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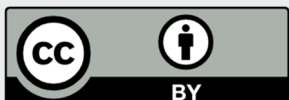
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Abstract

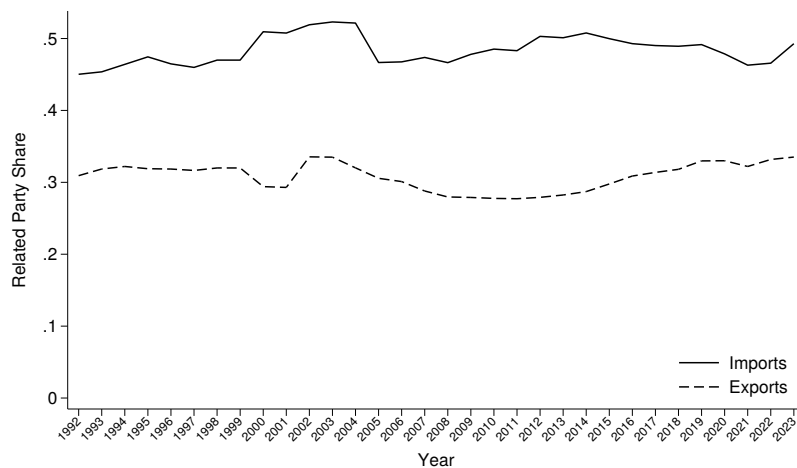
We leverage newly linked data from the U.S. Census Bureau and the U.S. Bureau of Economic Analysis to study transactions within U.S. multinational enterprises (MNEs). We show that using administrative data on intrafirm trade allows us to correct for measurement error in survey data and to identify the positive relationship between input-output (IO) linkages and the probability of trade between U.S. parents and their foreign affiliates. We also document the prevalence of intrafirm trade: more than half (three-quarters) of affiliates worldwide (in North America) export to or import from their U.S. parent. Our findings provide strong empirical support for traditional theories of firm boundaries that predict trade between vertically linked units of the same firm, and underscore the importance of accounting for the trade frictions that shape MNEs' regional supply chains.

JEL Codes: D23, F14, F23, F4, L20

Keywords: Multinational enterprises, Intrafirm trade, Input-output linkages

Recent decades have seen the emergence of global supply chains (e.g., Johnson and Noguera, 2012; Antràs and Chor, 2013). Multinational enterprises (MNEs) have played a key role, fragmenting different stages of their production processes across their subsidiaries in different countries. This results in intra-MNE trade flows in both intermediate and final goods. For example, General Motors (GM) has established several assembly plants in Mexico that produce cars using engines made in GM plants in the United States; and several vehicle models are then exported from GM’s Mexico plants to the United States (Head, Mayer and Melitz, 2024). The importance of trade within multinational production networks is reflected in its share of aggregate trade flows: intra-MNE transactions account for about half of U.S. goods imports and about a third of U.S. goods exports (Figure 1).¹

Figure 1. U.S. Related Party Imports and Exports, 1992-2023



Notes: This figure plots related party imports (exports) as a share of total U.S. imports (exports) using U.S. Census Bureau Related Party Trade Database (U.S. Census Bureau, 2025b).

We study trade flows within U.S. MNEs using unique new data that combine the complete mapping of multinational production networks with customs records on all U.S. merchandise trade transactions. We provide strong empirical support for traditional theories of firm boundaries, which predict that, conditional on integration, firms should utilize inputs produced within their boundaries, leading to observable trade flows between vertically linked production units of the same firm.²

¹This figure is based on public-use data on related-party trade published by the U.S. Census Bureau, which are jointly reported for U.S. and foreign MNEs.

²Since Coase (1937)’s seminal work, a large literature in organization economics has studied firms’ vertical integration decisions. Traditional theories of firm boundaries emphasize various benefits of integration, such as reducing transaction and adaptation costs (Williamson, 1971, 1975), mitigating opportunism (Klein et al., 1978), enhancing multi-tasking incentives (Holmström and Milgrom, 1991), aligning control with incentives

Influential work by Atalay, Hortaçsu and Syverson (2014) (henceforth AHS) and Ramondo, Rapoport and Ruhl (2016) (henceforth RRR) found little evidence of intrafirm trade flows for U.S. firms. Both studies rely on intrafirm trade data collected from surveys:³ AHS use the U.S. Commodity Flow Survey to study trade between different establishments of U.S. firms, while RRR employ survey data from the U.S. Bureau of Economic Analysis (BEA) on trade within U.S. multinational enterprises. Two puzzling findings emerge. First, while vertical linkages matter for integration choices, they do not affect intrafirm trade: the input–output (IO) coefficient linking the industries of operation of parents and affiliates does not predict whether they trade with each other. Second, intrafirm trade is sparse: almost one-half of upstream U.S. establishments do not report making shipments inside their firms, and the median foreign affiliate ships nothing to the rest of the corporation.

These findings challenge prevailing theories of firm boundaries, which posit that ownership should facilitate intrafirm transfers of inputs. In the words of AHS, “if firms do not own upstream and downstream units so the former can provide intermediate materials inputs for the latter, why do they?” Their answer is that ownership enables “the efficient transfer of intangible inputs,” a rationale “consistent with small amounts of shipments within vertically structured firms, and even with an absence of internal shipments altogether” (p. 1121).

We reassess the evidence using administrative data on intrafirm trade (customs records) from the U.S. Census Bureau combined with data on multinational production network from the U.S. Bureau of Economic Analysis (BEA). This linked dataset allows us to correct for measurement error in survey data on intrafirm trade.⁴

We measure intra-MNE trade using customs records from the U.S. Census Bureau’s Longitudinal Firm Trade Transactions Database (LFTTD).⁵ This dataset covers the universe of U.S. merchandise trade transactions, including those between multinational parents and

(Grossman and Hart, 1986; Hart and Moore, 1990), and improving coordination (Hart and Holmström, 2010). The insights of these theories have been extended to MNEs (e.g., Helpman, 1984; Antràs, 2003; Antràs and Yeaple, 2014).

³Data on the universe of intrafirm trade flows are not widely available. For select countries, data from value-added tax (VAT) declarations allow observing transactions within domestic production networks. For example, data on firm-to-firm transactions are available for Belgium (e.g., Bernard et al., 2022), Chile (e.g., Arkolakis et al., 2023), and Turkey (e.g., Demir et al., 2009). However, these data provide information on the value of the transactions, not on what is being traded. Moreover, intrafirm transactions can only be observed if different establishments of the same firm have different VAT identifiers.

⁴“Administrative data refers to data collected and maintained by federal, state, and local governments, as well as some commercial entities” and is “collected and maintained by agencies or firms are used to administer (or run) programs and provide services to the public” (U.S. Census Bureau, 2025a).

⁵The ability to combine data from the U.S. Census Bureau and the BEA is made possible by an inter-agency agreement between the institutions. To link these datasets, researchers have developed crosswalks between firm identifiers used in the BEA data and the firm identifiers in the Census Bureau’s Business Register used in customs records (Kamal et al., 2022).

their affiliates, defined as related-party trade. We link LFTTD to comprehensive data from BEA on the production networks of U.S. MNEs. We also utilize the supply and use tables published as part of BEA’s Input-Output accounts to measure vertical linkages between industries.

Customs transaction records enable us to correct different types of measurement error that arise when using BEA survey data on goods trade flows between multinational parents and their affiliates.⁶ First, *some transactions may not be recorded* in the BEA’s survey (e.g., due to interviewer’s or respondent’s error or imperfect recall). As a result, researchers may erroneously infer a lack of intra-MNE trade flows. By contrast, LFTTD is based on administrative customs records; we can thus observe *all transactions* between a parent and its foreign affiliates, which allows us to correct false 0’s in intra-MNE trade. Relatedly, the BEA foreign direct investment surveys only collect data on intrafirm trade for affiliates *above a certain size threshold*, such that intrafirm trade information for smaller affiliates is missing.⁷ There is *no reporting threshold* for U.S. traders in the LFTTD, thus providing information on transactions between U.S. parents and *all* of their foreign affiliates. Second, the BEA’s survey reports the *total* value of trade between a parent and its affiliate. In the absence of more detailed information, researchers are forced to allocate all trade flows to the affiliate’s main industry. In turn, this generates two empirical challenges. First, researchers may erroneously infer intra-MNE trade flows involving the affiliate’s primary industry. Second, they may disregard trade flows involving the affiliates’ other industries. LFTTD records trade flows at the detailed product level, making it possible to observe the *specific industries* in which a parent trades with its foreign affiliates. This allows us to correct both false 1s (in the affiliate’s primary industry) and missing values (in the affiliate’s other industries).

It is well known that measurement error in a binary dependent variable is a form of non-classical measurement error, which leads to biased estimates (e.g., Aigner, 1973; Bollinger, 1996; Meyer and Mittag, 2017). Our results indicate that misclassification in BEA survey data on intrafirm trade (false 0s, false 1s, missing values) leads both to attenuation and higher error variance, making it harder to identify the role of IO linkages: after correcting each type of measurement error, the point estimate of the IO linkage measure becomes increasingly larger and more precisely estimated.

⁶Ruhl (2015) points to measurement error as a possible source of the discrepancy between aggregate statistics on intra-MNE trade based on Census customs records and those based on BEA survey data. He shows that during 1992-2012, intra-MNE import shares remained flat (at around 45%) in the Census data, while they trended down (ending at around 35%) in the BEA data. As he underscores, understanding the role of measurement error in explaining this gap requires studying the underlying confidential microdata.

⁷The threshold is based on assets, sales, or net income (loss) greater than \$25 million.

By replacing survey data on intra-MNE trade with administrative data, we can thus overturn the first puzzle concerning the role of vertical linkages: the IO coefficient linking the industries of operation of parents and affiliates *do* predicts the extensive margin of trade between them. In our baseline specification, a 10 percentage point (pp) increase in the IO linkage increases the probability that the parent imports from (exports to) foreign production units by 29% (21%) relative to the average probability of intra-firm trade in our data.

We also qualify the second puzzle concerning the sparsity of intrafirm trade. As mentioned above, previous studies document that almost one-half of upstream U.S. establishments do not report making shipments inside their firms, and the median foreign affiliate ships nothing to the rest of the corporation. These results have been interpreted as evidence of a “lack of physical shipments linking sites within the multiplant firm” and a “similar lack of shipments across sites within U.S. multinational firms,” providing a rationale for theories of the firm in which ownership is driven by transfers of intangibles (Bilir and Morales, 2020).

Using our newly linked survey and administrative data, we document that more than half of all foreign affiliates trade with their U.S. parents (53% in 2004, 57% in 2019). The prevalence of intrafirm trade increases significantly once we account for the regional nature of MNE’s supply chains: when focusing on production units in North America, we find that three-quarters of them (73%, in both 2004 and 2019) trade with their U.S. parents. This is not surprising, given that multinationals tend to organize their production along regional supply chains, described as “Factory North America,” “Factory Europe,” and “Factory Asia” (Baldwin, 2013).⁸ Trading with foreign affiliates in nearby countries involves lower transport and communication costs compared to affiliates in more distant countries (Keller and Yeaple, 2013). In the case of U.S. multinationals, trading with affiliates in Canada and Mexico also involves lower tariffs, conditional on complying with the rules of origin of the North American Free Trade Agreement (NAFTA), which entered into force in 1994 and was replaced by the United States-Mexico-Canada Agreement (USMCA) in 2020 (Conconi et al., 2018).

These statistics should be considered lower bounds of the share of affiliates trading with their parents, for two reasons. First, they are based on direct exports and imports between affiliates and their parents; trade flows that go through other affiliates or third-party firms cannot be traced in our data. Second, administrative customs records do not account for intra-MNE trade flows in all industries.⁹

⁸For example, Head et al. (2025) show that U.S. MNEs in the motor vehicles industry own vertically related plants in many countries around the world, but mostly source inputs from their North American subsidiaries for production in North America.

⁹LFTTD does not cover trade flows in services. Moreover, when looking at parents’ related-party exports, we cannot account for parents’ related-party exports in all of their affiliates’ manufacturing sectors.

The finding that three-quarters of affiliates in North America trade with their parent suggests that U.S. tariffs can be extremely disruptive for U.S. MNEs, particularly when applied to regional trading partners. Indeed, U.S. automakers with extensive North American supply chains have advocated for the easing of the 2025 U.S. tariff increases on imports from Canada and Mexico (Wall Street Journal, 2025).

This is the first paper to combine data on the production network of U.S. multinationals with U.S. customs records to study the relationship between input-output linkages and intra-MNE trade flows and to document a regional bias in these flows.¹⁰ Our analysis is related to a series of recent papers that have used administrative data on intrafirm trade from other countries. Using customs data from France, Berlingieri et al. (2021) examine the relationship between input-output linkages and the intensity of intra-MNE flows. They find that French MNEs tend to source technologically more important inputs from affiliated parties.¹¹ Using firm-to-firm data for India and South Korea, respectively, Garg et al. (2023) and Hong (2021) document the prevalence of transactions within domestic multi-plant firms. Garg et al. (2023) find that around 40% of products are sourced by establishments exclusively from within the firm when a vertically integrated supplier exists. Hong (2021) finds that almost 90% of all manufacturing firms report either sales to or purchases from a related party. These findings contrast with those of AHS based on survey data on trade within multi-plant firms in the United States.

¹⁰Building on Kamal et al. (2022), Antràs et al. (2024) also link MNE production networks to customs records to examine patterns in U.S. parents' trade with both affiliated and unaffiliated parties to rationalize these patterns in a model featuring fixed costs of sourcing and sales that are shared across MNE's plants.

¹¹The authors examine how input-output linkages affect the intensity of French MNEs' imports from affiliated versus unaffiliated parties. We examine instead whether IO linkages predict the extensive margin of trade between U.S. multinational parents and their foreign affiliates.

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