The Effect of Competition in Upstream and Downstream Industries on Firm Boundaries

Sahil Raina & Kuncheng Zheng*

October 7, 2021

Abstract

How does competition in upstream and downstream industries affect firm boundaries? We use instrumented Chinese import penetration into up- and downstream industries to study this question. We find that greater competition in these industries causes focal industry firms' boundaries with vertically-linked industries to contract. Upstream competition also reduces firms' diversification into other industries, as the competition benefits firms' existing operations. Downstream competition, however, pushes firms to diversify more, as the resultant loss of customers weakens firms' performance. Our research highlights the importance of up- and downstream competition for firms' boundary choice and has implications for antitrust and international trade regulations.

JEL Codes: L25, G34, L24, F23

*Raina: Alberta School of Business, University of Alberta, e-mail: sraina@ualberta.ca; Zheng: D'Amore-McKim School of Business, Northeastern University, e-mail: k.zheng@northeastern.edu. The authors are grateful to Rajesh Aggarwal, Kenneth Ahern, Hendrik Bessembinder, Sugato Bhattacharyya, Sudipto Dasgupta, Olubunmi Faleye, Jayant Kale, Yelena Larkin, Uday Rajan, seminar participants at the Chinese University of Hong Kong finance seminar series and the Alberta School of Business finance brown bag series, and conference participants at the Northern Finance Association 2020 Meetings for their feedback.

Conflict of Interest Disclosure Statement

Sahil Raina

I have nothing to disclose.

Kuncheng Zheng

I have nothing to disclose.

I Introduction

Firms' choice of scope and boundaries has been studied extensively in the finance and industrial organization literatures. This long-enduring focus is warranted, given the trillions of dollars of assets that exchange hands annually to adjust firm boundaries.[1] Previous papers have identified some important factors shaping firm boundaries, e.g., asset specificity, complexity, and uncertainty.[2] Yet, a theoretically important determinant of firms' boundaries remains largely ignored in the empirical literature: the competitive environments faced by their suppliers and customers.

Upstream suppliers and downstream customers are often a firm's primary trading partners. As a result, their operating environments, including the competition they face, can have a direct impact on the firm's decisions, especially decisions regarding scope and boundaries. The competitiveness of these up- and downstream industries, moreover, is extremely fluid in the modern economy, with supply chains often straddling international boundaries. In such globalized settings, trade wars can quickly and drastically alter the competitive environment of a firm's suppliers and customers[3], adding import to the study of the relationship between up- and downstream competition and firm scope decisions.

In this paper, we empirically examine how upstream and downstream industries' competition alters firms' decisions regarding their boundaries and scopes of operation. We take advantage of the globalized modern economy and use carefully instrumented Chinese imports into U.S. manufacturing industries as exogenous shocks to these industries' competitiveness. We find that up- and downstream competition has a significant impact on firm boundaries.

[1] The average value of M&A transactions alone for the last four years was approximately $3.7T, according to the Institute of Mergers, Acquisitions, and Alliances.

[2] E.g., asset specificity: Acemoglu, Griffith, Aghion, and Zilibotti (2010); complexity: Woodruff (2002), Hortaçsu and Syverson (2007); uncertainty: Lieberman (1991). For further details, please refer to Lafontaine and Slade's survey on the subject.

[3] For instance, in the recent U.S.-China trade war, the American government's campaign to prevent Huawei, a Chinese company, from selling telecommunications infrastructure likely curtailed competitiveness in that industry. The suddenly reduced downstream competition would hurt the performance of the industry's suppliers, who were explicitly banned from selling equipment to Huawei (see `https://www.nytimes.com/2020/06/30/technology/fcc-huawei-zte-national-security.html`).

In particular, firms contract their boundaries with vertically-linked industries when either up- or downstream competition increases. On the other hand, firms' boundaries with non-vertically-linked industries contract when upstream competition increases and expand when downstream competition increases. We show that this asymmetry arises because of the different effects on focal industry firms of up- and downstream incumbent displacement caused by greater foreign competition.

Greater foreign competition in an industry exposes domestic incumbents to new competition. As the new entrants seek to establish themselves, they compete intensely with the incumbents. And, if these entrants' competition is sufficiently disruptive, (some) incumbents may shut down altogether.

The aforementioned asymmetry arises because the displacement of incumbents due to Chinese import penetration has starkly different impacts on firms in the focal industry depending on whether it occurs upstream or downstream. For upstream foreign competition, both intensified competition and incumbent displacement benefit operations of focal industry firms, who respond by contracting their boundaries and specializing further in their industry.[4]

In constrast, for downstream foreign competition, intensified competition and incumbent displacement have opposing effects on focal industry firms. More intense customer competition is beneficial for focal industry performance in general. However, given that Chinese downstream entrants do not source inputs from domestic focal industry firms, these firms lose customers as incumbents are displaced. As its net impact on focal industry performance is unclear, the effect of increased downstream Chinese import penetration on focal industry firms' boundaries depends on which effect dominates.

The effects of up- and downstream competition have gone largely untested due to hereto-

[4] A number of economic theories in industrial organization and finance attest to this relationship between supplier efficiency and firm boundaries, e.g., double marginalization, Coasian theory of the firm (Coase, 1937), incomplete contracts (Williamson, 1979, Hart and Moore, 1990), "growing out of trouble" (Matsusaka, 2001, Gormley and Matsa, 2011). It is not our intention to attempt to disentangle the relative strengths and weaknesses of these theories. Rather, we hope to highlight the effect of competition on the relationship between supply chain efficiency and firm boundaries.

fore unresolved empirical challenges, including: measuring firms' boundaries reliably, identifying supply chain linkages, and, most importantly, isolating the *causal* effect of up- and downstream industries' competition on firms' boundaries. We address each of these challenges in our paper. First, we employ three heterogeneous measures of firm boundaries to improve the reliability of our empirical analysis. To capture as broad a set of expansions into and contractions out of industries as possible, we use year-on-year changes in firms' segment presence in different industries. As segment data may omit small expansions into other industries, we supplement this measure with annual frequencies of acquisitions and joint ventures. These annual frequencies help us capture smaller expansions, with acquisitions including more permanent expansions and joint ventures including more tentative, exploratory expansions.

Identifying supplier-customer links between firms is another empirical hurdle, arising because of a dearth of supply chain data reported by firms. We solve this problem, following Acemoglu, Autor, Dorn, Hanson, and Price (2016), by using the 1992 U.S. Input-Output Tables to construct supply chains among manufacturing industries in the U.S. In particular, we identify links between suppliers and customers (and vice versa) as well as co-suppliers of the same customer industry.

Most importantly, we resolve serious endogeneity issues in determining the *causal* effects of up- and downstream industries' competition on firms' boundary and scope decisions. These issues may arise, for instance, because external factors (such as an industry's natural tendency towards monopoly) drive both firms' boundary decisions and their trading partners' competitive environments. Or, more expansive firm boundaries in an industry may reduce their up- and downstream industries' competitiveness rather than the other way around.

To overcome such endogeneity issues, we use the instrumented share of input in each U.S. industry produced by Chinese exporters to exogenously vary the level of competition in the industry.[5] First, by using competition arising from *non-U.S.* (Chinese) firm output share,

[5] We are not the first to use Chinese import penetration in this way as there is a large literature in labor

we eliminate non-causal links between up- and downstream competition and focal industry firm boundaries driven by U.S. *industry-specific* features or trends. Second, by instrumenting Chinese exports to U.S. industries using Chinese firms' exports to eight *non-U.S.* developed economies, we eliminate non-causal links which may be driven by U.S. *aggregate* features or trends. With our instrumented Chinese import penetration shifting up- and downstream competition, we can estimate the causal effects of trading partners' competitive environments on firm scope and boundaries.

For boundaries with vertically-linked industries, we find that when competition increases in an upstream or downstream industry (due to greater Chinese import penetration), boundaries with vertically-linked industries tend to contract. For upstream competition, where overall competition intensity and incumbent displacement both lead to focal industry firms specializing further, this is perhaps expected. Our finding that these boundaries also contract with increased downstream competition shows that, for boundaries with vertically-linked industries, the effect of more intense competition in the downstream industry dominates the effect of customer displacement.

For boundaries with non-vertically-linked industries, we find that greater up- and downstream competition have opposing effects. With greater Chinese entry upstream, we find that focal industry firms contract their boundaries with non-vertically-linked industries, i.e., diversify less. Again, given that focal industry firms' boundary decisions are impacted similarly by increased upstream competitive intensity and supplier displacement, this may be somewhat expected. When downstream Chinese import penetration increases, we find that focal industry firms diversify more. This indicates that, for boundaries with non-vertically-linked industries, the customer displacement effect dominates the effect of increased overall downstream competition. Downstream Chinese entry's opposing effects on boundaries with vertically- and non-vertically-linked industries are consistent with it having opposing pre-

economics, pioneered by Acemoglu et al. (2016), that also uses Chinese imports to shift competition in the U.S. However, we are the first to employ it to study inter-industry effects of competition on firm boundary decisions.

dicted effects on focal industry firm boundaries through overall downstream competition and customer displacement.

We also find that the effect of downstream Chinese entry on diversification is larger for boundaries with unrelated industries than for boundaries with co-supplier industries. This is consistent with firms trying to escape problems arising from their supply chain. Expanding to an entirely unrelated industry is more effective for escaping threats coming from up- or downstream industries than expanding to a co-supplier industry, which is relatively more exposed to such threats.

Our findings have important implications for several existing literatures in economics. Most directly, we contribute new empirical evidence to the finance literature on firm boundaries. In that literature, Gormley and Matsa (2011) provided new evidence that, following firm-specific negative shocks, firms tend to expand into unrelated industries in an attempt to "grow out of trouble." Previously, Maksimovic and Phillips (2002) studied the performance and investment behavior of conglomerates and found that conglomerates optimally allocate resources across their segments, accounting for industry and segment characteristics. Building upon these papers, we study firms' boundary decisions for non-vertically linked industries (as well as vertically linked ones), but focus on the causal effect of trading partners' competitive environment on these boundaries rather than idiosyncratic shocks or own-industry characteristics.

We also contribute to the finance literature on the determinants of vertical mergers.[6] Ahern and Harford (2014) is an important motivator for our research as it documents the importance of supply chain links for the incidence of mergers. We build upon this paper by testing whether up- and downstream industries' competitive structure, in particular, affects firms' acquisitive behavior. Other papers in this literature also explore reasons for vertical mergers. For instance, Bena and Li (2014) show the influence of corporate innovative

[6] For a survey of previous research on the determinants of vertical mergers, please refer to Lafontaine and Slade (2007).

behavior on firms' likelihood of being acquirers and targets. Harford (2005) confirms that shocks to industry prospects drive acquisitions but require sufficient liquidity, as well. While this literature is quite extensive in its study of the determinants of vertical mergers, we contribute to it substantially by documenting, for the first time, that up- and downstream industries' competitive environments influence firms' vertical acquisitions. We posit that this competition may also be the channel through which Ahern and Harford's documented merger waves propagate along supply chains.

This paper also impacts a third research area on the effects of up- and downstream industries' competition. Bhattacharyya and Nain (2011) study the effect of industry consolidation on upstream industries' product prices and its longer-term impact on upstream industries' competitive environment. A more recent paper by Bernile and Lyandres studies the effect of up- and downstream industry consolidations on the stock returns of firms. While, like our paper, these papers consider the effects of up- and downstream industry competition, they focus on product-market outcomes and market valuation, whereas we study how these industries' competition alters home industry firms' boundary decisions.

Our research is also related to the economics literature on the effect of Chinese competition on other countries' economies. This literature, thus far, has focused on two domains of economic research: labor markets and firm performance. Labor markets were a chief focus of the first wave of work in this literature. A number of papers studied the labor market effects of greater Chinese competition (Autor, Dorn, and Hanson, 2013, Acemoglu et al., 2016, Pierce and Schott, 2016, Bloom, Handley, Kurmann, and Luck, 2019). One of the key papers of this first wave, Autor et al. (2013), pioneered the instrumental variable estimation based on Chinese import penetration that we exploit in our study.[7] More recently, there has been a new focus on firm effects of Chinese competition (e.g., Gutiérrez and Philippon, 2017, Lie and Yang, 2017, Ayyagari and Maksimovic, 2017, Hombert and Matray, 2018, Schiff, 2019,

[7] In that same first wave of research, Pierce and Schott (2016) pioneered a difference-in-difference estimation method built around China's trade status with the U.S. used by some papers.

De Bodt, Eckbo, and Roll, 2019). Our industry-level research fits between the economy-wide scope of the first wave of labor market research and the firm-specific scope of the second wave of finance research, focusing on the effects of Chinese competition in up- and downstream U.S. industries on focal industry boundary decisions. We are almost singular in studying this important effect of Chinese competition. Besides us, Magyari (2017) is the only other paper studying such questions, though it focuses exclusively on the diversifying incentives of firms operating in industries with greater *direct* exposure to Chinese import competition. In our paper, we identify the impact of Chinese competition in up- and downstream industries. Additionally, though we also study diversifying behavior in our analysis of boundaries with non-vertically linked industries, we examine firms' boundaries more broadly, including vertically linked industries, as well.

Finally, our paper has two important policy implications. First, it adds to the debate on protectionism brought about by the recent rise in import barriers worldwide. We highlight the potential pressures placed on businesses to expand or shrink when there is increased foreign entry into their supplier and customer industries. More specifically, we show that foreign entry in those industries leads to contractions in firm boundaries with vertically linked industries. This implies that foreign competition in up- and downstream industries substantively affects firms' operations, which, in turn, influences their responses to such competition. These insights help to build a more complete understanding of the effect of trade wars on the U.S. economy.

Our paper also informs the ongoing policy debate on "eliminating double marginalization" (EDM) as a potential efficiency benefit when assessing vertical mergers. The Department of Justice and the Federal Trade Commission are currently considering whether EDM should be treated as an automatic benefit that counts for all vertical mergers or whether merging parties need to provide evidence of EDM-related benefits (Baker, Rose, Salop, and Morton, 2020). Our paper highlights that the potential double marginalization benefits of vertical mergers vary considerably depending on the competitive environments in the merging industries.

II Hypothesis Development

Foreign entry into an industry exposes domestic incumbents in that industry to new competition. The new foreign producers, to establish themselves, compete intensely with the domestic producers. The increased intensity of competition that they face due to the entrants may lead some incumbents to reduce operations or shut down altogether. As increased competitive intensity and incumbent displacement may have different effects on supply chain partners, for the sake of exposition, we treat them separately in our discussion below.

When Chinese imports penetrate upstream industries, the entry should lead focal industry firms to contract their boundaries with all industries. First, economic theories imply that increased upstream competitive intensity leads focal industry firms to contract their boundaries with vertically-linked industries. For instance, as upstream competition increases, the costs of double marginalization to focal industry firms decrease, which reduces their incentives to vertically integrate. This contractionary effect happens upstream and downstream, though it can be shown that upstream competition has a greater impact on upstream boundaries (and downstream competition on downstream boundaries). Coase's theory of the firm similarly predicts that greater upstream competition reduces the marginal cost of market transactions with the supplier industry, which means that focal industry firms are similarly less incentivized to operate in the upstream industry. Other theories, including incomplete contracts (based on Williamson, 1979, Grossman and Hart, 1986, Hart and Moore, 1990) make similar predictions for boundaries with vertically-linked industries.[8] The displacement of incumbent suppliers similarly has a contractionary effect on focal industry firm boundaries. Entrants succeed by producing output more efficiently than incumbents (as part of Schumpeter et al.'s "gale of creative destruction"). In so doing, they replace incumbents as suppliers of focal industry firms by offering cheaper and/or better products. The increased efficiency of a supplier industry further pushes focal industry firms to contract their bound-

[8] It is not our intent, in this paper, to disentangle the merits of the various theories linking up- and downstream industry operations and focal industry firm boundaries.

aries with vertically-linked industries, for the same reasons as listed above for increased competitive intensity.

Hypothesis 1 *Greater upstream Chinese import penetration causes focal industry firms to contract their boundaries with vertically-linked industries.*

Second, focal industry firms should also contract their boundaries with non-vertically-linked industries when their suppliers face greater Chinese import penetration. The increased upstream competitive intensity generally improves focal industry firms' performance, as suppliers facing greater competition will accept lower prices for their outputs. According to Matsusaka's "growing out of trouble" hypothesis, this reduces focal industry firms' incentives to diversify away from their current operations because the increased supplier competition reduces focal industry managers' incentives to escape to unrelated industries. Incumbent supplier displacement also has a contractionary effect on diversification, as entrants willing to accept lower prices further improve focal industry performance.

Hypothesis 2 *Greater upstream Chinese import penetration causes focal industry firms to contract their boundaries with non-vertically-linked industries.*

The predicted effect of increased Chinese imports in downstream industries on focal industry firm boundaries is ambiguous, as increased competitive intensity and customer displacement have opposing effects on focal industry firms. Increased competitive intensity in customer industries leads focal industry firms to contract their boundaries with both vertically-linked industries and non-vertically-linked industries, for the reasons listed above.[9] However, customer displacement by foreign entrants likely counteracts this contractionary effect. Foreign entrants may have their own suppliers and not source inputs from focal industry firms, causing these firms' existing customers to disappear without taking their place. As a result, foreign downstream entrants may reduce focal industry firms' customer base, as fewer

[9] Again, the effect of greater downstream competition is predicted to be contractionary both upstream and downstream but the downstream impact will be stronger.

customers are interested in purchasing their output. Therefore, perhaps counter-intuitively, these focal industry firms may vertically integrate more, especially downstream, to avoid the downstream customer base reduction. This effect of incumbent customer displacement likely weakens the contractionary effect of increased customer competitive intensity for boundaries with vertically-linked industries. These opposing effects of increased overall downstream competitive intensity and customer displacement make the net impact of downstream Chinese entry on focal industry firms' boundaries with vertically-linked industries an empirical exercise.

Hypothesis 3 *Greater downstream competitive intensity induced by Chinese import penetration causes focal industry firms to contract their boundaries with vertically-linked industries.*

Hypothesis 4 *Customer displacement induced by Chinese import penetration causes focal industry firms to expand their boundaries with vertically-linked industries.*

The predicted effect of greater Chinese import penetration on focal industry firm's boundaries with non-vertically-linked industries is similarly ambiguous. For instance, the previously-mentioned "growing out of trouble" hypothesis predicts reduced diversification activity in an industry when its performance improves. However, the impact of increased downstream Chinese import penetration on focal industry firms' performance is ambiguous due to the opposing effects of increased overall competitive intensity and customer displacement. Increased competitive intensity downstream improves focal industry performance while a shrinking customer base hurts it. Again, the net impact of downstream Chinese entry becomes an empirical exercise.

Hypothesis 5 *Greater downstream competitive intensity induced by Chinese import penetration causes focal industry firms to reduce diversification into non-vertically-linked industries.*

Hypothesis 6 *Customer displacement induced by Chinese import penetration causes focal industry firms to increase diversification into non-vertically-linked industries.*

III Data

III.A. Data Sources

We use data on U.S. imports of Chinese products from Acemoglu et al. (2016) to calculate Chinese import penetration. For each industry-year, we calculate the Chinese import penetration into the U.S. and eight other developed economies[10] based on U.N. Comtrade data.[11] We also follow Acemoglu et al. (2016) to calculate the weighted average of annual Chinese import penetration into up- and downstream industries in the U.S. and the eight other developed economies.[12] In all, for each industry, j, we have three import penetration measures—$IPR_{jt}^{home,US}$, $IPR_{jt}^{up,US}$, and $IPR_{jt}^{down,US}$—for each year and the accompanying averages of these import penetration measures across eight other developed economies. Our import penetration measures span from 1991 to 2011.

Supply chain relationships between industries are defined using the 1992 Input-Output

[10] These eight other developed economies are Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain, and Switzerland.

[11] Following Acemoglu et al. (2016), we define import penetration ratio (IPR) as

$$IPR_{jt} = \frac{M_{j,t}^{UC}}{Y_{j,91} + M_{j,91} - E_{j,91}}$$

where for U.S. industry j, $M_{j,t}^{UC}$ is the imports from China in year t and $M_{j,t}^{UC} Y_{j,91} + M_{j,91} - E_{j,91}$ is initial absorption (measured as industry shipment, $Y_{j,91}$, plus industry imports, $M_{j,91}$, minus industry exports, $E_{j,91}$). These measures are provided by the U.N. Comtrade database (`comtrade.un.org`). Unlike that paper, we do not use changes in $IPR_{j,t}$ to perform our analyses because we possess annual data on industries rather than three snapshots separated by a decade each.

[12] Weighted average Chinese import penetration into the U.S. in upstream industries is defined as

$$IPR_{jt}^{up} = \sum_i w_i j \times IPR_{it}$$

where w_{ij} is the purchase share of industry j from industry i of the total purchase of industry j, and IPR_{it} is the Chinese import penetration of industry i in year t. Weighted average import penetration in downstream industries is similarly calculated, using the output share of the industry to each downstream industry as the weighting variable.

table for the U.S. economy from the U.S. Bureau of Economic Analysis (BEA)[13]. This table traces upstream and downstream demand linkages between industries both inside and outside of U.S. manufacturing. An industry is a customer industry of another industry if it consumes more than 1% of the other industry's output.[14] We use 1992 data on inter-industry linkages to avoid contamination from Chinese import penetration in the sample period on the linkages we use to define firm boundaries. Further, by using industry-level data, our analyses are less exposed to concerns about firms endogenously choosing supplier and customer industries based on their specific circumstances (e.g., their exposure to Chinese import penetration).

We measure focal industry firm boundaries using three annual industry-level measures: operating segments, acquisition frequency, and joint venture frequency. To measure firm boundaries based on operating segments, we use data from Compustat on firm segments.[15] We use these data to identify whether a firm operates in an industry in a given year. We characterize any expansions and contractions for a firm in a given year based on the relationship between the firm's existing segments and its new segments. If a new segment is in an industry that is the supplier (customer) of one or more of the firm's pre-existing segments, we characterize the expansion as an upstream (a downstream) expansion.[16] Similarly, if a segment that disappears is in a supplier (customer) industry of one of the remaining segments' industries, we characterize the contraction as an upstream (a downstream) contraction. If the new (dying) segment is neither upstream nor downstream of any of the pre-existing (remaining) segments but the total connectedness[17] through all common customers of the new (dying) industry and all pre-existing (remaining) segment industries is more than 0.01% (i.e., $(1\%)^2$), we characterize the expansion (contraction) as a co-supplier expansion (contraction).[18] Finally, if an expansion (a contraction) does not fall into any of these three

[13] This table is available at `http://www.bea.gov/industry/io_benchmark.html`

[14] This is generally consistent with how acquisitions are characterized in the literature.

[15] We also use Compustat data for firm and industry characteristics that we include as control variables in our empirical analyses.

[16] An industry is a supplier of another industry if it produces more than 1% of the other industry's inputs.

[17] We define connectedness as the relatedness between one merging firm and a common customer (industry) times the relatedness between the other merging firm and the same common customer

[18] For example, if there is only one common customer, and the two merging firms have the same relatedness

categories, we characterize it as an unrelated expansion (contraction).

We measure firm boundaries via mergers and acquisitions frequency using data from Thomson Financial Securities Data's SDC, "Worldwide Mergers & Acquisitions Database." We include all announced acquisitions with U.S. targets and U.S. acquirers who are in manufacturing industries. We characterize a acquisition as "horizontal" if the primary SIC or NAICS codes of the two merging firms are the same. Following Fan and Lang (2000), we characterize a acquisition as "vertical" if one firm's primary industry consumes more than 1% of the other firm's primary industry's output. For a "vertical" acquisition, we use the net flow between the two merging firms to characterize the acquisition as upstream or downstream. If a acquisition is neither "vertical" nor "horizontal," but the total connectedness through all common customers of the two merging firms' industries is more than 0.01% (i.e, $(1\%)^2$), we characterize it as a co-supplier acquisition. If a acquisition does not fall into any of the three categories above, we characterize it as a diversifying acquisition. Finally, for each industry, we calculate the annual frequency of each of the five types of acquisitions, which we use for our analyses.

We use the Joint Venture and Strategic Alliance data from Thomson Financial Securities Data's SDC database for measuring boundary changes via joint ventures and strategic alliances. We include all joint ventures and alliances in the U.S. (we jointly refer to these as joint ventures). Each joint venture has one primary SIC code of the alliance and at least two (and up to 19) primary SIC codes of the participants. For each alliance-participant pair, we use the primary SIC codes to characterize the joint venture into five categories, just as we do for acquisitions. Following the same methodology, we categorize each joint venture *for each firm* as an upstream, downstream, co-supplier, unrelated, or horizontal joint venture. Again, as with acquisitions, we then calculate the annual frequency of each type of joint venture for each industry to use for our analyses.

with this customer, the relatedness to the customer has to be at least 1% for both industries. For robustness, we tested using 5% as the threshold for co-supplier connectedness and found similar results.

We use three distinct measures of firm boundaries because there is no ideal that perfectly captures changes in firms' boundaries. Compustat Segments data are invaluable to us because, using them, we can observe expansions and contractions of firms' boundaries.[19] However, Villalonga (2000) shows that Compustat Segments data are noisy and Schoar (2002) indicates this noisiness may bias analyses towards finding diversification discounts. To minimize the impact of this bias on our analysis, we do not study stand-alone firms versus conglomerates and focus on industry level. Furthermore, we attempt to mitigate any problems that may arise from using the operating segments data by also using measures based on data from Thomson Reuters on acquisitions and joint ventures which should not be affected by the segments data noisiness.

While acquisitions and joint ventures are unexposed to segments data issues, they measure only expansions of firm boundaries. Any variation in either measure is based on less or more expansion, rather than any change in contraction behavior. As segments data capture expansions *and contractions*, it is an important supplement to acquisitions and joint ventures. Without segments, our analyses would be limited to studying expansionary behavior alone.

Supplementing segments data with acquisitions and joint ventures, we are also able to examine smaller-scale changes in boundary expansions. Recall that our segments data are based on self-reported operating segment data provided by conglomerates. In accordance with FASB rules, conglomerates need to report operating segments that are important for firm operations. As a result, conglomerates may omit (or merge) smaller, less important, segments from their reports. By studying acquisitions and joint ventures, we can study smaller scale expansions that we could not study using the segment data alone.

Finally, using both acquisitions and joint ventures helps us study different types of ex-

[19] Reporting of such segments data has been required by the Financial Accounting Standards Board (FASB) since 1976 (see FAS Statement No. 14, `https://www.fasb.org/summary/stsum14.shtml`). The segment reporting requirement became stricter in 1998, when FAS Statement No. 131 superseded the existing rule and defined more strictly how firms should report segment data (see FAS Statement No. 131, `https://www.fasb.org/summary/stsum131.shtml`).

pansions. Acquisitions are relatively permanent expansions into industries whereas joint ventures are more collaborative and exploratory expansions into new industries. In this sense, joint venture-based expansions are more tentative than acquisitionary expansions. As these comparisons of the three datasets demonstrate, using these three measures provides a richness to our analysis of the effects of up- and downstream competition on firm boundaries that would not be possible otherwise.

III.B. Data Summary

The dataset we compile has three important features: Chinese import penetration, segment presence changes, and annual acquisition and joint venture frequencies. Chinese import penetration is measured for each industry and for each of its upstream and downstream industries both in the U.S. and in eight other developed economies: Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain, and Switzerland. Segment presence changes are measured on four dimensions (upstream, downstream, co-supplier, and unrelated) for each industry. Annual frequencies are measured for five types of acquisitions and joint ventures (horizontal, upstream, downstream, co-supplier, and unrelated) for each industry.

[Table 1 about here.]

In Table I, we describe all three features. First, the annual U.S. industry-level import penetration ratio of focal industries tends to be higher than for the weighted average of its upstream and downstream industries (6.81 versus 0.61 and 1.18, respectively). This difference arises because we only know Chinese import penetration for manufacturing industries, which means many up- and downstream industries' import penetration is missing and, when we weight up- and downstream industries' IPR by purchase shares of those industries based on IO tables from the BEA, we get relatively smaller IPRs. We could, alternatively, ignore non-manufacturing industries when calculating average up- and downstream IPR, but that may overweight manufacturing import shocks in our analyses.

The second panel of Table I shows us the net change in the segment presence of focal industry conglomerates in other industries. Recall that we find all conglomerate segment pairs with one of the segments in focal industry i in each year t, and identify the relationship between the two industries of the segments of each pair. Then we calculate the year-to-year changes in the number of pairs for each type of segment pair relationship. On average, conglomerates increase their upstream industry presence by 0.076 segments annually and increase their downstream presence by 0.059 segments. Conglomerates also decrease their co-supplier industry presence by 0.12 segments annually and increase their unrelated industry presence by 0.17 segments.

Table I also shows, in the third panel, that, overall, there are 9.5 acquisitions made by firms in a typical industry in a year. The vast majority of these, nearly 85% (8.05), are within-industry ("horizontal") acquisitions. Another 11% (1.01) are acquisitions of firms in unrelated industries. Only 0.3% (0.03) of acquisitions are of supply chain-linked industries, with a nearly even split between upstream and downstream acquisitions. The remaining 4.5% of acquisitions are of co-supplier firms (0.43).

The last panel of Table I presents joint venture frequencies. We observe that, for the typical industry, there are 0.037 joint ventures in an upstream industry and 0.02 joint ventures in a downstream industry in a given year. There are far more joint ventures in co-supplier industries (0.97 per year) and even more in unrelated industries (1.4). It is important to keep these magnitudes in mind when considering the impact of adjacent industry competition on focal industry acquisitions.

IV Research Design

Our goal in this paper is to study whether firms systematically expand or contract the scope of their operations in upstream, downstream, co-supplier, and unrelated industries in response to changes in competition in upstream and downstream industries.

We measure firm boundary changes, the outcome of interest in this paper, in three ways. First, we use the change in segment presence in other industries, categorized into the aforementioned four groups, of conglomerates that operate in the home industry. Change in segment presence captures all types of boundary adjustments, from acquisition, spin-offs, joint ventures, and strategic alliances to *de novo* establishments and divestitures. As such, segment presence gives us a relatively complete view of the response of home industry firms to up- and downstream industry competition shocks.

We also use the annual frequencies of acquisitions and joint ventures to study firm boundary changes. Through acquisitions, firms expand their boundaries and fully integrate operations that were previously outside the firm and whose outputs were procured via arms-length market transactions. Joint ventures allow firms to take a more tentative expansion strategy instead of fully establishing or acquiring a segment in a new industry. We detail the categorization into upstream, downstream, co-supplier, unrelated, and the unused within-industry boundary adjustments for all three measures of firm boundaries in Section III.

A straightforward, but problematic, way to study the *causal* effect of up- and downstream competition on focal industry firm boundaries is to examine the correlation between those industries' competitive environments and firm boundaries in the focal industry. Running such an analysis, however, would not identify the *causal* effect of up- and downstream industries' competition on firm boundaries. For instance, firm sizes in the focal industry and up- and downstream industries' concentration may both be driven by a third factor, such as the tendency of an up- or downstream industry to be a monopoly. Therefore, we need a source of exogenous variation in the competitive structure of up- and downstream industries that can determine the *causal* impact of those industries' competition on firm size in an industry.

We introduce such exogenous variation into industries' competitive structure using import penetration from Chinese competitors into the industries, much like Autor et al. (2013). We then examine how changes in the weighted averages of up- and downstream industries' competitive structures affect the boundaries of firms in the focal industry, while controlling

for focal industry penetration and various industry-level characteristics. The regression specification for these import penetration-based empirical tests is:

$$Y_{i,t+1} = \beta_{home} \times IPR_{it}^{home,US} + \beta_{up} \times IPR_{it}^{up,US} + \beta_{down} \times IPR_{it}^{down,US} + \alpha_i + \lambda_t + \eta_i X_{it}, \quad (1)$$

where $Y_{i,t+1}$ is a measure of firm boundaries in industry i in year $t+1$, $IPR_{it}^{home,US}$ is the percentage of U.S. sales in industry i at time t coming from Chinese producers (i.e., Import Penetration Ratio), $IPR_{it}^{up/down,US}$ is the purchase/output share-weighted average of the import penetration ratios for upstream/downstream industries of industry i at time t, α_i are industry fixed effects, λ_t are year fixed effects, and X_{it} are control variables for industry i in year t.

Using Chinese import penetration allows us to eliminate any links between up- and downstream industry competition and focal industry firm boundaries that may arise from *domestic, industry-specific* occurrences or characteristics unrelated to changes in up- and downstream industries' competition. For instance, an unexpected drought in the Southeast U.S. may drive down competition in domestic cotton harvesting and encourage cotton processors to expand into processing of alternatives to cotton. This would not be a causal effect of competition in cotton harvesting on boundaries of cotton processors. By using Chinese import penetration, we exclude linkages between domestic up- and downstream competition and focal industry firm boundaries that may be caused by such shared local events.

Estimated coefficients based on Equation 1 still may not be estimates of causal effect, either. There may be common factors driving firm boundaries in an industry and penetration into up- and downstream industries by Chinese entrants. To resolve this potential issue, following Autor et al. (2013) again, we instrument Chinese import penetration in U.S. industries using the average Chinese import penetration for the same industry in the same

year for eight other developed economies.[20] Our first stage, which predicts Chinese IPR for each U.S. industry-year using these other economies' Chinese IPRs, prevents aggregate U.S.-centric reasons for Chinese import penetration from influencing the competition shock to the industry. For instance, this instrument prevents aggregate shocks to U.S. demand from erroneously presenting a causal link between firm boundaries in U.S. industries and Chinese entry into up- and downstream industries of those firms. To implement this methodology, we instrument our three U.S. IPR measures in our first stage regressions as:

$$\begin{aligned} IPR_{it}^{home,US} &= \gamma_i + \xi_t + \sum_{j \in \{home,up,down\}} \delta_j \times IPR_{it}^{j,oth} + \theta_i X_{it} \\ IPR_{it}^{up,US} &= \gamma_i + \xi_t + \sum_{j \in \{home,up,down\}} \delta_j \times IPR_{it}^{j,oth} + \theta_i X_{it} \\ IPR_{it}^{down,US} &= \gamma_i + \xi_t + \sum_{j \in \{home,up,down\}} \delta_j \times IPR_{it}^{j,oth} + \theta_i X_{it}, \end{aligned} \tag{2}$$

where γ_i are industry fixed effects, ξ_t are year fixed effects, $IPR_{it}^{home,oth}$ is the average import penetration ratio for industry i in year t across the eight developed economies, $IPR_{it}^{up/down,oth}$ is the average across the eight developed economies of the weighted average of the import penetration ratio for upstream/downstream industries of industry i in year t, and all other variables are defined as previously. Based on first-stage regressions, we then run the following second stage of our 2SLS regressions:

$$\begin{aligned} Y_{i,t+1} = \beta_{home} \times \widehat{IPR_{it}^{home,US}} + \beta_{up} \times \widehat{IPR_{it}^{up,US}} + \beta_{down} \times \widehat{IPR_{it}^{down,US}} \\ + \alpha_i + \lambda_t + \eta_i X_{it}, \end{aligned} \tag{3}$$

where $\widehat{IPR_{it}^{home,US}}$ is the predicted U.S. import penetration ratio for industry i in year t, $\widehat{IPR_{it}^{up/down,US}}$ is the predicted weighted average of U.S. import penetration ratios for upstream/downstream industries of industry i in year t, and all other variables are defined

[20] The eight other countries are: Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain, and Switzerland

as previously.

Instrumenting the import penetration of Chinese products into U.S. industries with their penetration into eight other developed economies eliminates links arising due to *aggregate domestic* characteristics or trends. If, for instance, overall demand among U.S. consumers increases unexpectedly and drives up t-shirt prices, the price of raw cotton may increase and cotton processors may increase their specialization in the fabric. With the higher price of raw cotton in the U.S., Chinese exporters may also increase their penetration into the U.S. Again, this would not be a causal link between competition among cotton harvesters and firm boundaries of cotton processors. Further, simply using Chinese import penetration to measure competition would fail to isolate the causal link. However, by proxying Chinese import penetration into the U.S. using penetration into eight other developed economies eliminates the potential links caused by such aggregate domestic trends in demand. Therefore, by employing our instrumental variable regression approach, we hope to avoid endogeneity issues like the ones highlighted above and identify causal effects on focal industry firm boundaries of competition shocks in up- and downstream industries.

V Results

V.A. Preliminary Analyses

Before we present our findings, we must confirm that our instrumental variable (IV) regression setup is valid. As discussed in Section IV, we instrument Chinese import penetration into U.S. industries using the average Chinese import penetration into those same industries in eight other developed economies and study the effect of up- and downstream competition on firm boundaries using these instrumented import penetration ratios. The exclusion restriction is easily satisfied as it is implausible that Chinese import penetration in the *other developed economies' industries* would impact *U.S. firms'* boundary decisions through any

other channel than the worldwide increase of exports by Chinese firms in the last three decades.

[Table 2 about here.]

We also establish that our IV regressions do not suffer from a weak instruments issue. This is supported by the first stage regression output for one of our analyses shown in Table II. In the last row of that table, we present the F-statistics for a test of the joint predictive power of the exogenous independent variables in our first stage regressions (Equation 2) for upstream industries' average IPR, home industry IPR, and downstream industries' average IPR. The lowest F-statistic, for upstream industries' IPR, is 50.20, which is well above the traditional minimum threshold of 10 for the weak instrument test. The other F-statistics are substantially larger, 1080 for home industry IPR and 907 for average downstream industries' IPR. Given the implausibility of alternative channels and these F-statistics, we are confident that our IV regression analyses are valid and accurately test for the causal effects of up- and downstream Chinese import penetration on focal industry firms' boundaries.

V.B. Effects on Boundaries with Vertically-Linked Industries

Our analyses show that Chinese entry-induced competition in up- and downstream industries drives focal industry firms to contract their boundaries with vertically-linked industries. We present the results of these analyses in Table III.

[Table 3 about here.]

The first row of Table III shows that greater upstream competition results in a contraction of both upstream and downstream boundaries. For segment changes, a one percentage point increase in upstream IPR decreases upstream segment presence by 0.8%[21]. A one percentage

[21] We calculate the effect of changes in up- and downstream competition by multiplying the coefficient estimate with the mean level of the dependent variable. For instance, here, we calculate the effect of a 1% change in upstream IPR on upstream segment presence as: $\Delta seg = 0.01 * \beta_X / \overline{Y} = 0.01 * -0.063/0.076 = -0.008 = -0.8\%$.

point increase in upstream IPR also reduces upstream acquisition (joint venture) frequency by 0.9% (1.0%) and downstream acquisition (joint venture) frequency by 0.2% (0.4%), though the downstream joint venture effect is not statistically significant.

As with upstream competition, greater downstream competition leads firms to contract their boundaries with vertically-linked industries, especially with downstream industries. Interpreting the third row of coefficients from Table III, we see that an increase of one percentage point in downstream IPR decreases downstream segment presence by 0.4% and has no statistically significant effect on upstream segments. A one percentage point increase in downstream IPR reduces downstream acquisition (joint venture) frequency by 0.2% (0.4%) and reduces upstream acquisition (joint venture) frequency by 0.2% (0.3%). Increased downstream competition's effects are generally smaller in economic magnitude than those of upstream competition. This is consistent with increased competitive intensity and incumbent displacement pushing vertical boundaries in the same direction in the case of upstream competition and pushing them in opposing directions in the case of downstream competition.

We note that the effect of increased upstream competition on upstream boundaries presents more strongly than on downstream boundaries and the effect of increased downstream competition presents more strongly on downstream boundaries than upstream boundaries. This is consistent with the implications for boundaries with vertically-linked industries we discussed in Section II. The more direct impact of upstream (or downstream) industries' competition on focal industry firms' boundaries with themselves has a larger effect than on boundaries with industries in the other direction.

V.C. Effects on Boundaries with Non-Vertically-Linked Industries

For boundaries with non-vertically-linked industries, we find that increased competition due to Chinese entry causes opposing effects: upstream competition induces focal industry firms to diversify less whereas downstream competition induces greater diversification.

[Table 4 about here.]

Increased upstream competition due to increased Chinese import penetration makes firms contract their boundaries with non-vertically-linked industries, as we show in the first row of Table IV. Specifically, the first three columns of Table IV show that a one percentage point increase in upstream IPR reduces unrelated industry segment presence by 1.3% and acquisitions and joint ventures in unrelated industries by 0.6% and 0.3%, respectively. Furthermore, while a one percentage point increase in upstream IPR does not affect co-supplier segment presence, it reduces co-supplier industry acquisitions and joint ventures by 0.5% and 0.7%, respectively. Overall, through increased competitive intensity and supplier displacement, upstream Chinese import penetration causes focal industry firms' to contract boundaries with non-vertically linked industries.

In the third row of Table IV, we see that increased downstream competition due to Chinese entry into customer industries causes firms to expand their boundaries with non-vertically-linked industries, especially unrelated industries. Based on these coefficient estimates, we estimate that a one percentage point increase in downstream IPR increases unrelated industry segment presence by 0.2% and acquisitions and joint ventures in those industries by 0.1% and 0.05%. The effect of downstream IPR on co-supplier industries has the right sign, but is not statistically significant. Overall, the findings confirm that focal industry firms respond to Chinese entry into downstream industries by diversifying more. The negative effect of customer displacement on focal industry performance dominates the positive effect of increased downstream competitive intensity for firms' decisions relating to boundaries with non-vertically-linked industries.

The effects of downstream IPR on boundaries with non-vertically linked industries are generally weaker than those of upstream IPR. As discussed in Section II and earlier in this section, this is because upstream IPR's effects on competition through overall competitive intensity and supplier displacement move it in the same direction whereas the effects of downstream IPR through those two channels are in opposing directions.

Note also that upstream and downstream IPR has a stronger impact on boundaries with unrelated industries than with co-supplier industries. Because the "distance" between a focal industry firm's supply chain and a typical co-supplier industry is smaller, co-suppliers are "closer" to focal industry firms than firms in unrelated industries. Recall that, by definition, co-supplier industry firms share customers with focal industry firms whereas unrelated and focal industry firms do not share customers. As such, if managers want to "grow out of trouble" coming from upstream (or downstream) industries, it is more effective to expand into unrelated industries. Therefore, the effects of upstream (or downstream) competition on boundaries with co-supplier industries *should* be smaller than unrelated industry boundaries, as we observe.

Our findings here show that upstream and downstream Chinese entry-induced competition has starkly opposing effects on firms' boundaries with non-vertically-linked industries. Upstream Chinese import penetration has a contractionary effect on diversification whereas downstream has an expansionary effect. Further, because the two effects of upstream Chinese entry are in the same direction and the effects of downstream entry are in opposition to each other, upstream competition has a much larger impact on diversification, in economic terms, than downstream competition.

V.D. Supporting Evidence

So far, we have taken as given the effects of up- and downstream Chinese import penetration on focal industries' performance. We assume that Chinese entry upstream improves focal industry firm performance while the effect of downstream entry is ambiguous. Below, we empirically support these assertions by confirming the effects on firm performance and industry exports of upstream and downstream Chinese entry.

[Table 5 about here.]

Based on the hypotheses discussed in Section II, upstream Chinese entry should have a

strong positive impact on focal industry firms' performance while the effect of downstream entry should be ambiguous. Upstream foreign entry results in greater supplier competitive intensity and supplier displacement, both of which shift focal industry performance in the same direction. Downstream entry increases the intensity of overall customer competition, benefiting focal industry firms, but also shrinks their available customer base, which severely hurts them. In the first column of Table V, we test these predictions. From the first row, we confirm that increased upstream competition due to Chinese entry increases focal industry firms' performance. A one percentage point increase in upstream IPR increases RoA by ten basis points. From the third row, we find no statistically significant effect of greater downstream competition due to Chinese entry on focal industry firms' RoA. The offsetting effects of increased downstream competitive intensity and of customer displacement seem to cancel each other out with respect to performance.

The negative effect of customer displacement due to downstream Chinese entry assumes that the Chinese downstream entrants do not source their inputs from U.S. suppliers. If these entrants did use U.S. firm-produced inputs, focal industry firms' dying domestic customers would be replaced by Chinese customers. To confirm that Chinese entrants use non-U.S. pre-existing supply chains, we study the relationship between downstream Chinese import penetration and U.S. industries' exports. If downstream Chinese entrants utilize U.S. suppliers, U.S. suppliers' exports to China should be higher when downstream Chinese entry increases. As we show in columns (2) through (7) of Table V, we find no evidence of such an increase in U.S. supplier exports to China due to greater Chinese import penetration. In columns (2) through (4), we regress the weighted average of upstream industries' export ratios on Chinese IPR in the focal industry and, in columns (5) through (7), we regress focal industry export ratio on the weighted average of Chinese IPRs in downstream industries. For each inter-industry relationship, we test the relationship of the Chinese import penetration with concurrent upstream exports (columns (2) and (5)), one year prior upstream exports (columns (3) and (6)), and two year prior upstream exports (columns (4) and (7)). Across

all specifications, we find no evidence of a correlation between upstream exports and downstream Chinese import penetration. This non-finding confirms that, when Chinese exports enter a U.S. industry, they utilize their pre-existing suppliers and do not provide additional business to the industry's domestic (U.S.) suppliers.

V.E. Robustness Tests

To demonstrate that our findings are not sensitive to our specification choices, we present findings for regressions with greater lags between competition and boundary changes and for regressions with competition measured in changes to IPR instead of levels of IPR. Both sets of robustness tests indicate our results do not depend on our specific regression choices.

[Table 6 about here.]

First, we show that our findings are unchanged if we vary the time elapsed between when our upstream and downstream competition are measured and when their effects on firm boundaries are measured. In Table VI, we present the coefficients for the effects of upstream and downstream IPR on conglomerates' segment presence in upstream, downstream, co-supplier, and unrelated industries when they are measured in the same year, one year apart, two years apart, and three years apart.[22] The effects of upstream and downstream IPR tend to decay over time for most boundaries. The exception is their effects on unrelated boundaries, which get somewhat stronger as the temporal distance increases. These results indicate our findings are not sensitive to our choice to measure IPR and segment presence in consecutive years.

[Table 7 about here.]

While, in our analysis, we use the level of predicted Chinese import penetration, our results are qualitatively similar if, instead, we use *changes* in predicted Chinese import

[22] Tests using acquisition and joint venture frequencies provide similar results.

penetration. Empirically, using the level of Chinese IPR as the indicator of the level of competition in an industry is more appropriate than using changes in Chinese IPR. Even if, however, we replace our predicted Chinese IPR levels with predicted Chinese IPR changes, our results are qualitatively similar, as we show in Table VII. As with our main analyses, greater upstream IPR constricts upstream boundaries, greater downstream IPR constricts downstream boundaries, and greater downstream IPR constricts co-supplier boundaries.[23] Overall, given these findings, we believe our results are unlikely to be driven by our specification choices.

VI Conclusion

In this paper, we study how up- and downstream industries' competitive environment affects focal industry firms' boundaries with vertically-linked (upstream and downstream) and non-vertically-linked (unrelated and co-supplier) industries. We introduce exogenous variation into the competitive environment of up- and downstream industries using Chinese import penetration in U.S. industries, as instrumented by Chinese import penetration in eight other developed economies. Our findings provide three key insights. First, when either their up- or downstream industries become more competitive due to Chinese entry, firms contract their boundaries with vertically-linked industries. Second, when upstream industries face greater Chinese entry and become more competitive, firms contract out of unrelated and co-supplier industries whereas greater Chinese downstream entry causes firms to expand more into those industries, whereas when downstream industries face more entry, firms expand out of such non-vertically-linked industries. Third, the effect of upstream competition on focal industry firm boundaries is generally larger in economic magnitude than the effect of downstream competition. These three insights highlight the differences in the effects of entry-based competition in up- and downstream industries. Entry in upstream industries

[23] Results for acquisition frequencies and joint venture frequencies using IPR changes similarly parallel results using IPR levels.

results in greater overall competitive intensity and supplier displacement, both of which cause focal industry firms to contract. On the other hand, the two effects of entry in downstream industries have opposing effects on focal industry firm boundaries. Greater intensity of customer competition encourages them to contract their boundaries whereas customer base loss pushes them to expand their boundaries.

Our results are important for several reasons. First, we provide definitive evidence of the effect of up- and downstream industries' competition on firms' boundaries. This is a meaningful contribution to a number of topics in finance and economics, especially the literature studying the determinants of changes to firm boundaries, such as vertical acquisitions and diversifying acquisitions. Second, we establish cross-industry effects in the U.S. economy of Chinese competition, which adds an important new dimension to the study of the effects of Chinese economic growth.

Our findings also provide two major insights for regulators. We highlight the influence of up- and downstream industries' competitive environments on acquisitions, which U.S. antitrust regulators should consider in the current debate on "eliminating double marginalization" efficiency benefits. We also reveal the effect of increased foreign entry in up- and downstream industries on firm boundaries, which provides a new perspective on the ongoing debate on the merits and costs of protectionism. The heterogeneous and sizable effects of foreign entry in different parts of domestic supply chains behoove policymakers to consider the supply chain effects of competition when forming both antitrust and trade policy.

References

Daron Acemoglu, Rachel Griffith, Philippe Aghion, and Fabrizio Zilibotti. Vertical integration and technology: theory and evidence. *Journal of the european economic Association*, 8(5):989–1033, 2010.

Daron Acemoglu, David Autor, David Dorn, Gordon H Hanson, and Brendan Price. Import competition and the great us employment sag of the 2000s. *Journal of Labor Economics*, 34(S1):S141–S198, 2016.

Kenneth R Ahern and Jarrad Harford. The importance of industry links in merger waves. *The Journal of Finance*, 69(2):527–576, 2014.

David Autor, David Dorn, and Gordon H. Hanson. The china syndrome: Local labor market effects of import competition in the united states. *American Economic Review*, 103(6): 2121–68, 2013.

Meghana Ayyagari and Vojislav Maksimovic. Fewer and less skilled? human capital, competition, and entrepreneurial success in manufacturing. *Human Capital, Competition, and Entrepreneurial Success in Manufacturing (December 26, 2017)*, 2017.

Jonathan B Baker, Nancy L Rose, Steven C Salop, and Fiona Scott Morton. Recommendations and comments on the draft vertical merger guidelines. 2020.

Jan Bena and Kai Li. Corporate innovations and mergers and acquisitions. *The Journal of Finance*, 69(5):1923–1960, 2014.

Gennaro Bernile and Evgeny Lyandres. The effects of horizontal merger operating efficiencies on rivals, customers, and suppliers. *Review of Finance*, 23(1):117–160, 2019.

Sugato Bhattacharyya and Amrita Nain. Horizontal acquisitions and buying power: A product market analysis. *Journal of Financial Economics*, 99(1):97–115, 2011.

Nicholas Bloom, Kyle Handley, André Kurmann, and Philip Luck. The impact of chinese trade on us employment: The good, the bad, and the apocryphal. In *American Economic Association Annual Meetings*, volume 2019, 2019.

Ronald Harry Coase. The nature of the firm. *Economica*, 4(16):386–405, 1937.

Eric De Bodt, B Espen Eckbo, and Richard Roll. Corporate rivalry and return comovement. *Tuck School of Business Working Paper*, (3218544), 2019.

Joseph P. H. Fan and Larry H. P. Lang. The measurement of relatedness: An application to corporate diversification. *Journal of Business*, 73(4):629–660, 2000.

Todd A Gormley and David A Matsa. Growing out of trouble? corporate responses to liability risk. *The Review of Financial Studies*, 24(8):2781–2821, 2011.

Sanford J Grossman and Oliver D Hart. The costs and benefits of ownership: A theory of vertical and lateral integration. *Journal of political economy*, 94(4):691–719, 1986.

Germán Gutiérrez and Thomas Philippon. Declining competition and investment in the us. 2017.

Jarrad Harford. What drives merger waves? *Journal of Financial Economics*, 77(3):529–560, 2005.

Oliver Hart and John Moore. Property rights and the nature of the firm. *Journal of Political Economy*, 98(6):1119–1158, 1990.

Johan Hombert and Adrien Matray. Can innovation help us manufacturing firms escape import competition from china? *The Journal of Finance*, 73(5):2003–2039, 2018.

Ali Hortaçsu and Chad Syverson. Vertical integration and production: Some plant-level evidence. *University of Chicago mimeo*, 2007.

Francine Lafontaine and Margaret Slade. Vertical integration and firm boundaries: The evidence. *Journal of Economic Literature*, 45(3):629–685, 2007.

Erik Lie and Keyang Daniel Yang. Enter the dragon: Import penetration and innovation. *Available at SSRN 3041351*, 2017.

Marvin B Lieberman. Determinants of vertical integration: An empirical test. *Journal of Industrial Economics*, 39(5):451–466, 1991.

Ildiko Magyari. *Firm reorganization, chinese imports, and us manufacturing employment*. PhD thesis, Columbia University, 2017.

Vojislav Maksimovic and Gordon Phillips. Do conglomerate firms allocate resources inefficiently across industries? theory and evidence. *The Journal of Finance*, 57(2):721–767, 2002.

John G Matsusaka. Corporate diversification, value maximization, and organizational capabilities. *The Journal of Business*, 74(3):409–431, 2001.

Justin R Pierce and Peter K Schott. The surprisingly swift decline of us manufacturing employment. *American Economic Review*, 106(7):1632–62, 2016.

Avishai Schiff. *Firm finances and responses to trade liberalization: evidence from US tariffs on China*. PhD thesis, University of Texas, Austin, 2019.

Antoinette Schoar. Effects of corporate diversification on productivity. *The Journal of Finance*, 57(6):2379–2403, 2002.

Joseph Alois Schumpeter et al. Capitalism, socialism, and democracy. 1942.

Belén Villalonga. Matching bits to compustat: Towards richer data for large sample research within firms. *Unpublished manuscript, Anderson Graduate School of Management, University of California, Los Angeles*, 2000.

Oliver E Williamson. Transaction-cost economics: the governance of contractual relations. *The Journal of Law and Economics*, 22(2):233–261, 1979.

Christopher Woodruff. Non-contractible investments and vertical integration in the mexican footwear industry. *International Journal of Industrial Organization*, 20(8):1197–1224, 2002.

Tables

Table I. Summary statistics

This table presents summary statistics for three sets of important data. The first panel reports summary statistics for Chinese import penetration ratios in the US. The second panel reports summary statistics for the numbers of acquisitions within an industry-year for various types of acquisitions. The third panel reports summary statistics for the net change in related and unrelated industry segment presence of firms that have a presence in the focal industry in a year. For each variable, we provide, mean, standard deviation, minimum, maximum, and number of observations.

	Mean	Std. Dev.	Min	Max	Obs
Home Industry IPR	6.81	17.09	0.00	257.54	8,232
Upstream Industry IPR (Weighted Average)	0.61	0.89	0.00	8.564	10,059
Downstream Industry IPR (Weighted Average)	1.18	3.325	0.00	29.07	9,681
Upstream Change	.076	.78	-5	11	7,706
Downstream Change	.059	.83	-3	20	7,706
Co-supplier Change	-.12	3.18	-22	33	7,706
Unrelated Change	.17	2.90	-29	75	7,706
All	9.46	22.54	0.00	710	8,847
Upstream Mergers	0.015	0.092	0.00	0.64	8,847
Downstream Mergers	0.015	0.10	0.00	0.77	8,847
Vertical (up- and downstream) Mergers	0.030	0.15	0.00	1.42	8,847
Horizontal Mergers	8.05	21.68	0	710	8,847
Diversifying Mergers	1.01	3.42	0	56	8,847
Co-supplier Mergers	0.43	0.97	0	4.17	8,847
Upstream Joint Venture	.037	.21	0	2	5,685
Downstream Joint Venture	.020	.14	0	1	5,685
Horizontal Joint Venture	.24	.44	0	2	5,685
Co-supplier Joint Venture	.97	2.13	0	20	5,685
Unrelated Joint Venture	1.40	2.54	0	23	5,685

Table II. First Stage Regressions for IV Analysis

This table presents estimates from the first stage of IV regressions. The dependent variables are the weighted average in the US of Chinese import penetration ratio (IPR) across industries upstream of the home industry, the IPR for the home industry, and the weighted average of Chinese IPR across industries downstream of the home industry. The explanatory variables are the same variables but averaged across eight other wealthy countries: Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain, and Switzerland. The control variables include the annual average across the U.S. industry for total assets, leverage ratio, cash ratio, markup, Tobin's Q, and total sales. Industry fixed effects and year fixed effects are also included. Combined F-stats for the IPR variables and the number of observations are provided at the bottom of the table. Below each coefficient estimate, t-stats are reported in parentheses. All standard errors are clustered at the industry level.

	(1)	(2)	(3)
	Upstream IPR	Home IPR	Downstream IPR
Upstream IPR	0.989***	0.684	0.0198
(Other 8 Countries)	(41.26)	(1.42)	(0.31)
Home IPR	0.000429	0.967***	-0.00165
(Other 8 Countries)	(0.62)	(13.19)	(-1.10)
Downstream IPR	-0.00828	-0.500***	1.392***
(Other 8 Countries)	(-0.98)	(-3.07)	(18.38)
Control Variables	Y	Y	Y
Industry Fixed Effects	Y	Y	Y
Year Fixed Effects	Y	Y	Y
N	7454	7454	7454
F-stat	50.20	1079.82	907.32

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table III. Effect of Upstream and Downstream Competition on Vertical Boundaries

This table presents estimates from the second stage of IV regressions described in Equation 3. The dependent variables are changes in vertical boundaries measured in terms of year-over-year changes in operating segments in up- and downstream industries (columns (1) and (4)), annual acquisitions frequency in up- and downstream industries (columns (2) and (5)), and annual joint venture frequency in up- and downstream industries (columns (3) and (6)). The explanatory variables are the predicted weighted average of the IPRs in the U.S. market of upstream industries, IPR of the home industry, and weighted average of the IPRs of downstream industries. The control variables are annual industry averages for total assets, leverage ratio, cash ratio, markup, market-to-book ratio, and total sales. Industry fixed effects and year fixed effects are also included. Adjusted R^2 and the number of observations are provided at the bottom of the table. Below each coefficient estimate, t-stats are reported in parentheses. All standard errors are clustered at the industry level.

	Upstream			Downstream		
	(1) Segment Changes	(2) Acquisitions	(3) Joint Ventures	(4) Segment Changes	(5) Acquisitions	(6) Joint Ventures
Upstream IPR	-0.0630**	-0.0132**	-0.0353*	-0.0349	-0.0152**	-0.00820
	(-2.21)	(-2.28)	(-1.94)	(-1.36)	(-2.03)	(-0.73)
Home IPR	0.000729	-0.000087	-0.000707	-0.00179	-0.000241	0.000113
	(0.61)	(-0.37)	(-0.78)	(-1.13)	(-1.21)	(0.32)
Downstream IPR	0.00756	-0.00293*	-0.0115**	-0.0251*	-0.00295*	-0.00768***
	(1.25)	(-1.80)	(-2.28)	(-1.90)	(-1.86)	(-3.52)
Control Variables	Y	Y	Y	Y	Y	Y
Industry Fixed Effects	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y
N	6574	7464	5109	6574	7464	5109
Adjusted R^2	0.001	0.017	0.025	0.001	0.012	0.007

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table IV. Effect of Upstream and Downstream Competition on Non-Vertical Boundaries

This table presents estimates from the second stage of IV regressions described in Equation 3. The dependent variables are changes in non-vertical boundaries measured in terms of year-over-year changes in operating segments in unrelated and co-supplier industries (columns (1) and (4)), annual acquisitions frequency in unrelated and co-supplier industries (columns (2) and (5)), and annual joint venture frequency in unrelated and co-supplier industries (columns (3) and (6)). The explanatory variables are the predicted weighted average of the IPRs in the U.S. market of upstream industries, IPR of the home industry, and weighted average of the IPRs of downstream industries. The control variables are annual industry averages for total assets, leverage ratio, cash ratio, markup, market-to-book ratio, and total sales. Industry fixed effects and year fixed effects are also included. Adjusted R^2 and the number of observations are provided at the bottom of the table. Below each coefficient estimate, t-stats are reported in parentheses. All standard errors are clustered at the industry level.

	Unrelated			Co-supplier		
	(1) Segment Changes	(2) Acquisitions	(3) Joint Ventures	(4) Segment Changes	(5) Acquisitions	(6) Joint Ventures
Upstream IPR	-0.218***	-0.605***	-0.470***	-0.178	-0.218**	-0.672***
	(-2.71)	(-2.98)	(-3.52)	(-1.51)	(-2.51)	(-3.83)
Home IPR	-0.00108	-0.00184	-0.0194*	-0.000560	0.00532	-0.00649
	(-0.19)	(-0.28)	(-1.72)	(-0.12)	(1.31)	(-0.65)
Downstream IPR	0.0389**	0.0845***	0.0702**	-0.0130	0.0162	0.0324
	(2.07)	(2.84)	(2.55)	(-0.42)	(0.74)	(0.49)
Control Variables	Y	Y	Y	Y	Y	Y
Industry Fixed Effects	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y
N	6574	7464	5109	6574	6645	5109
Adjusted R^2	0.002	0.078	0.043	0.000	0.017	0.068

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table V. Effect of Upstream and Downstream Competition on Home Industry Firm Performance and Industry Exports
This table presents the effects of IPRs in period t on three sets of outcomes: firms' return-on-assets (RoA), upstream industries' export ratio, and home industries' export ratio. The dependent variable is RoA in year t (column (1)) for the RoA outcomes, weighted average of upstream industries' export ratio in years t (column (2)), $t-1$ (column (3)), and $t-2$ (column (4)) for the upstream industries' export ratio outcomes, and home industry export ratio in years t (column (5)), $t-1$ (column (6)), and $t-2$ (column (7)) for the home industry export ratio outcomes. In the RoA analyses, the explanatory variables are the predicted weighted average in year t of the IPRs in the U.S. market of upstream industries, IPR of the home industry, and weighted average of the IPRs of downstream industries. In the upstream export ratio analysis, it is the predicted home industry IPR in year t. And, in the home industry export ratio analysis, it is the predicted weighted average of the IPRs of downstream industries. The firm-level control variables, which apply only to the RoA analysis, are the firm's total assets, leverage ratio, cash ratio, and market-to-book ratio in year t. The industry-level control variables only apply to the upstream and home export ratio analyses. These controls are the weighted average of upstream industries' (home industry) annual averages for total assets, leverage ratio, cash ratio, and market-to-book ratio for the upstream (home industry) export ratio analyses. Firm (industry) fixed effects are included in firm level (export ratio) analyses and year fixed effects are included in all regressions. Adjusted R^2 and the number of observations are provided at the bottom of the table. Below each coefficient estimate, t-stats are reported in parentheses. All standard errors are clustered at the industry level.

	Firm Level	Upstream Export Ratio			Home Industry Export Ratio		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	ROA_t	t	$t-1$	$t-2$	t	$t-1$	$t-2$
Upstream IPR	0.0996***						
	(4.12)						
Home IPR	-0.0278**	-0.000150	-0.000111	-0.000226			
	(-2.39)	(-1.01)	(-0.83)	(-1.24)			
Downstream IPR	-0.0254				-0.00629	-0.00580	-0.00467
	(-1.56)				(-1.32)	(-1.29)	(-1.21)
Firm Level Controls	Y	N	N	N	N	N	N
Industry Level Controls	N	Y	Y	Y	Y	Y	Y
Firm Fixed Effects	Y	N	N	N	N	N	N
Industry Fixed Effects	N	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y	Y
N	44275	10059	9580	9101	6686	6364	6043
Adjusted R^2	0.063	0.001	0.001	0.001	0.001	0.001	0.001

Table VI. Effect on Segment Changes of Upstream and Downstream IPR Using Different Lags

This table presents estimates from second stage IV regressions based on Equation 3. The far left column of the table lists the dependent variable being examined in that row, which is changes in segment presence in one of four sets of industries relative to home industry firms: upstream, downstream, co-supplier, and unrelated industries. The remaining columns are separated into two categories based on the variable of interest examined in the regressions presented in that column: upstream industries' IPR (columns 1 through 4) and downstream industries' IPR (columns 5 through 8). Within each column group, the table presents findings for a different lag of the relevant IPR in each column, from t to $t-4$. Each cell provides the coefficient point estimate, t-statistic, and significance for the effect of the IPR specified in the column header on the boundary specified in the row header. For instance, for the cell in the top left corner, the statistics describe the effect of upstream IPR at time t on home industries' segment changes in upstream industries. The coefficients presented are calculated using regressions that include all three IPRs, as presented in Equation 3 but only the relevant IPRs are presented here. The control variables include the annual industry average for total assets, leverage ratio, cash ratio, markup, Tobin's Q, and total sales. Industry fixed effects and year fixed effects are also included. Below each coefficient estimate, t-stats are reported in parentheses. All standard errors are clustered at the industry level.

	Upstream IPR at				Downstream IPR at			
	(1) t	(2) $t-1$	(3) $t-2$	(4) $t-3$	(5) t	(6) $t-1$	(7) $t-2$	(8) $t-3$
Upstream	-0.0812***	-0.0630**	-0.0621**	0.00645	-0.0485*	-0.0349	-0.0358	-0.0289
	(-2.87)	(-2.21)	(-2.52)	(1.11)	(-1.68)	(-1.36)	(-1.35)	(-1.01)
Downstream	-0.0388*	0.00756	0.00976*	0.00957	-0.0321**	-0.0251*	-0.0200*	-0.0166
	(-1.67)	(1.25)	(1.74)	(1.55)	(-2.24)	(-1.90)	(-1.70)	(-1.43)
Co-supplier	-0.139	-0.178	-0.203	-0.125	-0.0361	-0.0130	-0.00690	-0.00871
	(-1.29)	(-1.51)	(-1.64)	(-0.88)	(-1.18)	(-0.42)	(-0.24)	(-0.27)
Unrelated	-0.243***	-0.218***	-0.230***	-0.253***	0.0299	0.0389**	0.0456***	0.0498**
	(-2.86)	(-2.71)	(-2.99)	(-2.84)	(1.40)	(2.07)	(2.63)	(2.55)

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table VII. Effect of Upstream and Downstream Competition Changes on Changes in Segments

This table presents estimates from second stage IV regressions based on Equation 3. The dependent variables are the numbers of change in upstream, downstream, co-supplier, unrelated segments within conglomerates in industry i year t. The variables of interest are the changes in the weighted average IPRs in the US market of upstream industries, the home industry, and downstream industries. The IVs of the three IPR change variables are the corresponding IPR changes in the markets of the eight wealthy countries. The control variables are the industry average total assets, industry average leverage ratio, industry average cash ratio, industry average markup, industry average Market-to-Book ratio, and industry total sales. Industry fixed effects and year fixed effects are also included. Adjusted R^2 and the number of observations are provided at the bottom of the table. Below each coefficient estimate, t-stats are reported in parentheses. All standard errors are clustered at the industry level.

	(1)	(2)	(3)	(4)
	Upstream	Downstream	Co-supplier	Unrelated
Δ Upstream IPR	-0.299**	-0.0925	-0.386	-0.155
	(-2.61)	(-0.92)	(-0.57)	(-0.57)
Δ Home IPR	0.00131	0.000175	-0.00450	-0.00621
	(0.52)	(0.03)	(-0.38)	(-0.55)
Δ Downstream IPR	-0.0340	-0.254***	-0.467***	0.0613
	(-1.08)	(-2.90)	(-2.76)	(0.65)
Control Variables	Y	Y	Y	Y
Industry Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
N	6574	6574	6574	6574
Adjusted R^2	0.001	0.001	0.000	0.002

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$