Trade Imbalances and the Global Footprint of U.S. Multinationals*

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Abstract

Why does the U.S. run a persistent trade deficit in goods—and a growing surplus in services—in an era of global production? This paper examines the role of U.S. multinational corporations (MNCs) in shaping these imbalances. Using newly harmonized data covering the global operations of U.S. MNCs over four decades, we document a systematic reallocation of production and service delivery across borders. We show that the expansion of MNC activity is closely linked to the evolution of the U.S. external balance: trade deficits in goods are disproportionately associated with rising foreign production and sourcing by U.S. firms, while surpluses in services grow alongside the outward delivery of digital and intangible-intensive activities. Yet the observed goods deficit is not driven by trade directly conducted by U.S. MNCs—whether through intra-firm transactions or through U.S. parents and affiliates trading with unaffiliated firms. Rather than reflecting the global footprint of U.S. MNCs, the goods trade deficit primarily captures imports by domestic firms with no foreign presence and by the U.S. affiliates of foreign multinationals. Its structure nonetheless mirrors the production networks and sourcing patterns shaped by U.S. firms as they reorganize activity across borders.

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1 Introduction

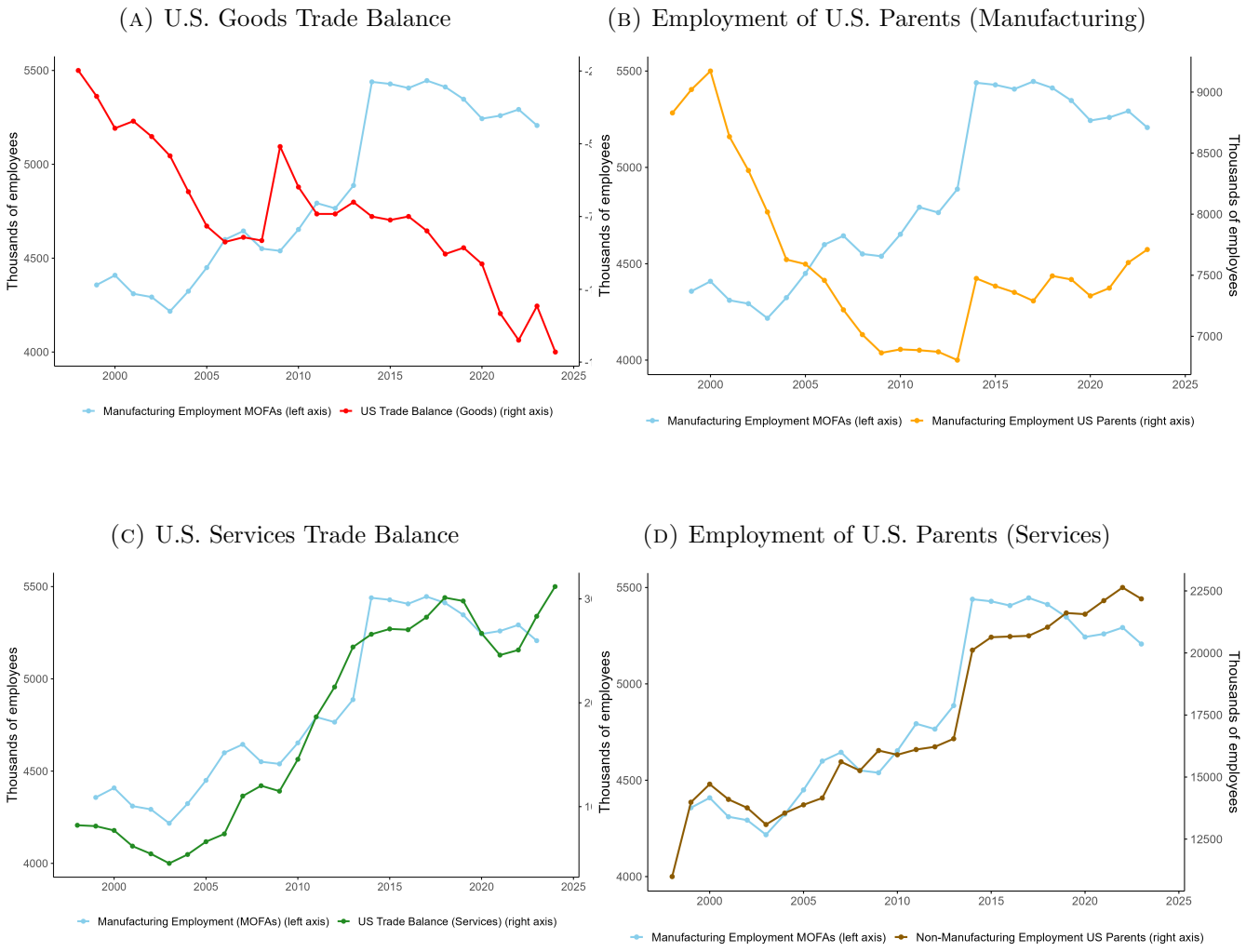
The persistent U.S. trade deficit in goods—and the parallel rise of the services surplus—has long fueled debate over the sustainability and sources of external imbalances.[1] Macroeconomic explanations remain central: fiscal expansions, low national savings, and excess global demand for U.S. assets are frequently cited as the structural forces behind these patterns. Yet such accounts often abstract from the decisions of the firms that actually produce, invest, and trade. This paper argues that the organizational choices of U.S. multinational corporations (MNCs)—where they produce, how they structure supply chains, and what they export—play a first-order role in shaping the composition and evolution of U.S. trade flows.

We focus on a central but underexplored pattern: the global expansion of U.S. MNCs is systematically linked to the composition of the U.S. trade balance. In goods-producing sectors, especially manufacturing, U.S. firms have increasingly shifted production stages abroad—either to their own affiliates or to foreign suppliers—with final goods imported back into the U.S. Over the same period, employment in domestic manufacturing within U.S. MNCs has declined, while their foreign affiliates have expanded abroad. This divergence in employment trajectories—falling at home, rising abroad—has unfolded in parallel with the persistent deterioration of the U.S. goods trade balance. Figure 1, Panels (A) and (B) bring these trends together, showing that the deepening deficit in goods has occurred alongside a sustained reallocation of multinational employment from U.S. parents to their affiliates overseas.

This divergence is even more striking when compared with the case of services, where both the trade balance and employment patterns have evolved in the opposite direction from manufacturing. The global expansion of U.S. MNCs has coincided not only with a growing goods trade deficit but also with a sizable and sustained surplus in services. While manufacturing employment has shifted abroad and declined among U.S. parents, domestic employment in services has nearly doubled over the same period. Figure 1, Panels (C) and (D) highlight this divergence. In services, foreign expansion has been accompanied by increased service production at the parent level, particularly in activities such as R&D, design, and engineering. These functions are likely to be central in supporting and coordinating operations abroad, and may also contribute to the strength of the U.S. services trade balance.

[1] Over the past four decades, the U.S. goods trade deficit has increased by nearly $1 trillion—rising from around $100 billion in the early 1980's to over $1.05 trillion in 2023. During the same period, the services surplus grew from about $50 billion to nearly $280 billion. This widening gap between goods and services balances—now exceeding $1.3 trillion—translates into an overall trade deficit of roughly $780 billion in 2023. See Figure B.1.

FIGURE 1: U.S. Foreign Affiliates Employment and Trade Balances



Notes: This figure presents trends in manufacturing employment at foreign affiliates of U.S. multinationals alongside U.S. trade balances and parent employment. In all panels, the blue line represents manufacturing employment in majority-owned foreign affiliates (MOFAs) of U.S. multinationals—the same series is shown throughout for consistency. Panels (A) and (B) relate to goods trade and manufacturing employment; Panels (C) and (D) cover services trade and non-manufacturing employment. Panels (A) and (C) plot the MOFA employment series (left axis, thousands) alongside the U.S. trade balance (right axis, billions of USD). Panels (B) and (D) compare MOFA employment with employment in U.S. parent firms (right axis) in the corresponding sector. Each series uses its own vertical axis to reflect differences in scale. Data are from the U.S. Bureau of Economic Analysis (BEA), 2000–2023.

Taken together, these patterns raise a central question: how does multinational production shape the U.S. goods trade balance—through both its direct footprint in trade flows and its influence on the structure of global sourcing? Using newly harmonized data, we document a set of stylized facts that reframe this debate. We distinguish between cross-border transactions conducted within multinational boundaries and those carried out through unaffiliated parties—a distinction often obscured in aggregate trade statistics. This proves critical. Although multinationals dominate total trade volumes, the bilateral goods deficit directly involving U.S. MNC parents or their foreign affiliates is remarkably small. In a direct accounting sense, the U.S. trade imbalance arises overwhelmingly from transactions between independent domestic firms and foreign suppliers. To our knowledge, this pattern has not been systematically documented in detail.[2] It suggests that the influence of multinationals is primarily indirect: shaping sourcing networks, displacing domestic production, and restructuring the geography of trade—even when their own cross-border imbalances are limited.

We show this by assembling a new panel dataset that tracks the global operations of U.S. MNCs by host country, sector, and year. This dataset is built from the public but fragmented archives of the Bureau of Economic Analysis (BEA), which provides detailed data on the activity of majority-owned foreign affiliates (MOFAs), including sales, employment, and trade. While the BEA data on MNCs is widely used as it provides rich information on foreign affiliates—covering activity by host country, sector, and year—its historical files are not in a research-ready format. Much of the challenge lies in changes in classification systems, reporting thresholds, and file structures over time. Reconstructing a coherent panel from 1983 to the present required addressing concordance issues across industry and country codes, as well as standardizing formats across legacy archives. The resulting dataset integrates affiliate-level sales, employment, and trade—disaggregated by intra-firm and arm's-length flows—thus enabling a novel and systematic view of U.S. MNCs in motion over four decades.

The empirical analysis proceeds in two steps. First, we quantify how the foreign footprint of U.S. MNCs relates to the composition of U.S. trade flows—distinguishing between intra-firm transactions, arm's-length trade, and unaffiliated activity. Second, we explore how shifts in the sectoral composition of multinational activity—both across and within countries—are reflected in trade outcomes. This approach allows us to connect macro-level external balances to micro-level reallocation decisions, shedding new light on the structural underpinnings of U.S. trade patterns.

[2] A notable exception is Flaaen (2014), who shows that in 2007, foreign multinationals accounted for over 27% of the total U.S. goods trade deficit, while U.S. multinationals recorded a small trade surplus.

A central motivation for our analysis is the growing disconnect between conventional trade statistics and the realities of global production. In goods, multinational firms increasingly fragment production across borders, organize complex value chains, and rely heavily on intra-firm trade. These patterns blur the meaning of gross exports and imports, as value-added is spread across multiple jurisdictions and intra-group transactions may reflect transfer pricing or internal cost allocation. In services, meanwhile, the rise of digital delivery, intellectual property licensing, and brand-based value creation has enabled U.S. firms to expand exports without shifting employment offshore. Yet as our decomposition shows, these patterns do not translate directly into trade deficits at the level of multinational transactions. Instead, they reshape the global sourcing environment in ways that shift the locus of recorded trade imbalances toward unaffiliated actors.

Our analysis connects to several strands of the literature on trade imbalances, multinational production, and the structure of foreign income. On the macro side, we build on classic frameworks that interpret trade balances as the outcome of saving-investment gaps (Lerner, 1936; Mundell, 1961), and on more recent work that embeds this logic within the global financial architecture. In this view, persistent U.S. trade deficits reflect the dollar's status as a reserve currency and the corresponding global demand for dollar-denominated assets (Lane and Milesi-Ferretti, 2018; Chinn and Ito, 2022; Atkeson et al., 2025). A complementary perspective emphasizes the role of excess foreign saving—so-called "global saving gluts"—that push capital into the U.S. and generate current account imbalances (Obstfeld and Rogoff, 2005; Bernanke, 2005; Blanchard et al., 2005; Caballero et al., 2008). However, as Obstfeld (2025) argues, these macro-financial explanations often fail to account for variation across time and across components of the current account: large deficits have coincided with domestic booms, fiscal expansions, and sectoral shocks, not just foreign saving pressures. What these approaches share is a macro-level abstraction from the structure of production and the organization of the firms that intermediate trade.

We shift the focus from macro aggregates to the firm-level structures that underlie them. A growing literature documents the dominant role of multinational corporations (MNCs) in global trade and investment (Bernard et al., 2018; Kamal et al., 2022). U.S. MNCs account for the majority of exports and imports, with intra-firm transactions representing a substantial share (Antràs, 2003; Antràs and Chor, 2013; Alviarez et al., 2022a,b; Alfaro et al., 2025). Empirical work has highlighted how firm boundaries affect trade margins, transfer pricing, and the allocation of income across jurisdictions (Alfaro et al., 2019; Guvenen et al., 2017; International Monetary Fund, 2019). Yet little is known about how these organizational patterns map into bilateral or aggregate trade balances. We contribute to this gap

by showing that, while MNCs dominate total trade volumes, the U.S. goods deficit emerges largely outside intra-firm flows—suggesting that multinational strategies shape trade indirectly through the production networks they configure. A related insight appears in Flaaen (2014), who documents that foreign multinationals import substantially more than they export, while U.S. multinationals tend to exhibit trade surpluses. We extend this evidence by tracing these asymmetries over four decades, across countries and sectors, and distinguishing intra-firm from arm's-length flows in a bilateral framework.

Our framework also relates to theories of foreign direct investment. In canonical models, horizontal FDI substitutes for trade by replicating production abroad to serve local markets, while vertical FDI fragments production internationally and complements trade flows (Markusen, 1984; Helpman, 1984; Markusen and Venables, 2000; Alfaro and Charlton, 2009). While these motives remain conceptually useful, real-world MNCs blend both forms across sectors and time. We remain agnostic about underlying intent, and instead use geographic and sectoral decompositions to trace the empirical links between multinational production and trade imbalances.

Finally, we relate to the literature on the U.S. net investment position and associated asymmetries. Despite having a negative net international investment position (NIIP), the U.S. has generally earned positive net investment income (Gourinchas and Rey, 2007; Lane and Milesi-Ferretti, 2007; Curcuru et al., 2008; Lane and Milesi-Ferretti, 2018; Engel and Wu, 2023; Jiang et al., 2021). This has been attributed, among others, to higher returns on U.S. outward FDI relative to foreign holdings in the U.S. While recent papers have documented the changing nature of U.S. international portfolios (Atkeson et al., 2025; Tabova and Warnock, 2025; Chari and Milesi-Ferretti, 2025), the dominance of Global Firms remains. The "dark matter" hypothesis (Hausmann and Sturzenegger, 2006) further suggests that unmeasured intangibles—management expertise, brand capital, and intellectual property—embedded in U.S. multinationals explain part of the external gap. We complement this work by showing how foreign service exports generated by MNCs map into recorded surpluses. The trends are consistent with the work by Ding et al. (2022) and the shift from manufacturing to services occurring both within firms and across firms.

By combining granular data with a reframing of the underlying mechanisms, we provide new evidence that U.S. trade imbalances are not solely a macro phenomenon but reflect the long-run reallocation of multinational production, and, in particular, how these firms have organized operations across borders. In doing so, the paper contributes to a growing literature that links micro-level firm behavior to aggregate trade outcomes.

The rest of the paper is organized as follows. Section 2 quantifies the contribution of U.S.

multinationals to the goods trade deficit by decomposing trade flows by firm type and partner affiliation, and documents cross-country asymmetries in MNC-related trade. Section 3 builds on these findings to ask whether U.S. affiliate activity abroad helps explain the evolution of the U.S. bilateral trade deficit. Using cross-country panel variation, we estimate whether increases in affiliate sales are systematically associated with changes in the U.S. trade balance. Section 4 turns to the global reallocation of production and service delivery, tracing how U.S. multinationals have shifted their footprint across sectors, countries, and time. Section 5 concludes. Additional robustness checks and extensions are reported in the Appendix.

2 Accounting for U.S. Multinationals in the U.S. Trade Deficit

We first analyze the direct contribution of multinational activity to the U.S. trade balance. Our analysis relies on a newly assembled panel that tracks the global operations of U.S. MNCs from 1983 to 2023, using detailed but historically fragmented data from the BEA public archives. Changes in classification systems, reporting thresholds, and file formats over time required harmonizing industry and country codes and standardizing legacy tables. The resulting dataset provides affiliate-level information on sales, employment, exports, and imports, disaggregated by host country, sector, and year. Trade flows are further broken down by transaction type, distinguishing between intra-firm and arm's-length operations. These concordances and a detailed description are available in Appendix A.[3]

2.1 U.S. Multinationals and the U.S. Trade Deficit

How much of the U.S. goods trade deficit can be directly traced to the cross-border activity of multinational firms? To address this question, we disaggregate total trade into flows that involve U.S. multinationals—both parent firms and their majority-owned foreign affiliates (MOFAs)—and those that do not.[4] This includes transactions by affiliates of foreign MNCs operating in the U.S. as well as purely domestic firms. While Section 3 examines broader channels through which multinational production reshapes trade patterns, the goal here is narrower: to assess, in a direct accounting sense, how much of the observed goods deficit

[3]The newly compiled dataset will soon be available on the authors' personal websites.

[4]In terms of US multinational activity abroad, BEA distinguishes between Majority-Owned Foreign Affiliates (MOFAs)—foreign businesses in which the combined ownership by one or more U.S. parents exceeds 50%—and minority-owned affiliaties—foreign entities in which a U.S. parent owns or controls, directly or indirectly, at least 10% of the business (and less than 50%). The main analysis centers around MOFAs, which dominate U.S. multinational activities abroad, accounting for about 96% of exports and 92% of imports, along with 85% of sales and 84% of employment. Their share of assets decreased after the GFC, from 91% to 84%. We perform additional analysis with all affiliates. See Figures B.2 and B.3 in the Appendix for a detailed comparison.

arises from each of these groups.

Panel A of Figure 2 shows U.S. exports (bars above the axis) and imports (below), broken out by firm type. Trade involving U.S. MNCs is shown in red; trade by other firms—including foreign MNCs and non-multinational domestic firms—is shown in blue. Several facts emerge. First, total trade volumes have expanded sharply since the early 1980s. Second, exports involving U.S. MNCs are large, often rivaling or exceeding those of non-MNCs, particularly before 2000. But the most striking pattern lies in the symmetry of MNC trade: their imports and exports move in parallel, generating a small and relatively stable trade deficit over time (solid red line). In contrast, trade related to Non-US MNCs is persistently unbalanced as their imports have grown faster than their exports, resulting in a widening trade deficit (solid blue line).

This asymmetry does not reflect superior export performance by U.S. MNCs. What distinguishes them is their import profile. Relative to their overall scale, US multinationals appear less dependent on imported inputs and final goods. That difference in composition, not any export edge, explains the divergence in trade balances.

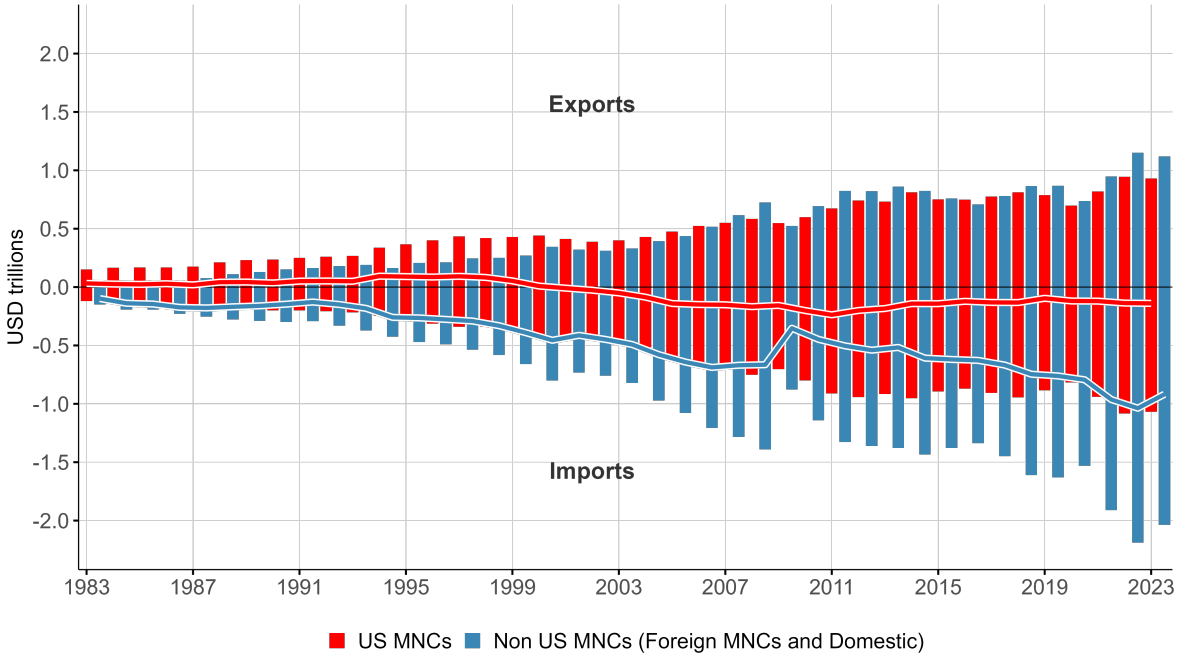
Panel B isolates trade involving U.S. foreign affiliates, excluding transactions between U.S. parent firms and unaffiliated foreign partners. Intra-firm trade—between U.S. parents and their affiliates—is shown in dark red, while other affiliate-related transactions appear in light red. As in Panel A, blue bars represent trade outside the U.S. MNC perimeter.

Three facts stand out. First, affiliate-based trade makes up about half of the total trade associated with U.S. MNCs, with the remainder driven by parents trading directly with unaffiliated firms. Second, the bulk of affiliate trade occurs within the boundaries of the firm itself, that is, between parents and their majority-owned affiliates abroad. Third, the affiliate component is consistently balanced over time. Neither intra-firm flows nor affiliate-level transactions with third parties contribute materially to the goods trade deficit. Instead, the modest imbalances attributed to U.S. MNCs in Panel A stem almost entirely from transactions between U.S. parent firms and unaffiliated suppliers. This highlights the limits of aggregate trade flows in capturing where imbalances truly originate.

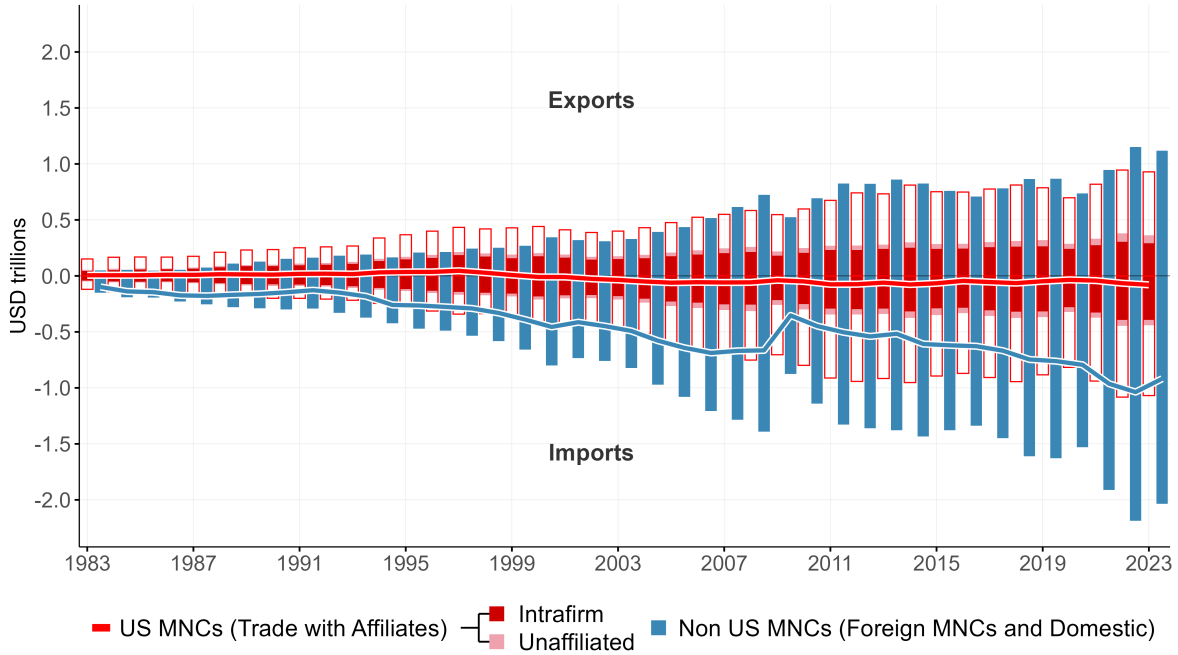
Taken together, these figures call for a reframing. The U.S. goods trade deficit is not, in a *direct accounting sense*, the result of intra-firm trade or transactions confined within multinational groups. Nor is it primarily driven by U.S. MNCs acting as dominant importers. Instead, the imbalance emerges from a broader landscape in which firms outside the US multinational perimeter import intensively and contribute disproportionately to the deficit. While U.S. MNCs are central to the reorganization of global production, their footprint in

FIGURE 2: Trade Balances Involving Multinationals: Broad vs. Narrow Definitions

(A) Parents and Foreign Affiliates



(B) Foreign Affiliates Only



Notes: This figure shows trends in manufacturing employment at U.S. multinationals and their foreign affiliates, alongside U.S. trade balances. In all panels, the blue line corresponds to manufacturing employment in majority-owned foreign affiliates (MOFAs) of U.S. multinationals—the same series is shown across panels for consistency. Panels (A) and (B) relate to goods trade and manufacturing employment; Panels (C) and (D) focus on services. Panels (A) and (C) plot MOFA employment (left axis) against the U.S. trade balance (right axis). Panels (B) and (D) compare MOFA and U.S. parent employment. Each series uses its own vertical axis. Data: U.S. Bureau of Economic Analysis (BEA), 2000–2023.

the recorded trade imbalance is indirect—shaping patterns that extend beyond their own transactions.

Yet the story of multinationals and the trade deficit does not end there. The next section turns to a different part of the multinational system: affiliates of foreign parents operating within the U.S., and the role they play in the composition and dynamics of U.S. trade.

2.2 Foreign (Non-US) Multinationals and the U.S. Trade Deficit

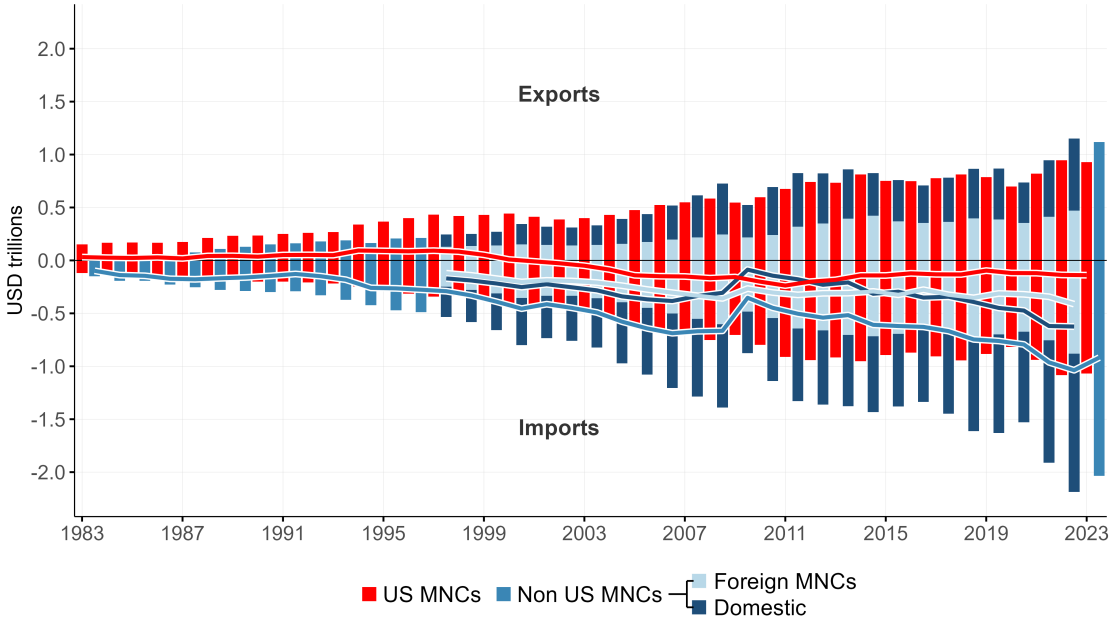
Affiliates of foreign multinational corporations operating in the United States, such as Toyota, BMW, Nestlé, or L'Oréal, play an important role in shaping the country's trade flows. Though headquartered abroad, these firms maintain production facilities and commercial operations within U.S. borders and are deeply integrated into global supply chains. Figure 3 dissects the U.S. goods trade balance by firm type. Panel A presents annual exports (above the horizontal axis) and imports (below), disaggregated by the type of firm involved in each transaction. Panel B shows the corresponding trade balances, where the total U.S. deficit appears in black. We distinguish three groups: U.S. multinationals (in red), foreign-owned affiliates operating in the United States (light blue), and purely domestic non-MNC firms (dark blue). The solid blue line aggregates the latter two, while the dashed lines decompose their individual contributions. The vertical distance between the black and blue lines reflects the portion of the trade deficit attributable to U.S. MNCs—relatively small and stable throughout the period.

Both groups contribute persistent trade deficits of comparable magnitude, underscoring that the bulk of the imbalance lies outside U.S. multinationals. But their recent trajectories differ. Over the past decade, imports by domestic firms have grown more rapidly, widening the dark blue deficit and increasing its weight in the overall imbalance. In contrast, the deficit associated with foreign MNCs has remained relatively stable. Foreign MNCs with operations in the US are typically established to serve U.S. consumers, not as export platforms. This distinction is crucial but often overlooked: while our main focus is on U.S. MNCs operating abroad, these inward affiliates represent the mirror image—foreign MNCs producing within the U.S. using imported inputs. Their production model relies heavily on imports of intermediate and capital goods for local assembly or manufacturing, but the final goods are mostly sold domestically. As a result, these affiliates generate large import flows without matching export flows, structurally contributing to the U.S. trade deficit.[5]

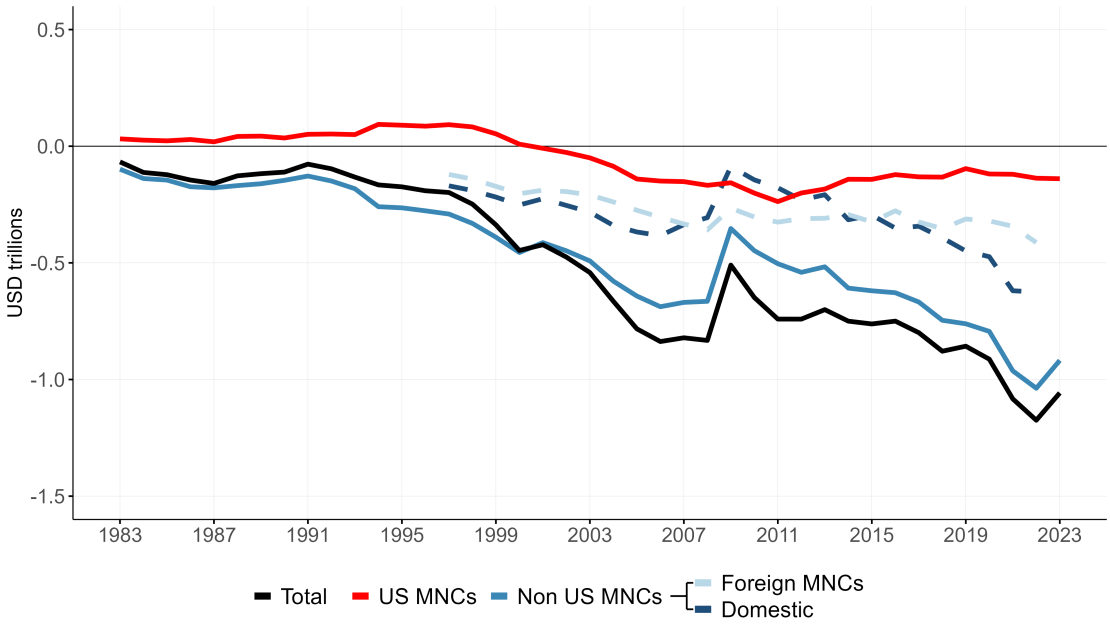
[5]There are important exceptions. For example, affiliates in the automotive sector—especially Japanese and German firms—export to nearby markets such as Mexico and Canada, facilitated by long-standing supply chain integration under the USMCA (formerly NAFTA). Still, the dominant pattern remains inward-facing.

FIGURE 3: Dissecting US Goods Trade Balance

(A) Trade by US MNCs, Foreign MNCs, and Domestic Firms



(B) Trade Deficit



Notes: This figure presents U.S. goods trade between 1983 and 2023, in billions of U.S. dollars, using data from the Bureau of Economic Analysis (BEA). Each bar represents annual exports (above the horizontal axis) and imports (below), disaggregated by firm and transaction type. Panel A shows in red the transactions involving U.S. multinational corporations (MNCs). The blue lines correspond to trade involving non-U.S. MNCs: light blue reflects transactions by foreign affiliates operating in the United States, while dark blue captures trade by firms that operate in a single country (non-MNCs or domestic firms). Panel B shows the trade deficit for each group, with dashed blue lines representing the components of the dark blue series. The total trade deficit is shown in black. All values are in nominal terms.

The incentives facing U.S. multinationals are structurally different. When operating abroad, U.S. parent firms tend to export intermediate goods embodying proprietary technology or upstream components not available locally (e.g., Keller and Yeaple, 2013; Irarrazabal et al., 2013). These exports often support affiliate production aimed at local consumption or third-market re-exports. In addition, U.S. MNCs export substantial volumes to unaffiliated firms abroad, particularly in sectors and destinations where direct exports are more profitable than serving the market through local affiliate operations.

This is not to suggest that U.S. MNCs are irrelevant to the trade deficit. On the contrary, their influence may be more structural than direct. Through global sourcing decisions, supplier realignment, and the offshoring of production stages, U.S. multinationals reshape the geography of trade in ways that may not appear in their own trade flows. Imports conducted by non-U.S. MNCs can still reflect the organizational footprint of U.S. multinationals, even if not their immediate transactions. The figures above therefore underscore the importance of distinguishing between where trade imbalances are recorded and where they are ultimately shaped.

2.3 Tracing Imbalances: Bilateral Trade and the Footprint of U.S. MNCs

Aggregate patterns can obscure the origins of trade imbalances. While Section 2 shows that deficits directly tied to U.S. multinationals are limited—negligible in intra-firm transactions and modest even when including U.S. parents' arm's-length trade—a bilateral lens can expose asymmetries that disappear in the aggregate.

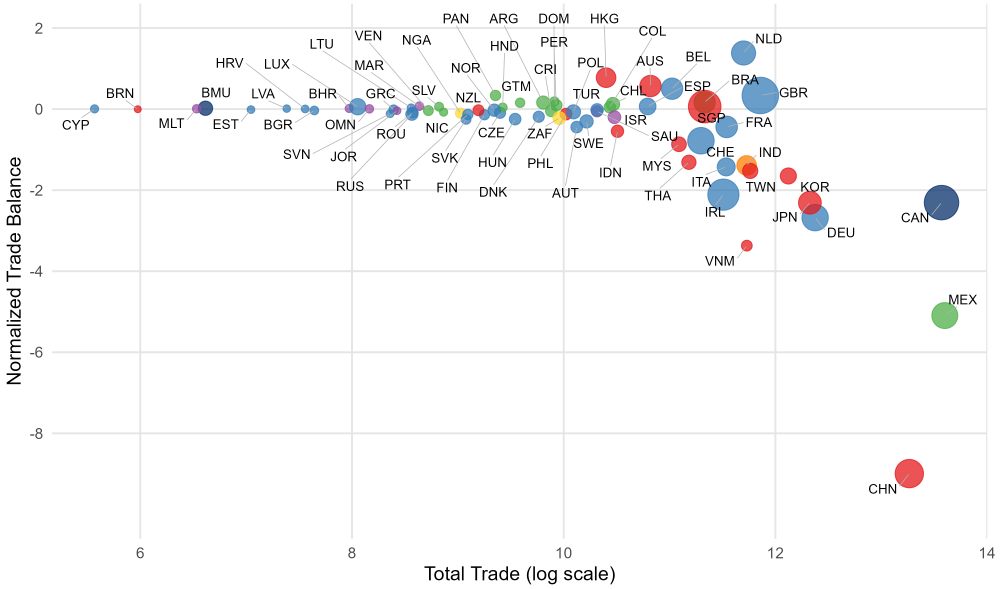
Figure 4 explores this heterogeneity by plotting normalized bilateral trade balances against total trade flows in 2023. Panel A shows total goods trade; Panel B isolates intra-firm trade between U.S. parents and their majority-owned foreign affiliates (MOFAs).[6] Each point represents a partner country; bubble size reflects affiliate sales, and color indicates geographic region. Trade balances are normalized by imports for comparability.

Two patterns emerge. First, total trade balances follow a clear gradient: the United States tends to run larger deficits with countries where overall trade volumes are higher. Familiar bilateral gaps—such as those with China, Mexico, Germany, and Vietnam—dominate the lower right of Panel A. Second, this pattern is entirely absent in the intra-firm data. In Panel B, most countries cluster around balance, with intra-firm surpluses appearing in Japan, Singapore, the Netherlands, and Canada. Intra-firm deficits arise in only a few cases—most notably Ireland and Belgium, where tax and production structures may amplify internal

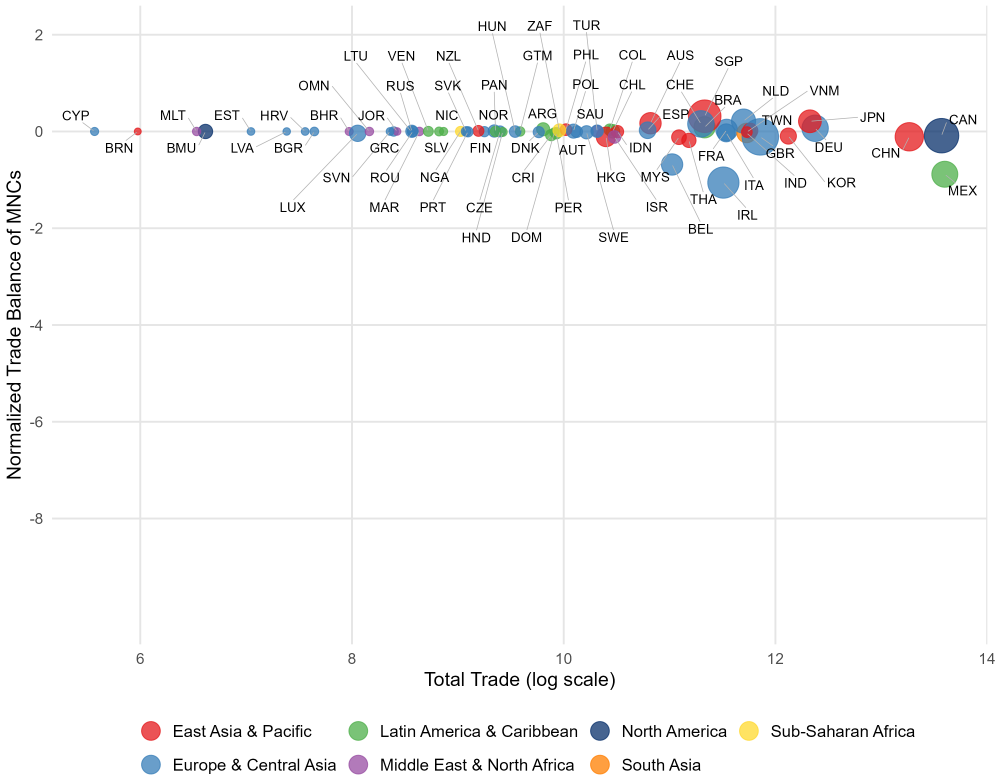
[6]Due to data limitations, we cannot identify bilateral trade between U.S. parents and unrelated parties. We therefore focus on trade between U.S. parents and their affiliates.

FIGURE 4: Bilateral Trade Balances in Total and Intra-firm U.S. Goods Trade

(A) Total Bilateral Trade Balance



(B) Intra-firm Trade Balance (U.S. Affiliates)



Notes: Each panel presents a bubble scatter plot by country for 2023, using data from the U.S. Bureau of Economic Analysis (BEA) and Comtrade. The x-axis in both panels shows total goods trade with the U.S. (exports + imports), plotted on a logarithmic scale. The y-axis in Panel A displays the total goods trade balance—defined as (exports – imports) divided by total imports. Panel B shows the intra-firm trade balance, defined similarly but limited to trade between U.S. parent firms and their majority-owned foreign affiliates (MOFAs), and normalized by intra-firm imports. Bubble size reflects the value of MOFA sales in each country, and colors indicate the country's region, as shown in the legend.

flows, and Mexico, where staged production chains, such as in autos, likely play a role. More broadly, the muted role of intra-firm trade is not due to offsetting surpluses and deficits, but to the fact that bilateral imbalances within multinational structures are small throughout. Even in China—the largest contributor to the aggregate U.S. trade deficit—the intra-firm balance is nearly flat.

This contrast is informative: some of the largest U.S. bilateral trade deficits occur in country pairs where the deficit arising from intra-firm trade is minimal—most notably in China.[7] This highlights that trade imbalances are not mechanically aligned with the geography of multinational activity. Yet the dispersion in intra-firm balances is far from random. It reflects how firms allocate production, route transactions, and respond to tax and regulatory environments—shaping where imbalances appear, even when they do not *directly* account for their aggregate scale.

3 U.S. MNCs and the Trade Deficit: Beyond Direct Transactions

The conventional narrative suggests that U.S. multinationals contribute to the trade deficit by offshoring production and reimporting goods back into the United States. But the data tell a different story. As shown in the previous section, the direct trade deficit attributable to U.S. MNCs is narrow and stable over time and modest in scale compared to the aggregate U.S. deficit, even though these firms account for a large share of total trade flows.

Still, the global footprint of U.S. firms may influence trade beyond the flows directly attributable to them. Multinational production fragments stages of value creation across borders and firm boundaries, shaping who produces, who trades, and how goods ultimately reach the U.S. market. For example, a good manufactured by a U.S. affiliate abroad may be used as an input by a foreign producer who then exports to the United States—generating a trade flow that is not recorded as involving the original MNC. In other cases, the expansion of U.S. firms abroad may alter competitive conditions, displacing domestic suppliers or triggering shifts in sourcing strategies.

Beyond these channels, multinational activity may also contribute to structural changes in the geography of production. When U.S. firms shift manufacturing operations overseas, they reinforce patterns of specialization: the United States continues moving toward services, while certain host countries expand their role in manufacturing, in part reflecting

[7] Compared with U.S. multinational activity abroad overall—where majority-owned foreign affiliates account for about 96% of exports, 92% of imports, 85% of sales, and 84% of employment—the role of MOFAs in China is noticeably smaller: roughly 83% of exports, 88% of imports, 73% of sales, 78% of employment, and 83% of assets (see Appendix Table B.4).

the footprint of U.S. multinationals (Alviarez, 2019; Alviarez et al., 2022c). These shifts in production structure can, in turn, reshape trade flows—raising U.S. imports of goods and exports of services—even if the underlying transactions are not formally recorded as MNC-related.

Indeed, we observe that U.S. imports have increasingly originated from countries where U.S. multinationals have expanded their operations. This correlation raises the possibility that multinational production influences the trade balance not through the transactions it generates directly, but through the global structures it helps establish—shaping patterns of specialization, sourcing, and market access in ways that reach beyond the firm itself.

To examine this idea empirically, we test whether changes in U.S. multinational activity abroad are systematically associated with changes in the U.S. bilateral trade deficit. The analysis exploits variation across countries over time and asks whether the expansion of affiliate operations is correlated with the geography of trade imbalances—regardless of whether the observed flows involve U.S. MNCs directly.

Specifically, we estimate the following regression:

$$\text{Trade Balance}_{c,t} = \beta \text{Affiliate Sales}_{c,t-1} + \gamma Z_{c,t-1} + \mu_t + \mu_c + \varepsilon_{c,t}, \tag{3.1}$$

where the dependent variable $\text{TB}_{c,t}$ denotes the U.S. trade balance with country c in year t, defined as net exports (exports minus imports) normalized by total trade. The main explanatory variable is a lagged measure of U.S. multinational presence: the share of total global MOFA sales accounted for by country c in the previous year. This captures how much of the global activity of U.S. multinationals is concentrated in each location. As a robustness check, we also use affiliate employment as an alternative proxy for multinational operations. Unlike sales, which may be influenced by transfer pricing or tax strategies, employment is arguably less sensitive to such distortions.

The control vector $Z_{c,t-1}$ includes the logarithm of real GDP per capita, the internal rate of return, and the bilateral exchange rate (national currency per U.S. dollar).[8] All specifications include year fixed effects (μ_t) and country fixed effects (μ_c), which account for common shocks over time and for time-invariant country characteristics. Standard errors are robust to heteroskedasticity.

[8]All controls are obtained from the Penn World Tables. Real GDP per capita ($rgdpna_pc$) is measured at constant 2021 national prices. The internal rate of return (irr) is the marginal return on capital implied by national accounts under zero economic profits. Exchange rates (xr) are defined as local currency units per U.S. dollar.

TABLE 1: Foreign Affiliates Sales and Trade Balance Regressions

	Affiliate Sales relative to global US MNCs sales		
Regressor	Total	Goods	Services
	(1)	(2)	(3)
	Panel A: Dependent variable – Normalized Trade Balance (Goods & Services)		
Affiliate Sales	-0.384[a]	-0.567[a]	0.584[b]
	(0.121)	(0.150)	(0.226)
Observations	995	967	972
R^2	0.934	0.935	0.933
Mean of dep. var.		−0.00377	
	Panel B: Dependent variable – Normalized Trade Balance (Goods)		
Affiliate Sales	-0.666[a]	-0.770[a]	-0.306
	(0.125)	(0.150)	(0.223)
Observations	995	967	972
R^2	0.941	0.941	0.936
Mean of dep. var.		−0.00471	
	Panel C: Dependent variable – Normalized Trade Balance (Services)		
Affiliate Sales	0.283[a]	0.203[a]	0.890[a]
	(0.0344)	(0.0424)	(0.0886)
Observations	995	967	972
R^2	0.825	0.792	0.822
Mean of dep. var.		0.000935	
Overall mean of main regressors (across panels)			
Mean of main regr.	0.00722	0.00551	0.00176

Notes: Each column reports the coefficient from a panel regression of the form $\text{Trade Balance}_{c,t} = \beta \text{Affiliate Sales}_{c,t-1} + \gamma Z_{c,t-1} + \mu_t + \mu_c + \varepsilon_{c,t},$, where $\text{Trade Balance}_{c,t}$ denotes the U.S. bilateral trade balance with country c in year t, normalized by total trade (exports + imports), for the outcome indicated in each panel: total goods and services, goods only, or services only. The main independent variable, $\text{Affiliate Sales}_{c,t-1}$, is the lagged ratio of affiliate sales in country c relative to total global sales of U.S. multinationals, as specified in each column header. The control vector $Z_{c,t-1}$ includes the logarithm of real GDP per capita, the internal rate of return, and the logarithm of the bilateral exchange rate. All regressions include year and country fixed effects, and standard errors are heteroskedasticity-robust (HC1). Cells report coefficient estimates with robust standard errors in parentheses. [a] p<0.01, [b] p<0.05, [c] p<0.10.

The coefficient β_t captures whether a higher share of U.S. multinational affiliate activity in a given country in year $t-1$ is followed by a change in the bilateral trade balance with that country in year t. A negative value of β_t indicates that a rising concentration of U.S. MNC operations in a location tends to precede a worsening U.S. trade balance vis-à-vis that country.

Panel A, column 1 of Table 1 shows the result of equation 3.1. The estimated coefficient β=-0.384 implies that a one percentage point increase in a country's share of total U.S. multinational affiliate sales is followed, on average, by a 0.384 percentage point decline in

the bilateral trade balance as a share of total trade. This negative relationship suggests that when U.S. MNCs expand their sales of goods and services in a given location, the United States tends to experience a worsening trade balance in goods and services with that country in the following year—even if those flows do not involve the firm directly.

Panels B and C decompose this effect by trade category. Panel B focuses on goods, and Panel C on services. By construction, the trade balance in goods and services equals the sum of the goods and services components; accordingly, the sum of coefficients in Panels B and C equals the coefficient in Panel A, column by column. In column (1), for example, the overall negative effect of affiliate expansion on the trade balance is driven primarily by a decline in net goods trade (β=-0.666), which is partially offset by an improvement in net services trade (β=0.283).

Columns (2) and (3) refine the analysis by replacing the regressor with sector-specific affiliate sales. Column (2) isolates sales in goods-producing sectors. The results mirror those in column (1): the overall trade balance deteriorates (β=-0.567), and the bilateral goods balance falls more sharply (β=-0.770), suggesting that foreign goods production by U.S. multinationals may substitute for U.S. exports or crowd out domestic output.

Column (3) shifts the focus to affiliate sales in services. The pattern is notably different. An expansion in services affiliate activity is associated with an improvement in the overall trade balance (β=0.584), driven entirely by a strong increase in net services trade (β=0.890). The effect on goods trade is small, negative, and statistically insignificant (β=-0.306). These results point to a potential complementarity between U.S. MNCs' services operations abroad—such as consulting, retail, R&D, or wholesale distribution—and the expansion of U.S. services exports to host countries. Results using affiliate employment instead of sales are reported in Appendix B.1.

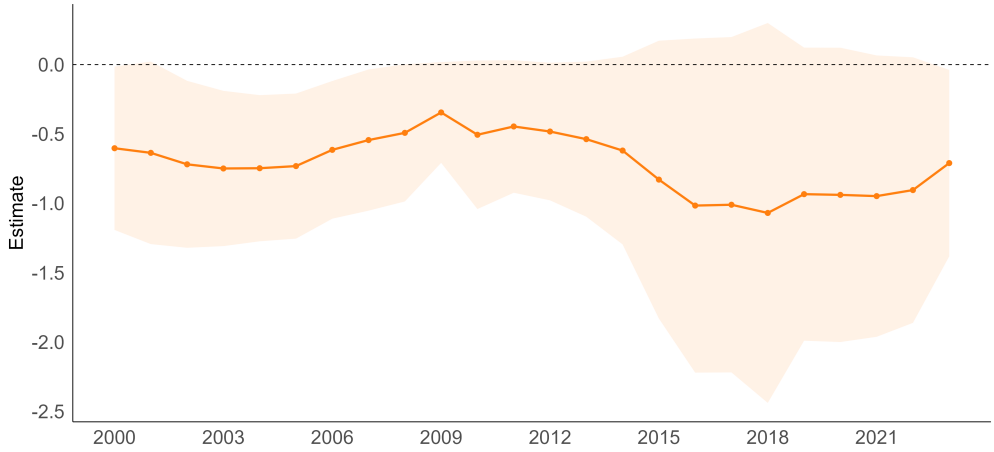
How the trade balance response evolved over time: to examine whether the relationship between U.S. multinationals' affiliate activity and the trade balance has changed over time, we estimate equation 3.1 separately for each year. Figure 5 plots the resulting year-specific coefficients β_t, showing how the effect of U.S. MNC affiliate sales on the bilateral trade balance evolves overtime, separately for goods (Panel A) and services (Panel B).

As in the pooled regression above, each specification includes country- and year-fixed effects and controls for key macroeconomic determinants of trade: the logarithm of real GDP per capita, the internal rate of return, and the bilateral exchange rate. All variables are lagged one year, and standard errors are heteroskedasticity-robust. Each point represents the estimated coefficient for a given year, and the shaded area shows the corresponding 95%

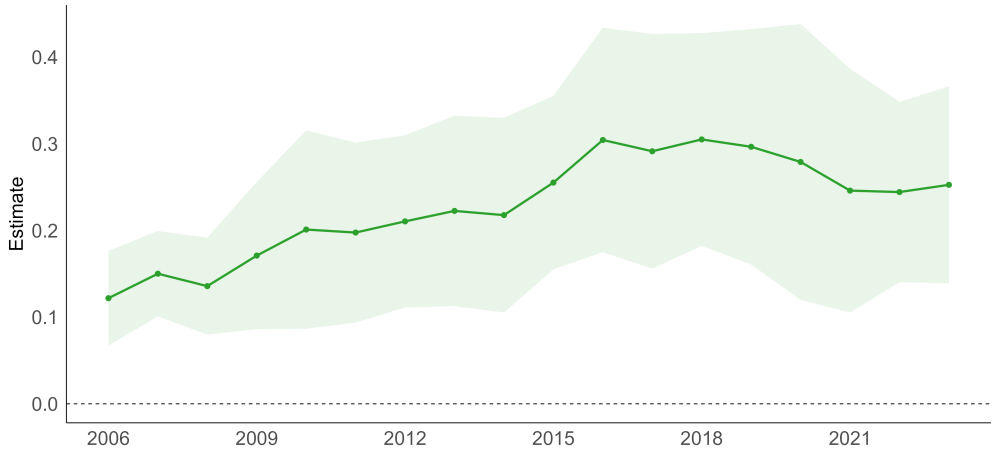
confidence interval.

FIGURE 5: Effect of Total Affiliates' Sales on Bilateral Trade Balance

(A) Goods Trade Balance



(B) Services Trade Balance



Notes: For each year t, we estimate Trade Balance$_{c,t} = \beta_t$Affiliate Sales$_{c,t-1} + \gamma Z_{c,t-1} + \varepsilon_{c,t}$,, where Trade Balance$_{c,t}$ denotes the U.S. bilateral trade balance with country c in year t, normalized by total trade (exports + imports), Affiliate Sales$_{c,t-1}$, is the lagged ratio of affiliate sales in country c relative to total global sales of U.S. multinationals, as specified in each column header. The control vector $Z_{c,t-1}$ includes the logarithm of real GDP per capita, the internal rate of return, and the logarithm of the bilateral exchange rate. Panel (a) plots the estimated yearly coefficients (β_t) from regressing the normalized goods trade balance on the lagged ratio of MOFA sales to total sales, while Panel (b) presents the analogous estimates for the services trade balance. Each point represents the coefficient estimate for the corresponding year, and the shaded areas denote 95% confidence intervals based on heteroskedasticity-robust (HC1) standard errors computed separately for each year-t cross-section. Services started in 2006 due to data availability.

The results suggest that the negative relationship between affiliate sales and the goods

trade balance persists throughout the period, though its magnitude varies. In contrast, the effect on the services trade balance is consistently positive and becomes stronger over time—particularly during the post-2010 period—suggesting an increasing complementarity between foreign affiliate activity in services and U.S. net service exports.[9]

Tracing Exogenous Shifts in U.S. Multinational Expansion

A potential concern in our baseline specification is that the location of U.S. multinational activity may itself be shaped by bilateral trade patterns. For instance, U.S. multinationals may be more likely to locate or expand operations in countries with deep trade integration with the United States—either due to the availability of tradable inputs, access to local distribution networks, or lower entry costs into bilateral trade. As a result, the observed correlation between affiliate activity and the trade balance may reflect endogenous sorting rather than the directional influence of multinational production.

To mitigate this concern, our main specification uses lagged affiliate activity. While this temporal structure helps limit contemporaneous feedback, it may not fully account for anticipatory investment decisions based on expected trade growth. To further address this concern, we construct an instrumental variable that generates exogenous variation in affiliate activity at the bilateral level.

The instrument follows a shift-share design that combines two elements: (i) country-specific initial shares of U.S. multinational affiliate activity across sectors, and (ii) global, time-varying shifts in U.S. MNC employment across sectors. Formally, the instrument for country c in year t is defined as:

$$\text{IV}_{ct} = \sum_{s} \omega_{cs}^{0} \cdot \Delta\text{Employment}_{s,-c,t},$$

where $\omega_{cs}^{0} = \frac{\text{Sales}_{cs}^{0}}{\sum_{s'} \text{Sales}_{cs'}^{0}}$ denotes the initial share of sector s in total U.S. affiliate sales in country c, and $\Delta\text{Employment}_{s,-c,t}$ is the global change in U.S. MNC employment in sector s, excluding employment in country c, China, and the United States.

The weights ω_{cs}^{0} capture the historical sectoral composition of U.S. multinational activity within each country, and they remain fixed over time. By removing the country's contribution—alongside China's and the United States'—from the shift component, we reduce the risk that the instrument is contaminated by bilateral shocks or by large-scale shifts driven

[9]The primary income account of the current account includes direct investment income, which has been positive, in net, since 1999. We exclude them from the analysis due to the limited sectoral and bilateral disaggregation.

by major players. This helps ensure that the sectoral shocks used in the instrument are plausibly exogenous to country-level trade imbalances with the United States. The interaction with initial affiliate shares at the country-sector level then maps global shocks into heterogeneous predicted expansions, yielding a bilateral, sector-specific instrument.[10]

Estimates using this instrument, along with first-stage results and robustness checks, are reported in Appendix C.

3.1 Breaking Down the Deficit: U.S. MNCs vs. Non-US MNCs

We complement the analysis by decomposing the U.S. bilateral goods trade deficit into components associated with U.S. multinationals and with other firms. For each country c and year t, we write the total trade balance as:

$$\text{Trade Balance}_{ct} = \text{Trade Balance}_{ct}^{\text{US MNC}} + \text{Trade Balance}_{ct}^{\text{Non-US MNC}},$$

where the two terms respectively capture the trade balance arising from U.S. foreign affiliates and from all other transactions. Notice that the US MNC component includes all trade involving majority-owned foreign affiliates of U.S. MNCs, with US parents and unrelated parties. What is excluded—due to data limitations at the bilateral level—is trade between U.S. parents and unaffiliated foreign firms, which is absorbed into the residual Non-US MNC term.[11]

To examine how these components relate to affiliate activity, we estimate:

$$\text{Trade Balance}_{ct}^{k} = \gamma_k \cdot \text{Affiliate Sales}_{ct}^{\text{total}} + \gamma Z_{c,t-1} + \mu_t + \mu_c + \varepsilon_{ct}^{k}, \tag{3.2}$$

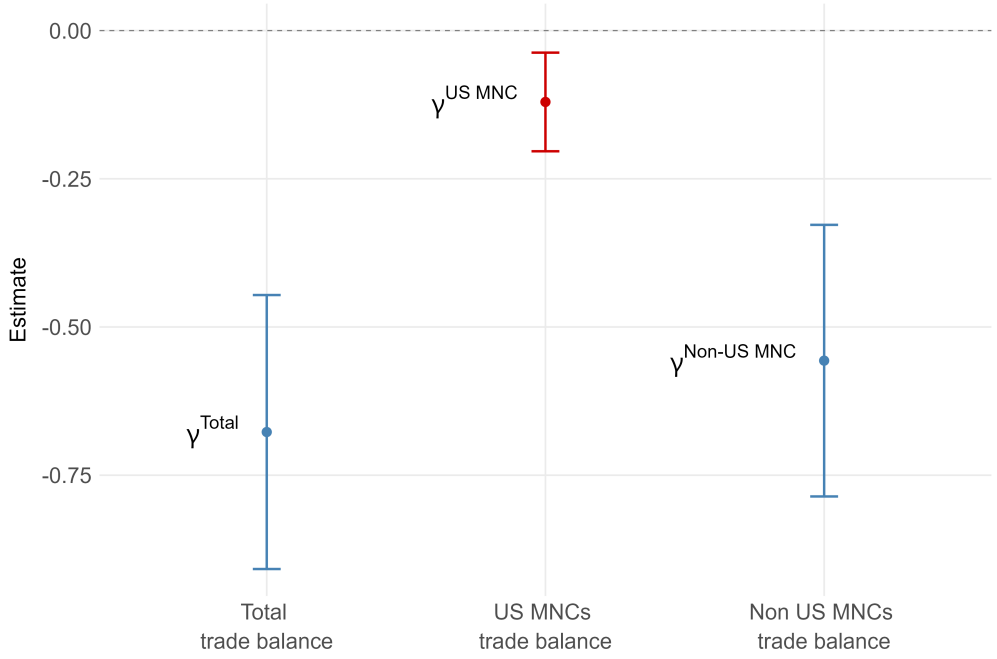
where $k \in \{\text{US MNC}, \text{Non-US MNC}\}$ and $\text{Affiliate Sales}_{ct}^{\text{total}}$ denotes total affiliate sales in country c at time t. The parameter γ_k can be interpreted as the average trade imbalance per unit of affiliate activity, separately for each firm type. Since the trade balance is additively separable across these two groups, the total coefficient in a pooled regression equals the sum of the two components: $\gamma = \gamma_{\text{US MNC}} + \gamma_{\text{Non-US MNC}}$.

[10] Although the shift component of the instrument is defined in terms of global changes in sectoral employment, its interaction with initial country-sector exposure generates predicted variation in the level of bilateral affiliate activity. This design is consistent with the main specification, which models the bilateral trade balance in levels rather than changes.

[11] The decomposition of the trade balance into a "U.S. MNC" and "Non-US MNC" component is limited by the available data. The U.S. MNC component includes only trade involving majority-owned foreign affiliates. Trade between U.S. parents and unaffiliated foreign firms cannot be separately identified at the bilateral level and is therefore included in the residual "Non-US MNC" category. As a result, the Non-US MNC component should be interpreted as the difference between the total and the observed MNC-affiliate flows or "Rest", and not as a clean representation of unaffiliated trade.

Figure 6 presents this decomposition. Each bar represents the estimated effect of affiliate sales on the bilateral trade balance, distinguishing between total trade (left), trade with U.S. MNCs (center), and trade with non-MNC partners (right). The underlying regression specification is analogous to the baseline: we regress the normalized bilateral goods trade balance on the lagged share of MOFA sales, including year and partner fixed effects and standard controls.

FIGURE 6: Decomposing the effect of MNCs on Trade Deficit



Notes: The figure decomposes the U.S. bilateral goods trade balance into components associated with U.S. multinationals and all other firms. For each country–year, the total US trade balance is expressed as the sum of two parts: one arising from trade involving majority-owned foreign affiliates of U.S. MNCs (U.S.MNC component) and one capturing all remaining transactions (Non-U.S.MNC component). Each coefficient is estimated from a regression of the form $\text{Trade Balance}_{ct}^{k} = \gamma_k \cdot \text{Affiliate Sales}_{ct}^{\text{total}} + \gamma Z_{c,t-1} + \mu_t + \mu_c + \varepsilon_{ct}^{k}$, where $k \in \{\text{Total}, \text{US MNC}, \text{Non-US MNC}\}$ and the dependent variable is the normalized bilateral goods trade balance for each component. All regressions include year and partner fixed effects and control for lagged GDP per capita, internal rate of return, and bilateral exchange rates. Vertical lines denote 95% confidence intervals based on heteroskedasticity-robust (HC1) standard errors.

The results show that while the total effect of affiliate sales on the trade balance is strongly negative, this pattern is not driven by transactions involving majority-owned foreign affiliates of U.S. MNCs. The estimated coefficient for trade with U.S. foreign affiliates is statistically significant but much smaller in magnitude, suggesting that—consistent with earlier results—trade flows directly linked to MNCs do not account for the observed deficits. Instead, the entire effect appears to come from trade with non-MNC partners. In other

words, the expansion of U.S. MNCs abroad may be shaping trade patterns beyond the firm boundary: goods produced by affiliates may flow into the U.S. through unrelated intermediaries, or the foreign MNC presence may alter competition and sourcing strategies among unaffiliated firms.

3.2 Destination of Affiliate Sales and Bilateral Trade Imbalances

The affiliate sales data allow us to go beyond total production in a host country and distinguish where those sales ultimately go. For each country c, we observe not only the total output of U.S. majority-owned foreign affiliates, but also how those sales are distributed across destinations: sold locally, exported back to the United States, or shipped to third-country markets.

We decompose total affiliate sales into three mutually exclusive components:

$$\text{Sales}_{ct}^{\text{total}} = \text{Sales}_{ct}^{\text{Host}} + \text{Sales}_{ct}^{\text{US}} + \text{Sales}_{ct}^{\text{Third}},$$

where each term denotes, respectively, affiliate sales in the host market, affiliate exports to the U.S., and affiliate exports to third countries. We then estimate the following regression:

$$\text{Trade Balance}_{ct} = \beta_1 \cdot \text{Sales}_{ct}^{\text{Host}} + \beta_2 \cdot \text{Sales}_{ct}^{\text{US}} + \beta_3 \cdot \text{Sales}_{ct}^{\text{Third}} + \gamma Z_{c,t-1} + \mu_t + \mu_c + \varepsilon_{ct}, \quad (3.3)$$

where Deficit_{ct} is the bilateral trade balance with country c, expressed relative to U.S. imports. The regression includes lagged controls $Z_{c,t-1}$, year fixed effects μ_t, and country fixed effects μ_c.

This specification allows us to ask whether different orientations of affiliate production are associated with deeper or shallower U.S. trade deficits. For instance, sales re-exported to the United States may correlate more closely with recorded imports, while sales to third markets or host-country consumers may reflect different channels of exposure. Since the three sales components sum to total affiliate sales, the coefficients β_1, β_2, and β_3 should be interpreted as conditional correlations rather than marginal effects in isolation.

TABLE 2: Destination-Specific Affiliate Sales and Trade Balance Regressions

Regressor	Affiliate Sales relative to global U.S. MNC sales		
	Total	Goods	Services
	(1)	(2)	(3)
	Panel A: Dependent variable – Normalized Trade Balance (Goods & Services)		
Sales to U.S.	-2.024^{a}	-4.519^{a}	0.849
	(0.629)	(0.906)	(0.562)
Sales to Host Country	-0.679^{a}	-0.341	1.477
	(0.253)	(0.283)	(0.904)
Sales to Third Markets	0.754^{a}	0.480^{b}	0.182
	(0.185)	(0.235)	(0.430)
Observations	953	861	876
R^2	0.939	0.947	0.940
Mean of dep. var.		-0.00377	
	Panel B: Dependent variable – Normalized Trade Balance (Goods)		
Sales to U.S.	-2.157^{a}	-3.756^{a}	0.808
	(0.531)	(0.761)	(0.589)
Sales to Host Country	-1.072^{a}	-0.915^{a}	0.190
	(0.267)	(0.297)	(0.876)
Sales to Third Markets	0.660^{a}	0.797^{a}	-1.015^{b}
	(0.183)	(0.231)	(0.460)
Observations	953	861	876
R^2	0.946	0.951	0.942
Mean of dep. var.		-0.00471	
	Panel C: Dependent variable – Normalized Trade Balance (Services)		
Sales to U.S.	0.134	-0.764^{a}	0.041
	(0.190)	(0.241)	(0.178)
Sales to Host Country	0.393^{a}	0.575^{a}	1.287^{a}
	(0.069)	(0.079)	(0.249)
Sales to Third Markets	0.094	-0.317^{a}	1.197^{a}
	(0.084)	(0.095)	(0.181)
Observations	953	861	876
R^2	0.829	0.819	0.832
Mean of dep. var.		0.000935	
Overall mean of main regressors (across panels)			
Mean of Sales^{US}	0.000811	0.000631	0.000183
Mean of $\text{Sales}^{\text{Host}}$	0.00444	0.00334	0.00127
Mean of $\text{Sales}^{\text{Third}}$	0.00208	0.00179	0.000363

Notes: Each column reports coefficient estimates from a panel regression of the U.S. bilateral trade balance (normalized by U.S. imports) on affiliate sales by destination. The three sales categories—sales to the U.S., sales to the host-country market, and sales to third countries—are jointly included and expressed relative to total global sales of U.S. multinationals. Columns (1)–(3) vary the sales definition: total affiliate sales, goods-only, and services-only, respectively. Each panel corresponds to a different trade balance measure: goods and services combined (Panel A), goods only (Panel B), and services only (Panel C). All regressions include lagged controls (log GDP per capita, interest rate, and log exchange rate), as well as year and country fixed effects. Standard errors are robust to heteroskedasticity and reported in parentheses. Superscripts denote significance levels: ^{a} $p < 0.01$, ^{b} $p < 0.05$, ^{c} $p < 0.10$.

Table 2 presents the results of a panel regression relating the U.S. bilateral trade balance to the composition and orientation of affiliate sales abroad. Each panel corresponds to a different trade balance measure: Panel A uses the total (goods + services) trade balance, Panel B isolates goods, and Panel C isolates services. Each column reports coefficients from a regression of the form in equation (3.3), where the independent variables are ratios of affiliate sales by destination: to the United States, to the host country, and to third-country markets. Columns (1)–(3) vary the set of affiliate sales included: total affiliate activity, goods-only affiliate sales, and services-only affiliate sales, respectively.

Across all panels, sales destined to the United States are strongly negatively associated with the U.S. goods trade balance. Specifically, a one-unit increase in the share of affiliate sales directed back to the U.S. is associated with a 2.157 percentage points decline in the normalized goods trade balance when using total affiliate sales (Panel B, column 1), and a 3.756-point decline when using goods-only affiliate sales (column 2). These estimates are large and statistically significant, consistent with a direct import channel: as a larger fraction of affiliate output is re-exported to the United States, the observed bilateral trade balance deteriorates

By contrast, sales to third-country markets are positively associated with trade balances, particularly in goods. In the goods-only specification (Panel B, column 2), increasing the share of affiliate sales to third-country markets by one unit is associated with a 0.797 percentage point improvement in the normalized goods trade balance. This suggests that outward production by U.S. firms serving third markets does not systematically affect U.S. imports directly from the host country—and may even displace foreign competitors in those markets without triggering offsetting flows into the U.S.

Sales to the local host-country market exhibit a more nuanced pattern. In goods, these sales are negatively associated with the trade balance: a one-unit increase in the share of affiliate sales to the host country is linked to a 1.072–percentage point decline in the normalized goods trade balance when using total affiliate sales (Panel B, column 1), and a 0.915–point decline when using goods-only affiliate sales (column 2). These effects are statistically significant and consistent with production substitution or sourcing realignment—where greater local sales by affiliates may reflect the displacement of U.S. exports by foreign-based production.

For services, however, the pattern reverses. A one-unit increase in the share of affiliate sales to the host country is associated with a 0.393–percentage point increase in the normalized services trade balance when using total affiliate sales (Panel C, column 1), a 0.575–point increase when using goods-only affiliates (column 2), and a 1.287–point increase in the services-only specification (column 3). These positive and statistically significant estimates suggest

that service-oriented affiliate activity abroad may complement U.S. exports—particularly in sectors where local presence facilitates the cross-border delivery of headquarters-intensive or coordination-based services.[12]

4 U.S. Multinationals in Motion: Tracing Global Production Shifts

Understanding the U.S. trade deficit requires understanding how multinational firms produce across borders. Over the past two decades, U.S. multinationals have not only expanded abroad but also reallocated activity across countries and sectors—reshaping sourcing patterns and altering what shows up in trade flows. Distinguishing between pure growth and structural reallocation is key to tracing how global production evolves—and how it connects to the geography of U.S. external imbalances.

To quantify these dynamics, we decompose changes in U.S. multinational activity into two components: aggregate expansion and structural reallocation. We then examine how each unfolds across geography and sectoral composition—asking whether growth has been concentrated in particular countries, whether the sector mix is shifting within countries, or whether both margins are in motion. This framework provides a flexible yet straightforward lens for tracking how the footprint of U.S. production abroad is evolving over time.

To implement this, we adapt the growth decomposition framework of Foster et al. (2001). Let g^{agg} denote the aggregate activity of U.S. foreign affiliates measured by sales, but we also do it for employment and assets. Aggregate activity at time t is:

We define the log growth of activity of U.S. foreign affiliates measured by sales, employment, or assets between periods t_0 and t_1 as:

$$g^{\text{agg}} = \sum_c \omega_{c,t_1} \cdot g_c,$$

where $g_c = \log y_{c,t_1} - \log y_{c,t_0}$ is the log change in sales of country c, and $\omega_{c,t_1} = y_{c,t_1}/Y_{t_1}$ is the final-period share of country c in the global total $Y_{t_1} = \sum_c y_{c,t_1}$.

We can express this aggregate growth as the sum of two economically interpretable compo-

[12] It is worth emphasizing that the coefficients should not be interpreted as marginal effects, since the three destination categories sum to total affiliate sales and are included jointly in the specification. Rather, the estimates reflect conditional associations, indicating how shifts in the composition of affiliate sales correlate with trade balance outcomes, holding total scale and fixed effects constant.

nents:

$$g_{t1}^{\text{agg}} = \sum_c \omega_{c,t_1} \cdot g_c = \underbrace{\sum_c \omega_{c,t_0} \cdot g_c}_{\substack{\text{Expansion at fixed} \\ \text{composition}}} + \underbrace{\sum_c (\omega_{c,t_1} - \omega_{c,t_0}) \cdot (g_c - \bar{g})}_{\substack{\text{Reallocation toward} \\ \text{faster-growing countries}}}, \tag{4.1}$$

where $\omega_{c,t_0} = y_{c,t_0}/Y_{t_0}$ denotes the initial share of country c in total output, and $\bar{g} = \sum_c \omega_{c,t_0}, g_c$ is the average growth rate computed using fixed initial-period weights.

The first term captures aggregate growth under a counterfactual scenario in which each country's growth is weighted by its initial share in global sales. This "expansion" component reflects the overall scaling-up of multinational operations, assuming that the geographic distribution of activity remains constant. The second term measures how much of aggregate growth is due to a reallocation of global shares toward countries that grew more than the average. This "reallocation" component is zero if shares remain constant, and positive when faster-growing countries gain weight in the global distribution of affiliate sales. In the empirical implementation, we compute these components using affiliate-level aggregates for each year and normalize them by total activity to obtain percentage contributions.

4.1 Nested Decomposition: Tracking Growth Across Countries and Sectors

We refine the decomposition framework by incorporating both the geographic and sectoral structure of U.S. multinational activity. Let $y_{cs,t}$ denote affiliate sales in country c, sector s, and year t, and let g_{cs} denote log growth between two periods. For each country, define its average sectoral growth rate as $\bar{g}c = \sum_s \omega s|c, t_0 \cdot g_{cs}$. Then the total growth can be expressed as:

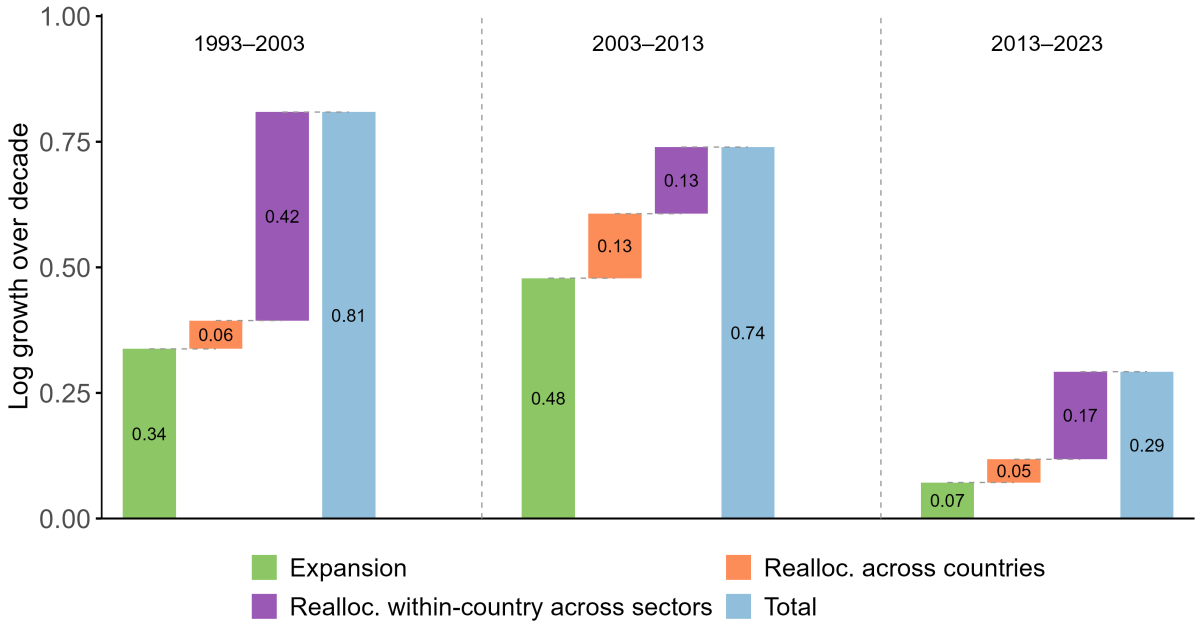
$$g^{\text{agg}} = \underbrace{\sum_{c,s} \omega_{cs,t_0} \cdot g_{cs}}_{\substack{\text{Expansion at fixed} \\ \text{country and sector} \\ \text{composition}}} + \underbrace{\sum_c (\omega_{c,t_1} - \omega_{c,t_0}) \cdot (g_c - \bar{g})}_{\substack{\text{Reallocation} \\ \text{across countries}}} + \underbrace{\sum_c \omega_{c,t_0} \cdot \left[\sum_s (\omega_{s|c,t_1} - \omega_{s|c,t_0}) \cdot (g_{cs} - \bar{g}_c) \right]}_{\substack{\text{Within-country} \\ \text{reallocation} \\ \text{across sectors}}} \tag{4.2}$$

The first term captures pure expansion: how much growth would have occurred if the sectoral and geographic structure had remained unchanged. The second term reflects reallocation across countries, as faster-growing countries gain weight in the global distribution. The third captures within-country reallocation: activity shifting toward faster-growing sectors within each country.

Figure 7 shows a clear deceleration in the growth of U.S. affiliate sales abroad, alongside a shift in how that growth is generated. Total log growth falls from over 0.8 in 1993–2003

to just 0.3 in 2013–2023, reflecting a steep decline in the global expansion of U.S. multinationals. But the composition of that growth evolves in telling ways. In the 1990s and 2000s, expansion at fixed structure remained the main driver, complemented by meaningful within-country sectoral shifts. Reallocation across countries played only a minor role. By the 2010s, expansion nearly vanishes, and growth is driven almost entirely by within-country reallocation. Cross-country shifts remain small throughout. This marks a transition from global scaling to local reshuffling within the existing footprint.

FIGURE 7: Affiliate Sales Growth: Expansion and Reallocation Across Decades (Country-Sector)



Notes: This figure presents the decomposition of aggregate log growth in U.S. affiliate sales over three decades, based on equation (4.2). Each panel displays the total change in log sales (far right bar), along with its three components: Expansion at fixed country and sector composition (far left bar), reallocation across countries (middle left bar) and within-country reallocation across sectors (middle right bar). The expansion component captures how much growth would have occurred if the sectoral and geographic structure had remained unchanged. The reallocation across countries term reflects the contribution of shifts in country shares—specifically, whether countries with above-average growth also increased their share of total affiliate sales. The within-country reallocation across sectors term captures activity shifting toward faster-growing sectors within each country. Bar heights reflect growth in levels; percentage labels indicate the share of total growth attributed to each component.

An alternative and complementary perspective places sectors—rather than countries—at the top of the aggregation. Instead of examining how the sectoral mix evolved within each country, we now ask how the geographic distribution changed within each sector. This framing may be particularly informative when assessing global specialization or interpreting sector-specific trends such as nearshoring in manufacturing or the expansion of service-oriented

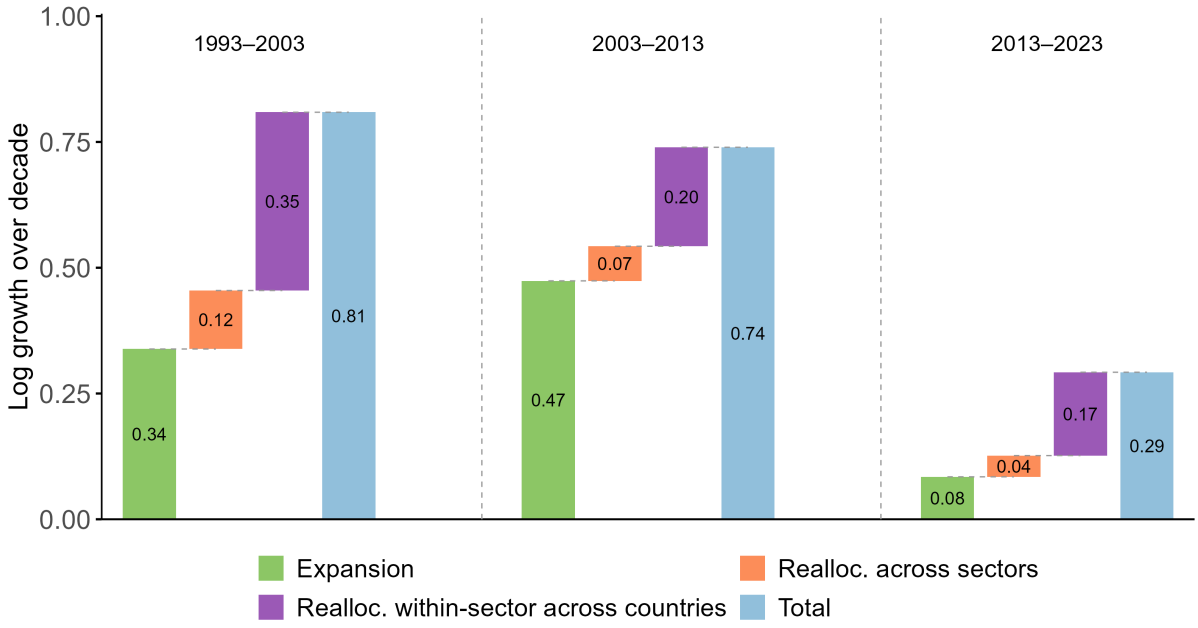
sectors.

The decomposition then takes the form:

$$g^{\text{agg}} = \underbrace{\sum_{c,s} \omega_{cs,t_0} \cdot g_{cs}}_{\substack{\text{Expansion at fixed} \\ \text{country and sector} \\ \text{composition}}} + \underbrace{\sum_{s} (\omega_{s,t_1} - \omega_{s,t_0})(g_s - \bar{g})}_{\substack{\text{Reallocation across} \\ \text{sectors}}} + \underbrace{\sum_{s} \omega_{s,t_0} \sum_{c} (\omega_{c|s,t_1} - \omega_{c|s,t_0})(g_{cs} - \bar{g}_s)}_{\substack{\text{Within-sector reallocation} \\ \text{across countries}}}$$

Here, the first term again captures expansion at fixed composition. The second term reflects shifts in the global sectoral structure—whether higher-growth sectors have expanded their share of total activity. The third term captures within-sector geographic reallocation: whether growth within sectors was concentrated in specific countries or reflected broader regional shifts.

FIGURE 8: Affiliate Sales Growth: Expansion and Reallocation Across Decades (Sector-Country)



Notes: This figure presents the decomposition of aggregate log growth in U.S. affiliate sales over three decades, based on equation (4.2). Each panel displays the total change in log sales (far right bar), along with its three components: Expansion at fixed country and sector composition (far left bar), reallocation across sectors (middle left bar) and within-sector reallocation across countries (middle right bar). The expansion component captures how much growth would have occurred if the sectoral and geographic structure had remained unchanged. The reallocation across sectors term reflects shifts in sector shares—specifically, whether sectors with above-average growth also increased their share of total affiliate sales. The within-sector reallocation across countries term captures activity shifting toward faster-growing countries within each sector. Bar heights reflect growth in levels; percentage labels indicate the share of total growth attributed to each component.

Figure 7 and Figure 8 reveal a consistent pattern, despite using different nesting structures. When decomposing first by country (Figure 7), most reallocation occurs across sectors within each country. When the nesting is reversed (Figure 8), most reallocation occurs within each sector across countries. In both cases, reallocation across the top-level dimension—sectors in Figure 8, countries in Figure 7—is modest. This symmetry suggests that U.S. multinationals are not shifting activity across countries or sectors broadly. Instead, the bulk of reallocation occurs within their existing footprint, as firms redirect resources toward faster-growing sectors within countries or toward stronger geographies within sectors.

5 Conclusion

U.S. multinationals are often blamed for the persistent trade deficit—linked to offshoring, job relocation, and growing import dependence. But the data tell a more nuanced story. Using newly harmonized information on their global operations, we show that the direct trade footprint of U.S. MNCs accounts for only a small share of the goods deficit. The deeper issue lies in how production is structured: who performs which stages, and where.

Over the past four decades, U.S. firms have reorganized globally: expanding abroad, anchoring upstream and intangible-intensive activities at home, and reshaping sourcing patterns across borders. The result is an external imbalance that reflects not only what multinationals do, but how they position themselves within global supply chains. Domestic firms import from unaffiliated suppliers. Foreign MNCs assemble final goods in the United States. Meanwhile, American multinationals export and import intermediate inputs to affiliates or partners abroad and retain key upstream functions at home.

This perspective reframes the debate. Trade imbalances are not simply the result of trade volumes or firm nationality, but emerge from the structure of global production—how firms sequence tasks, specialize across borders, and shape sourcing networks. The patterns documented here suggest that standard macroeconomic explanations of external imbalances, while important, are incomplete without accounting for the way production is organized across firms and countries.

In ongoing work, we develop a model of multinational production in which firms allocate stages of activity across countries based on market size, trade costs, and complementarities between upstream and downstream tasks. This framework helps rationalize the asymmetries documented here: foreign MNCs placing final assembly in the United States to serve local demand, while U.S. MNCs retain high-value, intangible-intensive functions at home and export intermediate inputs to affiliates or partners abroad. In this setting, trade imbalances

arise not from arbitrage alone, but from how production is structured—who performs which stages, and where. The decomposition patterns presented in this paper serve as key inputs for estimating the model's parameters, which we use to quantify how changes in the structure and geography of multinational activity shape the observed U.S. trade balance.

References

Alfaro, L., P. Antràs, D. Chor, and P. Conconi (2019): "Internalizing Global Value Chains: A Firm-Level Analysis," *Journal of Political Economy*, 127, 508–559.

Alfaro, L. and A. Charlton (2009): "Intra-Industry Foreign Direct Investment," *American Economic Review*, 99, 2096–2119.

Alfaro, L., P. Conconi, F. Kamal, and Z. Kroff (2025): "Trade within Multinational Boundaries," Working Paper 33887, National Bureau of Economic Research.

Alviarez, V. (2019): "Multinational Production and Comparative Advantage," *Journal of International Economics*, 119, 1–54.

Alviarez, V., B. C. Fujiy, and T. Świecki (2022a): "Cross-Border Intra-Firm Trade and the Propagation of Idiosyncratic Shocks: a New Dataset," .

Alviarez, V., G. Mion, and G. Ottaviano (2022b): "Cross-Border Production Networks and the Transmission of Economic Shocks," *Journal of International Economics*, 139, 103683.

Alviarez, V. I., C. Chen, N. Pandalai-Nayar, L. Varela, K. Yi, and H. Zhang (2022c): "Multinationals and Structural Transformation," Tech. Rep. Working Paper 30494, National Bureau of Economic Research.

Antràs, P. (2003): "Firms, Contracts, and Trade Structure," *Quarterly Journal of Economics*, 118, 1375–1418.

Antràs, P. and D. Chor (2013): "Organizing the Global Value Chain," *Econometrica*, 81, 2127–2204.

Atkeson, A., J. Heathcote, and F. Perri (2025): "The End of Privilege: A Reexamination of the Net Foreign Asset Position of the United States," *American Economic Review*, 115, 2151–2206.

Bernanke, B. S. (2005): "The Global Saving Glut and the U.S. Current Account Deficit," *Sandridge Lecture, Virginia Association of Economists*, federal Reserve Board Speech, March 10, 2005.

Bernard, A. B., J. B. Jensen, S. J. Redding, and P. K. Schott (2018): "Global Firms," *Journal of Economic Literature*, 56, 565–619.

Blanchard, O., F. Giavazzi, and F. Sa (2005): "International Investors, the U.S. Current Account, and the Dollar," *Brookings Papers on Economic Activity*, 36, 1–49.

Caballero, R. J., E. Farhi, and P.-O. Gourinchas (2008): "Financial Crash, Commodity Prices, and Global Imbalances," *Brookings Papers on Economic Activity*, 39, 1–55.

Chari, A. and G. M. Milesi-Ferretti (2025): "The United States and its Creditors: How Risky is the US External Position?" .

Chinn, M. D. and H. Ito (2022): "A Requiem for "Blame It on Beijing": Interpreting Rotating Global Current Account Surpluses," *Journal of International Money and Finance*, 121, 102510.

Curcuru, S. E., T. Dvorak, and F. Warnock (2008): "Cross-Border Returns Differentials," *The Quarterly Journal of Economics*, 123, 1495–1530.

Ding, X., T. C. Fort, S. J. Redding, and P. K. Schott (2022): "Structural Change Within versus Across Firms: Evidence from the United States," Working Paper 30127, National Bureau of Economic Research.

Engel, C. and J. Wu (2023): "The U.S. Dollar as a Safe Asset and the Global Financial Cycle," NBER Working Paper.

Flaaen, A. (2014): "Multinational Firms in Context," Mimeo.

Foster, L., J. Haltiwanger, and C. J. Krizan (2001): "Aggregate Productivity Growth: Lessons from Microeconomic Evidence," 303–372.

Gourinchas, P.-O. and H. Rey (2007): "From World Banker to World Venture Capitalist: U.S. External Adjustment and the Exorbitant Privilege," *Journal of the European Economic Association*, 6, 379–386.

Guvenen, F., R. J. M. Jr., D. Rassier, and K. J. Ruhl (2017): "Offshore Profit Shifting and Domestic Productivity Measurement," *NBER Working Paper No. 23324*.

Hausmann, R. and F. Sturzenegger (2006): "Global Imbalances or Bad Accounting? The Missing Dark Matter in the Wealth of Nations," .

Helpman, E. (1984): "A Simple Theory of International Trade with Multinational Corporations," *Journal of Political Economy*, 92, 451–471.

International Monetary Fund (2019): "2019 External Sector Report: The Dynamics of External Adjustment," Tech. rep., IMF.

Irarrazabal, A., A. Moxnes, and L. D. Opromolla (2013): "The Margins of Multinational Production and the Role of Intrafirm Trade," *Journal of Political Economy*, 121, 74–126.

Jiang, Z., A. Krishnamurthy, and H. Lustig (2021): "The Dollar as a Global Safe Asset: Demand, Supply, and Spillover Effects," NBER Working Paper.

Kamal, F., J. McCloskey, and W. Ouyang (2022): "Multinational Firms in the U.S. Economy: Insights from Newly Integrated Microdata," Tech. Rep. Working Paper 22-39, U.S. Census Bureau, Center for Economic Studies, Washington, DC.

Keller, W. and S. R. Yeaple (2013): "The Gravity of Knowledge," *American Economic Review*, 103, 1414–44.

Lane, P. R. and G. M. Milesi-Ferretti (2007): "The external wealth of nations mark

II: Revised and extended estimates of foreign assets and liabilities, 1970–2004," *Journal of International Economics*, 73, 223–250.

——— (2018): "The External Wealth of Nations Revisited: International Financial Integration in the Aftermath of the Global Financial Crisis," *IMF Economic Review*, 66, 189–222.

Lerner, A. P. (1936): "The Symmetry Between Import and Export Taxes," *Economica*, 3, 306–313.

Markusen, J. R. (1984): "Multinationals, Multi-Plant Economies, and the Gains from Trade," *Journal of International Economics*, 16, 205–226.

Markusen, J. R. and A. J. Venables (2000): "The Theory of Endowment, Intra-Industry and Multinational Trade," *Journal of International Economics*, 52, 209–234.

Mundell, R. A. (1961): "Flexible Exchange Rates and Employment Policy," *Canadian Journal of Economics and Political Science*, 27, 509–517.

Obstfeld, M. (2025): "Global Trade Rebalancing," *Brookings Papers on Economic Activity*, Spring, 3–75.

Obstfeld, M. and K. S. Rogoff (2005): "Global Current Account Imbalances and Exchange Rate Adjustments," *Brookings Papers on Economic Activity*, 36, 67–146.

Tabova, A. M. and F. E. Warnock (2025): "Exorbitant Changes in Three Parts," Working Paper 34372, National Bureau of Economic Research.

Online Appendix

"From Expansion to Reallocation: Trade Imbalances and the Global Footprint of U.S. Multinationals"

Laura Alfaro and Vanessa Alviarez

This Appendix provides supplementary information on the construction of the MNE dataset and the empirical procedures used in the main analysis. We begin by documenting the XX Additional tables and figures illustrate the robustness of our procedures and support the results reported in the main text.

A Data Harmonization and Panel Reconstruction (BEA 1983–2023)

This appendix documents the process of cleaning, standardizing, and consolidating the statistics from the *Activities of U.S. Multinational Enterprises* (MNEs) dataset, produced under the *U.S. Direct Investment Abroad* (USDIA) program by the U.S. Bureau of Economic Analysis (BEA). The dataset offers a comprehensive view of financial and operational indicators for U.S. MNEs, both domestically and abroad.

The BEA's official portal (https://www.bea.gov/international/di1usdop) provides a vast volume of industry- and country-level tables spanning 1983–2023. For reference, 144 different tables were available for 2019 alone. Files are published in PRN format for the 1983–1997 period and in Microsoft Excel format from 1998 onward. This heterogeneity, together with the thematic and temporal breadth of the dataset, makes it necessary to transform the original data into a set of harmonized and comparable panel datasets.

A.1 Processing Procedures

A.1.1 Conversion of PRN Files (1983–1997)

We developed a routine to convert each PRN file into Excel format, organizing the output by reporting year and table type. The original structure of the files posed several challenges due to variation across four distinct formats: (i) industry-level tables; (ii) country-level tables;

(iii) industry-by-region cross-classifications; and (iv) country-by-aggregate-sector classifications.

A.1.2 Standardization of Names: Industries, Countries, and Indicators

Category labels vary across time due to acronyms, abbreviations, synonyms, or typographical errors. To ensure traceability:

1. **Industries:** Whenever available, we prioritized BEA industry codes. In their absence, we performed manual assignments guided by (i) the explicit hierarchy shown in the table and (ii) the relative stability of magnitudes over time.

2. **Countries:** Variations were mostly orthographic or idiomatic (e.g., "Ivory Coast" vs "Côte d'Ivoire"), with some typographical corrections (e.g., "Krygyzstan" to "Kyrgyzstan").

3. **Indicators:** Synonyms (e.g., "Compensation of employees" vs "Employee compensation") were harmonized. Substantive renamings (e.g., "Gross product" to "Value added") and typos (e.g., "Total liablilities") were also standardized.

This step ensured greater consistency across industries, countries, and indicators—primarily by standardizing names—which in turn facilitates the intertemporal harmonization performed in subsequent stages.

A.1.3 Preservation of Hierarchical Structures

A common risk when integrating indicators across industries and countries is the loss of hierarchical structure (e.g., "Chemical products" $\subset$ "Manufacturing"). To prevent this, we inferred parent–affiliate relationships based on the indentation levels found in the original PRN and Excel files. Greater indentation indicated a lower-level category, which we linked to the most recent higher-level category with lesser indentation. This resulted in a reproducible category tree that preserves industry-subindustry and region-country nesting. This approach allowed us to automate category linkage (e.g., all subindustries under "Manufacturing") without relying on row order in later stages of processing.

A.1.4 Thematic Consolidation and Restructuring into Panel Format

After processing each table individually, we consolidated the data by thematic content and level of detail. We identified four common disaggregation patterns:

1. By industry-level;
2. By country-level;
3. By industry-by-region cross-classifications;
4. By country-by-aggregate-sector cross classifications.

The first two formats allow for the construction of integrated tables containing both financial and operational indicators (e.g., assets, expenditures, sales, net income, employee compensation, employment), such as BEA Tables A1 (by country) and A2 (by industry).

When the information follows a three-dimensional structure (i.e., industry–region or country–sector cross-classifications), the BEA distributes indicators across multiple tables. For instance, asset data appear in Table B5 (countries × region) and Table B6 (industries × sector). In these cases, we merged the tables using common keys and built a long-format panel dataset with consistent columns for year, unit of analysis, and indicators.

A.1.5 Harmonizing Classifications Over Time

Industries: Given changes in BEA's reporting structure and sector classifications, we built a harmonized industry taxonomy to ensure interpretability across the full 1983–2023 window. For example, prior to 1999, "Petroleum and Coal Products" was not classified under "Manufacturing" but instead appeared under a broader industry labeled "Petroleum." To align the earlier years with the post-1999 structure, we retroactively reassigned this subsector to "Manufacturing," thereby ensuring stable aggregation across subperiods.

This restructuring was not fully automatable. The number of classification inconsistencies and exceptional cases required manual review and judgment. In our revised taxonomy, we corrected outdated historical definitions where necessary to align them with current industrial groupings, always with the goal of preserving economic interpretability across time.

Whenever available, we used BEA industry codes as our primary reference to construct a concordance between SIC codes (used from 1983 to 1998) and NAICS codes (applied from 1999 onward). Correspondences were resolved based on traceability and hierarchical consistency. In cases where the available detail did not allow for a unique or unambiguous mapping, we allocated the residual to an "Other" category within the appropriate aggregation level, ensuring that classification levels were not mixed.

Finally, we validated the resulting industry structure over time by inspecting both the levels and the time-series behavior of key aggregates. Outliers or structural breaks inconsistent with

the expected dynamics of each sector were flagged for further review and, where necessary, reclassified. The final harmonized categories are presented in Table A.1.

Countries: To ensure intertemporal consistency in country-level aggregates, we harmonized the BEA country reporting across the full 1983–2023 period by constructing a stable set of geographic units. While BEA's grouping of countries by continent simplifies the harmonization task relative to the industrial case, certain discontinuities in coverage and changes in presentation required special treatment.

Our approach focused on two core principles: (1) define a central set of countries with continuous presence across the entire period, and (2) classify all others into a residual "Other" category within their respective continents. For instance, countries such as the Czech Republic, Hungary, Poland, and Russia are not reported individually in BEA tables prior to 1999, but appear from 1999 onward. To preserve a consistent country composition across time, we retain these economies within "Other Europe" throughout both subperiods, preventing artificial shifts in the regional aggregates.

A special case arises in 1983–1988, during which the BEA grouped countries into "Developed" and "Developing" blocs, including composite categories such as "Australia, New Zealand, and South Africa" within the developed group. Beginning in 1989, these countries are reassigned geographically: Australia appears under "Asia and the Pacific," South Africa under "Africa," and New Zealand is no longer reported individually. To reconcile these reporting regimes, we retroactively disaggregated the composite group and reassigned each country to its post-1989 continent classification. When individual reporting was unavailable in specific years, countries were incorporated into the corresponding "Other" category.

Throughout this process, we prioritized continuity in the country panel. Countries with persistent coverage were retained individually, while those with intermittent or shifting presence were assigned to residual categories consistently. This approach preserves the stability of regional aggregates and avoids spurious breaks resulting from changes in table formatting or reporting thresholds over time. The resulting harmonized country groupings are summarized in Table A.2.

A.2 Tables Used in the Analysis

The USDIA dataset organizes tables along two primary dimensions. First, by the unit of analysis: the universe of foreign affiliates, U.S.-based parent companies, and majority-owned foreign affiliates (MOFAs). Second, by the level of disaggregation: by industry, by country, by industry-by-country, and by country-by-industry cross-sections. Table A.3 lists all the

tables considered in our analysis, grouped by subject and scope.

TABLE A.1: Industry Categories and Subcategories

All industries
Mining
Metal mining
Nonmetallic minerals
Oil and gas extraction
Other Mining
Manufacturing
Food
Beverages and tobacco products
Textiles, apparel, and leather products
Lumber, wood, furniture, and fixtures
Paper
Printing and related support activities
Petroleum and coal products
Chemicals
Plastics and rubber products
Nonmetallic mineral products
Primary and fabricated metals
Primary metals
Fabricated metal products
Machinery, Computers, electronic products, electrical equipment and other
Agriculture, construction, and mining machinery
Industrial machinery
Computers, electronic products, electrical equipment and other
Transportation equipment
Other Manufacturing
Wholesale trade
Professional and commercial equipment and supplies
Petroleum and petroleum products
Drugs and druggists' sundries
Other Wholesale Trade
Retail trade
General merchandise stores

Clothing and clothing accessories stores
Other Retail Trade
Finance (except banking), insurance, and real estate
Finance, except depository institutions
Insurance carriers and related activities
Real estate and rental and leasing
Management of nonbank companies and enterprises
Banking
Agriculture, forestry, fishing, and hunting
Construction
Utilities
Transportation and warehousing
Health care and social assistance
Other industries

TABLE A.2: Country-Level Hierarchy

All countries
Canada
Europe
Austria
Belgium
Denmark
Finland
France
Germany
Greece
Ireland
Italy
Luxembourg
Netherlands
Norway
Portugal
Spain
Sweden
Switzerland
Turkey
United Kingdom
Other Europe

LAC & Other West Hemisph.
South America
Argentina
Brazil
Chile
Colombia
Ecuador
Peru
Venezuela
Other South America

Central America
Mexico
Panama
Other Central America

Western Hemisphere
Bermuda
United Kingdom Islands, Caribbean
Other Western Hemisphere

Africa
Egypt
Nigeria
South Africa
Other Africa

Middle East
Israel
Saudi Arabia
United Arab Emirates
Other Middle East

Asia and Pacific
Australia
China
Hong Kong
India
Indonesia
Japan
South Korea
Malaysia
Philippines
Singapore
Taiwan
Thailand
Other Asia and Pacific

TABLE A.3: List of BEA Tables by Scope, Detail, and Code

Scope of analysis	Level of detail	Table code	Table name
All Affiliates	Industry	I.A 2.	Selected Data for Foreign Affiliates and U.S. Parents in All Industries
	Country	I.A 1.	Selected Data for Foreign Affiliates in All Countries in Which Investment Was Reported
	Industry by Country	I.B 6.	Total Assets of Affiliates, Industry of Affiliate by Country
		I.C 5.	Expenditures for Property, Plant, and Equipment by Affiliates, Industry of Affiliate by Country
		I.D 4.	Sales by Affiliates, Industry of Affiliate by Country
		I.D 10.	Net Income of Affiliates, Industry of Affiliate by Country
		I.G 2.	Employment of Affiliates, Industry of Affiliate by Country
		I.H 4.	U.S. Exports of Goods Shipped to Affiliates, Industry of Affiliate by Country
		I.H 12.	U.S. Imports of Goods Shipped by Affiliates, Industry of Affiliate by Country
	Country by Industry	I.B 5.	Total Assets of Affiliates, Country by Industry of Affiliate
		I.C 4.	Expenditures for Property, Plant, and Equipment by Affiliates, Country by Industry of Affiliate
		I.D 3.	Sales by Affiliates, Country by Industry of Affiliate
		I.D 9.	Net Income of Affiliates, Country by Industry of Affiliate
		I.G 1.	Employment of Affiliates, Country by Industry of Affiliate
		I.G 3.	Compensation of Employees of Affiliates, Country by Industry of Affiliate
		I.H 3.	U.S. Exports of Goods Shipped to Affiliates, Country by Industry of Affiliate
		I.H 11.	U.S. Imports of Goods Shipped by Affiliates, Country by Industry of Affiliate
MOFAs	Industry	II.A 2.	Selected Data for Foreign Affiliates and U.S. Parents in All Industries
		II.E 3.	Goods and Services Supplied by Affiliates, Industry of Affiliate by Destination
		II.E 11.	Goods Supplied by Affiliates, Industry of Affiliate by Destination
		II.E 13.	Services Supplied by Affiliates, Industry of Affiliate by Destination
		II.H 2.	U.S. Trade in Goods With Affiliates by Industry of Affiliate
	Country	II.A 1.	Selected Data for Foreign Affiliates in All Countries in Which Investment Was Reported
		II.E 2.	Goods and Services Supplied by Affiliates, Country by Destination
		II.E 10.	Goods Supplied by Affiliates, Country by Destination
		II.E 12.	Services Supplied by Affiliates, Country by Destination
		II.H 1.	U.S. Trade in Goods With Affiliates by Country
	Industry by Country	II.B 6.	Total Assets of Affiliates, Industry of Affiliate by Country
		II.C 5.	Expenditures for Property, Plant, and Equipment by Affiliates, Industry of Affiliate by Country
		II.D 4.	Sales by Affiliates, Industry of Affiliate by Country
		II.D 10.	Net Income of Affiliates, Industry of Affiliate by Country
		II.E 15.	Services Supplied by Affiliates, Industry of Affiliate by Country
		II.E 17.	Services Supplied by Affiliates to Foreigners, Industry of Affiliate by Country
		II.G 2.	Employment of Affiliates, Industry of Affiliate by Country

Continued on next page

Table A.3 – continued

Scope of analysis	Level of detail	Table code	Table name
		II.G 4.	Compensation of Employees of Affiliates, Industry of Affiliate by Country
		II.H 4.	U.S. Exports of Goods Shipped to Affiliates, Industry of Affiliate by Country
		II.H 12.	U.S. Imports of Goods Shipped by Affiliates, Industry of Affiliate by Country
	Country by Industry	II.B 5.	Total Assets of Affiliates, Country by Industry of Affiliate
		II.C 4.	Expenditures for Property, Plant, and Equipment by Affiliates, Country by Industry of Affiliate
		II.D 3.	Sales by Affiliates, Country by Industry of Affiliate
		II.D 9.	Net Income of Affiliates, Country by Industry of Affiliate
		II.E 4.	Goods and Services Supplied by Affiliates to the United States, Country by Industry of Affiliate
		II.E 7.	Goods and Services Supplied by Affiliates to the Host Country, Country by Industry of Affiliate
		II.E 8.	Goods and Services Supplied by Affiliates to Foreign Countries Other Than the Host Country, Country by Industry of Affiliate
		II.G 1.	Employment of Affiliates, Country by Industry of Affiliate
		II.G 3.	Compensation of Employees of Affiliates, Country by Industry of Affiliate
		II.H 3.	U.S. Exports of Goods Shipped to Affiliates, Country by Industry of Affiliate
		II.H 5.	U.S. Exports of Goods Shipped to Affiliates by U.S. Parents, Country by Industry of Affiliate
		II.H 11.	U.S. Imports of Goods Shipped by Affiliates, Country by Industry of Affiliate
		II.H 13.	U.S. Imports of Goods Shipped by Affiliates to U.S. Parents, Country by Industry of Affiliate
U.S. Parents	Industry	II.E 9.	Goods and Services Supplied by Affiliates, Industry of U.S. Parent by Destination
		I.K 1	Selected Financial and Operating Data of U.S. Parents by Industry of U.S. Parent

A.3 Construction and Harmonization Methodology for MOFAS Sales Data for Decomposition

Based on the three-dimensional country–sector database (harmonized across countries but not across sectors due to limited industrial detail), we apply the following procedure to obtain a dataset without missing values:

1. **Cleaning.** Periods, countries, and sectors are filtered to retain subsets with the lowest proportion of missing values, while preserving those of high relevance.

2. **Industrial consolidation.** Sectoral information (even if definitions change across temporal subsamples) is unified to ensure continuity over time; a scale correction is then applied in the next step.

3. **Geographic scaling factors.** For each country–sector–year, ratios between the country–sector-level database and the industry–region-level database are computed. These factors rescale the non-harmonized industry values in the country–sector database to new values (aiming to replicate a harmonized base, guided by industry–region data). If information is missing for a country, it is replaced with the factor from the higher level of its geographic or industrial hierarchy.

4. **Temporal smoothing of ratios.** A state-space model (using the Kalman filter) is applied to the logarithmic growth of the ratios to smooth their dynamics and fill missing values. The ratio levels are then recovered, imposing non-negativity.

5. **Application of factors.** Regional aggregates are distributed to countries using the new ratios. Both observed and rescaled cells are treated as blocked (i.e., not modifiable in subsequent stages).

6. **Sales imputation.** A state-space model (using the Kalman filter) is estimated on the logarithmic growth of sales to fill missing values derived from originally absent levels (not from ratios, which were imputed in step 5). Early sample periods are also reconstructed based on later observations (avoiding plateaus and ensuring non-negativity).

7. **Hierarchical reconciliation with residual.** Since step 6 does not guarantee that the adjusted values (countries or disaggregated industries) do not exceed their original aggregates (subtotals or totals), re-estimation is performed where necessary (over the subset imputed in step 6), imposing:

(a) For industries within a country–year and for countries within a sector–year:

$$\text{Original Aggregate} = \text{Sum of Adjusted Values} + \text{“Other”},$$

where “Other” is the accounting residual and is never blocked (it is recalibrated if necessary).

(b) If the aggregate is not blocked, it is adjusted to equal the sum of affiliates plus the residual.

(c) If the aggregate is blocked and the adjusted values exceed the total, they are proportionally scaled to restore the identity with a zero residual; if they do not exceed, only free values are reassigned.

8. **Closure and numerical stability.** The difference is reduced through a projection onto a simplex with minimum floors (non-negativity) and an adjustment is performed to eliminate discrepancies caused by rounding.

Despite the above, the final dataset still exhibits minimal discrepancies between the sum of adjusted values and the original aggregates: in the worst year, around 1.4%.

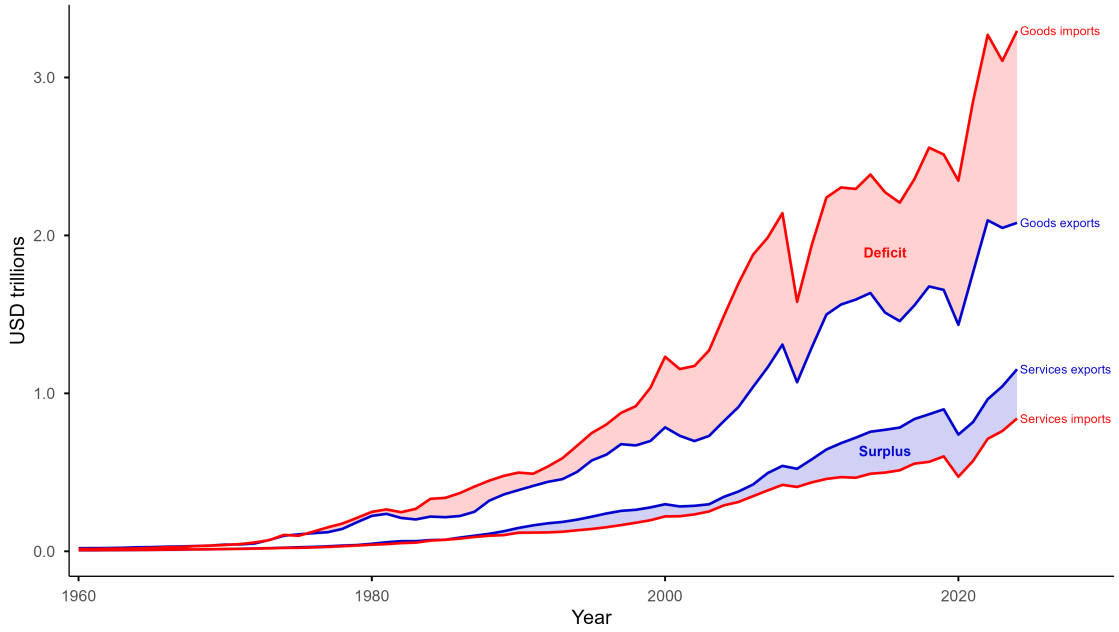
B Additional Tables and Figures

TABLE B.1: Foreign Affiliates Employment and Trade Balance Regressions

	Affiliate Employment relative to global US MNCs employment		
Regressor	Employment in MOFAs (1)		Employment in all affiliates (2)
	Panel A: Dependent variable – Normalized Trade Balance (Goods & Services)		
Affiliate Employment	-0.740[a]		-0.693[a]
	(0.117)		(0.102)
Observations	1479		1204
R^2	0.942		0.951
Mean of dep. var.		−0.00377	
	Panel B: Dependent variable – Normalized Trade Balance (Goods)		
Affiliate Employment	-0.753[a]		-0.718[a]
	(0.133)		(0.117)
Observations	1479		1204
R^2	0.946		0.954
Mean of dep. var.		−0.00471	
	Panel C: Dependent variable – Normalized Trade Balance (Services)		
Affiliate Employment	0.0133		0.0249
	(0.0338)		(0.0315)
Observations	1479		1204
R^2	0.803		0.799
Mean of dep. var.		0.000935	
Overall mean of main regressors (across panels)			
Mean of main regr.	0.00496		0.00650

Notes: Each column reports the coefficient from a panel regression of the form $\text{Trade Balance}_{c,t} = \beta \text{Affiliate Employment}_{c,t-1} + \gamma Z_{c,t-1} + \mu_t + \mu_c + \varepsilon_{c,t}$, where $\text{Trade Balance}_{c,t}$ denotes the U.S. bilateral trade balance with country c in year t, normalized by total trade (exports + imports), for the outcome indicated in each panel: total goods and services, goods only, or services only. The main independent variable, $\text{Affiliate Employment}_{c,t-1}$, is the lagged ratio of affiliate employment in country c relative to total global employment of U.S. multinationals, as specified in each column header. The control vector $Z_{c,t-1}$ includes the logarithm of real GDP per capita, the internal rate of return, and the logarithm of the bilateral exchange rate. All regressions include year and country fixed effects, and standard errors are heteroskedasticity-robust (HC1). Cells report coefficient estimates with robust standard errors in parentheses. [a] p<0.01, [b] p<0.05, [c] p<0.10.

FIGURE B.1: U.S. Trade in Goods and Services, 1960–2023

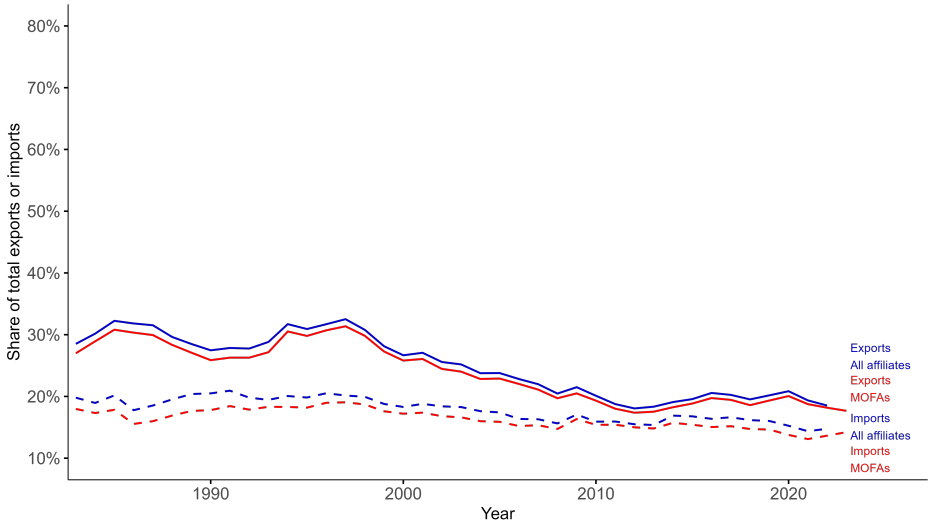


Notes: This figure shows U.S. trade flows from 1960 to 2023, in trillions of U.S. dollars, based on data from the Bureau of Economic Analysis (BEA). The top panel plots goods imports (solid red line) and goods exports (solid blue line), with the shaded red area indicating the trade deficit in goods. The bottom panel shows service imports (solid red line) and service exports (solid blue line), with the blue shaded area indicating the trade surplus in services. All values are presented in nominal terms.

FIGURE B.2: Exports and Imports Ratios - Majority Owned Vs. All Affiliates

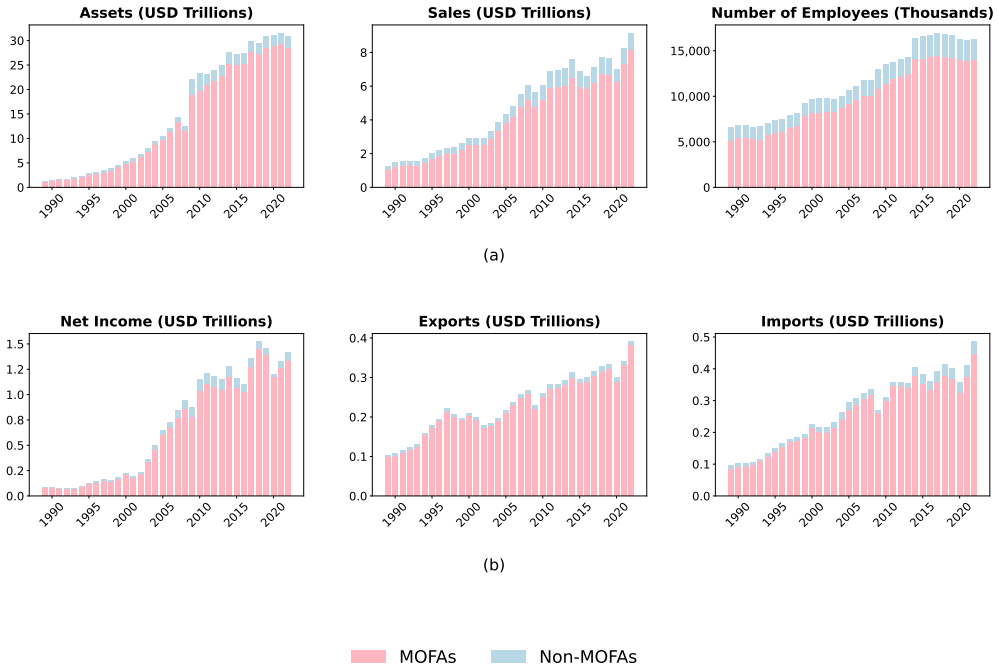
(A) Foreign Affiliates Only

(B) Parents and Foreign Affiliates



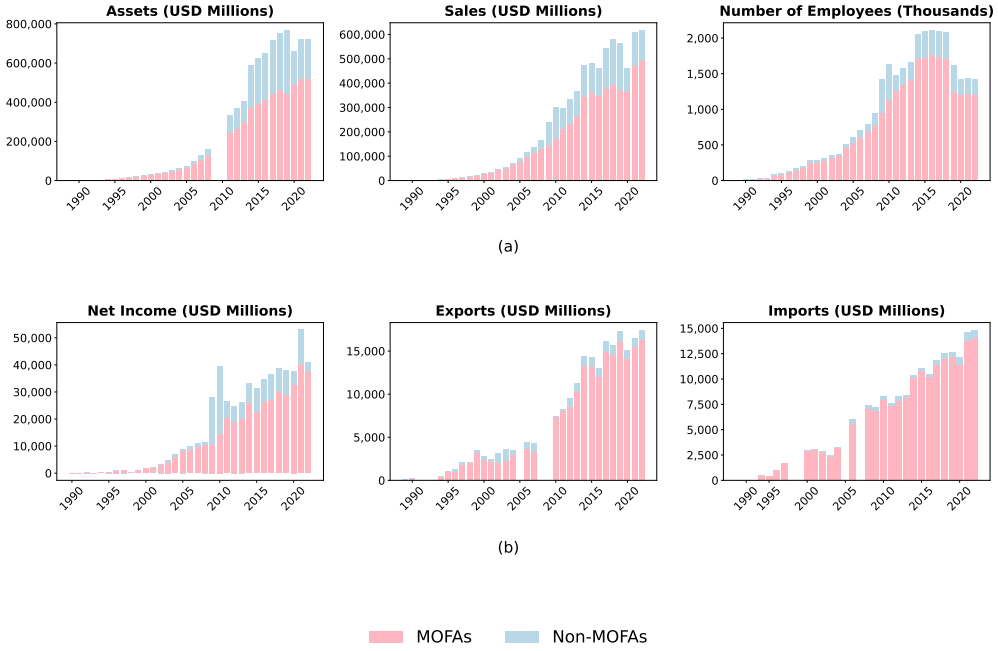
Notes: Panel (a) shows the share of total U.S. goods exports and imports conducted through foreign affiliates between 1983 and 2023 for MOFAs (Majority-Owned Foreign Affiliates) and between 1983 and 2022 for all affiliates, based on data from the U.S. Bureau of Economic Analysis (BEA). Panel (b) presents the share of total U.S. goods exports and imports associated with U.S. parents and their foreign affiliates between 1983 and 2023 for MOFAs and between 1983 and 2022 for all affiliates. In addition to transactions through foreign affiliates, this measure includes trade between U.S. parent companies and unaffiliated foreign entities. Blue lines denote MOFAs and red lines denote all affiliates; solid lines are export shares and dashed lines are import shares.

FIGURE B.3: US Foreign Affiliates: MOFAS and Non-MOFAS, 1989-2022.



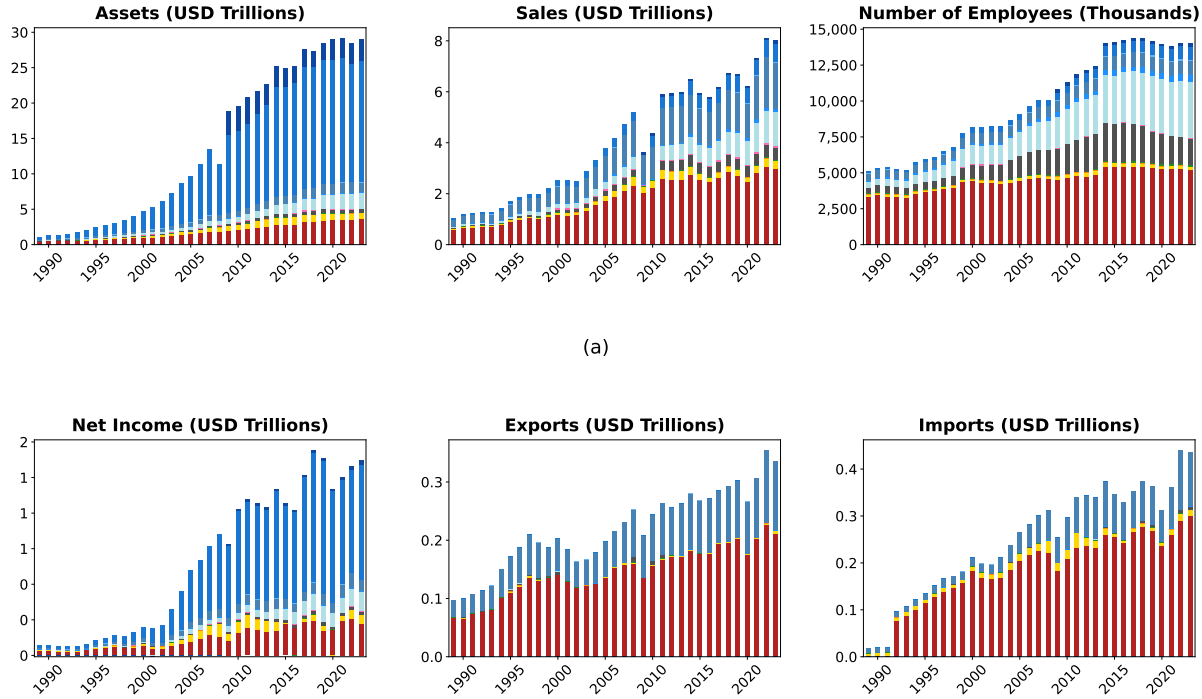
Notes: MOFAs are majority-owned foreign affiliates. Non-MOFAs are all affiliates minus MOFAs. Figures display assets, sales, number of employees, net income, exports, and imports in real terms (deflated by the GDP deflator obtained from the U.S. Bureau of Economic Analysis via FRED). Source: BEA.

FIGURE B.4: US Foreign Affiliates in China: MOFAS and Non-MOFAs, 1989-2022.



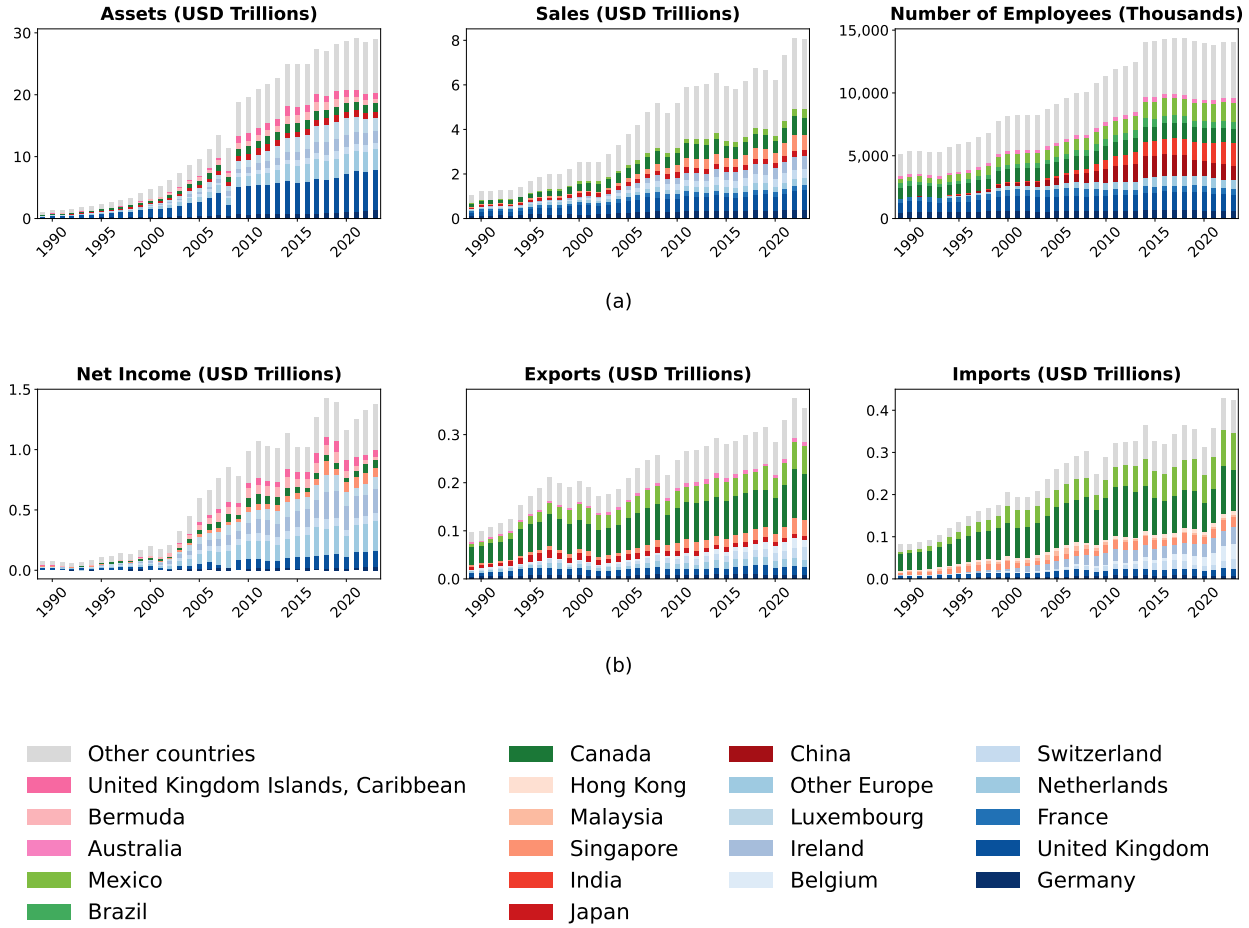
Notes: MOFAs are majority-owned foreign affiliates. Non-MOFAs are all affiliates minus MOFAs. Figures display assets, sales, number of employees, net income, exports, and imports in real terms (deflated by the GDP deflator obtained from the U.S. Bureau of Economic Analysis via FRED). Source: BEA.

FIGURE B.5: Majority-Owned Foreign Affiliates (MOFAs): Assets, Sales, Employment, Net Income, Exports, and Imports by Industry, 1990–2022.



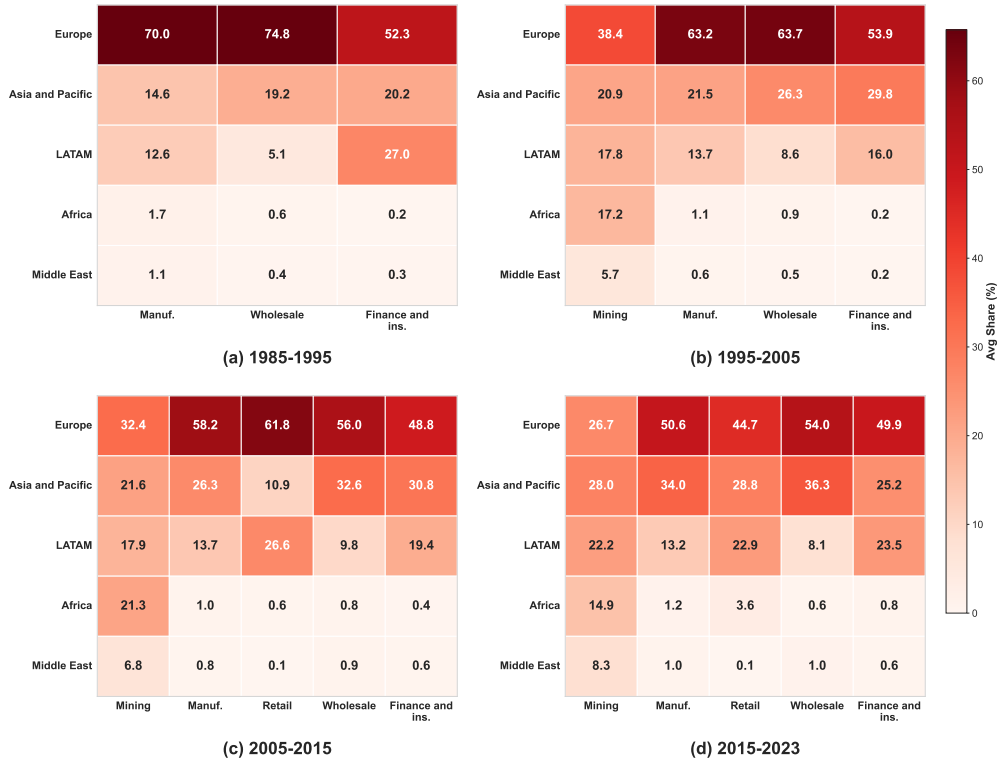
Notes: The figure displays assets, sales, number of employees, net income, exports, and imports of majority-owned foreign affiliates (MOFAs) by industry between 1990 and 2022.
Source: Bureau of Economic Analysis (BEA)

FIGURE B.6: Majority-Owned Foreign Affiliates (MOFAs): Real Assets, Sales, Employment, Net Income, Exports, and Imports by Top 10 Countries, 1990–2022.



Notes: The figure displays the evolution of assets, sales, number of employees, net income, exports, and imports of majority-owned foreign affiliates (MOFAs) between 1990 and 2022. All monetary variables are expressed in real terms, that is, they were deflated using the U.S. GDP deflator from the Bureau of Economic Analysis (BEA), obtained via FRED. Each panel shows the contribution of the top 10 countries—ranked by their average share across all years—along with an aggregate category labeled *"Other countries"* that includes all remaining economies. Country colors were chosen based on their geographic region.
Source: Bureau of Economic Analysis (BEA).

FIGURE B.7: Sectoral Distribution of Sales by Geographic Region, 1985–2023



Notes: The figure displays the sectoral composition of sales for U.S. Majority-Owned Foreign Affiliates (MOFAs) across five geographic regions and four time periods. Each panel represents average sales shares (in percent) by sector and region. Darker shades indicate higher sales shares. Panel (a) covers 1985–1995, (b) 1995–2005, (c) 2005–2015, and (d) 2015–2023.
Source: Bureau of Economic Analysis (BEA).

C IV Results for U.S. MNC Activity and the Trade Balance

To be included

D Decomposing the Change in Aggregate MNCs Activity

We define the log growth of total sales of U.S. foreign affiliates between periods t_0 and t_1 as:

$$g^{\text{agg}} = \sum_c \omega_{c,t_1} \cdot g_c,$$

where $g_c = \log y_{c,t_1} - \log y_{c,t_0}$ is the log change in sales of country c, and $\omega_{c,t_1} = y_{c,t_1}/Y_{t_1}$ is the final-period share of country c in the global total $Y_{t_1} = \sum_c y_{c,t_1}$.

We can express this aggregate growth as the sum of two economically interpretable compo-

nents:

$$g_{t1}^{\text{agg}} = \sum_c \omega_{c,t_1} \cdot g_c = \underbrace{\sum_c \omega_{c,t_0} \cdot g_c}_{\substack{\text{Expansion at fixed} \\ \text{composition}}} + \underbrace{\sum_c (\omega_{c,t_1} - \omega_{c,t_0}) \cdot (g_c - \bar{g})}_{\substack{\text{Reallocation toward} \\ \text{faster-growing countries}}},$$

where $\omega_{c,t_0} = y_{c,t_0}/Y_{t_0}$ is the initial share and $\bar{g} = \sum_c \omega_{c,t_0} g_c$ is the average growth rate using fixed weights from t_0.

The first term captures aggregate growth under a counterfactual scenario in which each country's growth is weighted by its initial share in global sales. This "expansion" component reflects the overall scaling-up of multinational operations, assuming that the geographic distribution of activity remains constant. The second term measures how much of aggregate growth is due to a reallocation of global shares toward countries that grew more than the initial average. This "reallocation" component is zero if shares remain constant, and positive when faster-growing countries gain weight in the global distribution of affiliate sales.

Now let's show that the decomposition is exact by expanding the right-hand side:

$$\begin{aligned}
&\sum_c \omega_{c,t_0} g_c + \sum_c (\omega_{c,t_1} - \omega_{c,t_0})(g_c - \bar{g}) \\
&\qquad = \sum_c \omega_{c,t_0} g_c + \sum_c \omega_{c,t_1}(g_c - \bar{g}) - \sum_c \omega_{c,t_0}(g_c - \bar{g}) \\
&\qquad = \sum_c \omega_{c,t_0} g_c + \sum_c \omega_{c,t_1} g_c - \sum_c \omega_{c,t_1} \bar{g} - \sum_c \omega_{c,t_0} g_c + \sum_c \omega_{c,t_0} \bar{g} \\
&\qquad = \sum_c \omega_{c,t_1} g_c - \bar{g} \sum_c \omega_{c,t_1} + \bar{g} \sum_c \omega_{c,t_0} \\
&\qquad = \sum_c \omega_{c,t_1} g_c,
\end{aligned}$$

where we use the fact that $\sum_c \omega_{c,t_0} = \sum_c \omega_{c,t_1} = 1$. ■

Nested Growth Decomposition: Across Countries and Within-Country Sectors

We now expand the decomposition to incorporate the sectoral composition within each country. Let $y_{cs,t}$ denote the sales of U.S. affiliates in country c, sector s, and year t, and define:

- $g_{cs} = \log y_{cs,t_1} - \log y_{cs,t_0}$: log growth in sales for country-sector cell;
- $Y_t = \sum_{c,s} y_{cs,t}$: total global sales at time t;
- $y_{s,t} = \sum_c y_{cs,t}$: total global sales of sector s at time t;

- $\omega_{cs,t} = y_{cs,t}/Y_t$: share of cell (c, s) in global total;
- $\omega_{s,t} = y_{s,t}/Y_t$: global share of sector s;
- $\omega_{c|s,t} = y_{cs,t}/y_{s,t}$: share of country c within global sales of sector s;
- $g_s = \sum_c \omega_{c|s,t_1} \cdot g_{cs}$: growth of sector s;
- $\bar{g} = \sum_s \omega_{s,t_0} \cdot g_s$;
- $\bar{g}s = \sum_c \omega c|s, t_0 \cdot g_{cs}$: average growth in sector s (initial country weights).

We express total growth as:

$$g^{\text{agg}} = \sum_{c,s} \omega_{cs,t_1} \cdot g_{cs},$$

and apply the same logic as above in two steps:

Step 1: Across countries. Define $g_c = \sum_s \omega_{s|c,t_1} \cdot g_{cs}$. Then:

$$g^{\text{agg}} = \sum_c \omega_{c,t_1} \cdot g_c = \underbrace{\sum_c \omega_{c,t_0} \cdot g_c}_{\substack{\text{Expansion at fixed} \\ \text{country composition}}} + \underbrace{\sum_c (\omega_{c,t_1} - \omega_{c,t_0}) \cdot (g_c - \bar{g})}_{\substack{\text{Reallocation toward} \\ \text{faster-growing countries}}},$$

with $\bar{g} = \sum_c \omega_{c,t_0} \cdot g_c$.

The first term captures the expansion of global sales, assuming the distribution of activity across countries remains constant. The second term reflects reallocations in global shares across countries: it is positive when countries with above-average growth gain weight in the total, and negative when their share declines.

Step 2: Within each country. For each c, define $\bar{g}_c = \sum_s \omega_{s|c,t_0} \cdot g_{cs}$. Then:

$$g_c = \sum_s \omega_{s|c,t_1} \cdot g_{cs} = \underbrace{\sum_s \omega_{s|c,t_0} \cdot g_{cs}}_{\substack{\text{Expansion at fixed} \\ \text{sectoral composition within } c}} + \underbrace{\sum_s (\omega_{s|c,t_1} - \omega_{s|c,t_0}) \cdot (g_{cs} - \bar{g}_c)}_{\substack{\text{Reallocation within } c \text{ toward} \\ \text{faster-growing sectors}}}.$$

Putting both steps together yields a fully nested decomposition of global affiliate growth. The first component captures pure expansion: how much total growth would have occurred if the geographic and sectoral composition of activity had remained unchanged. The second component reflects reallocation across countries—that is, whether countries that experienced faster growth also gained weight in the global distribution of affiliate activity. The third

component captures within-country reallocation across sectors, quantifying the extent to which growth was driven by shifts in sectoral composition inside each country, as activity moved toward sectors with above-average growth.

$$g^{\text{agg}} = \underbrace{\sum_{c,s} \omega_{cs,t_0} \cdot g_{cs}}_{\substack{\text{Expansion at fixed} \\ \text{country and sector} \\ \text{composition}}} + \underbrace{\sum_{c} (\omega_{c,t_1} - \omega_{c,t_0}) \cdot (g_c - \bar{g})}_{\text{Reallocation across countries}} + \underbrace{\sum_{c} \omega_{c,t_0} \cdot \left[\sum_{s} (\omega_{s|c,t_1} - \omega_{s|c,t_0}) \cdot (g_{cs} - \bar{g}_c) \right]}_{\text{Within-country reallocation across sectors}}$$

We now verify that this two-level decomposition recovers aggregate growth:

$$\begin{aligned}
g^{\text{agg}} &= \sum_{c,s} \omega_{cs,t_1} \cdot g_{cs} \\
&= \sum_{c} \omega_{c,t_1} \cdot \sum_{s} \omega_{s|c,t_1} \cdot g_{cs} \\
&= \sum_{c} \omega_{c,t_0} \cdot g_c + \sum_{c} (\omega_{c,t_1} - \omega_{c,t_0}) \cdot (g_c - \bar{g}) \\
&= \sum_{c} \omega_{c,t_0} \cdot \left(\sum_{s} \omega_{s|c,t_1} \cdot g_{cs} \right) + \sum_{c} (\omega_{c,t_1} - \omega_{c,t_0}) \cdot \left(\sum_{s} \omega_{s|c,t_1} \cdot g_{cs} - \bar{g} \right) \\
&= \sum_{c} \omega_{c,t_0} \cdot \sum_{s} \left[\omega_{s|c,t_0} \cdot g_{cs} + (\omega_{s|c,t_1} - \omega_{s|c,t_0}) \cdot (g_{cs} - \bar{g}_c) \right] \\
&\quad + \sum_{c} (\omega_{c,t_1} - \omega_{c,t_0}) \cdot (g_c - \bar{g}) \\
&= \sum_{c,s} \omega_{cs,t_0} \cdot g_{cs} + \sum_{c} \omega_{c,t_0} \cdot \sum_{s} (\omega_{s|c,t_1} - \omega_{s|c,t_0}) \cdot (g_{cs} - \bar{g}_c) + \sum_{c} (\omega_{c,t_1} - \omega_{c,t_0}) \cdot (g_c - \bar{g}) \\
&= \sum_{c,s} \omega_{cs,t_1} \cdot g_{cs}
\end{aligned}$$

■

Nested Growth Decomposition: Across Sectors and Within-Sector Countries

We now develop an alternative nested decomposition of total log growth in U.S. affiliate sales that places sectors at the top level of aggregation. Let $y_{cs,t}$ denote the sales of affiliates in country c, sector s, and year t, and define total growth as:

$$g^{\text{agg}} = \sum_{c,s} \omega_{cs,t_1} \cdot g_{cs} = \sum_{s} \omega_{s,t_1} \cdot g_s$$

We decompose this in two steps.

Step 1: Across sectors.

$$g^{\text{agg}} = \underbrace{\sum_s \omega_{s,t_0} \cdot g_s}_{\substack{\text{Expansion at fixed} \\ \text{sector composition}}} + \underbrace{\sum_s (\omega_{s,t_1} - \omega_{s,t_0}) \cdot (g_s - \bar{g})}_{\substack{\text{Reallocation across} \\ \text{sectors}}}$$

The first term measures how much global growth would result if the sectoral distribution remained fixed. This is the pure expansion component at the sector level, capturing weighted growth across sectors without any change in their global share. The second term quantifies reallocation across sectors: it is positive when faster-growing sectors gain weight in the global total, and negative when slower-growing sectors expand at the expense of more dynamic ones.

Step 2: Within each sector.

$$g_s = \sum_c \omega_{c|s,t_1} \cdot g_{cs} = \underbrace{\sum_c \omega_{c|s,t_0} \cdot g_{cs}}_{\substack{\text{Expansion at fixed} \\ \text{country composition within sector } s}} + \underbrace{\sum_c (\omega_{c|s,t_1} - \omega_{c|s,t_0}) \cdot (g_{cs} - \bar{g}_s)}_{\substack{\text{Reallocation within sector } s \\ \text{toward faster-growing countries}}}$$

This second layer distinguishes whether sectoral growth arises from uniform expansion across countries or from structural shifts within sectors. The first term reflects within-sector expansion at a fixed country composition. The second term is positive when high-growth countries gain weight within the sector.

Putting both layers together yields the full decomposition:

$$g^{\text{agg}} = \underbrace{\sum_{c,s} \omega_{cs,t_0} \cdot g_{cs}}_{\substack{\text{Expansion at fixed} \\ \text{sector and country composition}}} + \underbrace{\sum_s (\omega_{s,t_1} - \omega_{s,t_0}) \cdot (g_s - \bar{g})}_{\substack{\text{Reallocation across} \\ \text{sectors}}} + \underbrace{\sum_s \omega_{s,t_0} \cdot \sum_c (\omega_{c|s,t_1} - \omega_{c|s,t_0}) \cdot (g_{cs} - \bar{g}_s)}_{\substack{\text{Within-sector reallocation} \\ \text{across countries}}}$$

The three terms in this decomposition reflect distinct forces. The first captures baseline expansion under fixed composition—a world where neither sectors nor countries gain weight. The second captures shifts in the global sectoral structure—whether dynamic sectors are expanding their footprint. The third captures compositional shifts within each sector—whether

activity is moving toward higher-growth countries within sectors.

Verification of exactness:

$$
\begin{aligned}
g^{\text{agg}} &= \sum_{c,s} \omega_{cs,t_1} \cdot g_{cs} \\
&= \sum_{s} \omega_{s,t_1} \cdot \sum_{c} \omega_{c|s,t_1} \cdot g_{cs} \\
&= \sum_{s} \omega_{s,t_0} \cdot g_s + \sum_{s} (\omega_{s,t_1} - \omega_{s,t_0}) \cdot (g_s - \bar{g}) \\
&= \sum_{s} \omega_{s,t_0} \cdot \left(\sum_{c} \omega_{c|s,t_0} \cdot g_{cs} \right) + \sum_{s} \omega_{s,t_0} \cdot \sum_{c} (\omega_{c|s,t_1} - \omega_{c|s,t_0}) \cdot (g_{cs} - \bar{g}_s) \\
&\quad + \sum_{s} (\omega_{s,t_1} - \omega_{s,t_0}) \cdot (g_s - \bar{g}) \\
&= \sum_{c,s} \omega_{cs,t_0} \cdot g_{cs} + \sum_{s} \omega_{s,t_0} \cdot \sum_{c} (\omega_{c|s,t_1} - \omega_{c|s,t_0}) \cdot (g_{cs} - \bar{g}_s) + \sum_{s} (\omega_{s,t_1} - \omega_{s,t_0}) \cdot (g_s - \bar{g}) \\
&= \sum_{c,s} \omega_{cs,t_1} \cdot g_{cs}
\end{aligned}
$$

■