Capital Injection in the Production Network*

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Abstract

We study the effects of acquisitions on firms and their production networks in Türkiye using rich administrative firm-to-firm transaction data. Leveraging a staggered event-study design, we compare post-acquisition outcomes of target firms and their trading partners to matched controls. Acquisitions increase the intangible intensity of target firms but have no consistent effects on conventional performance measures. A key finding is that the network consequences of acquisitions depend on the acquirer's origin. Domestic acquisitions lead to tangible capital deepening and strengthen existing buyer–supplier relationships along the intensive margin, while foreign acquisitions tend to shift production toward outsourcing and diversify network connections. We argue that these differences stem from variation in firms' relationship capability: their ability to sustain productive links in a network governed by incomplete contracts.

JEL classification: D22, D24, J08, O14.

Keywords: Firm Acquisitions, Production Networks, Relationship Capability

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1 Introduction

Mergers and Acquisitions (M&As) are events that shape industries. Their most direct effect is the increase in size and, often, market power of the involved businesses. Because firms are intertwined in a network of cross-industry, supplier-customer relationships, the effects of M&As are likely to reverberate through supply chains. This insight naturally leads to a number of related questions. What are the *network effects* of M&As, i.e. the effects on the buyers and suppliers of the involved firms? Do the latter *rewire* their own network of buyers and suppliers in predictable directions, e.g. towards more, or more productive partners? What are the ultimate welfare consequences of M&As, both horizontal and vertical,[1] taking network effects into account? Lastly, but relevantly: is there any systematic difference in these patterns, whether M&As occur within or across country borders?

To shed light on these questions, in this paper we perform an empirical investigation of both direct and network effects following major firm *acquisitions* occurred in the Turkish economy between 2011 and 2019. This setting offers a number of advantages. The most apparent one is about data: like other countries of smaller or comparable dimension and development, Türkiye enables access to administrative records about the *universe* of firm-to-firm total yearly transactions, which can be linked to other administrative data sources such as social security records, firm balance sheets, and customs. In addition, we are able to link these data to comprehensive records of all M&As occurred in Türkiye between 2011 and 2019, including those where one of the transacting partners was not Turkish. Furthermore, in recent decades Türkiye has liberalized its capital markets and eliminated most restrictions to foreign direct investment.[2] Thus, it offers an ideal setting to compare the direct and network effects of acquisitions undertaken by domestic and foreign (i.e., non-Turkish) firms.

Our analysis rests on comparing post-acquisition changes in key outcomes for acquired firms—and, importantly, for their networks of buyers and suppliers—to corresponding changes for comparable firms that did not experience an acquisition—or their networks. We focus on acquisitions because, unlike mergers, they preserve the legal entity of both parties involved, allowing for a consistent pre- and post-event comparison. The acquisition events we examine occurred over time in a staggered fashion: to appropriately summarize their dynamic effects, we present the results in an event-study framework. A typical challenge to

[1] In a classical analysis, Williamson (1968) pointed out that the welfare consequences of horizontal M&As are *ex ante* ambiguous, as the depressing effects of increased market power may be at least in part offset by efficiency gains. Vertical M&As are more complex: from a welfare perspective, some potential advantages are the elimination of double marginalization and the solution to hold-up problems (Klein et al., 1978). However, Hart and Tirole (1990), building on the contract theory of M&As by Grossman and Hart (1986), show that vertical M&As can also depress welfare by foreclosing rivals to inputs and customers.

[2] Türkiye's Foreign Direct Investment Law No. 4875 (*Doğrudan Yabancı Yatırımlar Kanunu*), enacted in 2003, liberalized the investment regime by granting foreign and domestic investors equal treatment and eliminating most entry restrictions. This provision maintained limited constraints only in a few selected sectors such as broadcasting, aviation, energy, and defense.

any empirical assessment of the *causal* effect of M&As is that these events do not occur at random. Our results would be misleading if, for example, the acquired firms were already embarked on a differential trend relative to firms they are compared to. To mitigate this concern, we adopt an identification strategy based on selection on observables. We leverage a rich set of pre-treatment firm-level characteristics observable in our dataset, including features of firms' local networks; and we assume that counterfactual trends are parallel conditional on these.[3]

Our results can be summarized as follows. For the acquired firms, both foreign and domestic acquisitions raise the ratio of intangible capital—including Research and Development (R&D)—to revenues, pointing to a systematic shift toward knowledge-based assets after ownership change. Yet the two types of acquisitions differ in their effect on tangible capital: domestic acquisitions are followed by significant increases, while foreign acquisitions are not. In terms of performance outcomes, labor productivity rises for domestically acquired firms but shows no significant change for foreign acquisitions, while markups at the acquired firm level remain flat in both cases. Turning to the networks of acquired firms, we observe a marked expansion of the local network (total number of suppliers and customers) of foreign acquired firms; there is no robust evidence of analogous effects for domestic acquisitions. An interesting result of our analysis is that for both buyers and sellers, labor productivity (defined as firm revenue by employment) does not appear to increase significantly; for suppliers, there is some evidence that it actually decreases. At the same time, our proxy for markups (firm revenue by total cost of goods sold) registers marked increases across both buyers and suppliers.

These patterns suggest that acquisition are systematically associated to the reorganization of production and—possibly—to rent redistribution in the production network. The relative increase in intangibles experienced by acquired firms stands in stark contrast with the classic empirical study on vertical ownership by Atalay et al. (2014). Their analysis (which, unlike ours, did not rely on extensive firm-to-firm transaction data) shows that, counterintuitively, common ownership along supply chains does not lead to increased input flows. To explain the occurrence of vertical integration, Atalay et al. (2014) provide some tentative evidence to suggest that acquisitions are meant to facilitate the transfer of assets in an efficiency-enhancing way. Our findings lend additional support to this hypothesis.[4] At the same time, domestically- and foreign-acquired firms take advantage of their enhanced intangible capital

[3]As we elaborate in section 3, we operationalize our analysis by implementing the staggered differences-in-differences methodology by Callaway and Sant'Anna (2021) with inverse probability weighting. Moreover, we show that propensity score reweighting dramatically improves the covariate balance between treated and control firms, lending further credibility to our empirical strategy.

[4]Echoing the contract theory of acquisitions by Grossman and Hart (1986), they can be loaded with additional interpretation: acquisitions occur because the acquirers have, in a world of incomplete contracts, an incentive to transfer assets towards the acquired firm, which is in a better position (in terms of business environment, market access, etc.) to make a profitable use of them.

with markedly different strategies. In the domestic case, we observe capital deepening and exploitation of existing network relationships on the intensive margin. In the foreign case, outsourcing and diversification of network partners dominates. We postulate that these results ultimately depend on differences in firms' *relationship capability*, which we define as the ability to uphold incomplete contracts under shocks. In the Turkish setting, this special, unmeasurable asset is likely more prevalent among domestically-acquired firms.

Related literature. This paper bridges for the first time two distinct strands of literature: that on the empirical effect of M&As, and the empirical literature on production networks (which concerns the propagation of shocks and/or the consequence of new linkages).

Scholars have long been interested in the productivity and innovation consequences of M&As, and their policy implications. We have no pretense to provide a comprehensive review of a large literature, though a summary of some key contributions can help frame ours. The productivity effects of M&As are elusive. Blonigen and Pierce (2016) find limited evidence for them across U.S. industries, though M&As are observed to raise estimated markups. By contrast, Braguinsky et al. (2015) report increased efficiency for early 20th century Japanese cotton-spinning plants undergoing acquisition. Analogously, Kulick (2017) finds positive effects in the U.S. ready-mix concrete industry. A common issue to many such studies is that they assess productivity effects only indirectly, via Total Factor Productivity on Revenue (TFPR), although some notable exceptions report effects on directly measured quantities. For example, Eliason et al. (2020) observe worse post-M&As health outcomes for patients in the dialysis industry, whereas Demirer and Karaduman (2024) report increased technical efficiency for power plants targeted by acquisitions. In general, the effects of M&As on productivity appear heterogeneous and context-specific; similar conclusions are drawn by the literature that studies their effect on innovation.[5] This paper contributes to this literature in two key respects. First, it emphasizes the *production network* effects of acquisitions, measured on a variety of outcomes ranging from labor productivity to profit margins and intensity of different types of asset. Second, it contrasts the estimated effects between domestic and foreign acquisitions.[6]

The empirical literature on shock propagation in production network is, by contrast, more recent, having emerged from the insight by Acemoglu et al. (2012) that the topology of production networks may amplify shocks and thus, drive business cycles. Both Barrot

[5]The theoretical analysis of M&A effects on innovation is more nuanced. On the one hand, complementarity in R&D assets and scale effects can spur increased innovation; on the other hand, increased market concentration can decrease incentives for it. Whereas some empirical studies document circumstances where M&As and innovation are positively associated (e.g. Bena and Li, 2014) others observe a neutral (e.g. Danzon et al., 2007; Igami and Uetake, 2020) or negative (e.g. Ornaghi, 2009; Cunningham et al., 2021) association.

[6]To the best of our knowledge, this comparison is novel in the literature. Using an identification strategy similar to ours, a recent study by Gregori et al. (2023) estimates the productivity effects of cross-border acquisitions within the E.U. (but they do not compare them to to domestic acquisitions). They find evidence for negative-to-neutral effects on TFPR.

and Sauvagnat (2016) and Carvalho et al. (2020) leverage exogenous shocks caused by natural disasters to document sizable macroeconomic effects due to the propagation, respectively in the U.S. and Japan. Related contributions include Pasten et al. (2020), who examine the propagation of monetary policy shocks in the production network, and Bonadio et al. (2021), who study the diffusion of shocks caused by the COVID-19 pandemic throughout international supply chains. A smaller and even more recent set of studies examines the implications of creating new linkages in the production network. Bernard et al. (2019), for example, show that access to high-speed rail in Japan helps firms link up to partners farther away, which yields ultimate benefits on their performance. In related work, Alfaro-Ureña et al. (2022) show that Costa Rican firms that become suppliers of newly arrived multinationals experience persistent gains in TFPR and firm growth. The setting examined in their paper bears some analogies with ours: similarly to new multinationals, foreign acquistions can also be interpreted as an external injection of capital (and possibly knowledge, management practices) into the network. We contribute to this literature by documenting the effect of acquisitions (domestic and foreign) and their implications in terms of reorganization of production and input sourcing in the network. Unlike Alfaro-Ureña et al. (2022) however, we find no productivity effects on the suppliers of the acquired firms. Instead, we observe increased profit margins for both buyers and suppliers.

Our contribution is arguably most closely related to the aforementioned landmark study by Atalay et al. (2014). The key finding in their paper is that vertical integration does not appear conducive to increased exchange of inputs between commonly owned firms.[7] To explain the occurrence of acquisitions, the authors conjecture that they are best explained as a means to facilitate a more efficient use of intangible assets. Due to data limitations, however, Atalay et al. (2014) could only support their conjecture with suggestive evidence. By contrast, we examine the effect of acquisitions with a rich set of administrative data, which allow to measure the impact on a number of dimensions related to the intensity of intangible use and to the (local) production network of acquired firms. Furthermore, our analysis is not descriptive: under the assumptions underpinning our empirical strategy, our results can be interpreted as the causal effects of (domestic or foreign) acquisitions on a firm and its network. The increased availability of administrative data certainly enables more accurate empirical analyses on various dimensions of horizontal and vertical integration. For example, Alfaro et al. (2025) recently used newly linked Census data to reconstruct the production network of U.S. multinationals, showing that intrafirm trade is more prevalent than originally observed by Atalay et al. (2014) with survey data. We add to this literature also by showing that besides any effect on input transfer between acquirer and target firms, acquisitions lead to a reconfiguration of the local production network around the target, and in particular an increase in the number of the target's buyer and seller firms.

[7] This finding is also supported by Ramondo et al. (2016), who show that a few affiliates are responsible for the vast majority of intra-firm trade in multinationals.

Paper organization. The next sections of this paper are structured as follows. Section 2 describes our data sources and summary statistics. Section 3 outlines our empirical strategy, presents the results, and discusses them. Section 4 concludes. Two appendices elaborate on the empirical strategy and results.

2 Data and Summary Statistics

We combine several administrative databases maintained by the Turkish Ministry of Industry and Technology (*Sanayi ve Teknoloji Bakanlığı*) with a comprehensive database of all M&As occurred in Türkiye between 2011 and 2019. These two data sources are described next.

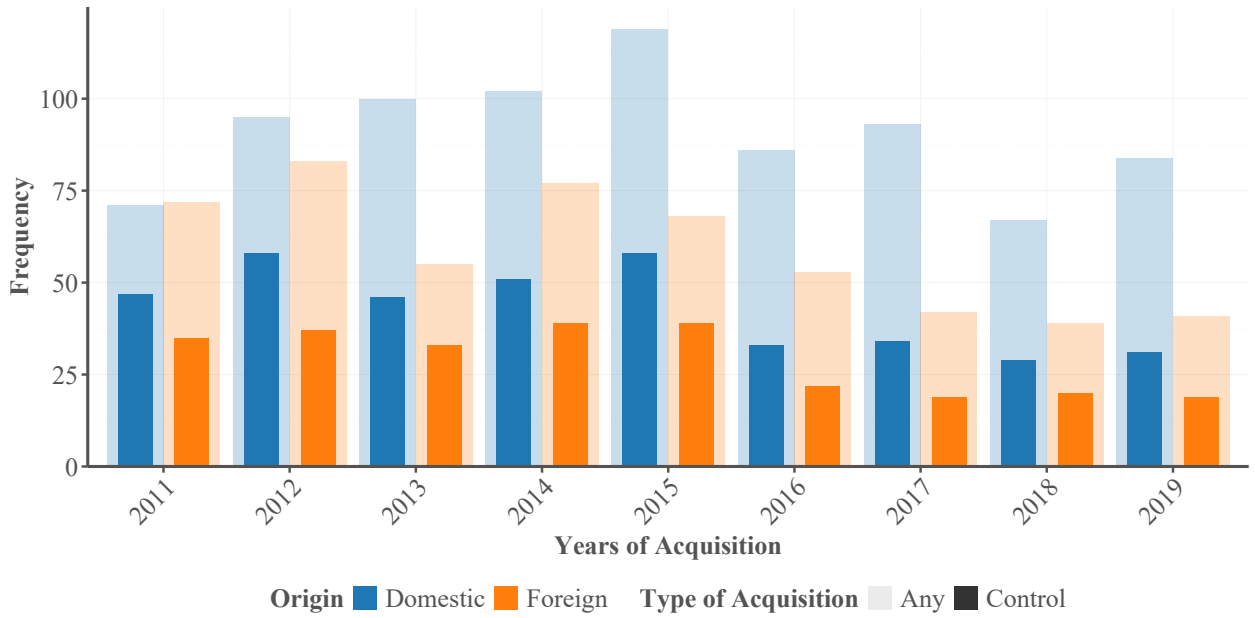
Administrative data. We construct our dataset starting from a business register storing information about some key characteristics of firms: including their identifiers, four-digit NACE activity codes, the location of their administrative center (at the province level), and the year of establishment. We match firm identifiers to Social Security records about all workers employed in a firm within each year. This information allows us in particular to construct robust and reliable measures of firm size (headcount). We also link our business register to detailed firm-level financial information, including balance sheet and income statement records, provided by the Turkish Ministry of Treasury and Finance (*Hazine ve Maliye Bakanlığı*). The latter ministry also provides data about the total yearly monetary transaction between any two firms, which it uses to levy value added taxes. Transactions are censored below 5,000 Turkish liras (ca. $1,500 in 2015). Firm-level information is only available for businesses obliged to report their balance sheet and income statement, i.e. firms whose total yearly purchases or sales surpass certain time-varying thresholds.[8] We select the sample further, as acquired firms are typically larger than average and non-acquired firms are only necessary to construct a suitable control group. In particular, we keep only those firms which, at any point in time, registered more than 10 employees and sales for more than five millions Turkish liras (ca. $1,500,000 in 2015), leaving us with an unbalanced sample of 299,888 unique firms. Furthermore, we discard firm-year observations that do not report a positive record for the cost of goods sold in their income statement.

Acquisitions data. We pair the administrative data with a newly elaborated dataset on all M&As in Türkiye, constructed from official announcements published in the Turkish Trade Registry Gazette (*Türkiye Ticaret Sicili Gazetesi*). All M&A transactions in Türkiye are legally mandated to be registered and disclosed in this source, which is consequently the most

[8]Between 2013 and 2017, for example, these thresholds were set at 160,000 Turkish liras (ca. $48,000 in 2015) for purchases, and at 220,000 Turkish liras (ca. $66,000 in 2015) for sales. Only around 20-25% of all Turkish firms passed either threshold, but those that did, combined, accounted for more than 90% of the total economic activity (Demir et al., 2024).

comprehensive and reliable record of events about changes in firm ownership or legal entity. We accessed a digitized version of all Gazette records between 2011 and 2019 (courtesy of Deloitte Türkiye), which we manually cleaned and verified to ensure consistency, remove duplicates, and standardize firm identifiers. Our empirical analysis focuses on acquisitions, which—unlike mergers—allow a before-and-after assessment of firm outcomes, facilitating causal interpretation under standard identification assumptions. Accordingly, we restricted our dataset to acquisitions events only. Each transaction is linked to the tax identification number of the acquired firm, unless the latter is fully absorbed by the acquirer and ceases to exist as a separate legal entity (a case that we treat as an effective merger). A convenient feature of the Turkish administrative data is that they report time-invariant *plant* identifiers matched to the identifiers of their *holding* company. When acquisitions occur, the latter identifier changes while the former does not. We retain in our sample only those acquired firms whose reconstructed plant identifier history reports a change of ownership in the same year originally registered in the Gazette.[9] In addition, we drop from our sample those firms that report multiple such ownership changes, which are however not associated with any M&As recorded in the Gazette. These may be instances of "shadow" M&As that could confound our empirical analysis.

FIGURE 1: Distribution of acquisitions over time



Note. This figure displays the yearly empirical frequency of all acquisition events between 2011 and 2019, separately for domestic and foreign acquisitions. Slimmer, more intensely colored bars represent control acquisitions. Source: *Türkiye Ticaret Sicili Gazetesi* (Turkish Trade Registry Gazette).

Our records indicate whether acquisitions are partial, or instead resulted in full control of the target firm (with acquirers ending up owning more than 50% of all the target's shares).

[9]To this end, we only use the identifier of the *largest plant* ever associated with a firm, as tracking all of them is generally impractical.

This information allows us to distinguish between "generic" acquisitions and "control" acquisitions (the latter being a subset of the former). The Trade Registry also allows us to identify whether each acquiring firm is domestic (Turkish) or foreign, including the full denomination and country of origin of any foreign acquirer.[10] Figure 1 uses histograms to represent the time distribution of all acquisition (and control acquisitions specifically) separately for foreign and domestic acquirers. Domestic acquisitions average between 65 and 120 per year, with a peak in 2015. By contrast, foreign acquisitions fluctuated between 40 and 80 per year, with a decline after 2014. After the cleaning steps we take in our firm-level panel and upon merging the latter with the M&A data, between 2011 and 2019 we are left with 803 domestically acquired firms (of which 290 underwent control acquisitions) and 479 foreign-acquired firms (resulting in full control for 220 of them).

Descriptive statistics. Table 1 reports summary statistics for key firm-level variables (age, headcount, number of suppliers and customers, as well as key balance sheet and income statement information) across never acquired firms, domestically acquired firms, and foreign acquired firms. Averages and standard deviations (in parentheses) are calculated by pooling all years in the data, including post-acquisition periods for acquired firms. Notably, the two groups of acquired firms display broadly similar averages of all reported characteristics. Whereas domestically acquired firms register higher values for both sales and cost of goods sold, foreign acquired firms have a higher numbers of supplier and customer firms. As one would expect, never-acquired firms (the candidate control observations of our empirical analysis) are by contrast much smaller across all measures, with much fewer employees, lower sales, and smaller network degrees. In addition, they appear to be somewhat older. To appropriately perform the causal evaluation of the acquisitions events, we build control groups comparable to the treated ones via a selection-on-observables approach. We detail our approach in the next section as well as in Appendix A.

3 Empirical analysis

After a self-contained discussion of our empirical strategy, this section presents the empirical results of this paper for distinct groups of outcome variables. In the last part of this section, a discussion summarizes the results and provides them with economic interpretation.

Empirical strategy. We estimate the causal effect of *control* acquisitions, whether domestic or foreign, on a number of outcomes of interest that are measured on target (acquired) firms, or on their local network of buyers and suppliers. We focus on control acquisitions, despite the smaller size of the treatment group, for the sake of easier interpretation of our

[10] In this paper, we choose not to dig into an heterogeneity analysis of foreign acquisitions by country of origin as this would stretch the statistical power of our dataset.

TABLE 1: Descriptive Statistics

Variable	Never acquired firms	Domestically acquired firms	Foreign acquired firms
Age	22.83	15.44	16.58
	(19.15)	(12.41)	(13.35)
Number of employees	283.0	5846.8	5529.7
	(2140.1)	(26194.6)	(13897.4)
Number of suppliers (in-degree)	21.78	175.61	271.00
	(71.96)	(530.34)	(886.42)
Number of customer firms (out-degree)	21.03	192.44	217.56
	(50.66)	(426.60)	(366.85)
Total payroll	0.59	17.72	16.19
	(6.87)	(76.22)	(35.65)
Value of tangible assets	2.07	70.80	64.64
	(46.24)	(392.38)	(463.69)
Value of the R&D stock	0.02	1.54	1.74
	(1.001)	(10.092)	(9.008)
Value of non-R&D intangibles	0.53	31.78	36.76
	(34.21)	(238.17)	(298.06)
Cost of goods sold	10.26	328.60	195.41
	(355.36)	(2162.64)	(505.67)
Total value added	2.36	79.93	79.88
	(53.49)	(269.84)	(215.80)
Total sales	11.74	384.08	246.43
	(367.23)	(2271.03)	(598.16)
Gross profit	1.48	55.48	51.02
	(31.45)	(249.96)	(131.28)

Note. This table reports the average values (with standard deviations in parentheses) for key firm-level variables, separately calculated for three types of firms: domestically acquired, foreign acquired, and others (potential control observations). Statistics are calculated by pooling all yearly observations of each firm type in the sample. All monetary variables (from "Total payroll" to "Gross profit") are expressed as millions of Turkish liras, deflated by yearly consumer price indices.

results (there is no ambiguity on whether the acquirer exerts full control on the target firm post-acquisition). In Appendix B we also report the (qualitatively similar) results where the treatment group is extended to all acquisitions. As shown in Figure 1, all acquisitions (including control ones) occurred in a staggered fashion, and they are approximately evenly distributed over the time window captured with our data. Thus, methodologies devised to assess causal effects of staggered treatments are the natural choice in this setting.

We adopt in particular the methodology by Callaway and Sant'Anna (2021): we estimate a number of *time-and-cohort-specific conditional* average treatment effects on the treated (ATT):

$$\text{ATT}(g, o, t) = \mathbb{E}\left[Y_{it}(g, o) - Y_{it}(0) | \, G_{gi} = 1, O_i = o, X_i \right].$$

Here, i denotes a firm; t time measured as years; g denotes the year when the treatment

occurs ("cohort"); o is the origin of the acquirer, i.e. $o = 0$ for domestic and $o = 1$ for foreign; $Y_{it}(g, o)$ is the value of a particular outcome Y that either firm i or its local network gets at time t if firm i is treated on year g by an acquirer of origin o; $Y_{it}(0)$ is the corresponding no-treatment counterfactual; G_{gi} is a binary cohort identifier for treated firms, which is specific to a cohort g; while X_i is a collection of pre-treatment characteristics. Because the vast majority of firms in the data never undergo any acquisitions, we impute the counterfactuals $Y_{it}(0)$ via the outcomes of firms that are *never treated*. The outcomes measured at the network level are always weighted averages of some variable of interest Y for either the suppliers or the buyers of firm i, using weights of the kind w_{ijt}—which represents the total value of firm i's purchases from firm j at time t. Specifically, network-level outcomes are represented as:

$$\overline{Y}_{it}^{sup} = \frac{\sum_{j \in \mathcal{S}(i,t)} w_{ijt} Y_{jt}}{\sum_{j \in \mathcal{S}(i,t)} w_{ijt}}$$
$$\overline{Y}_{it}^{buy} = \frac{\sum_{j \in \mathcal{B}(i,t)} w_{jit} Y_{jt}}{\sum_{j \in \mathcal{B}(i,t)} w_{jit}}$$

respectively for the suppliers of firm i at time t—collected in the set $\mathcal{S}(i, t)$—and for the analogous set of buyers—collected in $\mathcal{B}(i, t)$.[11]

The identification of the ATT parameters of interest relies on a number of assumptions detailed by Callaway and Sant'Anna (2021); most notably, parallel counterfactual trends between treated and controls. It is plausible that parallel trends only hold *conditionally* on selected covariates X_i. This would occur if, for example, the outcome of interest is firm size and acquisitions are more likely to target firms already embarked on a differential trend of firm growth. To address this, we follow one of the approaches recommended by Callaway and Sant'Anna (2021) and, when imputing counterfactuals, we weigh control observations by cohort-and-origin-specific estimated propensity scores. To this end, we use the following observed characteristics: pre-treatment firm size (total headcount), intensity of tangible capital, and intensity of intangible capital; pre-treatment in-eigenvalue and out-eigenvalue centrality of the firm;[12] and about twenty binary industry indicators. In Appendix A we provide some graphical visualization—through so-called Love plots—of how propensity score weighting helps achieve a reasonable degree of covariate balance across treated and (weighted) control observations, for both domestic and foreign acquisitions. This lends further credibility to our empirical strategy. Importantly, domestic firms that are responsible for acquisitions (acquirers) are preemptively removed for the sample, and never

[11] We also estimated corresponding effects for all *unweighted* averages, which are invariably qualitatively analogous to the weighted ones.

[12] The notions of in-eigenvalue and out-eigenvalue centrality extend the concept of eigenvector centrality to directed networks. In-eigenvalue centrality measures a node's (a firm's) importance based on the centrality of nodes that point into it (the firm's sellers), while out-eigenvalue centrality reflects the centrality of nodes that the node itself points to (the firm's buyers). They are computed from the dominant eigenvectors of the network's adjacency matrix and its transpose, respectively.

contribute to the control group regardless of their propensity score estimates (thus avoiding easily arguable issues of confounding). For analogous reasons, partially acquired firms (which underwent non-control acquisitions) and firms whose largest plants were subject to ownership changes—as discussed in Section 2—are similarly removed.

For both firm-level and cell-level outcomes, we report summaries of the estimates that we arrange graphically in an *event study* fashion. Specifically, we display the following linear combinations of the estimates, alongside their standard errors:

$$\widehat{\tau}_d(o) = \sum_g j(g)\, \widehat{\text{ATT}}(g, o, g+d),$$

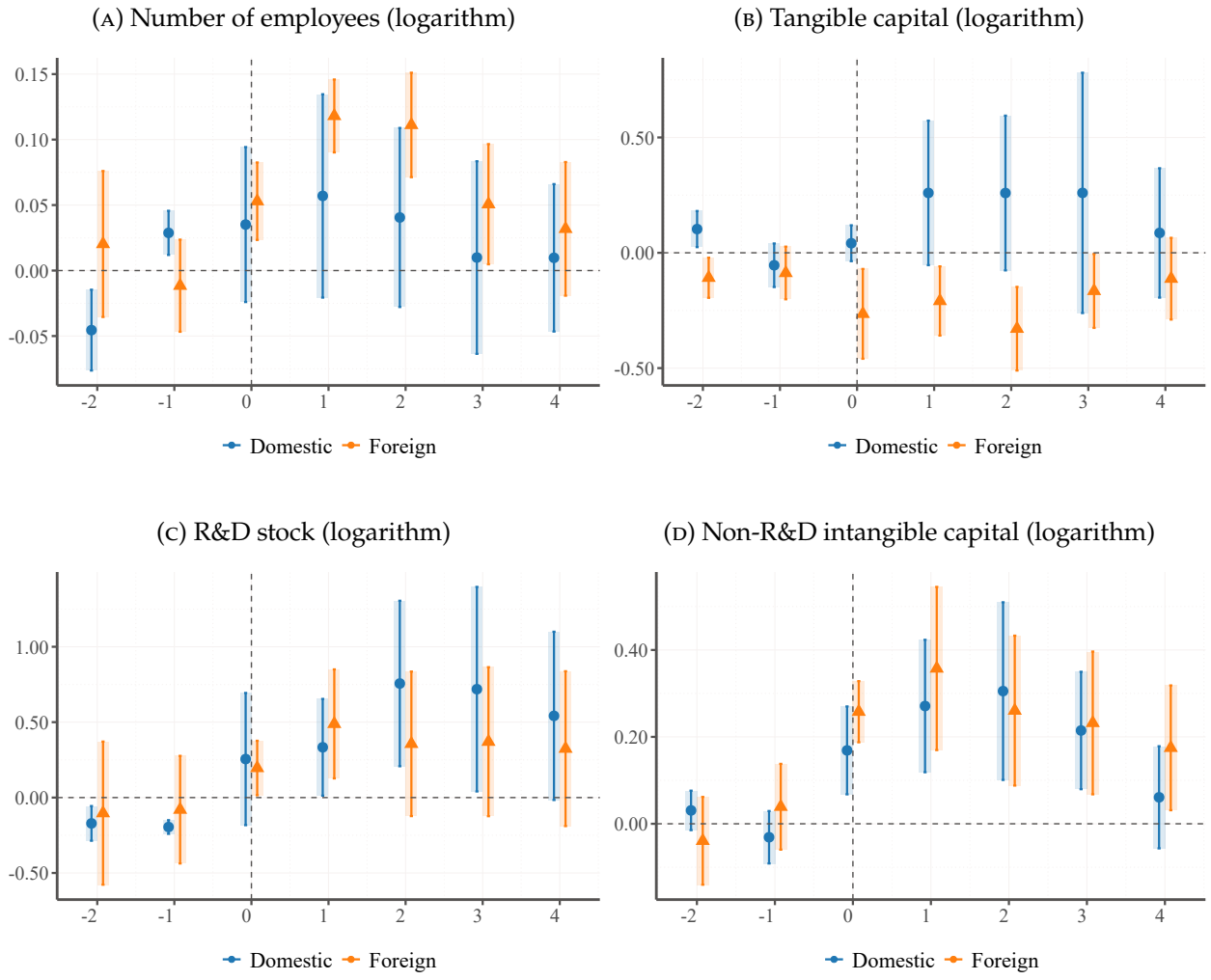
where $j(g)$ is a weight specific to a cohort g that measures its frequency in the treated population. For all our outcomes of interest Y, we report results for $d \in \{-2, \ldots, +4\}$. For each outcome of interest, we combine separate event studies for $o \in \{0, 1\}$, i.e. domestic and foreign acquisitions, in a single figure. Following Callaway and Sant'Anna (2021), all standard errors are obtained by bootstrapping the observation-specific influence functions evaluated at the estimates. In order to account for possible instances of outcome dependence among firms (due to e.g. to shocks that occur within industries or over the supply chain, common time trends, or other unobserved shared factors orthogonal to the treatment) we conduct a block bootstrap which clusters standard errors at the level of Turkish regions (*bölge*). The implicit assumption is that no unobserved dependence across observations from different regions occurs. However, estimates based on alternative choice for the clustering level (e.g., two-digits sectors) yield virtually identical inference conclusions.

Direct effects on target firms: input usage. We first report the direct effects on the acquired firms, and in particular on their size and the intensity of use for different inputs. Figure 2, panel A shows results for the most direct measure of firm size: the (log) total number of employees. For domestic acquisitions, one cannot discern a statistically significant effect. By contrast, foreign acquisitions lead to a short-term 5-10% increase in the target's employees, an effect that appears to fade away over time. Panel B reports results on the total value of tangible capital, which register a remarkable difference. Whereas domestic acquisitions come with an increase of tangible assets by about 20-30% in monetary value (though statistically noisy), foreign acquisitions are associated with a symmetric and more robust *decrease*. Lastly, Panels C and D illustrate results for both the R&D stock and the value of all intangible assets distinct from capitalized R&D expenditures. Whereas the former measure is the empirical counterpart of the standard "knowledge capital" concept (Griliches, 1979), the latter conflates organizational capital, trademarks, as well as sales, general and administrative expenses.[13] Both measures appear to increase following an

[13]We calculate the R&D stock from R&D investments using the perpetual inventory method with a 20% depreciation rate. Conversely, non-R&D intangibles are summed directly from balance sheet entries.

acquisition, whether the acquirer is domestic or foreign (by about 50% for the R&D stock, and by about 30% for other intangibles). Though we defer to the latest part of this section for a comprehensive discussion, we note that *with one exception* all results are in line with the expectation that acquisitions are performed to facilitate a more productive use of intangible assets (similarly to Grossman and Hart, 1986; Atalay et al., 2014). The interesting exception is the stark decrease in intangibles associated with foreign acquisitions. This effect is best interpreted as evidence for *outsourcing* in light of our later results on the network measures.

FIGURE 2: Effects on the acquired firms: input usage

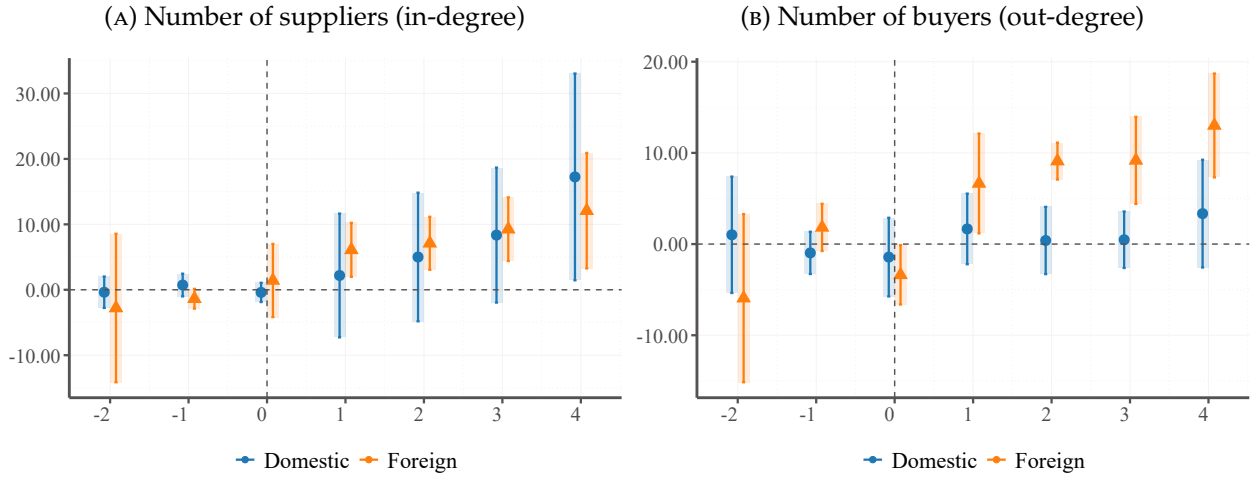


Note. The figure reports event study coefficients $\widehat{\tau}_d$ where the outcome Y_{it} is the logarithm of, respectively: an acquired firm's total headcount (Panel A), the total value of its tangible assets (Panel B), the total value of its R&D stock (Panel C) and the total value of its intangible assets other than R&D (Panel D). All estimates are conducted separately for domestic and foreign acquisitions. Confidence intervals at the 95 per cent level are obtained from clustered bootstrapped standard errors, where clusters group all firms in the same region, pooling all years. Source: *Sanayi ve Teknoloji Bakanlığı* (Turkish Ministry of Industry and Technology).

Direct effects on target firms: network connections. Figure 3 displays effects on the total intensity of network connection for the acquired firms. We distinguish in particular between

the effect on the total number of supplier firms (in network parlance, the *in-degree*) and the total number of customer firms (out-degree). Results for both are provided in panels A and B, respectively. To facilitate a more immediate interpretation, we report results on the *levels* of both degree measure. However, results based on logarithms or on total purchases or sales are analogous. After foreign acquisitions, both the number of buyers and that of suppliers appears to increase by about ten units at the target firm. In the domestic acquisition case, only the number of suppliers does, and this effect is only statistically significant a few years into the acquisition. These results are not easily interpreted at first glance. Theories of production network formation emphasize the fixed costs associated with extra connections (see e.g. Bernard et al., 2022; Dhyne et al., 2023). As firms expand post-acquisitions, they can mobilize more resources to diversify their set of buyers. However, why domestic acquisition targets do not appear to connect with a higher number of buyers remains puzzling.

FIGURE 3: Effects on the acquired firms: network connections

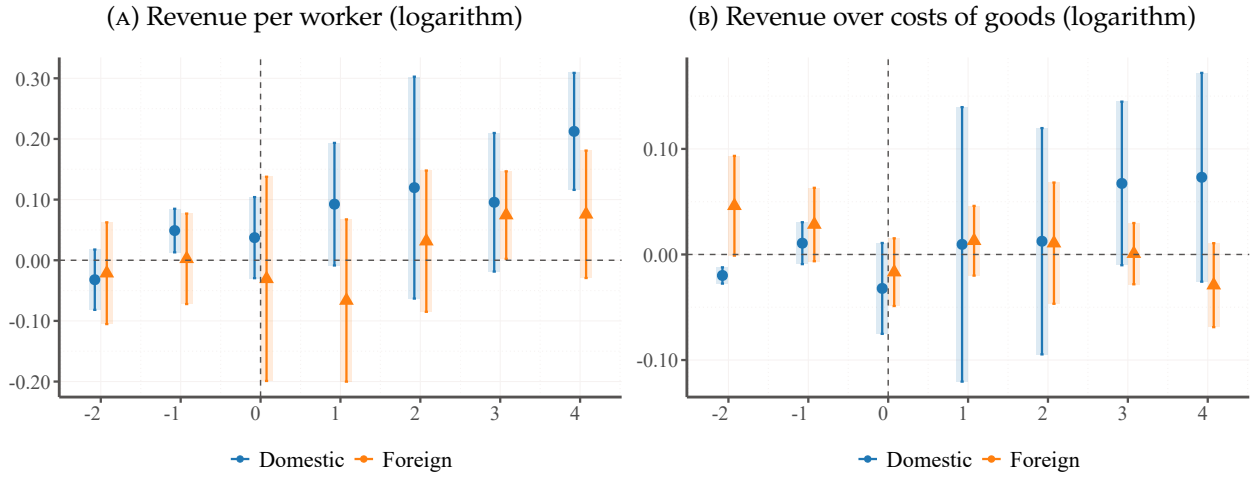


Note. The figure reports event study coefficients $\widehat{\tau}_d$ where the outcome Y_{it} is, respectively: an acquired firm's total number of suppliers (Panel A) and of buyers (Panel B). All estimates are conducted separately for domestic and foreign acquisitions. Confidence intervals at the 95 per cent level are obtained from clustered bootstrapped standard errors, where clusters group all firms in the same region, pooling all years. Source: *Sanayi ve Teknoloji Bakanlığı* (Turkish Ministry of Industry and Technology).

Direct effects on target firms: performance measures. We move next to a classical question in the literature on M&As: do acquisitions improve firm productivity and performance? A baseline hypothesis is that they do, even beyond the more restrictive setting of horizontal mergers *à la* Williamson (1968) where technical efficiency gains are more directly postulated. If, in fact, the incumbent owners lacked the knowledge or assets to enact any efficiency improvements, one would expect them to sell the firm to a third party that possesses such means. We attempt an answer by measuring the effect of acquisitions on (the logarithm of) two proxies for labor productivity and markups: total (deflated) sales divided by the

number of employees and the cost of goods sold, respectively.[14] Panels A and B of Figure 4 report the results for both measures. We only observe some weak evidence in favor of increased labor productivity (by around 10%) while there is no evidence of markup effects. Overall, we find the evidence we provide not unlike that given by the literature on M&As reviewed in Section 1: inconclusive. It is worth to note that when extending the analysis to *all* acquisitions (not simply control ones) we do observe positive *and* statistically significant effects on our markup proxy, especially for domestic acquisitions (see Figure A.5, Appendix B). That the effect disappears when we restrict the analysis to control acquisitions suggests that minority or partial acquisitions may be driven by the expectation of higher future margins, which would occur without taking over the companies in question.

FIGURE 4: Effects on the acquired firms: performance



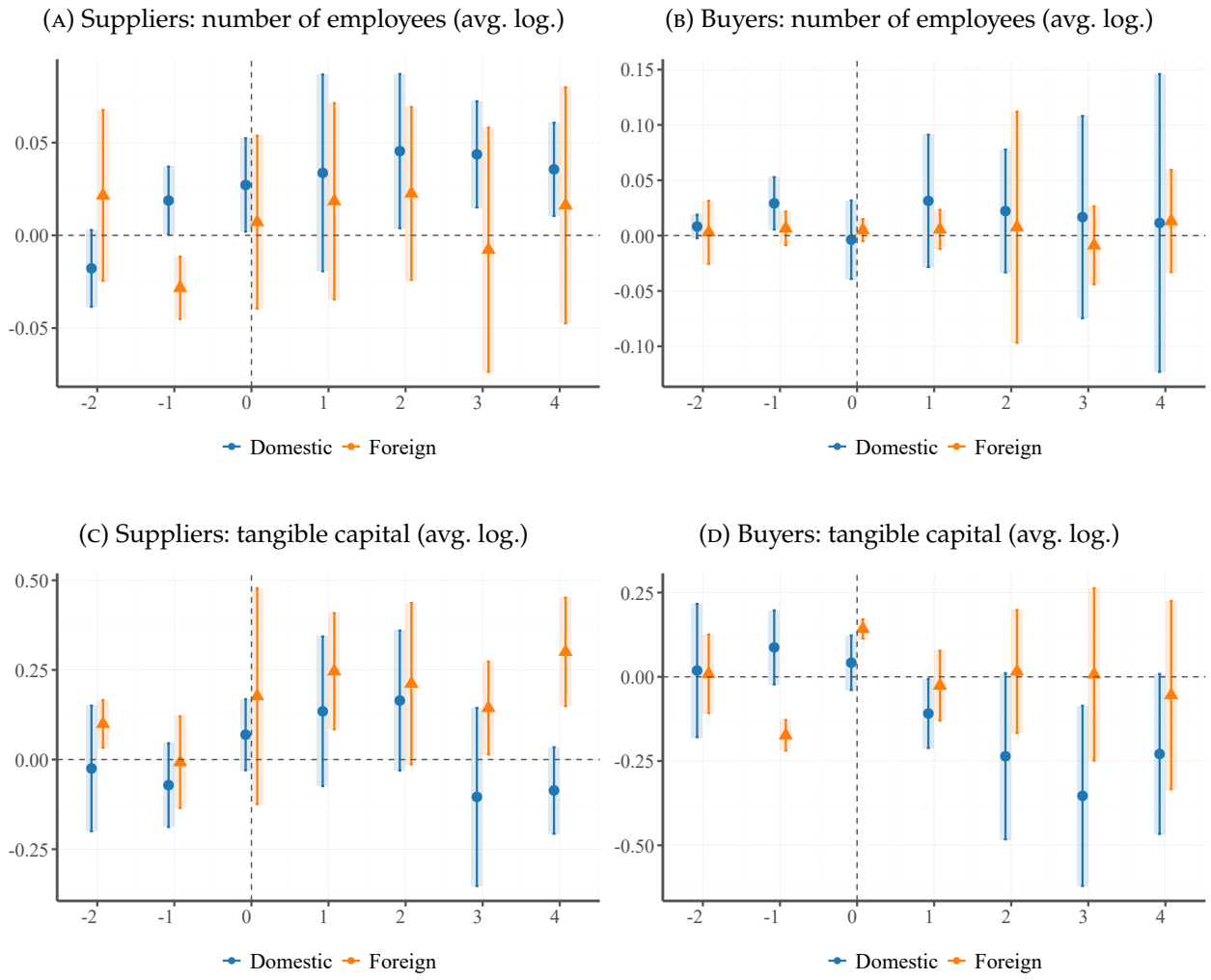
Note. The figure reports event study coefficients $\widehat{\tau}_d$ where the outcome Y_{it} is the logarithm of the ratio between an acquired firm's deflated revenue and, respectively: its total employee count (Panel A) and the cost of goods sold (Panel B). All estimates are conducted separately for domestic and foreign acquisitions. Confidence intervals at the 95 per cent level are obtained from clustered bootstrapped standard errors, where clusters group all firms in the same region, pooling all years. Source: *Sanayi ve Teknoloji Bakanlığı* (Turkish Ministry of Industry and Technology).

Network effects: input usage. The key question of this paper is how does the local network of target firms, that is their local networks of supplier and customer companies, change following acquisitions? To address this, we examine the response of selected variables of the $\overline{Y}_{it}$ kind, as introduced at the beginning of this question. We start by examining weighted averages (among suppliers, or buyers of the target firms) of the log-inputs variables from Figure 2. The results for the labor input (number of employees) and for tangible capital

[14]Less approximate measures for productivity and markups can be obtained by engaging in exercises in production function estimation. However, the latter require assumptions that may not be immediately verifiable in a dataset the size of ours. Conversely, cruder measures are more transparently interpreted. We shall evaluate effects on more rigorous measures of productivity and markups in a future iteration of this paper.

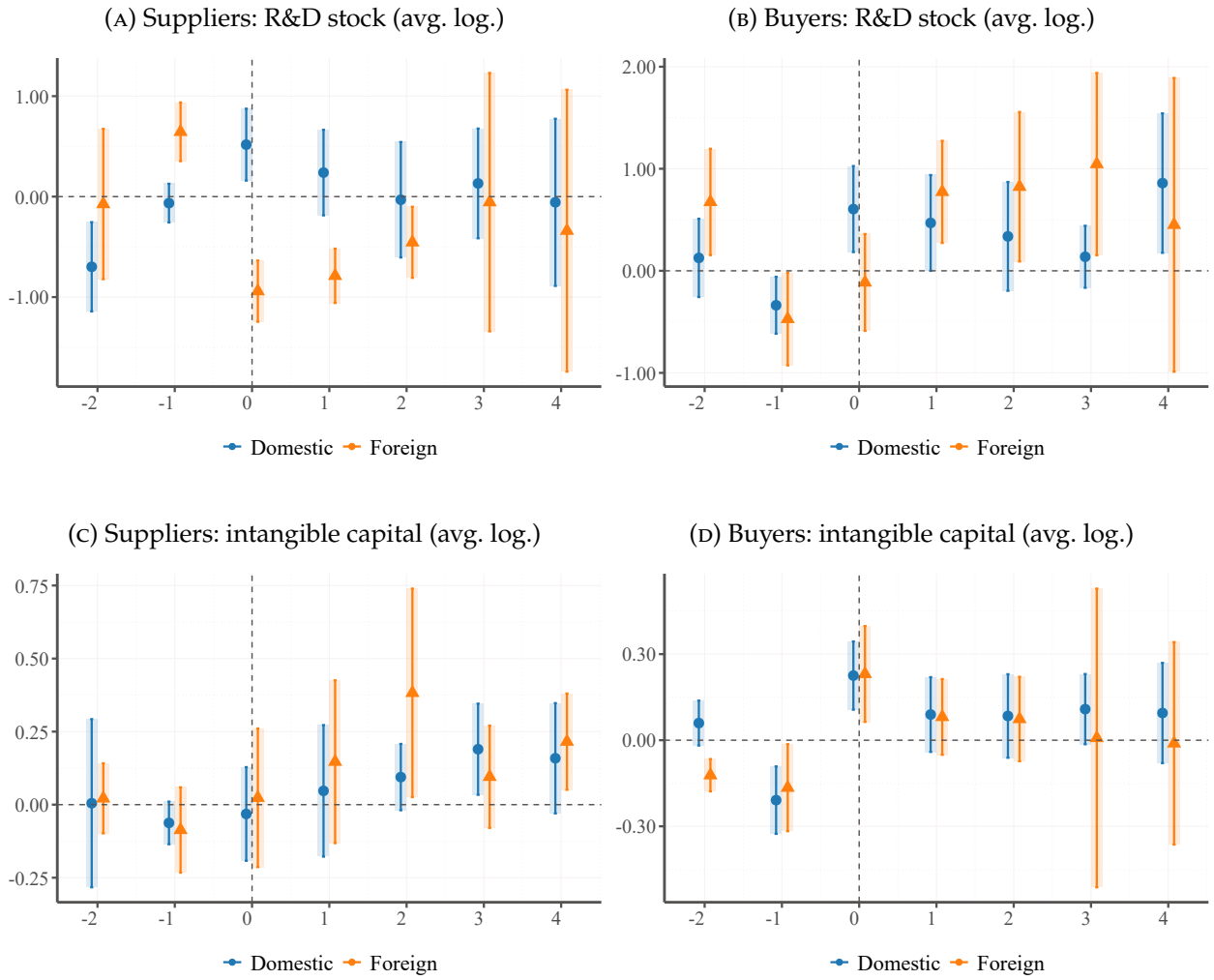
are reported In Figure 5. Panel A, for example, examines the effect on the average size (measured in terms of employees) of the suppliers of target firms, whether the latter are domestic or foreign. The estimated coefficients are interpreted as average differences, d years from/into the acquisition, in the average logarithms (i.e. average changes, all else equal) of those suppliers' size. Similarly, Panel B assesses the effects on buyer size, whereas panels C and D evaluate the effect on the average tangible capital of suppliers and buyers, respectively. Since our focus is primarily about examining how local networks respond in general to the acquisition, at this stage all network effects conflate both intensive and extensive margins effects (the latter being due to the endogenous rewiring of connections).

FIGURE 5: Effects on the acquired firms' networks: conventional inputs



Note. The figure reports event study coefficients $\widehat{\tau}_d$ where the outcome Y_{it} is the weighted average of the logarithmic number of employees across the suppliers *or* the buyers of an acquired firm (Panels A and B, respectively), and the corresponding weighted averages of the logarithmic total value of tangible assets (Panels C and D). Weights are defined by total bilateral yearly transactions, as described at the beginning of this section. All estimates are conducted separately for domestic and foreign acquisitions. Confidence intervals at the 95 per cent level are obtained from clustered bootstrapped standard errors, where clusters group all firms in the same region, pooling all years. Source: *Sanayi ve Teknoloji Bakanlığı* (Turkish Ministry of Industry and Technology). avg. log.: average (of) logarithm(s).

FIGURE 6: Effects on the acquired firms' networks: intangible assets

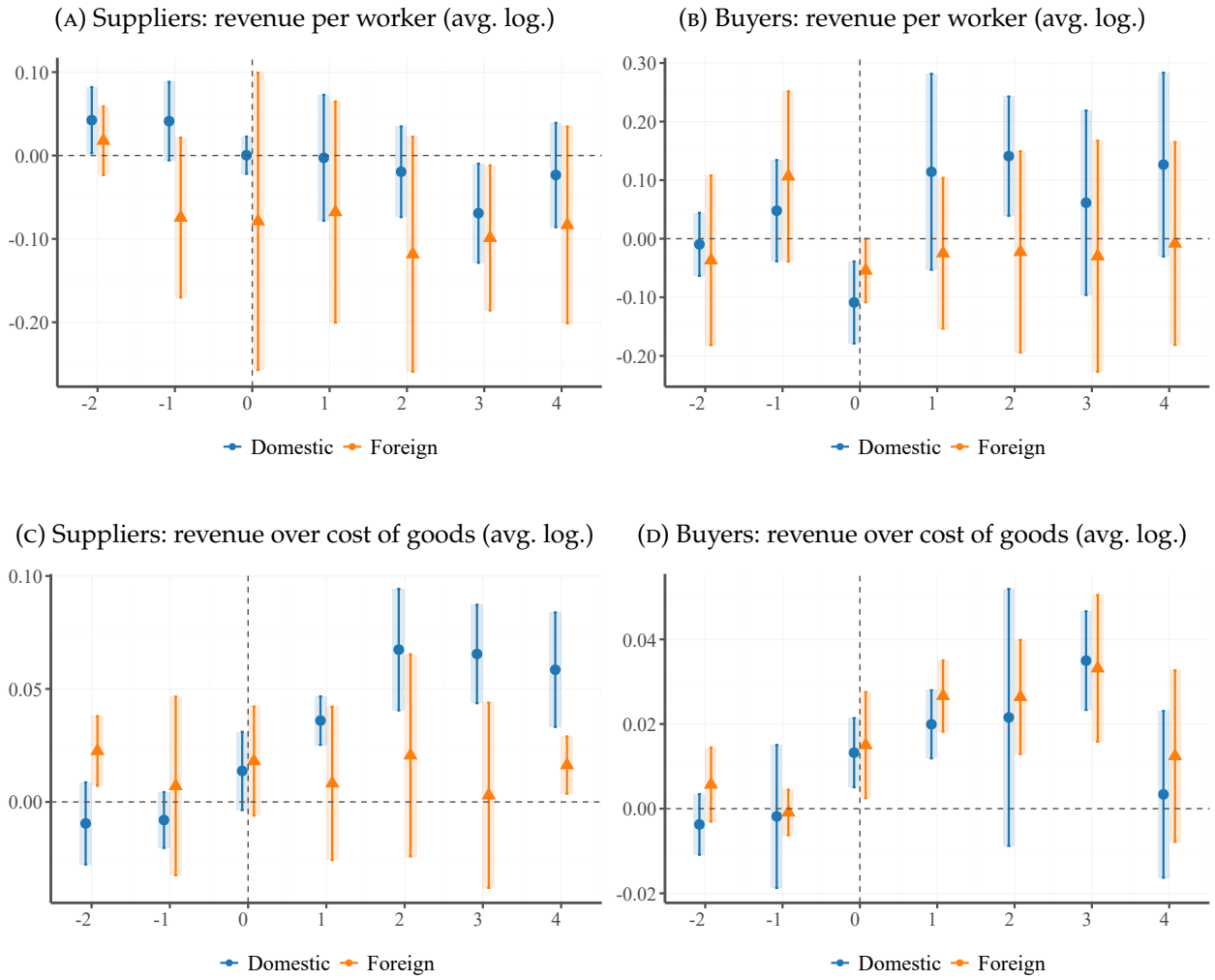


Note. The figure reports event study coefficients $\widehat{\tau}_d$ where the outcome Y_{it} is the weighted average of the logarithmic R&D stock across the suppliers *or* the buyers of an acquired firm (Panels A and B, respectively), and the corresponding weighted averages of the logarithmic total value of intangible assets other than R&D (Panels C and D). Weights are defined by total bilateral yearly transactions, as described at the beginning of this section. All estimates are conducted separately for domestic and foreign acquisitions. Confidence intervals at the 95 per cent level are obtained from clustered bootstrapped standard errors, where clusters group all firms in the same region, pooling all years. Source: *Sanayi ve Teknoloji Bakanlığı* (Turkish Ministry of Industry and Technology). avg. log.: average (of) logarithm(s).

Most estimates from Figure 5 are either zero or statistically insignificant. For domestically acquired firms, suppliers appear to be on a trend of increasing size that starts before the acquisition event. There are, however, two notable results. Panel C provides evidence of a positive effect on the tangible capital of the foreign-acquired firms' suppliers. This effect, as we elaborate in the later discussion, appears to complement the negative direct effect on tangible capital from Figure 2, Panel B. On the other hand, there appears to be a negative effect on the tangible capital intensity of the domestically-acquired firms buyers. The analogous results on R&D and other intangible assets are displayed in Figure 6. As with most network-level results on conventional inputs, we do not detect any clear-cut

effects, though buyers appear to engage somewhat more in R&D. At first glance, our network-level assessment reveals only a handful of relevant effects. However, network-level firm performance measures reveal a more nuanced picture.

FIGURE 7: Effects on the acquired firms' networks: performance



Note. The figure reports event study coefficients $\widehat{\tau}_d$ where the outcome Y_{it} is the weighted average of the logarithmic ratio between deflated revenue across the suppliers *or* the buyers of an acquired firm (Panels A and B, respectively), and the corresponding weighted averages of the logarithmic ratio between deflated revenue and the cost of goods sold (Panels C and D). Weights are defined by total bilateral yearly transactions, as described at the beginning of this section. All estimates are conducted separately for domestic and foreign acquisitions. Confidence intervals at the 95 per cent level are obtained from clustered bootstrapped standard errors, where clusters group all firms in the same region, pooling all years. Source: *Sanayi ve Teknoloji Bakanlığı* (Turkish Ministry of Industry and Technology). avg. log.: average (of) logarithm(s).

Network effects: firm performance. How do the connections of acquired firms perform, compared to the connections of comparable firms that did not experience any acquisition? To address this question, in Figure 7 we report results on our the average of our two proxies for productivity and markups—in logarithms—for suppliers and buyers of both

domestically and foreign acquired firms. Although we are unable to detect any robust effect on labor productivity—if anything, in the suppliers case it seems to decrease, on average—the results on our markup proxy reveal a more interesting pattern. In fact, the suppliers of domestically acquired firms typically experience an increase in their average row margins by five log-points. For foreign-acquired firms, the increase is more modest and it is not statistically significant. For buyers, in both cases of domestic and foreign acquisitions we observe an increase by two-to-four average log-points, though the effect is weak and not statistically significant four years since the acquisition event. These results reveal some yet-uncovered implication of acquisitions: regardless of their ultimate effect on the performance of the acquired firms, the buyers of the latter (as well as some suppliers) experience an improvement of their market power and profitability.

Discussion. We take up the challenge of providing a comprehensive explanation to all our findings. We start from the most robust evidence: all acquisitions appear linked with an increase in intangible assets, in line with the original conjecture by Atalay et al. (2014) in their empirical study of vertical ownership. Following the acquisition, however, production, sourcing decisions, and the local network around the target firms reorganizes itself in ways that differ substantively between the domestic and foreign acquisitions cases.

Domestic acquisitions, unlike foreign ones, are also associated with *tangible capital deepening*. Because domestic target firms do not appear to hire substantively more workers, they become more capital intensive, and unsurprisingly they also register an increase in revenue per worker. The size of their local network, as captured by the two degree measures, does not appear to change. However, their suppliers become larger, presumably to match an increased input demand. This effect is more visible on supplier headcount than in suppliers' tangible assets, which is consistent with the notion that as the target firm itself becomes more capital-intensive, its suppliers can focus on labor-intensive tasks instead. Both the buyers and the suppliers of the firm register an increase in the markup proxy, which is most easily explained by an increase in their relative market power. As the target firm itself expands, but the number of its partners stay constant, these can extract a higher surplus from the relationship. In practice, this translates as lower costs, which may also explain the weak positive effects on the labor productivity proxy.

Foreign acquisitions, by contrast, lead targets to implement *outsourcing* and *network expansion* strategies. On the one hand, the comparative advantage of foreign acquirers lies in intangible assets; on the other hand, expanding the local tangible stock is relatively more costly for them. As a result, foreign-acquired firms prefer to *outsource* capital-intensive tasks: their tangible capital stock comparatively decreases, their networks expand in both the buyer and seller direction, and their suppliers appear more capital-intensive. The necessary adjustment costs are perhaps the reason behind the observed short-lived increase in the target firm's

headcount. Following the acquisition, the buyers of foreign targets display suggestive evidence of increased markups *and* R&D stock. We provide a tentative explanation is likely different to the one given for domestic case: we argue that foreign-acquired firms provide more innovative or *differentiated* goods and services in the Turkish economy, which enhance the attractiveness of buyers' output to their own buyers. In other words, the effect occurs along the numerator of the markup, unlike the denominator effect that we postulated for the buyers of domestically acquired firms.

What can explain the observed differences? Domestic and foreign acquirers operate in different environments, and they possess different knowledge and *relationship capabilities* with local firms. We note that Bernard et al. (2022) introduced the concept of relationship capability in production network literature as the inverse of a firm's fixed cost to establish new relationships.[15] Here, we sketch an alternative definition that is better suited to explain our empirical evidence. A buyer-seller relationship in the production network is a risky affair: it requires trust and the ability to navigate the implications of incomplete contracts. Accordingly, a firm's relationship capability can be alternatively defined as the ability to uphold agreements under shocks and unforeseen circumstances (e.g. through *mutual trust*). Domestic acquirers (and by extension, their acquired firms) are arguably endowed with a better knowledge relationship capability in the local environment, which affords them the ability to better navigate shocks to mutual relationship. As a result, they prefer fewer and deeper connections. Foreign acquirers, by contrast, may suffer a relative disadvantage in terms of relationship capability. Accordingly, they prefer to expand *and diversify* their local networks so as to decrease their risk. This makes outsourcing capital-intensive tasks relatively more convenient, in line with the empirical evidence.

4 Conclusion

This paper provides the first systematic empirical assessment of the effect of firm acquisitions on both the acquired firms and their buyers and sellers—that is, their local production networks. Using some originally assembled Turkish data, we provide estimates of the causal effects of acquisitions on a rich set of outcomes: these estimates rest on the staggered occurrence of acquisitions in Türkiye between 2011 and 2019 and an empirical strategy based on selection on observables. Our key results is that domestic and foreign acquisitions share some key similarities—in particular, they experience an increase in their intangible assets, in line with—Atalay et al. (2014)—but they also follow different patterns. Whereas domestic firms rely on capital deepening, foreign firms outsource tasks that require tangible capital. For reasons that arguably depend on domestic and foreign acquirers' differential

[15] As a result, firms with higher relationship capabilities are better able to find partners and therefore, expand.

ability to establish productive relationships in local networks, the customer firms (buyers) of all acquisition targets experience a boost in their performance.

This paper is currently preliminary and incomplete. We plan three directions to expand it, complete it and polish it. First, we are going to examine effects on additional outcomes: for example, the import and export intensity of target firms. It is arguable that if any effect is present, it is especially pronounced in the foreign acquisitions case. Second, we plan to refine our performance measures, to replace them with estimates of total factor productivity as well as markup estimates that rely on them (following standard methods that are now well-established in the production networks literature). Third, we plan to build a theoretical model of network formation that accommodates heterogeneity in firms' relationship capability, to examine under what conditions would its predictions regarding the exogenous expansion in a firm's intangible assets match the empirical evidence on the effect of acquisitions.

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A Covariate balance

This appendix elaborates on the control-on-observables approach which, as part of our empirical strategy, we take to make our treatment and control groups comparable. By adapting the kind of inverse probability weighting (IPW) approach proposed by Callaway and Sant'Anna (2021), we identify the time-cohort-origin specific treatment effects on the treated as follows:

$$\text{ATT}_{IPW}(g,o,t) = \mathbb{E}\left[\left(\frac{G_{gi}O_{oi}}{\mathbb{E}\left[G_{gi}O_{oi}\right]} - \frac{\dfrac{p_{g,o}\left(X_i\right)C_i}{1-p_{g,o}\left(X_i\right)}}{\mathbb{E}\left[\dfrac{p_{g,o}\left(X_i\right)C_i}{1-p_{g,o}\left(X_i\right)}\right]}\right)\left(Y_{it} - Y_{i(g-1)}\right)\right].$$

In the above expression, $C_i \in \{0,1\}$ indicates whether a firm never undergoes any M&A event or change of ownership ($C_i = 1$), or it does ($C_i = 0$); O_{oi} is a binary origin identifier for treated firms, which is specific to origin o, whereas $p_{g,o}\left(X_i\right)$ is a *cohort-and-origin-specific* propensity score based on pre-treatment characteristics X_i. In particular, the latter is defined as:

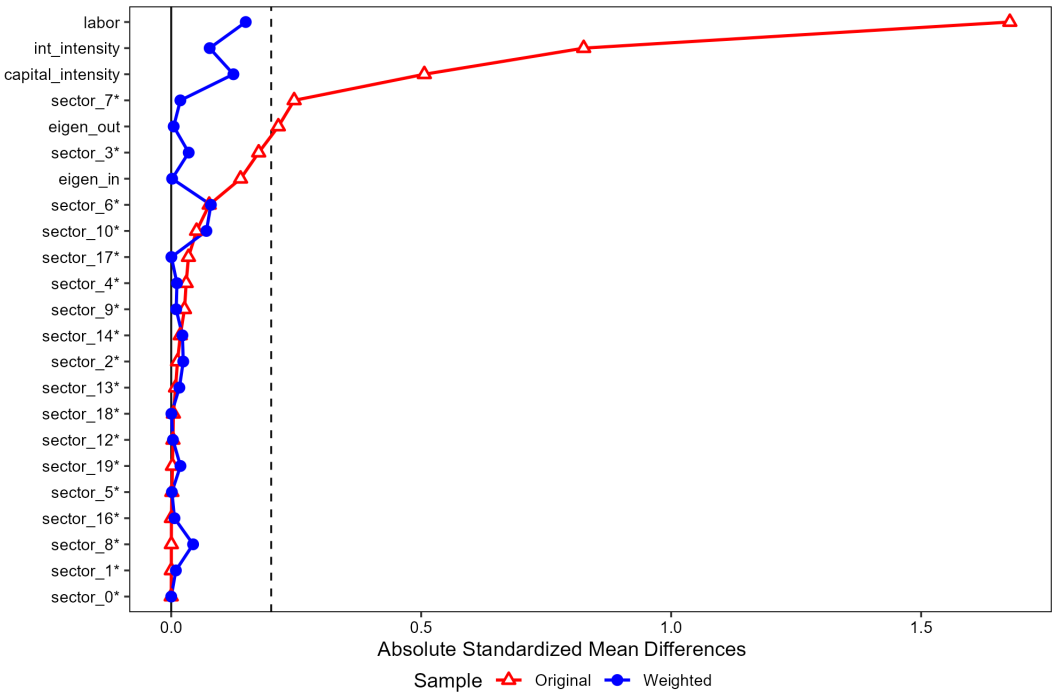
$$p_{g,o}\left(X_i\right) = \mathbb{P}\text{r}\left(G_{gi} = 1 \cap O_{oi} = 1 \middle| X_i\right).$$

Estimation is based on the sample analogue of the expression for $\text{ATT}_{IPW}(g,o,t)$, with the propensity score being specified as a logistic (logit) link function whose location parameter is a linear function of X_i and with a scale parameter normalized to unity. All instances of estimation of a propensity score $p_{g,o}\left(X_i\right)$ only involve treated (acquired) firms from cohort g and origin o, and never-treated ($C_i = 1$) firms.

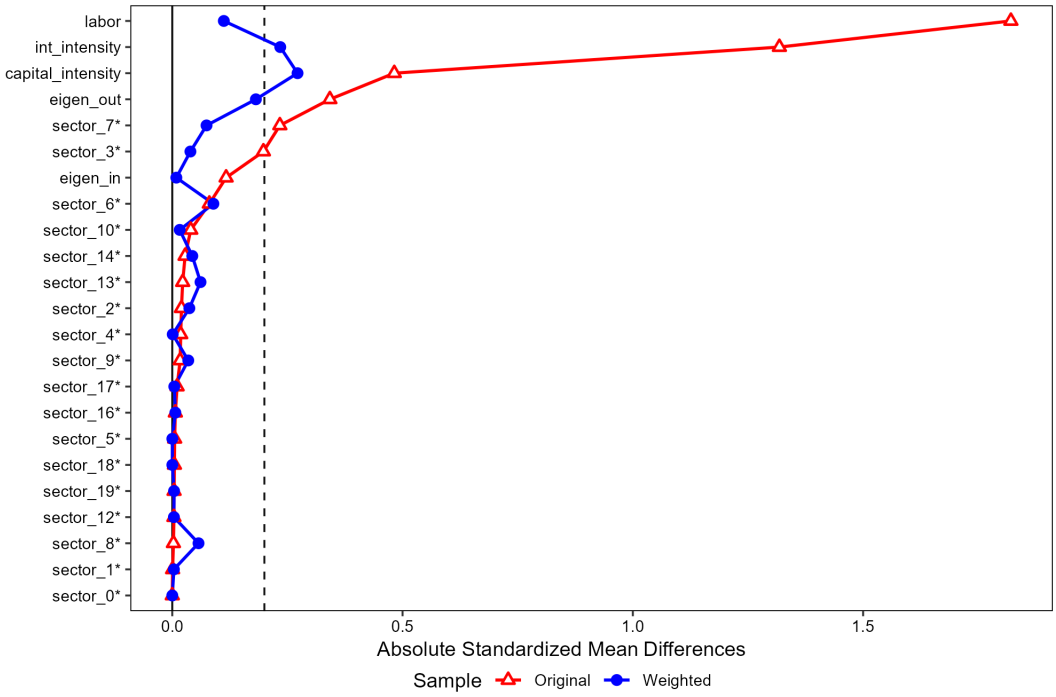
The aim of IPW is to weigh control observations so as to *ex post* achieve good covariate balance between treated and weighted-control samples. Absent any additional confounders, the ATT parameters can then be interpreted causally. Displaying covariate balance for each cohort and origin is, however, impractical. To show the propensity score's ability to achieve covariate balance, Figure A.1 reports "Love plots" which, following the statistical practice, provide an immediate visualization of both before- and after-weighting covariate balance in the case where *one single propensity score were estimated across all cohorts* g. In particular, for each covariate x_i they report values of the "absolute standardized bias" $\left|\bar{x}_1 - \bar{x}_0\right| / s_x$, where $\bar{x}_1$ and $\bar{x}_0$ are sample weighted means for the treated and control groups, and s_x is the pooled weighted standard deviation; weights are either equal to one (raw comparison) or to the propensity score. The two panels of Figure A.1 perform this exercise for both domestic and foreign acquisitions, and Figure A.2 repeats both exercises by accommodating minority acquisitions in the treated groups (as in Appendix B). The Love plots display a remarkable ablity of propensity-score reweighting at shrinking the absolute standardized bias for the most offending covariates, especially size, capital, and network centrality measures.

FIGURE A.1: Covariate balance: love plots (control acquisitions)

(A) Domestic firms



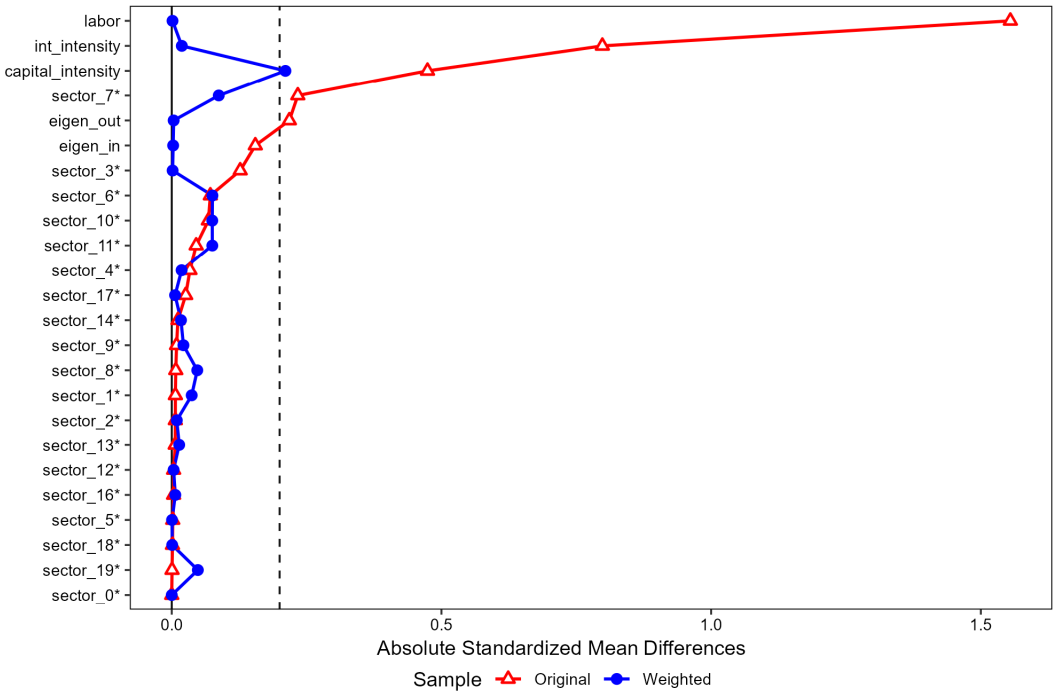
(B) Foreign firms



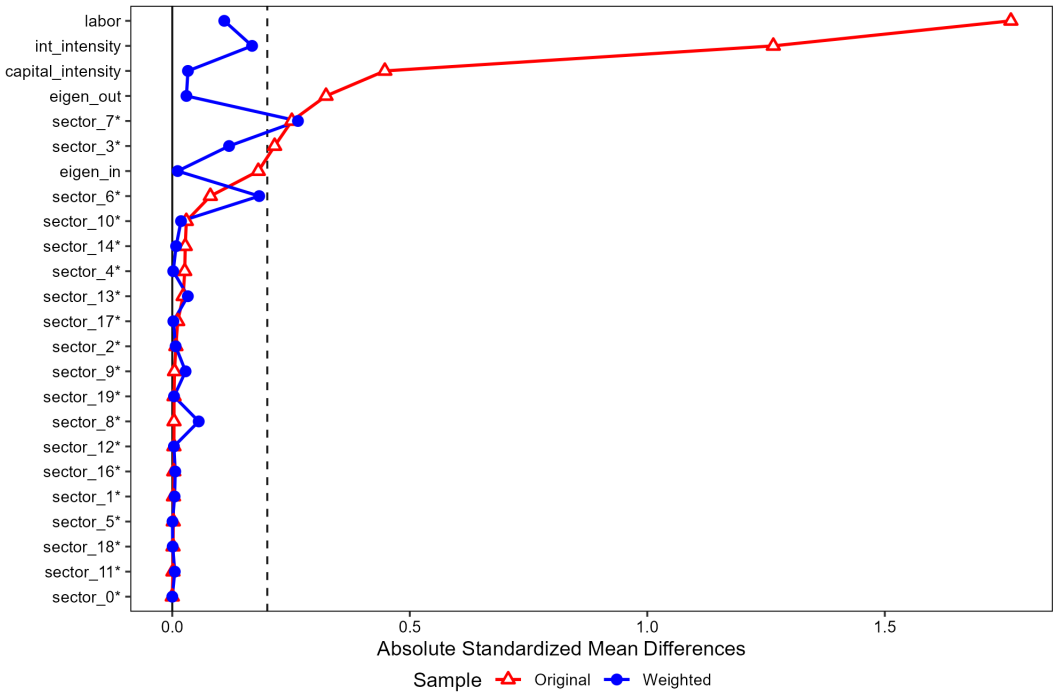
Note. This figure displays "Love plots" that report the absolute standardized mean difference between the treated and control group for each covariate in X included in our empirical analysis. The two plots are displayed separately for domestic *control* acquisitions (panel A) and foreign *control* acquisitions (panel B). In panel A, the *original* sample (red lines) excludes foreign acquisitions, and vice versa in panel B. Non-control acquisitions are removed throughout. In both panels, the *weighted* sample (blue lines) is obtained by inversely weighting control observations by their propensity score estimates based on pre-treatment characteristics. Source: *Sanayi ve Teknoloji Bakanlığı* (Turkish Ministry of Industry and Technology).

FIGURE A.2: Covariate balance: love plots (all acquisitions)

(A) Domestic firms



(B) Foreign firms



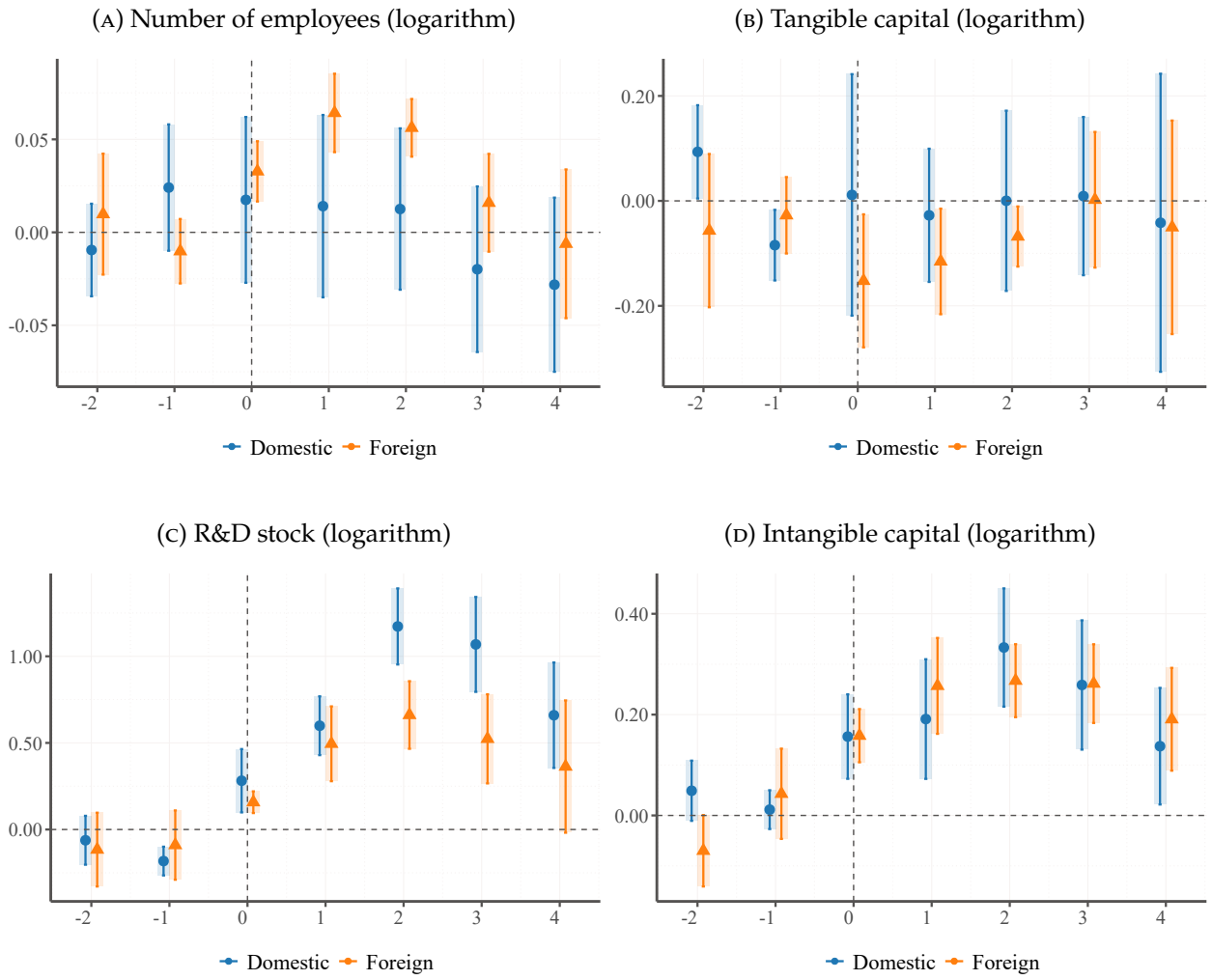
Note. This figure displays "Love plots" that report the absolute standardized mean difference between the treated and control group for each covariate in X included in our empirical analysis. The two plots are displayed separately for *all* domestic acquisitions (panel A) and *all* foreign acquisitions (panel B). In panel A, the *original* sample (red lines) excludes foreign acquisitions, and vice versa in panel B. In both panels, the *weighted* sample (blue lines) is obtained by inversely weighting control observations by their propensity score estimates based on pre-treatment characteristics. Source: *Sanayi ve Teknoloji Bakanlığı* (Turkish Ministry of Industry and Technology).

B Results involving minority acquisitions

In addition to the main estimates reported in the paper, we also performed estimates where the definition of treated/acquired firm accommodates *minority* or partial acquisitions that do not result in full control of the target firm. The latter implication makes any interpretation of the results harder to motivate through shifts in firm strategy or decisions, which is why this paper focuses on control acquisitions. We find it nevertheless interesting to review this extended set of results. Any (brief) discussion in this appendix focuses on the (few) differences between these results and the main ones based on control acquisitions only.

Direct effects on target firms. Figure A.3 reports results on size (employees) and capital usage for the target firms: it corresponds with Figure 2 in the main text. Compared to it, any arguable effect on tangible capital for domestic acquisitions vanishes, though domestically acquired minority firms also appear to report a more dramatic increase in their R&D stock.

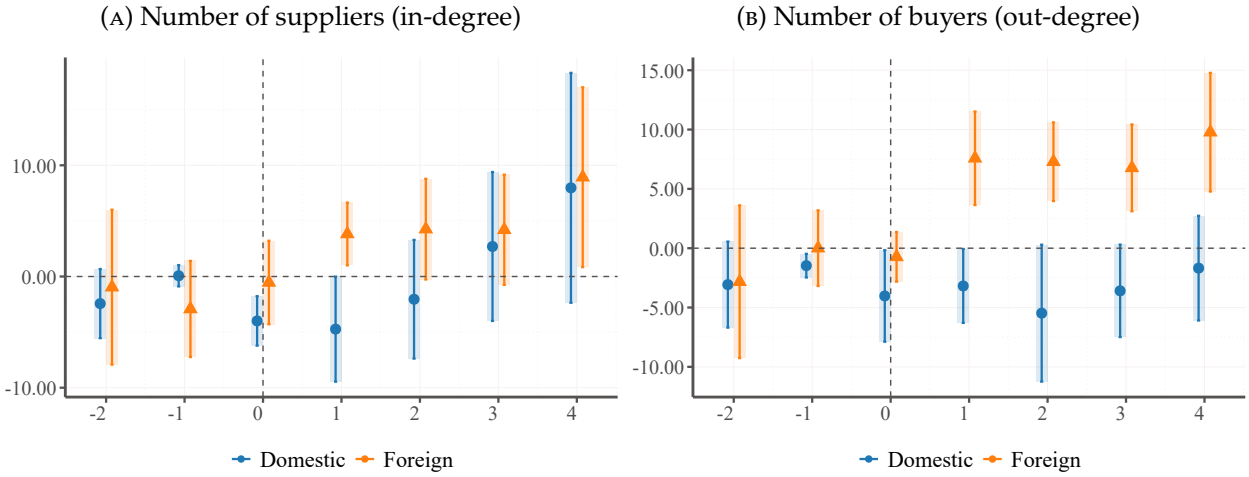
FIGURE A.3: Effects on the acquired firms (all acquisitions): input usage



Note. See the notes to Figure 2. This figure differs from Figure 2 as the definition of treatment encompasses all acquisitions (not just control acquisitions) whether domestic or foreign.

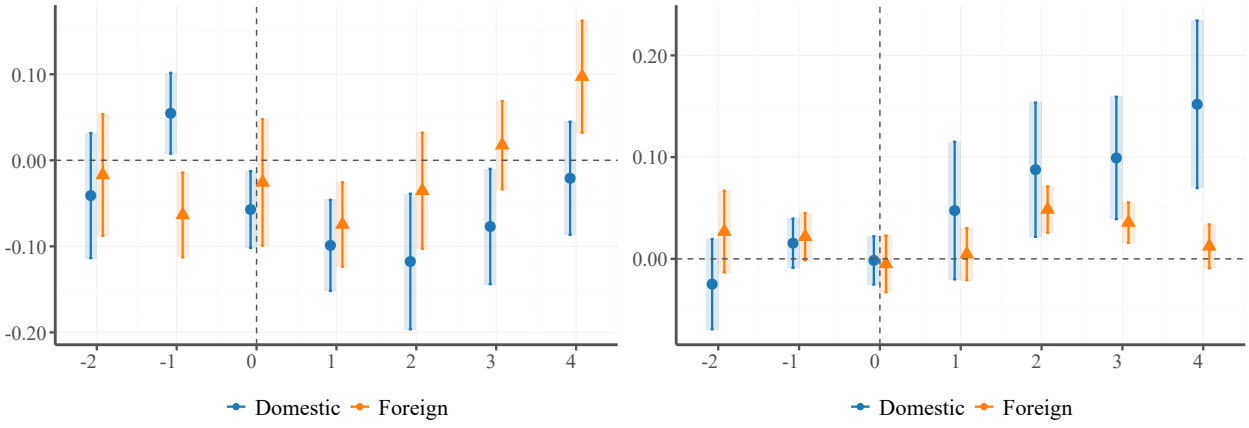
Figure A.4 is about the effects on network connections (in-degree and out-degree) and it corresponds with Figure 3 in the main text. The notable difference is that both types of network connection appear to *decrease* for domestically acquired firms, though statistical significance is questionable. Figure A.5 reports effects on our two performance measures (proxies for labor productivity and markups) and the results appear mixed: in the domestic acquisitions case, labor productivity appears to decrease while markups appear to increase. A tentative interpretation is that minority domstic acquisitions tend to target firms that reorganize themselves by relying relatively more on in-house production and intangibles. As we discussed in the main text, the results on our markup proxy cannot be extrapolated any further.

FIGURE A.4: Effects on the acquired firms (all acquisitions): network connections



Note. See the notes to Figure 3. This figure differs from Figure 3 as the definition of treatment encompasses all acquisitions (not just control acquisitions) whether domestic or foreign.

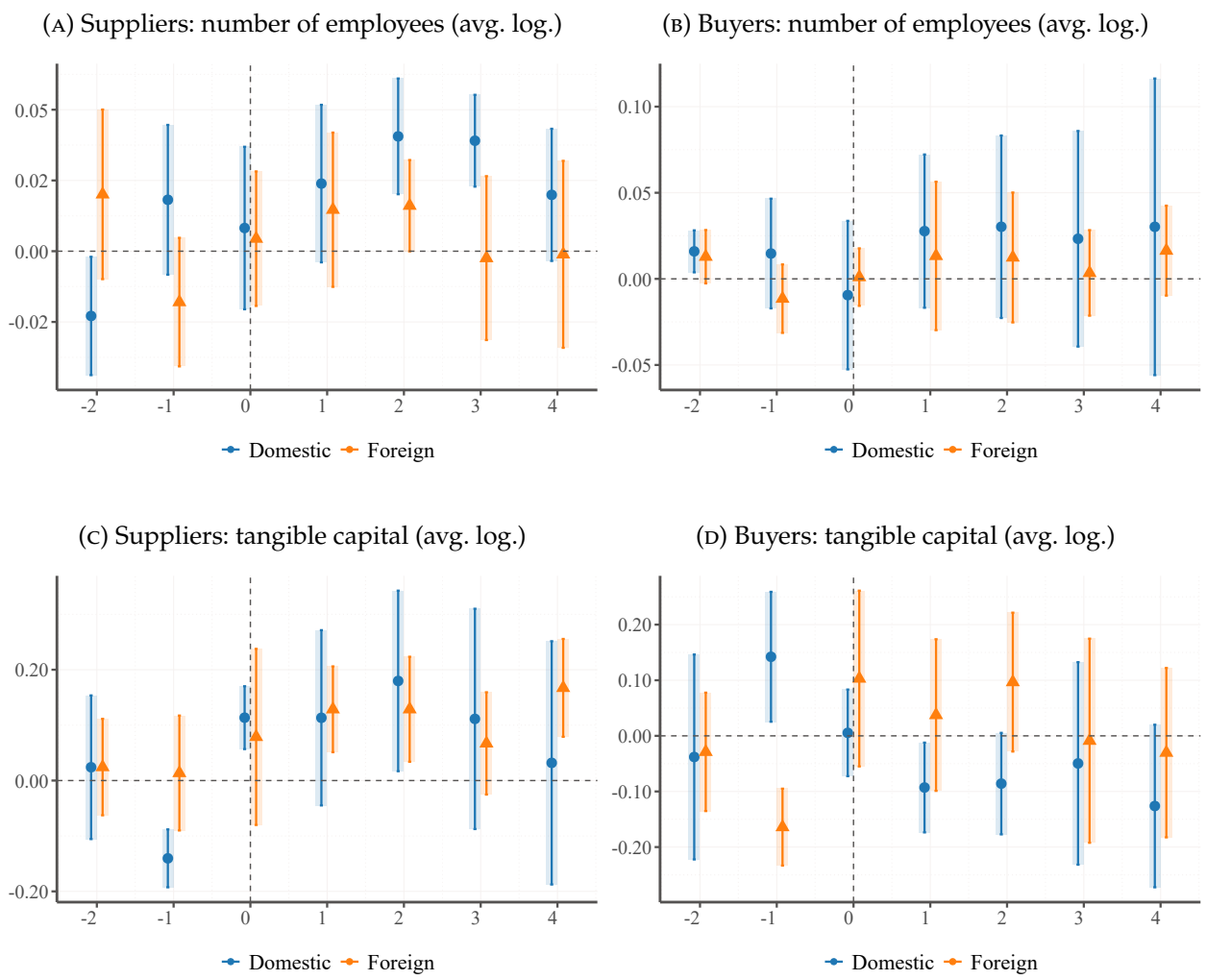
FIGURE A.5: Effects on the acquired firms (all acquisitions): performance



Note. See the notes to Figure 4. This figure differs from Figure 4 as the definition of treatment encompasses all acquisitions (not just control acquisitions) whether domestic or foreign.

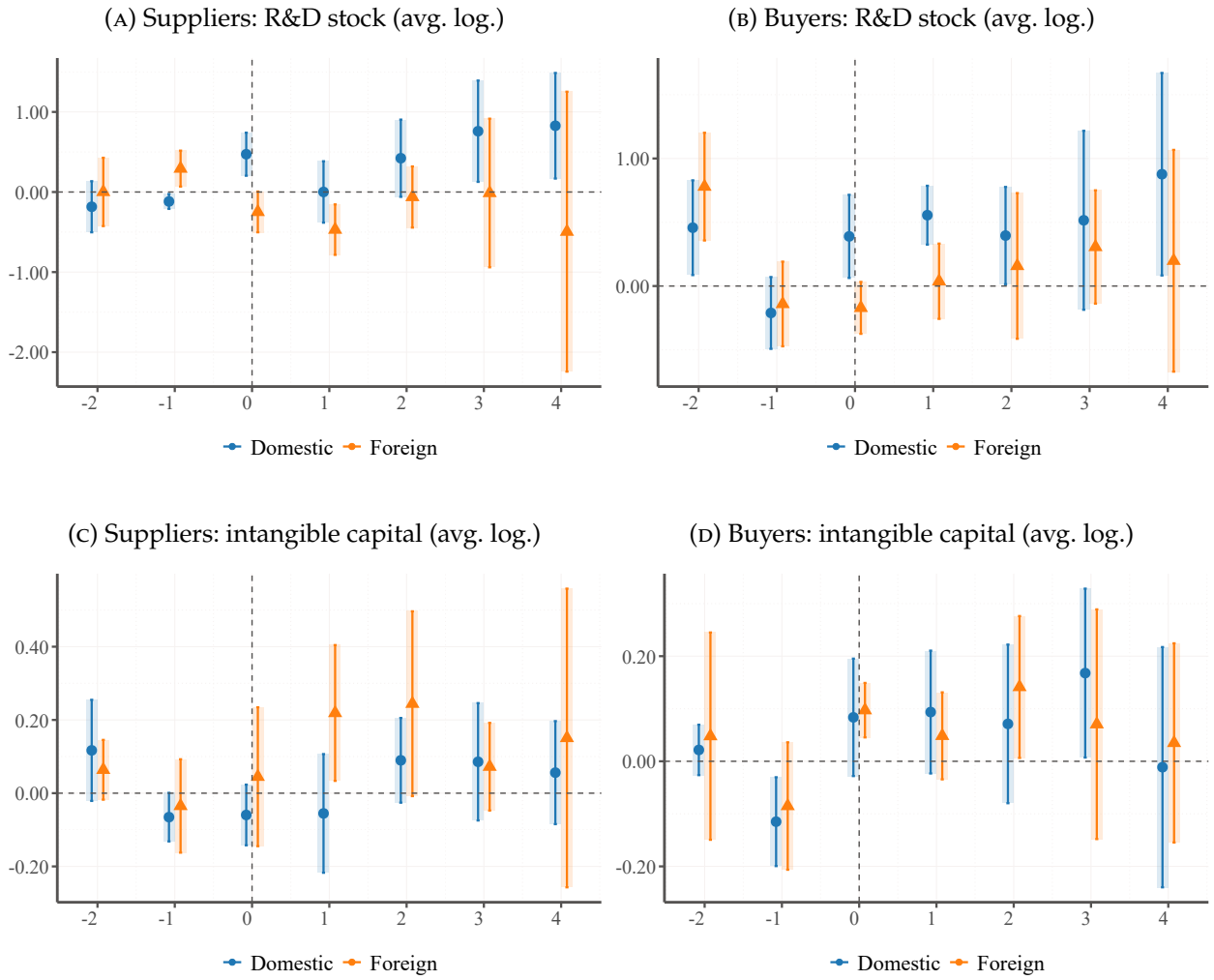
Network effects. Figures A.6 and A.7 report results on the average log-size and capital usage among suppliers and buyers of all target firms, minority acquisitions included. They correspond with 5 and 6, in the main text, respectively. There are no remarkable differences with respect to the main results. However, suppliers of domestically acquired firms appear to be somewhat more capital-intensive, as they register some (statistically noisy) positive effects on the average logarithm of tangible capital, as well as hints of a positive trend in their R&D assets. These findings complement those from the direct effects on target firms: a tentative explanation is that an outsourcing mechanism, analogous to the one we argued for foreign control acquisitions in the main text, may be at work. However, this begs the question of why would this mechanism not operate only for domestic control acquisitions. We plan to explore this and other hypotheses in future work.

FIGURE A.6: Effects on the acquired firms' networks (all acquisitions): conventional inputs



Note. See the notes to Figure 5. This figure differs from Figure 5 as the definition of treatment encompasses all acquisitions (not just control acquisitions) whether domestic or foreign.

FIGURE A.7: Effects on the acquired firms' networks (all acquisitions): intangible assets

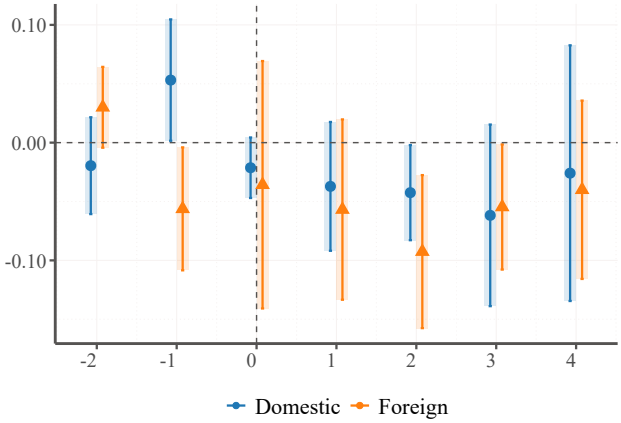


Note. See the notes to Figure 6. This figure differs from Figure 6 as the definition of treatment encompasses all acquisitions (not just control acquisitions) whether domestic or foreign.

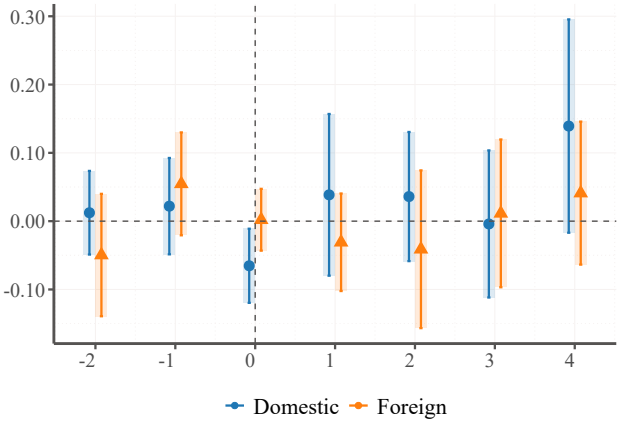
Lastly, Figure A.8 reports results for the productivity and markup proxies in the network (it corresponds with Figure 7 in the main text). These results are notable for two reasons. On the one hand, the labor productivity of all suppliers appears to decrease. On the other hand, the average markup proxy registers, relative to the control acquisitions benchmark, *even more markedly* positive effects for both buyers and suppliers, especially in the case of domestic acquisitions.

FIGURE A.8: Effects on the acquired firms' networks (all acquisitions): performance

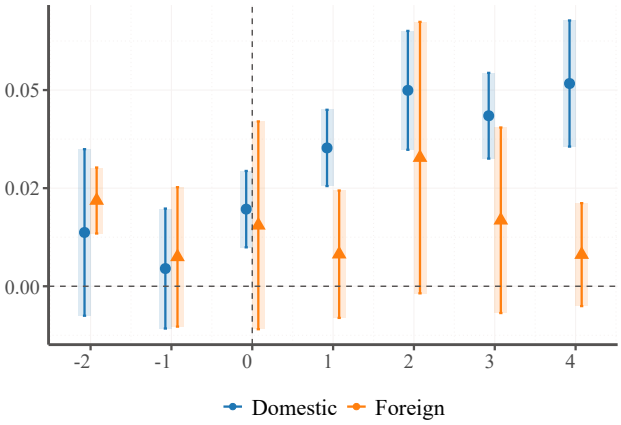
(A) Suppliers: revenue per worker (avg. log.)



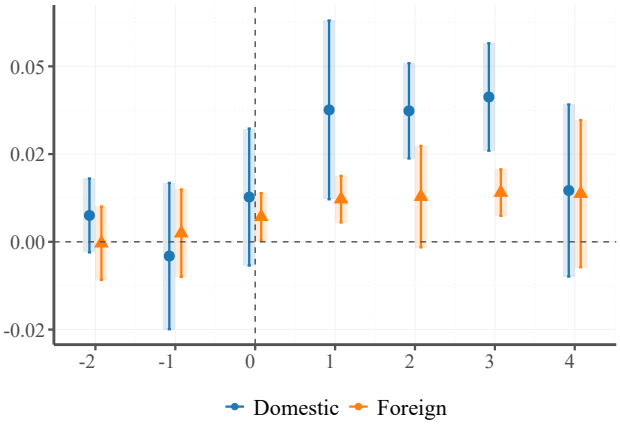
(B) Buyers: revenue per worker (avg. log.)



(C) Suppliers: revenue over cost of goods (avg. log.)



(D) Buyers: revenue over cost of goods (avg. log.)



Note. See the notes to Figure 7. This figure differs from Figure 7 as the definition of treatment encompasses all acquisitions (not just control acquisitions) whether domestic or foreign.