Yes	Yes	Yes
Source	Orbis	Orbis	Orbis
Observations	1,256,648	4,047,684	4,047,692
R ²	0.124	0.441	0.517

Notes: This table reports domestic firms' heterogeneous innovation and product composition response to FDI news within each industry. The dependent variable is the log change of patent applications and indicators of whether a firm drops a product and switches its primary product, respectively. The variable "FDI news" is the average number of unique FDI news events a firm is exposed to across its products. The variable "Actual FDI" is the average number of actual entry a firm faces across its products. All variables on the right-hand side are lagged by one year. All regressions include firm and city-industry-year fixed effects. Standard errors are clustered at the city-industry level and reported in the parentheses.

for product adjustment. Table 8 and Figure 1 show that while all bins of domestic firms tend to drop products in response to FDI threats, the response is significantly stronger for the less productive bins. The bottom two bins of domestic firms are 41 and 39 percent, respectively, more likely to drop products when facing FDI threats, while the other bins are around 30 percent more likely to drop products after FDI news. Unlike the TFP results, we do not have a significant U-shape relationship for innovation and product composition decisions. These findings suggest that while both the most and the least productive domestic firms upgrade productivity when threatened by foreign competition, they do so through distinctively different mechanisms.³⁴

exercise, we also examined host-country stock market responses to publicly listed domestic firms that are exposed to FDI news and found that even with the control of firm and daily fixed effects, the stock prices of the publicly listed domestic companies affected by the news fall significantly the day after the news.

³⁴ In the online Appendix (Section 6), we also examined how firm responses to FDI threats could vary depending on the firm's operation structure and found that the estimated effect of FDI news is significantly stronger for single-plant firms as well as non-exporting and non-multinational firms in the host country. We also explored how domestic firms' response to FDI news could vary across industries and countries and showed that as suggested by Aghion et al. (2005), industries with more "neck-to-neck" competition exhibit more productivity upgrading. Across countries, domestic firms in developed nations respond more strongly than those in developing nations and news events on FDI from developed countries are more influential.

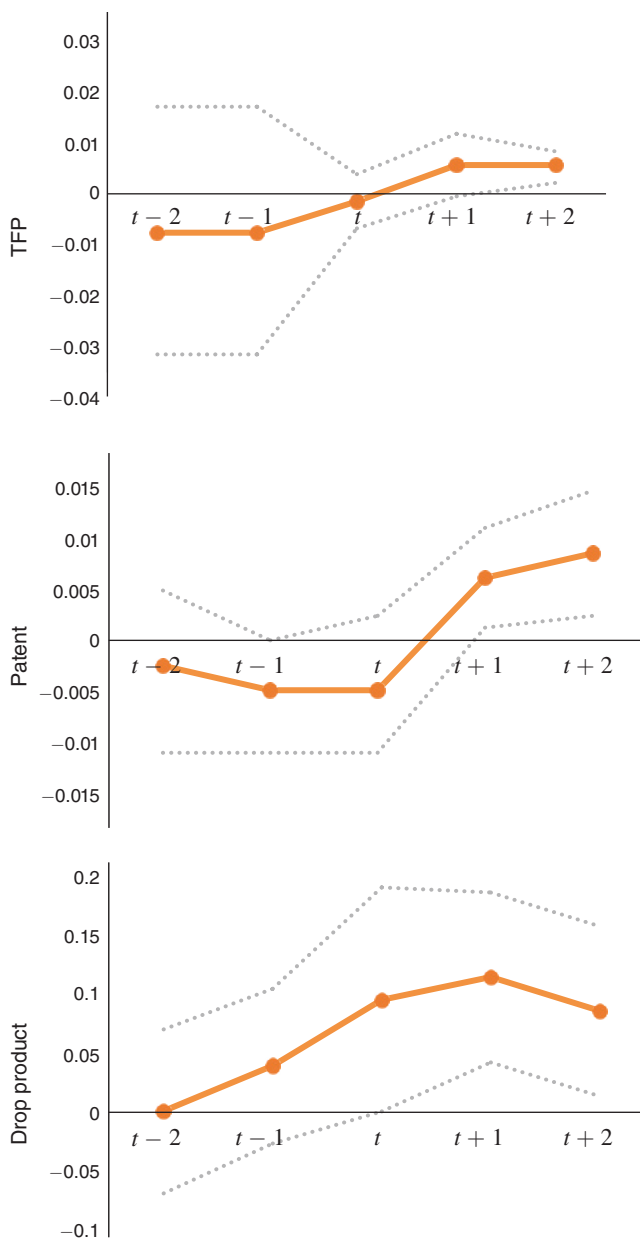


FIGURE 2

Note: Dynamics in TFP, innovation, and product responses to FDI news (t represents the occurrence of news events; solid curve represents the coefficients; dash curves represent 95 percent confidence intervals).

E. The Dynamics of Responses

Now we explore the dynamics of the effects by examining domestic firms' responses in periods before, during, and after the new events occurred. Figure 2 shows that before news events occurred, domestic firms, as expected, did not exhibit

statistically significant responses in terms of TFP, innovation, or product composition. There is instead a weak negative, albeit statistically insignificant, correlation between domestic firms' TFP growth and innovation and the arrival of a news event in the future. Similarly, there are no statistically significant changes in domestic firms' TFP and innovation during a news event. This is anticipated as firms are unlikely to have instantaneous TFP improvements or patenting activities while, or right after, the news events take place. However, domestic firms' TFP tends to improve significantly the year after a news event and continues to improve in the second year. Consistent with Table 2, if a domestic firm is exposed to a news event in year t , the firm's TFP would grow, on average, by 0.6 percent in year $t + 1$ as well as in $t + 2$. Similarly, each news event in year t is shown to raise innovation significantly by 0.5 percent in $t + 1$. The effect becomes slightly stronger the next year, leading to a statistically significant 0.7 percent increase in innovation. In contrast to the lag in TFP growth and patenting, domestic firms' reactions by dropping threatened products are witnessed immediately, in the same period of the news event. Domestic firms are 9 percent and 11 percent, respectively, more likely to drop products in t and $t + 1$, while the response subsides to 8 percent in $t + 2$. The finding that domestic firms react significantly to FDI news within the first two years of the news events is consistent with the average window between the publishing date of a news event and the expected arrival date of actual FDI. Domestic firms have incentives to respond as soon as the threat of foreign competition emerges and before they are exposed to actual competition.

V. Establishing the Effect of Information

A. Exploring the Substance of News

Given that the goal of this paper is to investigate the role of information in firm behavior, we next explore the content of each news article to extract useful information and examine how domestic firms' reactions might vary with the specific information provided. Exploiting the effect of news content helps to better establish the role of news/information as the specific substance reported and the tone of language used in each news tend to be driven by the information available to the news reporters and less likely—compared to the incidence of news reporting—to be driven by unobserved local productivity shocks.

We find that the substance of news significantly affects domestic firms' behavior. Specifically, we identify whether the news texts reveal any uncertainty or ambiguity (such as contingencies on government approval) about the foreign investments by either explicitly mentioning the uncertainty and contingency or using ambiguous language such as “intend to,” “consider,” “may invest,” “want to invest,” “could invest,” and etc. in describing a future FDI event.

For example, the following pieces of news, “ExxonMobil is also considering joining Sinopec in other petrochemical projects and is waiting for government approval for a petrochemicals complex to be built in Fujian province in partnership with Fujian Petrochemical and Saudi Aramco” and “Chinese telecommunications products maker Huawei Technologies intends to invest in the building of a research and

development (R&D) centre in Romania,” have either mentioned contingency of the investment (on government approval) or used uncertain words such as “intend to,” and are thus considered as news with uncertainty. In contrast, investments in news like “Ciba Specialty Chemicals Holdings Inc. (CSB) said Monday it has signed an agreement with local authorities in Qingdao, China, to invest in a new pigment plant that will significantly expand its production network in Asia” are, in our definition, described with certainty. Threats reported with uncertainty are considered less credible than threats reported unambiguously.³⁵ Domestic firms were found to respond more strongly, in terms of both productivity and innovation decisions, to more credible FDI threats—that is, FDI news events where the investments are described less ambiguously.³⁶

B. Falsification Test

In the analysis so far, we accounted for all time-variant, city-industry specific factors using a city-industry-year fixed effect and all firm-specific factors using a firm fixed effect, addressing the possibility that FDI news might be driven by local industry-specific shocks and trends or firm-specific factors and trends. While it is unlikely that the incidence as well as the substance of FDI news is systematically driven by each individual domestic firm’s future productivity shocks, we also included firm-specific domestic investment news as an additional control to control for firm-specific potential demand and productivity shocks that might be correlated with news.

In this subsection, we consider a placebo test by exploiting the specific timing of FDI news and assuming that each piece of FDI news had been published six months or a year earlier or later. If FDI news events indeed capture local or domestic firms’ productivity and economic trends or simply reflect actual FDI trends, the slight backward or forward adjustment in the timing of news should lead to relatively small changes in the estimated effect of FDI news. If, instead, the empirical concern does not apply, FDI news, when assumed to have been published before the actual publication date, should not lead to any response by domestic firms; similarly, when assumed published after the actual publication date, the in-effect aged FDI news should result in little or much more moderate domestic firm responses. The placebo analysis finds no significant TFP responses in the falsification setting.³⁷

³⁵ See the online Appendix for a detailed discussion of alternative (conservative versus liberal) definitions used.

³⁶ The results are available upon request. In addition to the substance of news, we also investigated how domestic firms’ responses might vary with the influence of the news. To measure the influence of each publication, we obtained the circulation volume of news publications and the national reputation of the news agency, from data sources such as Ulrich, News Bank’s Access World News, and Audit Bureau of Circulation. We found that domestic firms exhibit stronger TFP response to more influential news. Further, we also noticed that the position in which the investment information is first provided also affects the degree of response. News events in which information of the investment is provided in earlier paragraphs have a stronger effect on domestic firm responses. We also identified the motives and target markets of each prospective investment whenever the information is available and found only news of foreign investments targeted to domestic markets affect domestic firms’ TFP, R&D and investment decisions. These results are reported in the online Appendix.

³⁷ We also performed a falsification test by investigating the effect of FDI news on other performance outcomes such as revenue and profit growth. If indeed FDI news events reflect domestic-firm or city-industry specific trends (for instance, FDI news are reported because of the expected demand boom or actual FDI trends), we should expect as well a significant correlation between FDI news and other firm-level growth variables such as profit growth. This

C. IV Analysis

Next, we further strengthen our identification strategy, in addition to the steps that have already been taken, and offer additional sensitivity analysis using an IV approach. Given our sets of controls for all time-varying local shocks and time-invariant firm factors, the primary remaining concern could be the possibility that FDI news events are systematically correlated with unobserved, individual domestic firm shocks (given that city-industry-level shocks have already been accounted for).

To mitigate this concern, we exploit the interdependence between FDI news and other news categories in the supply decisions of news media given that the other news categories are unlikely to be correlated with individual firms' productivity shocks (in a way that goes beyond the city-industry wide effect). For example, the volume of FDI news events could be influenced by domestic political news. Readers' interests in FDI issues could increase during political debates, motivating media to pay more attention to FDI activities, especially FDI activities in the city's main industries. This could lead to a positive relationship between the two types of news. On the contrary, FDI and economic news in general could be crowded out by sports news, as readers' interests in those issues likely subside during major sports events. The crowding-out effect in news supply has been explored by Eisensee and Strömberg (2007) for identifying the effect of news coverage on disasters on government responses. The paper shows that media coverage of disasters is lower when the disaster occurs at the same time as other newsworthy events such as the Olympic Games, and this, in turn, affects government relief responses. Similarly in this paper, the crowding-out effect between these different types of news provides relatively exogenous sources of variation in news supply and enables us to identify the effect of news coverage. We, hence, collect time-varying, city-specific political and sports news and use these two types of news as instruments for FDI news. We find in Table 9, as anticipated, a positive interdependence between media attention to FDI and domestic politics and a negative correlation in media coverage on FDI and sports. The volume of FDI news events tends to rise during times of increasing political events and fall during sports events. The instrumented FDI news events, on the other hand, remain to exert similar effects on domestic firms.

D. Economic Magnitude

We now discuss the magnitude of the economic impact of FDI news on productivity growth that is suggested by our estimates. As Bloom, Draca, and Van Reenen (2016) noted, it is difficult to examine general equilibrium results that require taking into account a range of broader impacts. Nevertheless, we can, as in Bloom, Draca, and Van Reenen (2016), use the regression coefficients to perform partial

hypothesis is not supported in the data. We do not observe any significant relationship between anticipated competition and domestic firms' profit growth. The effect of FDI news is pronounced only in productivity, innovation, and the other strategic responses examined earlier. These results offer us further reassurance that the estimated effect of FDI news is unlikely to have captured economics trends and shocks that are not already controlled for or the effect of actual FDI.

TABLE 9—IV ANALYSIS: ALTERNATIVE TYPES OF NEWS

Dependent variable	FDI news	FDI news	FDI news
Sample	City-industry-year	City-industry-year	City-industry-year
	(1)	(2)	(3)
<i>First Stage</i>			
IV: City politics news × city share of industry	0.109 (0.021)		−0.026 (0.003)
IV: City election news × city share of industry		0.332 (0.094)	
IV: City sport news × city share of industry			
Actual FDI	0.020 (0.007)	0.023 (0.007)	0.026 (0.008)
Domestic news	0.339 (0.051)	0.342 (0.051)	0.343 (0.051)
Domestic sales growth	0.011 (0.001)	0.011 (0.001)	0.011 (0.001)
Domestic sales growth squared	−0.001 (0.000)	−0.001 (0.000)	−0.001 (0.000)
City-year fixed effects	Yes	Yes	Yes
City-industry fixed effects	Yes	Yes	Yes
Country-industry-year fixed effects	Yes	Yes	Yes
City-industry-year cluster	Yes	Yes	Yes
Observations	207,057	207,057	207,057
R^2	0.042	0.042	0.041
Dependent variable	TFP growth	TFP growth	TFP growth
Sample	All	All	All
<i>Second Stage</i>			
FDI news	0.029 (0.015)	0.030 (0.016)	0.031 (0.006)
Actual FDI	(0.010) (0.007)	(0.010) (0.007)	−0.01 (0.007)
Domestic news	(0.001) (0.012)	(0.001) (0.012)	−0.002 (0.011)
Size	0.144 (0.001)	0.144 (0.001)	0.135 (0.001)
Capital intensity	0.057 (0.001)	0.057 (0.001)	0.057 (0.001)
Firm fixed effects	Yes	Yes	Yes
City-industry-year fixed effects	Yes	Yes	Yes
City-industry cluster	Yes	Yes	Yes
Source	Full	Full	Full
Observations	981,142	981,142	981,142
R^2	0.23	0.23	0.05

Notes: This table reports the IV analysis where FDI news events are instrumented by alternative types of local news. The dependent variable is a domestic firm's log change of TFP. In the TFP analysis, all variables on the right-hand side are lagged by one year and all regressions include firm and city-industry-year fixed effects. Standard errors are clustered at the city-industry level and reported in the parentheses.

equilibrium calculations to get rough magnitudes for the potential importance of FDI threats in shaping individual firms' productivity growth.

In 2001–2007, we estimate an average 8 percentage point productivity growth for domestic firms in our sample. These firms are threatened, on average, 0.08 times during this period. Given the baseline estimate in Table 1 (4.9 percent), this means that firm responses to FDI threats account for 5 percent of firm productivity growth.³⁸ Actual FDI, in contrast, is not found to contribute net firm productivity gains, as shown in most existing studies. As expected, the economic impact of FDI threats can vary significantly in magnitude across regions and countries. For example, domestic firms in developing countries experienced, on average, a 5 percent productivity growth in 2001–2007. Given that they are threatened, on average, 0.11 times across products and the estimated parameter of FDI news is 0.043, productivity self-upgrading in response to FDI threats account for about 10 percent of firm productivity growth in developing countries.³⁹

Our estimated firm productivity gains from responding to FDI threats are comparable to the firm productivity gains from (actual) foreign competition documented in the literature. Focusing on productivity gains from trade liberalization in Chile, Pavcnik (2002) show that 3 to 10 percent of Chilean plants' productivity gains in the import-competing sector is attributable to trade liberalization. Bloom, Draca, and Van Reenen (2016), examining the impact of Chinese import competition on European firms, find that over the 2000–2007 period Chinese imports accounted for 9 percent of within-firm TFP growth. Keller and Yeaple (2009), one of the few studies that show actual FDI to increase domestic firm productivity in the same industry using US manufacturing firm data in 1987–1996, estimate that increases in foreign MNC activities account for 8 percent of US firm productivity growth.

The above comparison suggests that responses to the threat of foreign multinational competition constitute an economically important mechanism through which foreign competition could affect domestic firms, and represent a source of productivity gains that could be equally important as the effects of actual foreign competition due to either trade or FDI liberalization.⁴⁰

³⁸ The anticipation of foreign competition could also affect the innovation and productivity of vertically linked industries. As shown in Goldberg et al. (2010a, b) and Topalova and Khandelwal (2011), increased imports of intermediate inputs could enhance innovation and firm productivity by enabling domestic firms to access better foreign technologies and higher-quality foreign intermediate inputs. Similarly, increased competition in final-good markets could raise the payoff from innovation for intermediate-input producers and motivate them to increase innovation and productivity. This mechanism can become active before actual competition occurs. Domestic firms may increase innovation in advance to better utilize foreign intermediate inputs and access final-good producers when actual entry occurs. Albeit not the focus of this paper, we also explored these potential mechanisms by constructing the weighted sum of FDI news in upstream and downstream industries using the 2002 Benchmark Input-Output Accounts published by the US Bureau of Economic Analysis. We found that domestic firms' innovation increases when there are FDI news events in downstream industries. Actual FDI activities in downstream industries are also found to be associated with higher TFP in upstream industries.

³⁹ It is important to note that the threat of foreign competition can also serve as a signal from which local firms might learn about the attractiveness of making investments in the local market. The news that a big, competitive foreign firm is entering the market could raise local firms' confidence on the market and incentives to innovate and invest. This further highlights the importance to account for the effects of information on prospective competition.

⁴⁰ We also explored how anticipation of future foreign competition and responding to the threat might shape the ex post effects of actual foreign competition. We differentiated between anticipated and unanticipated foreign multinational entry and found that when entry is anticipated, domestic firms tend to fare significantly better in terms of profit growth and are less likely to exit after the actual arrival of foreign multinational firms. These results suggest that the opportunity of responding to the threat of foreign competition could help mitigate the market reallocation effects of actual foreign competition.

VI. Conclusion

In this paper, we investigate domestic firm responses to foreign competition threats using a unique constructed dataset of foreign investment news and exploring time lags between the arrival of foreign investment news and the arrival of actual investments. We investigate firm responses in both productivity and underlying mechanisms including innovation, investment, and product composition. Our results indicate that domestic firms respond significantly to the threat of foreign multinational competition by increasing productivity, innovation, and investment, and adjusting product composition. The actual arrival of foreign investment, in contrast, leads to product dropping and switching only, without a significant firm productivity effect. The degree of responses to FDI threat also increases with the amount of information regarding the certainty level of future investments.

Our analysis also shows that responses to FDI news exhibit substantial heterogeneity across firms. Within each industry, domestic firms at the right and left tails of the TFP distribution respond significantly to the news by upgrading TFP, while domestic firms with intermediate TFP levels show little reactions. Further, the mechanisms of TFP upgrading differ sharply across firms. Domestic firms closest to the productivity frontier improve TFP by increasing innovation while domestic firms furthest behind enhance their TFP by dropping products.

We undertake two approaches to address potential correlations between FDI news and unobserved domestic firm shocks that remain after the use of city-industry-year and firm fixed effects. First, we use various placebo tests by exploiting the exact timing of FDI news events. For example, we assume that each piece of FDI news had been published slightly earlier or later and find no domestic firm response to the placebo news events. Second, we adopt alternative IV approaches by exploiting the interdependence between FDI news and other types of news including political and sports news. Our analysis shows that the estimated effect of FDI news remains robust. In establishing the magnitude of the economic impact of FDI news, we show that in 2001–2007 responses to FDI threats account for 5 percent of firm productivity growth across all sample countries and 10 percent of firm productivity growth in developing nations.

Our analysis contributes to the literature by offering new evidence on the effect of foreign competition threats and distinguishing between preemptive, strategic actions and the spillover and market reallocation effects of actual foreign competition. Our findings show that the latter are not the only links that connect foreign competition with domestic firm performance: domestic responses could be initiated before the actual arrival of competition. The response to competition threats represents an economically important and different mechanism through which globalization affects domestic economies, constituting in the context of this paper the central source of firm productivity gains from multinational competition. Evaluating the gains from foreign competition based exclusively on the *ex post* effects could thus lead to an underestimation of the aggregate gains. Economic policies aiming to foster the innovation and productivity growth of domestic firms also should not be delayed until the actual arrival of foreign competition and should evolve over time with the development of foreign competition.

APPENDIX

TABLE A.1—SUMMARY STATISTICS

Variables	Source	Mean	SD	Min	Max	Format
<i>Firm characteristics</i>						
TFP growth	Orbis, NBS	0.04	0.37	-13.74	13.21	log change
Patent growth	Orbis	0.001	0.07	-4.26	5.06	log change
Investment growth	Orbis, NBS	-0.14	1.59	-14.91	12.67	log change
Wage growth	Orbis, NBS	0.09	0.29	-8.32	8.52	log change
Add product	Orbis	0.02	0.15	0.00	1.00	Binary
Drop product	Orbis	0.02	0.14	0.00	1.00	Binary
Switch primary product	Orbis	0.04	0.21	0.00	1.00	Binary
RD	NBS	0.12	0.32	0.00	1.00	Binary
New product	NBS	0.09	0.28	0.00	1.00	Binary
Firm size	Orbis, NBS	3.35	1.69	0.00	11.98	log
Firm capital intensity	Orbis, NBS	2.08	1.39	-3.78	17.81	log
<i>FDI news and actual FDI (firm level)</i>						
FDI news (all)	Factiva	0.02	0.29	0.00	35.00	Level
FDI news (unique)	Factiva	0.004	0.05	0.00	5.00	Level
Actual FDI	Orbis	0.006	0.07	0.00	4.00	Level
Domestic news	Factiva	0.004	0.09	0.00	19.00	Level
Investment value	Factiva	0.05	0.59	0.00	22.80	log
Expected employment	Factiva	0.003	0.08	-0.08	9.05	log
Expected output	Factiva	0.01	0.24	0.00	18.20	log

Note: This table reports the sources and the summary statistics of main variables.

REFERENCES

- Akerberg, Daniel A., Kevin Caves, and Garth Frazer. 2015. "Identification Properties of Recent Production Function Estimators." *Econometrica* 83 (6): 2411–51.
- Aghion, Philippe, Nick Bloom, Richard Blundell, Rachel Griffith, and Peter Howitt. 2005. "Competition and Innovation: An Inverted-U Relationship." *Quarterly Journal of Economics* 120 (2): 701–28.
- Aghion, Philippe, Richard Blundell, Rachel Griffith, Peter Howitt, and Susanne Prantl. 2009. "The Effects of Entry on Incumbent Innovation and Productivity." *Review of Economics and Statistics* 91 (1): 20–32.
- Aitken, Brian J., and Ann E. Harrison. 1999. "Do Domestic Firms Benefit from Foreign Direct Investment? Evidence from Venezuela." *American Economic Review* 89 (3): 605–18.
- Aitken, Brian, Ann Harrison, and Richard E. Lipsey. 1996. "Wages and foreign ownership: A comparative study of Mexico, Venezuela, and the United States." *Journal of International Economics* 40 (3–4): 345–71.
- Alfaro, Laura, and Maggie Chen. 2018. "Selection and Market Reallocation: Productivity Gains from Multinational Production." *American Economic Journal: Economic Policy* 10 (2): 1–38.
- Amiti, Mary, and Amit K. Khandelwal. 2013. "Import Competition and Quality Upgrading." *Review of Economics and Statistics* 95 (2): 476–90.
- Bao, Cathy Ge, and Maggie Xiaoyang Chen. 2018. "Foreign Rivals Are Coming to Town: Responding to the Threat of Foreign Multinational Entry: Dataset." *American Economic Journal: Applied Economics*. <https://doi.org/10.1257/app.20170113>.
- Bernard, Andrew B., Stephen J. Redding, and Peter K. Schott. 2010. "Multi-Product Firms and Product Switching." *American Economic Review* 100 (1): 70–97.
- Bloom, Nicholas, Mirko Draca, and John Van Reenen. 2016. "Trade Induced Technical Change: The Impact of Chinese Imports on Innovation, Diffusion and Productivity." *Review of Economics and Studies* 83 (1): 87–117.
- Bloom, Nicholas, Paul M. Romer, Stephen J. Terry, and John Van Reenen. 2013. "A Trapped Factors Model of Innovation." *American Economic Review* 103 (3): 208–13.
- Bustos, Paula. 2011. "Trade Liberalization, Exports, and Technology Upgrading: Evidence on the Impact of MERCOSUR on Argentinian Firms." *American Economic Review* 101 (1): 304–40.

- De Loecker, Jan.** 2013. "Detecting Learning by Exporting." *American Economic Journal: Microeconomics* 5 (3): 1–21.
- Dixit, Avinash.** 1979. "A Model of Duopoly Suggesting a Theory of Entry Barriers." *Bell Journal of Economics* 10 (1): 20–32.
- Eckel, Carsten, and J. Peter Neary.** 2010. "Multi-Product Firms and Flexible Manufacturing in the Global Economy." *Review of Economic Studies* 77 (1): 188–217.
- Eisensee, Thomas, and David Strömberg.** 2007. "News Droughts, News Floods, and U.S. Disaster Relief." *Quarterly Journal of Economics* 122 (2): 693–728.
- Feenstra, Robert C., and Gordon H. Hanson.** 1997. "Foreign direct investment and relative wages: Evidence from Mexico's maquiladoras." *Journal of International Economics* 42 (3–4): 371–93.
- Fernandes, Ana M., and Caroline Paunov.** 2012. "Foreign Direct Investment in Services and Manufacturing Productivity: Evidence for Chile." *Journal of Development Economics* 97 (2): 305–21.
- Fons-Rosen, Christian, Sebnem Kalemli-Ozcan, Bent Sørensen, Carolina Villegas-Sanchez, and Vadym Volosovych.** 2013. "Quantifying Productivity Gains from Foreign Investment." National Bureau of Economic Research (NBER) Working Paper 18920.
- Gandhi, Amit, Salvador Navarro, and David Rivers.** 2016. "On the Identification of Production Functions: How Heterogeneous is Productivity?" <https://economics.nd.edu/assets/210851/paper.pdf>.
- Goldberg, Pinelopi Koujianou, Amit Kumar Khandelwal, Nina Pavcnik, and Petia Topalova.** 2010a. "Imported Intermediate Inputs and Domestic Product Growth: Evidence from India." *Quarterly Journal of Economics* 125 (4): 1727–67.
- Goldberg, Pinelopi K., Amit K. Khandelwal, Nina Pavcnik, and Petia Topalova.** 2010b. "Multiproduct Firms and Product Turnover in the Developing World: Evidence from India." *Review of Economics and Statistics* 92 (4): 1042–49.
- Goolsbee, Austan, and Chad Syverson.** 2008. "How Do Incumbents Respond to the Threat of Entry? Evidence from the Major Airlines." *Quarterly Journal of Economics* 123 (4): 1611–33.
- Guadalupe, Maria, Olga Kuzmina, and Catherine Thomas.** 2012. "Innovation and Foreign Ownership." *American Economic Review* 102 (7): 3594–3627.
- Harrison, Ann E., and Margaret S. McMillan.** 2003. "Does direct foreign investment affect domestic credit constraints?" *Journal of International Economics* 61 (1): 73–100.
- Helpman, Elhanan, Marc J. Melitz, and Stephen R. Yeaple.** 2004. "Export versus FDI with Heterogeneous Firms." *American Economic Review* 94 (1): 300–316.
- Javorcik, Beata Smarzynska.** 2004. "Does Foreign Direct Investment Increase the Productivity of Domestic Firms? In Search of Spillovers through Backward Linkages." *American Economic Review* 94 (3): 605–27.
- Just-Auto Editorial Team.** 2007. "China: Continental to Invest in New Tyre Plan." *Just-Auto*, October 29.
- Kalemli-Ozcan, Sebnem, Bent Sørensen, Carolina Villegas-Sanchez, Vadym Volosovych, and Sevcen Yesiltas.** 2015. "How to Construct Nationally Representative Firm Level Data from the ORBIS Global Database." National Bureau of Economic Research (NBER) Working Paper 21558.
- Keller, Wolfgang, and Stephen R. Yeaple.** 2009. "Multinational Enterprises, International Trade, and Productivity Growth: Firm Level Evidence from the United States." *Review of Economics and Statistics* 91 (4): 821–31.
- Levinsohn, James, and Amil Petrin.** 2003. "Estimating Production Functions Using Inputs to Control for Unobservables." *Review of Economic Studies* 70 (2): 317–41.
- Lileeva, Alla, and Daniel Treffer.** 2010. "Improved Access to Foreign Markets Raises Plant-level Productivity...For Some Plants." *Quarterly Journal of Economics* 125 (3): 1051–99.
- Lu, Yi, Zhigang Tao, and Lianming Zhu.** 2017. "Identifying FDI spillovers." *Journal of International Economics* 107: 75–90.
- Mayer, Thierry, Marc J. Melitz, and Gianmarco I. P. Ottaviano.** 2014. "Market Size, Competition, and the Product Mix of Exporters." *American Economic Review* 104 (2): 495–536.
- Mayer, Thierry, Marc Melitz, and Gianmarco Ottaviano.** 2016. "Product Mix and Firm Productivity Responses to Trade Competition." National Bureau of Economic Research (NBER) Working Paper 22433.
- Melitz, Marc.** 2003. "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity." *Econometrica* 71 (6): 1695–1725.
- Milgrom, Paul, and John Roberts.** 1982. "Predation, Reputation, and Entry Deterrence." *Journal of Economic Theory* 27 (2): 280–312.
- Nocke, Volker, and Stephen Yeaple.** 2014. "Globalization and Multiproduct Firms." *International Economic Review* 55 (4): 993–1018.
- Olley, G. Steven, and Ariel Pakes.** 1996. "The Dynamics of Productivity in the Telecommunications Equipment Industry." *Econometrica* 64 (6): 1263–97.

- Pavcnik, Nina.** 2002. "Trade Liberalization, Exit, and Productivity Improvement: Evidence from Chilean Plants." *Review of Economic Studies* 69 (1): 245–76.
- Rauch, James E.** 1999. "Networks versus markets in international trade." *Journal of International Economics* 48 (1): 7–35.
- Shanghai Daily Editorial Office.** 2007. "Tire Maker Stretches to Match Demand." October 29.
- Snider, Connan, and Jonathan W. Williams.** 2015. "Barriers to Entry in the Airline Industry: A Multidimensional Regression-Discontinuity Analysis of AIR-21." *Review of Economics and Statistics* 97 (5): 1002–22.
- Spence, A. Michael.** 1981. "The Learning Curve and Competition." *Bell Journal of Economics* 12 (1): 49–70.
- Tenn, Steven, and Brett W. Wendling.** 2014. "Entry Threats and Pricing in the Generic Drug Industry." *Review of Economics and Statistics* 96 (2): 214–28.
- Topalova, Petia, and Amit Khandelwal.** 2011. "Trade Liberalization and Firm Productivity: The Case of India." *Review of Economics and Statistics* 93 (3): 995–1009.
- Van Biesebroeck, Johannes.** 2008. "The Sensitivity of Productivity Estimates: Revisiting Three Important Debates." *Journal of Business and Economic Statistics* 26 (3): 311–28.