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Abstract

We study how multinational corporations (MNCs) shape firm-level and aggregate structural transformation. Using confidential microdata from Japan and exploiting a quasi-exogenous reform that expanded foreign investment opportunities in China, we assess empirically how this reform affected employment at firms in both the host country (China) and the home country (Japan). In liberalized industries, Japanese manufacturing affiliates in China expanded employment, while parent firms in Japan shifted out of manufacturing and into higher-value service activities, including R&D. To assess the broader relevance of this mechanism, we use microdata from several advanced and middle-income economies, and show that MNCs account for the majority of the middle-income countries' reallocation to manufacturing.

JEL Classification: F23, F60

Keywords: Multinational firms, manufacturing employment, services employment, foreign direct investment liberalization

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1 Introduction

Multinational firms play a significant role in shaping firm-level and aggregate employment dynamics across manufacturing and non-manufacturing sectors.[1] By moving production across national borders, these firms also shape sectoral employment patterns across countries. Such resource reallocation across sectors and countries raises the possibility that multinationals (MNCs) can provide a unified mechanism through which countries experience distinct and simultaneous paths of structural transformation – the process by which the services employment share rises over time, while the manufacturing employment share first increases as employment moves out of agriculture and then declines as employment shifts toward services.[2]

The goal of our paper is to empirically assess whether and how multinationals affect structural transformation within and across countries. We use confidential Japanese microdata that links parent firms in Japan to their foreign affiliates worldwide, including in China. We then exploit China's major foreign direct investment (FDI) policy change in 2002, which encouraged greater inward FDI into China, as a quasi-random experiment that was plausibly exogenous from the perspective of the Japanese multinational firms. Crucially, the policy's encouragement varied across products, and the product-level changes can be aggregated to the industry-level. Then, for both Japanese manufacturing affiliates in China, as well as the Japanese parents in Japan, we assess whether those firms in industries for which FDI into China was encouraged experienced different changes in economic activity.

Controlling for tariffs, we find that the "treated" affiliates in China expanded employment and sales, and the share of treated parents' employment in R&D and international business services also increased. Moreover, the increase in manufacturing affiliate sales was largely driven by increased exports to Japan. In sum, we provide empirical evidence that in response to China's FDI policy change, Japanese multinationals contributed to firm-level structural change both in China – by making it more of an export hub and accelerating its movement up the manufacturing hump – and in Japan, where they accelerated its transition to services, especially those supporting MNC activity. To the best of our knowledge, this is the first empirical evidence that multinationals are a driver of structural transformation across countries.

To motivate our empirical analysis, we begin by presenting a simple firm-level multinational framework in which the foreign affiliate produces intermediate goods that are exported back to the home country. The domestic parent uses the imported intermediates and domestic

[1] See for instance Muendler and Becker (2010), Boehm et al. (2020), and Kovak et al. (2021).

[2] Kuznets (1973) and Maddison (1980) pioneered the documentation of structural transformation across OECD countries. Jorgenson and Timmer (2010) provides updated evidence.

labor to produce final goods. Opening up to FDI increases the efficiency of both foreign and domestic production processes, which leads to an increase in employment at the affiliate, and a reduction in manufacturing employment coupled with an increase in services employment at the parent.

Our data draws from two main sources. First, we use two confidential datasets, one on Japan's overseas subsidiaries of its multinationals, and one on the multinational parents. Through these datasets, we are able to link the parents to their affiliates in China. Thus, for each parent, we know the activity of each of its affiliates in China including employment and sales by destination. In addition, we know employment by function (e.g. manufacturing, R&D, international business, etc.) at the parents and can thus examine effects on firm-level employment shares. Second, we use data on the FDI policy reform in China in 2002. This reform, enacted as part of China's entry into the WTO, loosened restrictions on inward FDI. Crucially, the extent of FDI encouragement varied across products. We aggregate the product-level FDI changes to the industry level in order to facilitate our econometric analysis. Our treatment variable at the affiliate level is the export-weighted share of Harmonized System (HS6) products within an industry that were more highly encouraged. For parents, our treatment variable is the same share at the parent's first manufacturing affiliate in China.

We implement a differences-in-differences (DID) specification in which we examine the differential response of the "treated" Chinese affiliates relative to the untreated affiliates, relative to the period before the policy change, and similarly for the Japanese parents. For our baseline specification we use an indicator version of our treatment variable according to whether the share is above or below the median. In all of our specifications, we control for tariffs between China and the rest of the world, and between China and Japan, to absorb any confounding trade policy change by China that differentially impacted the same industries. We also control for affiliate or firm, and region-year, fixed effects.

We find that treated manufacturing affiliates experienced economically meaningful double-digit percent increases in sales and employment, relative to untreated affiliates. Driving the increase in sales is an increase in exports to Japan that is 23 percent larger than for untreated affiliates. Indeed, the share of total affiliate sales sold locally declines by five percent. These results suggest that following China's FDI liberalization, Japanese parents re-oriented their Chinese affiliates to serve as export hubs.

Turning to the parents, we find that in treated parents, the R&D employment share, total sales, and productivity increased economically and statistically significantly relative to untreated parents. Parents' imports from Asia increased, as well.

Taken together, our results show how multinationals can drive firm-level structural transformation across countries, even those at different stages of their transformation. The manufacturing affiliates in China expand production and employment, and reorient that production to serve as an export hub of intermediate goods back to Japan. This facilitates China's manufacturing expansion as it moves up the "hump". By contrast, in Japan, the opposite happens. A relevant part of services employment – employment in R&D and international business – expands its level and share. This facilitates Japan's moving up its services curve.

Beyond controlling for tariffs, we examine two threats to identification. First, we use a dynamic DID to examine the parallel trends assumption and find support for the assumption for our outcomes. Second, the FDI liberalization occurred during China's 10th Five-Year Plan (2001-2005), which specified the particular industries to be supported by favorable policies. We compute the correlation between our treated industries, and the industries supported by the Five-year plan and it is 0.094, which is small.

We also implement extensive robustness analysis. For the affiliate-level and parent-level regressions, we consider alternative definitions of the treatment variable, such as a continuous treatment, and alternative tariff controls. For the parent-level results, we alternatively define treatment status based on their largest affiliate, and expand the set of fixed effects to (parent) industry-year fixed effects. In all cases, the results are consistent with our baseline results. In addition, to study the extensive margin of adjustment, we estimate an industry-level regression and find that the cumulative number of entering affiliates following the FDI liberalization is higher for the treated industries.

Our firm-level partial equilibrium results cannot speak to the aggregate effects of this channel on structural transformation in home and host countries. As a first step at this question, we take a broader view on the role of MNCs in structural transformation by conducting an accounting decomposition using firm-level data from five economies at different stages of development (Hungary, China, France, Japan and the U.S.). Our goal is to quantify how much of the change in the aggregate manufacturing employment share is associated with the evolution of multinational firms, domestic firms, as well as the broader shift of employment to the services sector. Adapting the decomposition by Foster et al. (2006) to our goal, three patterns emerge. First, in the advanced economies, in the 1990s, two-thirds of the decline in the manufacturing employment share in the U.S. and Japan, and in the 2000s, virtually all of the decline in that share in Japan and France, is accounted for by domestic firms. Second, in the emerging market economies, the reverse is true – the increase in their manufacturing employment share is accounted for primarily by MNCs (entry by new affiliates). Finally, across all countries, the broader shift to services is important.

Related Literature Our paper contributes to two main strands of literature: (i) the effects of multinationals, including their impact in China, and (ii) structural transformation, particularly with respect to manufacturing employment. The first literature has typically not emphasized implications for structural transformation, while the second has largely overlooked the role of multinationals in shaping sectoral employment dynamics across countries.

One strand of the multinational literature examines explanations for the decline in manufacturing employment in developed economies, often focusing on trade-based mechanisms, such as China's accession to the World Trade Organization (WTO) (Autor et al. 2013, Pierce and Schott 2016) or offshoring by multinationals (Muendler and Becker 2010, Boehm et al. 2020, Kovak et al. 2021). A related body of work studies the interaction between multinationals and trade. Helpman et al. (2004) provides a foundational framework modeling firm heterogeneity in multinational production. Irarrazabal et al. (2013) extends this framework to include intra-firm trade and estimates its implications. Arkolakis et al. (2018) incorporate multinational activity, trade, and innovation, while Ramondo and Rodríguez-Clare (2013) develops a model linking multinationals and trade, building on Eaton and Kortum (2002). While these contributions provide key insights, they do not empirically examine the interdependence of manufacturing employment shifts across countries, which is the primary focus of our paper. Furthermore, they do not study firm-level or aggregate structural transformation across home and host economies.

Our paper also relates to research on how multinationals transmit shocks across countries (Boehm et al. 2019, Alviarez et al. 2017, Alfaro and Chen 2012, Hanson et al. (2005)), as well as their role in growth, innovation, and productivity (Alfaro et al. 2010, Ramondo and Rodríguez-Clare 2013, Alfaro 2016, Alfaro and Chen 2018, Arkolakis et al. 2018, Alviarez 2019, Okubo 2021). Among these, Alfaro and Chen (2018) is particularly related to our work. Their framework builds on Helpman et al. (2004) to generate testable implications for multinational firms using microdata. However, there are two key differences. First, their main theoretical exercise considers a symmetric reduction in multinational production (MP) frictions, while we examine a unilateral reduction, which leads to different implications for firm-level employment. Second, on the empirical side, they employ a panel-data approach, whereas we exploit a single policy change in China and analyze its effects on both foreign affiliates and parent firms.

Our paper is also related to studies examining the formation and life cycle of multinational affiliates and their relationship with parent firms (Feinberg and Keane 2006, Ramondo et al. 2016, Gumpert et al. 2020, Garetto et al. 2021). Additionally, a smaller strand of literature focuses on multinational activity in China and Japan, as well as Japanese FDI in China

(Head and Ries 2003, Sheng and Yang 2016, Chen et al. 2019, Eppinger and Ma 2024).

The research on structural transformation has studied empirically and theoretically the forces and mechanisms leading to the reallocation of resources across broad sectors. Past research relied on sectoral data, but there is a small and growing literature using micro data to document patterns of structural change. Such studies include Herrendorf and Schoellman (2018), which examines worker transitions out of agriculture, and Gallipoli and Makridis (2018), which analyzes the impact of new jobs in the information technology sector. Ding et al. (2022) studies structural transformation both between and within firms in the U.S. Closely related to our empirical results about the shift away from manufacturing and towards services within Japanese parents, Bloom et al. (2024) finds that in response to the China shock, intra-firm reallocation in the U.S. resulted in a decrease in manufacturing employment and an increase in services employment, particularly in areas such as R&D and management. Among these, Bloom et al. (2024) and Ding et al. (2022) are the closest to our work, given their focus on within-firm structural transformation. Our contribution is to quantify the role of multinationals in enhancing structural transformation in both the home and host countries by using quasi-random exogenous variation in China's FDI policy – to our knowledge, it is the first paper to examine this mechanism as a driver of structural transformation across countries.

On the theoretical side, most of the literature has focused on closed economy models.[3] Ishikawa (1992) and Matsuyama (2009) made early contributions to open economy frameworks, and more recently, there has been a growing literature on quantitative open economy models, including Uy et al. (2013), Betts et al. (2017), Swiecki (2017), Teignier (2018), Cravino and Sotelo (2019), Sposi (2019), Lewis et al. (2022), Lee (2025), and Sposi et al. (2025).[4] Our contribution is to study this issue empirically, at the firm-level, while also providing a simple theoretical setting by which structural transformation can happen at the firm-level.

The rest of the paper is organized as follows. Section 2 presents a simple multinational framework to motivate our empirical analysis. Section 3 discusses our Japanese parent and Chinese affiliate data. Section 4 presents our regression strategy, details our empirical results, and contains extensions and robustness checks. Section 6 concludes.

[3] See Herrendorf et al. (2014) for a survey of such models.

[4] Also, see Alviarez (2019) for a model of multinationals and sectoral reallocation in an open economy.

2 A Stylized Model of Intra-Firm Trade and Task Reallocation

In this section, we present a stylized model to guide our empirical analysis. To keep it simple, we focus on a firm-level maximization problem and abstract from industry- or general-equilibrium effects. The model has two key features: (1) multinational production involves intra-firm trade, where affiliates produce and export intermediate goods to parents, substituting for domestic manufacturing workers; and (2) service workers in parent firms (e.g., R&D and international business units) support multinational production by enhancing the quality and efficiency of imported intermediates. To focus on these two channels, we assume that the foreign affiliate produces only intermediate goods for export, and that the multinational parent firm relies exclusively on imported intermediates for production (i.e., no domestic intermediates are used).[5] The comparative static exercise we implement in the model will be a unilateral FDI liberalization that improves the efficiency of the affiliate in the destination market and/or the efficiency of utilizing the imported intermediate goods from the affiliate to the parent.

2.1 Setup

We consider a firm-level optimization problem. The multinational (parent) firm i is assumed to face a constant-elasticity-of-substitution (CES) demand:

$$q_i = \left(\frac{p_i}{P}\right)^{-\sigma} Q, \tag{2.1}$$

where $Q = \frac{E}{P}$ is the real consumption and P is the ideal price index, taken as constants. σ is the elasticity of substitution between products produced by various firms in the home country. Next, production of the (manufacturing) goods in the parent firm uses both imported intermediate goods and manufacturing workers at home as the inputs:

$$q_i = \left((a_i s_i m_i)^{\frac{\rho-1}{\rho}} + l_i^{\frac{\rho-1}{\rho}}\right)^{\frac{\rho}{\rho-1}},$$

where m_i and l_i are (parent) firm i's imported intermediates and labor inputs (i.e, manufacturing workers), with price is p_m and wage rate w_m respectively. ρ is the elasticity of substitution between imported intermediates and domestic manufacturing workers. The efficiency of the imported intermediates in the production of the final good has two components:

[5]This second simplifying assumption can be interpreted as an endogenous firm-level choice that arises when the wage rate of domestic manufacturing workers-adjusted for the quality and efficiency of intermediate goods-is sufficiently high relative to that of their counterparts in the FDI host country.

a_i, which is exogenous and determined by FDI barriers, and s_i, which can be enhanced by the parent firm through hiring complementary service workers (e.g., in R&D or international business units). The cost of improving s_i is assumed to be

$$C(s_i) = w_s \frac{s_i^2}{2},$$

where w_s is the wage rate of service workers. In other words, the firm needs to hire $\frac{s_i^2}{2}$ service workers in order to raise the endogenous efficiency to s_i. The firm takes the import price and the wages as given.

Turning to the multinational (manufacturing) affiliate, we assume it employs a simple linear production technology in which labor is the sole input used to produce intermediate goods that are exported to the parent firm:

$$m_i = e_a l_a, \tag{2.2}$$

where m_i denotes the quantity of intermediates produced for intra-firm trade, and l_a represents the number of workers employed in the affiliate's production. e_a captures the (exogenous) efficiency level of the multinational production at the affiliate level, affected by FDI barriers. Since we focus on the affiliate's intra-firm trade, its export value is simply equal to its total sales. Importantly, we also assume that the parent firm determines the affiliate's level of production so as to maximize the total profit of the multinational firm (i.e., the parent and affiliate combined). Consequently, there is no double-marginalization problem, and the price of the intermediates exported from the affiliate is simply

$$p_m = \frac{w_a}{e_a},$$

where w_a is the wage rate paid by the affiliate. In summary, the affiliate earns zero profit and functions solely as a production unit for the intermediate goods.

From equation (2.1), we derive the firm's revenue function as

$$p_i q_i = q_i^{\frac{\sigma-1}{\sigma}} P^{\frac{\sigma-1}{\sigma}} E^{\frac{1}{\sigma}}.$$

Thus, the firm's optimization problem can be decomposed into two steps.[6] First, given s_i, the

[6] By solving the model in this way, we assume that the firm chooses s_i first and then m_i and l_i. Since this is a single-agent model, the optimization problem is the same if we assume all decisions are made at the same time. The approach here better highlights the complementarity between imported intermediates and domestic R&D workers.

firm chooses m_i and l_i to maximize the operating profit that excludes the cost of improving the efficiency:

$$\pi^0(s_i, a_i, p_m) \equiv \max_{m_i, l_i} \pi(m_i, l_i; s_i, a_i, p_m),$$

where we define the maximand as

$$\pi(m_i, l_i; s_i, a_i, p_m) \equiv \left((a_i s_i m_i)^{\frac{\rho-1}{\rho}} + l_i^{\frac{\rho-1}{\rho}} \right)^{\frac{\rho(\sigma-1)}{(\rho-1)\sigma}} P^{\frac{\sigma-1}{\sigma}} E^{\frac{1}{\sigma}} - (p_m m_i + w_m l_i). \tag{2.3}$$

Second, the firm makes the decision of hiring service workers by maximizing its final profit:

$$\Pi^0(a_i, p_m) \equiv \max_{s_i} \; \Pi(s_i; a_i, p_m), = \max_{s_i} \left[\pi^0(s_i, a_i, p_m) - w_s \frac{s_i^2}{2} \right]. \tag{2.4}$$

Given s_i, the relationship between optimal m_i and l_i is given

$$\frac{m_i^*}{l_i^*} = \left(\frac{w_m}{p_m} \right)^{\rho} (a_i s_i)^{\rho-1}. \tag{2.5}$$

There are two offsetting effects of an increase in a_i or e_a (i.e., a reduction in p_m) on manufacturing employment. The first is a substitution effect, whose strength depends on ρ. The second is a size effect from efficiency gains, whose strength depends on the degree of returns to scale (σ). When ρ is bigger than σ, the substitution effect dominates, implying that unilateral FDI liberalization (that increases a_i and/or e_a) reduces manufacturing employment in the parent firm. In what follows, we assume $\rho > \sigma$.

To shed more light on how a_i and e_a affect manufacturing employment within multinationals, we derive the quantities and values of the imported intermediate goods in equations A.2 and A.4) in Appendix A. Using these expressions, affiliate-level and parent manufacturing employment can be derived. These are also in Appendix A.

2.2 Unilateral FDI Liberalization

We consider a unilateral FDI liberalization that reduces barriers to multinational production in the host country (China). The liberalization encourages Japanese multinational parent firms to transfer more advanced technologies to their foreign affiliates. Consequently, it induces parent firms to raise either the efficiency of intermediates in final-good production (a_i) or affiliate production efficiency (e_a), which in turn lowers the price of imported intermediates, p_m.[7]

Proposition 1. *When the efficiency of imported intermediate goods (i.e., a_i) and/or that of affiliate-level multinational production (i.e., e_a) increases, the following effects arise:*

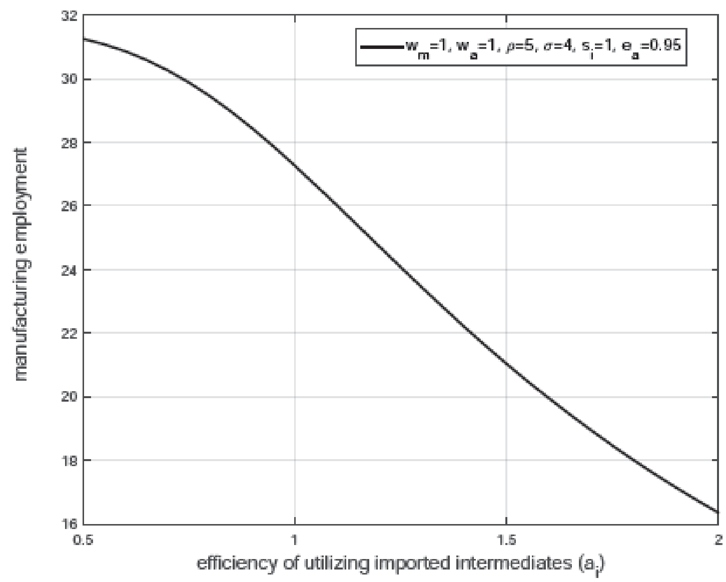
1. *Employment of manufacturing workers in the parent firm decreases provided that the elasticity of substitution between the imported intermediates and manufacturing workers at home is sufficiently large (i.e., $\rho > \sigma$).*
2. *Employment and employment shares of service workers that complement multinational production increase since they complement multinational production.*
3. *Usage of imported intermediates (i.e., intra-firm trade) increases.*
4. *Profits and sales of the parent firm increase.*
5. *Export value (i.e., sales) and employment of the manufacturing affiliate increase.*

Proof. See Appendix A. □

The intuition behind the first result has been discussed above. Figure 1 shows how the manufacturing employment of the parent firm varies with the efficiency of utilizing the imported intermediates when the substitution effect dominates the productivity-enhancing effect (i.e., $\rho > \sigma$). For the second and third results, the productivity-enhancing effect of lower FDI barriers incentivizes parent firms to hire more service workers who complement multinational production and to import more intermediates from their foreign affiliates. At the same time, the profits and sales of the parent firms also rise. Finally, the foreign affiliate produces more and hires additional workers, again thanks to the productivity-enhancing effect of lower FDI barriers. In what follows, we provide evidence for these firm-level predictions using China's unilateral FDI liberalization in 2002.

[7] The empirical context of this paper is an FDI liberalization episode that either removed or substantially raised the ceiling on the foreign equity share permitted in multinational affiliates in selected industries. The classical argument advanced by Dunning (1979) highlights the role of ownership advantages—particularly superior technologies and managerial know-how—in motivating multinational enterprises to expand abroad. Under this view, a relaxation of foreign equity restrictions allows parent firms to exercise greater control and thereby transfer their proprietary technologies more effectively to affiliates. In our setting, this manifests as an increase in the efficiency of imported intermediates used in final-good production (reflecting higher-quality inputs supplied by the parent) and/or an improvement in the affiliate's own production efficiency due to enhanced access to parent-firm technologies and organizational practices.

Figure 1: Parent Manufacturing Employment and the Efficiency of the Imported Intermediates



Notes: This figure shows how the parent firm's manufacturing employment (l_i) responds to an improvement in the efficiency of utilizing the imported intermediates (a_i), which raises the effective contribution of foreign inputs and reduces the need for domestic manufacturing labor. The effect is the same if e_a increases (instead of an increase in a_i). ρ is the elasticity of substitution between imported intermediates and domestic manufacturing workers. σ is the elasticity of substitution between products produced by firms in the home country. e_a denotes the (exogenous) efficiency level of the multinational production at the affiliate level. s_i is the (endogenous) efficiency of utilizing imported intermediates. w_m is the wage rate of manufacturing workers in the FDI home country. w_a is the wage rate paid by the affiliate in the FDI host country.

3 Data and Empirical Setup

3.1 China's FDI Liberalization: Institutional Context (1978–2007)

Due to its rapid economic transformation and significant policy reforms in foreign direct investment, China provides a compelling setting to empirically validate the predictions of our model on multinational liberalization and structural transformation. Before 1979, foreign multinational activity in China was virtually non-existent. However, with the introduction of market-oriented reforms and the gradual opening of the economy to foreign investment, China became a major destination for multinational firms.

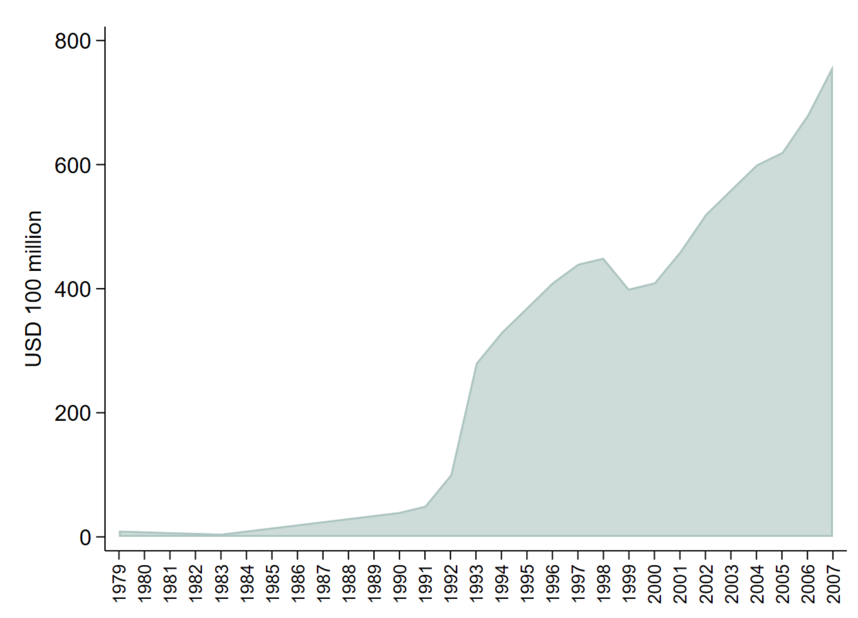
Starting in December 1978, China began its gradual opening to foreign investment. Although FDI inflows grew steadily during the 1980s, they remained relatively small due to strict local content requirements and technology transfer restrictions from foreign MNC firms to Chinese firms. China's commitment to join the WTO prompted further reforms, notably in 1995 with the establishment of the "Catalogue for the Guidance of Foreign Investment Industries" (hereafter referred to as the "Catalog"). This comprehensive list categorized industries into four groups based on their level of FDI encouragement: "supported", "permitted", "restricted", and "prohibited". While this reform laid the groundwork for foreign investment in various industries, the most significant policy change occurred in March 2002, as part of China's WTO accession. During this period, China substantially relaxed FDI restrictions across various industries. Specifically, it removed or significantly increased the limit on the equity share that foreign entities could hold in MNCs within certain industries.

The policy shift in early 2002 substantially reduced barriers to inward FDI, resulting in a marked increase in overall inflows, as illustrated in Figure 2. However, this increase was uneven across different types of foreign-owned firms. According to the Statistical Yearbook of China, FDI inflows into wholly foreign-owned enterprises rose sharply from USD 23.9 billion in 2001 to USD 57.3 billion in 2007, while inflows into joint ventures declined from USD 22.0 billion to USD 17.0 billion over the same period. It is worth noting that minor revisions in November 2004 added only a handful of new products (seven) to the "supported" category, followed by further revisions in October 2007. Yet, these subsequent reforms were limited in scope and timing, and thus had little effect on the overall trend between 2001 and 2007.

Among foreign manufacturing firms in China, Japanese firms play a particularly important role. According to the Annual Survey of Industrial Firms, there were 26,490 foreign firms (excluding those from Hong Kong, Macao, and Taiwan) employing 8,954,083 workers in

China in 2005. Of these, 3,430 were Japanese firms (13%), employing 1,222,729 workers (14%), based on the authors' calculations.[8] Thus, Japanese manufacturing firms represent a significant share of foreign manufacturing activity in China.

FIGURE 2: FDI inflows into China: 1979-2007



Notes: This figure displays annual inflows of foreign direct investment (FDI) into China from 1979 to 2007, measured in hundreds of millions of U.S. dollars. The data are drawn from the *China Foreign Economic Statistical Yearbook* (various years), and the visualization follows Lu et al. (2017). FDI levels are reported at official historical values and reflect total inflows recorded each year.

3.2 Japanese Multinationals and Their Chinese Affiliates

To test the model's predictions, we study how China's 2002 FDI liberalization affected the employment structure of Japanese multinational corporations and their foreign affiliates. Our analysis combines detailed Japanese firm-level microdata with newly constructed measures of China's FDI policy reforms, complemented by controls for concurrent trade liberalization around China's WTO accession.

Our primary sources are two confidential datasets from Japan's Ministry of Economy, Trade, and Industry (METI): the Basic Survey on Overseas Business Activities (BSOBA) and the Basic Survey of Japanese Business Structure and Activities (BSJBSA). The key advantage of these surveys is that they allow us to link Japanese parent firms to their affiliates abroad, including those operating in China, thereby capturing the full parent–affiliate structure that

[8]These figures are derived from the Annual Survey of Industrial Firms (China) and firm-level data from the Basic Survey on Overseas Business Activities (BSOBA) provided by the Japanese government.

matters for the mechanism in our model. Both datasets span the period 1998–2007, providing a balanced window before and after the 2002 policy change.[9]

BSOBA reports information on overseas subsidiaries of Japanese multinationals in manufacturing industries, including both minority- and majority-owned affiliates. For each affiliate, the survey records employment, total sales, and their destination (China's domestic market, Japan, or third countries), three-digit industry codes, and the parent's equity share.[10]

The second survey, BSJBSA, provides the corresponding parent-level information in Japan. It covers firms with at least 50 employees and 30 million yen in assets across mining, manufacturing, wholesale, retail, and other service industries. Crucially, the survey reports employment by departmental function—manufacturing, R&D, international business, marketing/planning, information processing, sales, finance, IT, education, and other services—allowing us to distinguish the types of workers most directly involved in coordinating foreign production. In addition, BSJBSA records detailed trade information at the parent level, including exports and imports by region and by transaction type (intra-firm versus arm's-length), along with total sales by activity and input usage.

We merge BSOBA and BSJBSA using a common firm identifier. Out of 17,623 affiliate-year observations for Chinese manufacturing subsidiaries between 1998 and 2007, 15,476 match to a parent in BSJBSA (an 86% match rate). Unmatched affiliates correspond mostly to parents not covered in BSJBSA or with missing responses in given years. Together, the two surveys provide a comprehensive view of how Japanese multinationals allocate employment and production across their domestic and overseas operations.

3.3 Sample Construction

Our empirical strategy requires observing firms before and after China's 2002 FDI liberalization. We therefore restrict attention to Japanese parents whose first Chinese manufacturing affiliate was established prior to 2002 and drop all affiliates founded after 2002, as these lack pre-policy outcomes. The resulting sample includes 12,106 affiliate-year observations and 9,783 parent-year observations from 1998 to 2007.

For the parent-level regressions studying how firms shift employment from manufacturing toward higher-skilled service functions, we exclude parents that report zero manufacturing employment prior to 2002, since our analysis focuses on within-firm adjustments. Parents who

[9]Years in METI surveys run from April to March; thus the 2002 survey corresponds to the first post-reform year.

[10]The 53 three-digit industries in BSOBA are broadly comparable to four-digit NAICS manufacturing industries.

had manufacturing workers before 2002 remain in the sample even if their manufacturing employment subsequently falls to zero. Nearly all MNC parents report some non-manufacturing employment; only three parent-year observations record zero non-manufacturing employment.

Table 1 summarizes the characteristics of Japanese manufacturing affiliates in China and their parent firms in Japan. Panel A shows that Japanese affiliates in China are sizeable: the average affiliate employs 555 workers and reports annual sales of 4.6 billion JPY, with a highly skewed distribution reaching 60.8 billion JPY at the 99th percentile. Japanese parents typically retain substantial control over their overseas subsidiaries, holding an average equity share of 74%. Affiliates primarily serve the Chinese domestic market—about 59% of their sales remain in China—while 32% are exported back to Japan and roughly 9% to third countries.

Panel B describes the corresponding parent firms in Japan. These firms are large, employing on average 2,158 workers and generating roughly 190 billion JPY in annual sales. Non-manufacturing activities account for nearly half of parent-firm employment, underscoring the breadth of headquarters functions within these organizations. Within the non-manufacturing workforce, service-intensive roles are particularly prominent: research and development (R&D) and international business together represent close to 9% of total employment, with substantial variation across firms. Parent companies also source inputs globally, importing on average 14.2 billion JPY per year, with significant reliance on Asian suppliers and a notable share arriving from their own foreign affiliates.

The patterns in Table 1 underscore the tight integration between Japanese headquarters and their manufacturing affiliates in China. They also highlight the role of specialized service workers within parent firms—particularly those in R&D and international business—in supporting and coordinating foreign production. This parent-affiliate structure is central to our empirical analysis and maps directly into the mechanism of the model, where service-intensive headquarters activities complement overseas manufacturing operations.

Table 1: Summary Statistics: Japanese Affiliates in China and Their Parents

Variable	Obs.	Mean	std. dev.	p1	p25	p50	p75	p99
Panel A: Affiliates in China								
Equity share (%)	12,106	73.5	26.2	10.0	50.4	78.0	100	100
Employment (units)	11,995	555	1,263.7	8	86	211	507	6,027
Sales (JPY billions)	12,106	4.6	18.2	0.02	0.35	1.0	2.9	60.8
Sales in China (%)	12,106	58.9	42.0	0	9.7	75.7	100	100
Sales to Japan (%)	12,106	31.9	39.6	0	0	5.2	72.3	100
Sales to 3rd mkts (%)	12,106	9.2	22.7	0	0	0	1.8	100
Panel B: Parent Firms in Japan								
Employment (units)	9,500	2,158	5,654	60	220	593	1,727	31,290
Manufacturing emp. share (%)	9,500	51.2	29.9	0	29.1	58.5	75.3	96.5
R&D & IB share (%)	9,500	8.76	11.0	0	0.94	4.94	12.8	54.4
Sales (JPY billions)	9,500	190.2	746.4	1.1	8.0	25.8	108.3	2,742.4
Manufacturing sales (JPY billions)	9,500	110.3	403.8	0	3.1	14.4	62.1	1,709.1
Imports (JPY billions)	9,500	14.2	125.7	0	0	0.4	2.7	196.5
Imports from Asia (bn)	9,500	7.5	48.8	0	0	0.3	1.8	128.9
Imports from affiliates (bn)	9,500	3.9	30.1	0	0	0.1	0.9	72.7

Notes: Panel A summarizes Japanese manufacturing affiliates in China using METI's Basic Survey on Overseas Business Activities (BSOBA). Panel B reports characteristics of Japanese parent firms using METI's Basic Survey of Business Structure and Activities (BSJBSA). Sales and imports are in JPY billions; shares are percentages. Parent-level outcomes refer to activity in Japan only. The sample covers 1998–2007 and includes all affiliates in China matched to their Japanese parents.

3.4 China's FDI Reform and Industry-Level Exposure

China's 2002 revision of the Catalogue for the Guidance of Foreign Investment Industries introduced substantial changes in the extent to which specific products and sectors were open to foreign investment. The Catalogue classifies each product category as encouraged, restricted, or prohibited, and the 2002 reform shifted many categories toward greater openness. Following the spirit of Lu et al. (2017), we classify each Catalogue product as having become more welcome, less welcome, or unchanged between 1997 and 2002. A product becomes more welcome if it moves to a less restrictive category (e.g., from "permitted" to "encouraged"), and becomes less welcome if it moves in the opposite direction. Products whose designation remains unchanged form the no-change group. These categories constitute the underlying policy variation we use for our empirical analysis.

A central challenge is that the Catalogue defines policy changes at the level of Chinese product descriptions, whereas Japanese economic activity is organized at the JSIC three-digit industry level. To construct a meaningful exposure measure for Japanese industries, we must translate the Catalogue's product-level information into a classification system that can be consistently matched to Japanese firms. We therefore use the Harmonized System (HS6) as a common language linking Chinese products to Japanese industries. Catalogue products are first mapped to HS6 using a structured, multi-stage validation procedure; Japanese JSIC industries are independently linked to HS6 using standard JSIC–NAICS–HS concordances. This HS6 bridge allows us to match the Catalogue's policy labels to the set of HS6 products associated with each JSIC industry. A detailed description of the full mapping protocol—including the AI-assisted validation steps used to refine Catalogue product assignments—is provided in Appendix C.

Using this unified HS6 framework, we construct two continuous measures of exposure for each JSIC industry. (1) The simple exposure measure is the share of HS6 products linked to an industry that became more welcome under the 2002 reform. (2) The value-weighted exposure measure weights each HS6 product by its export value from China, giving more importance to economically significant products. Together, these measures quantify the extent to which China's FDI liberalization targeted sectors relevant to each Japanese manufacturing industry. In the analysis below, we use the value-weighted measure as our main exposure variable, as it captures both the extensive and intensive margins of the policy change across products.

Each Japanese affiliate operating in China inherits the exposure of its JSIC industry. To assign exposure at the parent-firm level, we use the JSIC industry of the parent's first manufacturing affiliate in China—a choice motivated by the fact that first affiliates are, in our data, substantially larger than later ones and almost always entered China before 2002. This approach yields a stable, economically meaningful measure of parent-level exposure and mitigates concerns that post-reform entry decisions might mechanically influence treatment assignment. Robustness checks using the parent's largest pre-2002 affiliate produce similar patterns.

The resulting dataset provides a transparent and interpretable measure of exposure to China's 2002 FDI liberalization at both the affiliate and parent-firm level, grounded in a consistent translation from product-level policy changes to Japanese industrial classifications.

3.5 Controlling for Trade Liberalization

A major concern is that the employment effects observed among Japanese affiliates in China may be influenced not only by changes in foreign direct investment policies but also by significant tariff reductions associated with China's accession to the WTO. These reductions included both lower tariffs on Chinese exports worldwide and reduced import tariffs on intermediate inputs and capital equipment entering China, enhancing the production capacity of Chinese exporters. Consequently, changes in manufacturing employment among foreign affiliates in China could potentially be affected by reductions in WTO-related tariff. Similarly, changes in the employment level and structure of Japanese parent companies could result from lower tariff for their Chinese affiliates and relaxed restrictions for Japanese multinationals in China after 2002.

To address for these factors, we constructed time-varying, industry-level tariffs at the JSIC 3-digit level to use as control variables. These variables capture changes in import and export tariffs both between China and the rest of the world, and between Japan and China. We collect bilateral tariff data from the World Integrated Trade Solution (WITS) database for each year, country pair, and at the HS6 product level.[11]

We then match product level (HS 6-digts) tariffs to the industry classification NAICS 6-digit, using a concordance by Pierce and Schott (2016) and weighting each product by its trade value share within the industry. Since our analysis requires data at the JSIC 3-digit level, we further aggregated tariffs to the NAICS 4-digit level, using trade value shares at the NAICS 6-digit level as weights within each 4-digit industry. Finally, we developed a custom concordance to map NAICS 4-digit codes to JSIC 3-digit codes. Where detailed assignment was not possible, we used broader NAICS codes (three-digit or two-digit) to ensure comprehensive coverage.

For bilateral tariff calculations, we computed two main categories: tariffs imposed by China and Japan on imports from other countries, and tariffs imposed by other countries on exports from China and Japan. To estimate the tariffs that China and Japan apply to imports, we used tariff data reported by each country for its imports, creating an overall tariff rate that represents imports from the rest of the world. This overall rate was aggregated by weighting each partner country's tariff by its share in China or Japan's total import trade value. For tariffs imposed by other countries on exports from China and Japan, we used data reported by each importing country and weighted each country's tariff rate by its share in total Chinese or Japanese exports. This approach ensures that tariffs from countries that are major importers of Chinese or Japanese goods carry more influence in the final average tariff calculation.

[11] WITS collects tariffs for each country at HS-8 digits but publishes these tariffs at the HS-6 digits. To aggregate from HS-8 to HS-6, they construct two types of tariff averages: a simple average and a trade-weighted average. In our analysis, we rely on the trade-weighted average. The tariff we used from WITS is the effectively applied tariff defined as the lowest available tariff. Thus, if a preferential tariff exists, it is used as the effectively applied tariff. Otherwise, we use the MFN-applied tariff.

Importantly, the correlation between the tariff changes from 1998-2001 to 2002-2007 and the change in FDI restrictions as represented by our affiliate treatment variable is small and statistically insignificant (see Appendix Table D.1). Furthermore, we find no systematic patterns when we plot the change in (affiliate) industry-level import/export tariffs (from 1998-2001 to 2002-2007) against the FDI treatment variable, suggesting that tariff reductions do not confound the effects of FDI policies (Appendix Figure D.1). This might suggest that the large-scale trade liberalizations undertaken by China and the rest-of-the-world upon China's WTO accession were more broad-based and not closely linked to China's FDI policy change. Regardless, in the specifications below, we control for import and export tariff changes.

4 Empirical Analysis

4.1 Empirical Strategy

We use China's FDI policy change in early 2002 as a quasi-natural experiment to examine how reduced barriers to inward FDI affect MNCs' employment in both Japan and China.[12] Our identification strategy relies on two key points. First, the exact timing of this policy change was plausibly unexpected. This uncertainty arose not only from the specific timing of China's WTO accession in December 2001 but also from the implementation timeline of the FDI policy, which was part of China's commitments upon joining the WTO.[13]

Second, this policy change was arguably exogenous for Japanese MNCs with affiliates in China. The Chinese government might have made industry-specific FDI policies based on productivity growth trends in each industry.[14] However, it is unlikely that the Chinese government considered the economic conditions of Japanese local affiliates and their parent firms in Japan when formulating its FDI policies.

Using a difference-in-differences (DID) approach, our first estimating equation investigates the effects of China's FDI liberalization on Japanese manufacturing affiliates in China:

$$y_{a,t} = \beta_0 + \beta_1 \cdot 1(\text{Treat}_a) \times \text{Post02}_t + \gamma_1 \cdot \tau^{\text{m}}_{a,t} + \gamma_2 \cdot \tau^{\text{x}}_{a,t} + \delta_a + \delta_{r(a),t} + \epsilon_{a,t}, \tag{4.1}$$

[12] In 2004 and 2007, there were revisions to the primary reform. However, the 2004 revisions were minimal and do not alter our empirical analysis. To address the 2007 changes, we exclude 2007 data as a robustness check, whose results are reported Appendix E.

[13] China's WTO accession negotiations lasted 15 years, beginning in 1986. We check for anticipation effects by examining pre-trends and find no evidence of them.

[14] For example, the government might decide to relax FDI restrictions in the car industry if domestic car producers are sufficiently productive to compete with and benefit from foreign firms operating in China.

where a refers to the manufacturing affiliate in China and t denotes the year. The outcome variable $y_{a,t}$ includes affiliate employment, equity share, total sales, and the shares of sales to the local market, Japan, and third countries. The indicator variable Post02_t restricts the sample to Japanese manufacturing affiliates established in China before 2002 to mitigate endogeneity concerns.

The indicator $1(\text{Treat}_a)$ is defined at the affiliate's three-digit industry level. As introduced in Section 3.4, it is a value-weighted exposure measure that weights each HS6 product by its export value from China. It equals one if the continuous treatment measure lies above the industry median (0.32), and zero otherwise. We adopt this indicator specification in the baseline analysis, following Callaway et al. (2024), who highlight the challenges of applying difference-in-differences with continuous treatments.[15] For concreteness, we also report regression results using the continuous treatment variable in the robustness checks.

All regressions include affiliate fixed effects (δ_a) and province-year fixed effects ($\delta_{r(a),t}$) to absorb affiliate-level heterogeneity and provincial FDI policy changes. Furthermore, we always include controls for industry-level import tariffs $\tau^{\text{m}}_{a,t}$, represented by the effectively applied tariff from China to the rest of the world, and controls for industry-level export tariffs $\tau^{\text{x}}_{a,t}$, represented by the effectively applied tariff from the rest of the world to China.[16] Standard errors are two-way clustered at the industry and the year levels.

Additionally, we implement an event-study type analysis by running a dynamic difference-in-differences regression:

$$y_{a,t} = \sum_{k \neq 2001} \beta_k \cdot 1(\text{Treat}_a) \times 1(t = k) + \gamma_1 \cdot \tau^{\text{m}}_{a,t} + \gamma_2 \cdot \tau^{\text{x}}_{a,t} + \delta_a + \delta_{r(a),t} + \epsilon_{a,t}, \tag{4.2}$$

where $1(t = k)$ is an indicator for each period in the study window, capturing the dynamic effects of FDI liberalization on the outcomes of interest. We treat 2001 as the omitted year, serving as the baseline prior to policy implementation. Accordingly, the coefficients β_k, are interpreted relative to this baseline year and measure the treatment effect in year k compared to 2001.

The second estimation equation examines the effects of China's FDI liberalization on the

[15]In particular, they show that interpreting differences in treatment effects on treated-type parameters across different values of the treatment can be challenging due to selection bias that could not be ruled out by the parallel trends assumption.

[16]In robustness checks, we also use bilateral tariffs (China–US, China–Japan) to replicate our regression results.

operations of Japanese MNC parents in Japan:

$$y_{p,t} = \beta_0^p + \beta_1^p \cdot 1(\text{Treat}_p) \times \text{Post02}_t + \gamma_1^p \cdot \tau^{\text{m}}_{a(p),t} + \gamma_2^p \cdot \tau^{\text{x}}_{a(p),t} + \gamma_3^p \cdot \tau^{\text{m}}_{p,t} + \gamma_4^p \cdot \tau^{\text{x}}_{p,t} + \delta_p + \delta_{r(p),t} + \epsilon_{p,t}, \quad (4.3)$$

where p indexes the parent firm. The outcome variable $y_{p,t}$ alternates across employment, employment share, sales, labor productivity, and imports. The indicator variable $1(\text{Treat}_p)$ represents the FDI treatment applied to the first manufacturing affiliate of the parent firm p in China.[17]

Similar to the affiliate-level specification, we exploit within-parent variation over time. All regressions include parent fixed effects (δ_p). To control for prefecture-specific economic fluctuations over time, we incorporate prefecture-year fixed effects, $\delta_{r(p),t}$. Additionally, all parent-level regressions account for overall import and export tariffs faced by both the parent firms and their first manufacturing affiliates in China at the three-digit industry level (i.e., $\tau^{\text{m}}_{a(p),t}$, $\tau^{\text{x}}_{a(p),t}$, $\tau^{\text{m}}_{p,t}$ and $\tau^{\text{x}}_{p,t}$).

As in the affiliate-level regressions, we also implement an event-study type analysis by running the following dynamic DID regression:

$$y_{p,t} = \sum_{k \neq 2001} \beta_k^p \cdot 1(\text{Treat}_p) \times 1(t = k) + \gamma_1^p \cdot \tau^{\text{m}}_{a(p),t} + \gamma_2^p \cdot \tau^{\text{x}}_{a(p),t} + \gamma_3^p \cdot \tau^{\text{m}}_{p,t} + \gamma_4^p \cdot \tau^{\text{x}}_{p,t} + \delta_p + \delta_{r(p),t} + \epsilon_{p,t}, \quad (4.4)$$

where our main focus is on the coefficients β_k, which capture how parent firms' employment, sales, and trade evolve in response to the FDI policy—relative to the baseline year—for MNCs with affiliates in FDI-encouraged industries.

4.2 Regression Results

This section presents empirical evidence on how lower FDI barriers affect MNCs' employment, intra-firm trade, and performance of both affiliates (in the host country) and parent firms (in the home country). We show how China's FDI policy change induced structural transformation within firms across borders. Table 2 reports the baseline results: columns 1–3 correspond to estimates of equation (4.1) for Japanese manufacturing affiliates in China, while columns 4–6 report estimates of equation (4.3) for Japanese parent firms.

[17] In the robustness checks, we also explore an alternative definition of the treatment based on the industry of the largest manufacturing affiliate with operations before 2002.

Table 2: China's FDI Liberalization: Effects on Japanese Affiliates in China and Japanese MNC Parents

Dependent variables:	Affiliates			Parents		
	Manufacturing			Employment		
	Employment	Sales	Equity Share	Manuf.	R&D + Intl. Business	R&D + Intl. Business Share
	(1)	(2)	(3)	(4)	(5)	(6)
$1\,(\text{Treat}_a) \times \text{Post02}_t$	0.138	0.246	0.017	-0.051	0.055	0.012
	(0.073)	(0.117)	(0.007)	(0.031)	(0.046)	(0.005)
$\ln \tau^{\text{x}}_{a,t}$	-0.816	-3.489	-0.074	-0.732	0.648	0.055
	(0.900)	(1.512)	(0.118)	(0.489)	(1.101)	(0.059)
$\ln \tau^{\text{m}}_{a,t}$	-0.039	0.856	-0.060	0.092	-0.004	-0.011
	(0.624)	(1.105)	(0.051)	(0.354)	(0.426)	(0.031)
$\ln \tau^{\text{x}}_{p,t}$	–	–	–	1.278	1.091	-0.050
	–	–	–	(0.672)	(0.876)	(0.065)
$\ln \tau^{\text{m}}_{p,t}$	–	–	–	-1.381	-1.025	-0.310
	–	–	–	(1.827)	(3.164)	(0.317)
Affiliate FE	Yes	Yes	Yes	No	No	No
Province-year FE	Yes	Yes	Yes	No	No	No
Firm FE	No	No	No	Yes	Yes	Yes
Prefecture-year FE	No	No	No	Yes	Yes	Yes
Observations	11,598	11,704	11,704	8,082	7,044	8,442
Adjusted R^2	0.909	0.869	0.875	0.953	0.908	0.770

Notes: This table reports estimates of equation (4.1) in columns (1)–(3) and of equation (4.3) in columns (4)–(6). The dependent variables are: logarithm of employment (1), logarithm of total sales (2), equity share defined as the ownership stake of the parent on the Chinese affiliate (3), logarithm of manufacturing employment (4), logarithm of employment in the Research and Development (R&D) department and International Business (Intl. Business) department (5), and employment share in the Research and Development (R&D) department and International Business (Intl. Business) department (6). $1\,(\text{Treat}_a)$ is an indicator (FDI) treatment variable defined at the affiliate's 3-digit industry level (above or below the median). Post02_t is an indicator variable that takes the value of one for years after 2002. For the parent firm, we use its first affiliate to define the treatment. We only include manufacturing affiliates that entered China before 2002 and their parent firms. Parent firms with zero manufacturing employment before the FDI policy shock in 2002 are excluded from the regressions. For all affiliates-level regressions, import tariffs $\tau^{\text{m}}_{a,t}$, represent the effectively applied tariff from China to the rest of the world, measured at the three-digit industry level, and export tariffs, $\tau^{\text{x}}_{a,t}$, represent the effectively applied tariff from the rest of the world to China. For parent-level regressions, $\tau^{\text{m}}_{\text{a},t}$ and $\tau^{\text{x}}_{a,t}$ are import and export tariffs faced by their first manufacturing affiliates in China at the three-digit industry level; i.e., $\tau^{\text{m}}_{a(p),t}$ and $\tau^{\text{x}}_{a(p),t}$, respectively. Besides, $\tau^{\text{m}}_{p,t}$ and $\tau^{\text{x}}_{p,t}$ are import and export tariffs faced by the parent firms. Standard errors in parentheses are clustered at the industry (affiliate) and year levels.

For Japanese affiliates in China, we find that those in treated industries experienced an additional 24.6% increase in total sales and a 13.8% increase in employment after 2002, relative to affiliates in non-treated industries (columns 1–2). These effects are statistically significant and economically meaningful. Since sales rose more than employment, labor productivity also increased in treated affiliates. Column 3 further shows a 1.7 percentage points rise in the equity share held by parent firms, indicating stronger ownership commitments in response to improved FDI conditions.

Turning to parent firms in Japan, columns 4–6 show evidence of employment reallocation within these firms. Relative to multinational parents in the control group, those with a treated affiliate reduced domestic manufacturing employment by about 5.1% and increased employment in R&D and international business departments by about 5.5% after 2002, though both effects are marginally insignificant. Importantly, the employment share of R&D and international business departments in total employment rose by 1.2 percentage points after 2002—a substantial and statistically significant increase relative to the sample mean of 8.76% (see Panel B of Table 1). In summary, these results suggest that employment within treated multinational parents seems to have shifted away from manufacturing toward service activities that directly support global expansion—namely, R&D and international business.

Table 3 provides further evidence on the effects of China's FDI liberalization on affiliate sales. Affiliates in treated industries experienced a 24.6% increase in total sales after 2002, driven primarily by a 23.5% rise in exports to Japan. In contrast, local sales showed smaller and statistically insignificant changes, suggesting that the liberalization's main impact came through expanded exports to Japan. Since some affiliates do not export to Japan or to third markets, estimates in columns 2, 4 and 5 are not directly comparable. To address this issue, we compute three types of sales shares (local sales, exports to Japan and exports to third markets) and use the first two to re-estimate our regression equation. Column 3 indicates that the local sales share of treated affiliates declined by about 5.2 percentage points after 2002—a sizable and statistically significant change relative to the sample mean of 58.9% (see Panel A of Table 1).[18] Taken together, these results suggest that the relaxation of FDI restrictions in China substantially facilitated production fragmentation and the formation of regional value chains between Japan and China.

[18] Because the three sales shares sum to one, the share of exports to third markets increase by 2.4 p.p.(=5.2–2.8).

Table 3: China's FDI Liberalization: Effect on Affiliate Sales

Dependent variables:	Sales			Exports		
	Total	Local	Local Share	Japan	Third Markets	Japan Share
	(1)	(2)	(3)	(4)	(5)	(6)
$1\,(\text{Treat}_a) \times \text{Post02}_t$	0.246	0.143	-0.052	0.235	0.258	0.028
	(0.117)	(0.125)	(0.023)	(0.120)	(0.213)	(0.020)
$\ln \tau^{\text{x}}_{a,t}$	-3.489	-1.743	0.067	-5.044	-3.238	-0.204
	(1.512)	(1.451)	(0.235)	(1.740)	(3.169)	(0.186)
$\ln \tau^{\text{m}}_{a,t}$	0.856	0.170	-0.086	2.426	-0.082	0.079
	(1.105)	(0.885)	(0.159)	(1.176)	(1.492)	(0.116)
Affiliate FE	Yes	Yes	Yes	Yes	Yes	Yes
Province-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,704	10,032	11,704	6,586	3,209	11,704
Adjusted R^2	0.869	0.827	0.777	0.817	0.766	0.808

Notes: This table reports estimates of equation (4.1). The dependent variables are: logarithm of total sales (1), logarithm of local sales (2), share of local sales (3), logarithm of exports to Japan (4), logarithm of exports to third markets (5), and share of exports to Japan (6). $1\,(\text{Treat}_a)$ is an indicator (FDI) treatment variable defined at the affiliate's 3-digit industry level (above or below the median). Post02_t is an indicator variable that takes the value of one for years after 2002. We only include manufacturing affiliates that entered China before 2002. Import tariffs, $\tau^{\text{m}}_{a,t}$, represent the effectively applied tariff from China to the rest of the world, measured at the three-digit industry level. Export tariffs, $\tau^{\text{x}}_{a,t}$, represent the effectively applied tariff from the rest of the world to China. Standard errors in parentheses are clustered at the industry (affiliate) and year levels.

Table 4 presents evidence on the effects of China's FDI liberalization on multinational parents. Column 1 shows no significant change in the share of total service employment among treated parents after 2002. We then divide total service employment into two categories: R&D and international business, which complement multinational production, and "other services", including departments such as marketing/planning, sales, IT, catering, and finance. Column 2 indicates that the share of R&D and international business employment increased among treated parents after 2002. Column 3 shows that employment in "other services" declined, albeit insignificantly. Because "other services" primarily complement domestic manufacturing rather than multinational production, the fall in domestic manufacturing employment likely reduced "other services" employment as well. Overall, these results suggest that firm-level structural change was concentrated in professional service jobs supporting multinational production—namely R&D and international business.

Table 4: China's FDI Liberalization and Japanese MNC Parents: Employment, Sales and Trade

Dependent variables:	Services Employment			Sales		Labor Productivity		Imports	
	Total Share	R&D + Intl. Bus. Share	Others Share	Total	Manuf.	Total	Manuf.	From Asia	From All Affiliates
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$1\,(\text{Treat}_a) \times \text{Post02}_t$	0.001	0.012	-0.011	0.130	0.155	0.107	0.126	0.219	0.192
	(0.008)	(0.005)	(0.007)	(0.043)	(0.053)	(0.053)	(0.076)	(0.099)	(0.108)
Aff.-level tariffs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Par.-level tariffs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prefecture-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8,442	8,442	8,442	8,434	8,030	7,786	6,398	5,871	4,876
Adjusted R^2	0.811	0.770	0.807	0.982	0.972	0.622	0.598	0.832	0.824

Notes: This table reports estimates of equation (4.3). The dependent variables are: total service employment share (1), service employment share in the Research and Development (R&D) department and International Business (Intl. Bus.) department (2), others service employment share (3), logarithm of total sales (4), logarithm of manufacturing sales (5), total labor productivity is measured as total sales minus inputs, all divided by total employment (6), manufacturing labor productivity is measured as manufacturing sales minus inputs, all divided by total employment (7), total imports to Asia (8), and total imports to all affiliates (9). $1\,(\text{Treat}_a)$ is an indicator (FDI) treatment variable defined at the affiliate's 3-digit industry level (above or below the median). Post02_t is an indicator variable that takes the value of one for years after 2002. For the parent firm, we use its first affiliate to define the treatment. We only include manufacturing affiliates that entered China before 2002 and their parent firms. Parent firms with zero manufacturing employment before the FDI policy shock in 2002 or zero manufacturing employment after 2002 are excluded from the regressions. All regressions account for overall import and export tariffs faced by both the parent firms ($\tau^{\text{m}}_{p,t}$ and $\tau^{\text{x}}_{p,t}$) and their first manufacturing affiliates in China at the three-digit industry level ($\tau^{\text{m}}_{a(p),t}$ and $\tau^{\text{x}}_{a(p),t}$). Standard errors in parentheses are clustered at the industry (affiliate) and year levels.

Turning to columns 4 to 7 of Table 4, we find that both sales and productivity of treated parents increased after 2002, particularly when measured by manufacturing sales. Complementing this, columns 8 and 9 show that treated parents also expanded imports from Asia and from their affiliates after 2002.[19] These results suggest the following mechanism: after China relaxed FDI restrictions, Japanese multinationals shifted some intermediate production to Chinese affiliates, leading to lower parent-level manufacturing employment and higher imports from Asia. In turn, service employment that complements multinational production expanded, while parent firms gained in sales and productivity through access to cheaper and/or higher-quality imported intermediate goods from their affiliates in China.

The combined evidence from affiliates and parents highlights how multinationals drive struc-

[19]However, the analysis is limited by data availability, as the dataset does not contain information on imports from China by parent firms or their Chinese affiliates during 1998–2007.

tural transformation at the firm level in response to FDI liberalization. On the affiliate side, treated Japanese affiliates in China expanded employment and sales, with a disproportionate increase in exports back to Japan, reinforcing their operations in the host country and strengthening the regional value chain. On the parent side, firms with treated affiliates in Japan reallocated employment away from manufacturing and toward higher value-added service jobs—particularly R&D and international business—while also becoming more productive and increasing imports from their Asian affiliates. Overall, these findings are consistent with our model's prediction that inward FDI liberalization promotes resource reallocation at both parents and affiliates and facilitates the formation of regional value chains among geographically proximate countries.

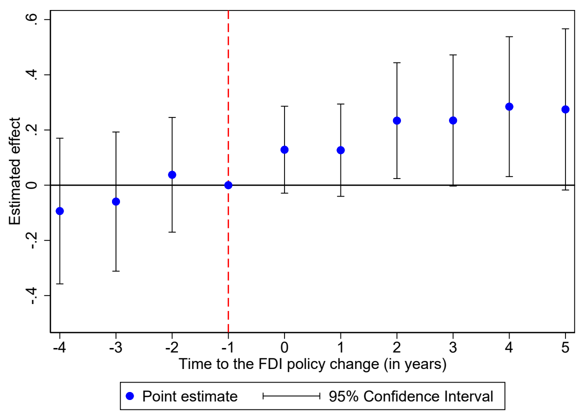
We now turn to the potential anticipation effect arising from the 2002 FDI policy change. If Japanese MNCs that intended to conduct or expand their production in China had correctly anticipated the policy shift and thus entered the encouraged industries prior to 2002, we would not observe employment/productivity effects among firms in the treatment group. Hence, any such anticipation effect would bias the results toward finding no effect, suggesting that the actual effects documented above are likely to represent lower bounds of the true impacts.

To further examine the potential anticipation effect, we analyze the dynamic impact of China's FDI liberalization on several key variables of interest using the affiliate-level regression specified in equation (4.2) and the parent-level regression specified in equation (4.4). Figure 3 illustrates the dynamic effects on affiliates' employment, sales, and share of local sales. Besides, Figure 4 depicts the effects on parents' manufacturing employment and the employment shares of R&D and international business units. In all five figure panels, almost all point estimates for the years preceding the FDI policy shock are close to zero and statistically insignificant, indicating that the parallel trends assumption holds for the variables under study. Moreover, the treatment–year dummy coefficients indicate that the divergence between treatment and control begins in 2002. This pattern suggests that the FDI policy change triggered within-firm structural adjustments across borders and strengthened regional value chains in Asia.

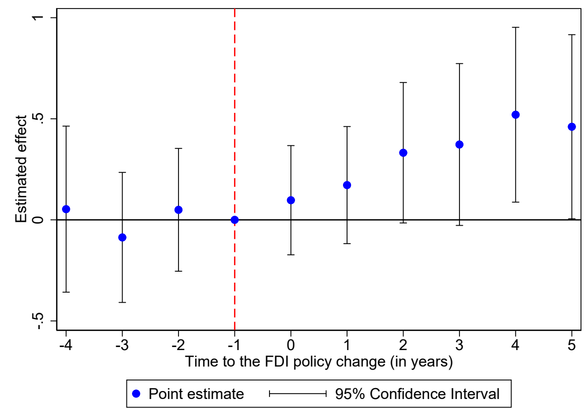
Finally, another threat to our identification is that the Chinese government also implemented its 10th Five-Year Plan during 2001-2005, which specified certain industries that were to be supported by the government's favorable policies. Our empirical exercises would capture the effect originating from the 10th Five-Year Plan, if the supported industries specified by the Plan were similar to the FDI-encouraged industries induced by the FDI policy change. To mitigate this concern, we compute the correlation between our treatment assignment and

FIGURE 3: Affiliate-Level Adjustment to FDI Liberalization

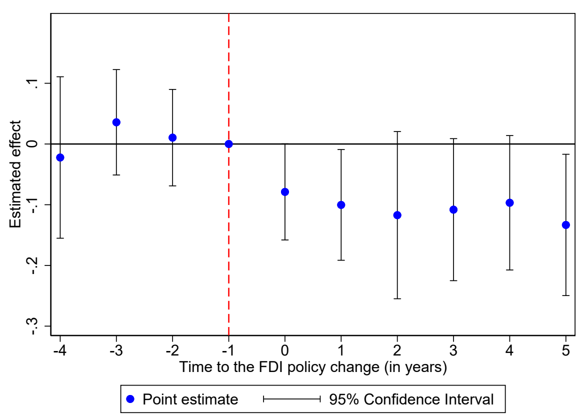
(A) Employment



(B) Sales

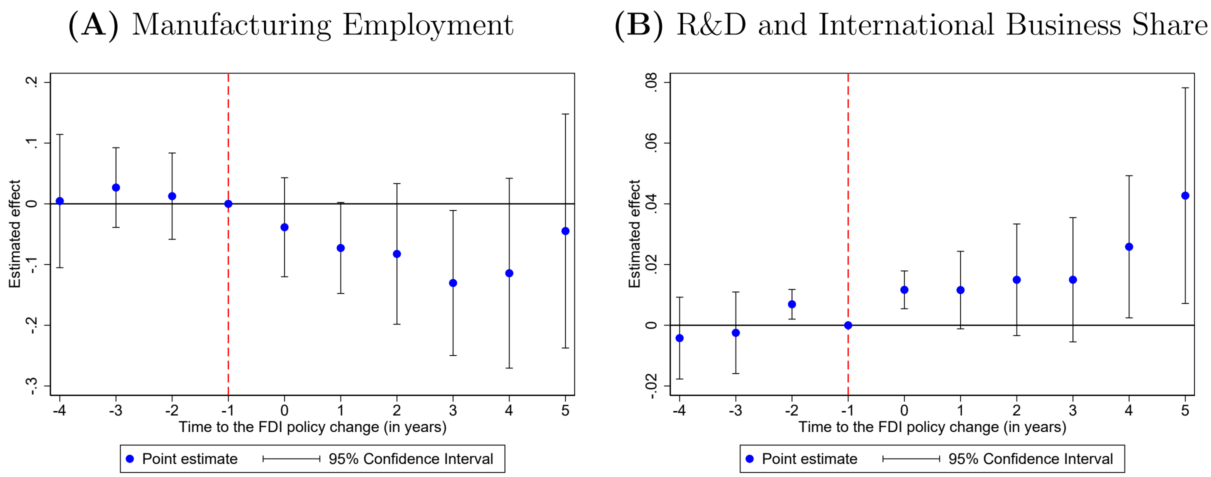


(C) Share of Affiliate Sales to the Domestic Market



Notes: This figure reports estimates of equation (4.2). Each panel reports coefficients on treatment-year dummies from an event-study specification estimated over the 1998–2007 period. The omitted year is 2001, immediately preceding the 2002 FDI liberalization, and all coefficients are expressed relative to that baseline. Panel (A) shows the response of affiliate-level employment, Panel (B) displays total affiliate sales, and Panel (C) reports the share of affiliate sales directed to the domestic market. All regressions include firm and year fixed effects. The patterns illustrate how affiliate-level outcomes evolved around the reform window, holding pre-trends and firm-level characteristics constant.

Figure 4: Parent-Level Response to FDI Liberalization: Employment Composition



Notes: This figure reports estimates of equation (4.4). Each panel reports the dynamic responses of parent-level outcomes to China's 2002 FDI liberalization. Each panel displays coefficients on year dummies from an event-study specification covering 1998–2007, with 2001 omitted and normalized to zero. Panel (A) shows the evolution of manufacturing employment, and Panel (B) shows the share of parent-firm employment in R&D and international business functions. All regressions include firm and year fixed effects.

the indicator for industries supported under the Tenth Five-Year Plan and find a coefficient close to zero (0.094), indicating a negligible relationship. Therefore, it is unlikely that our empirical exercises capture the effect of the 10th Five-Year Plan, instead of the FDI policy change.[20]

4.3 Robustness Checks and Additional Empirical Results

In this section, we implement robustness checks for the regression results obtained above and provide some additional empirical results. We relegate most tables to the appendix to save space.

We first implement robustness checks for the affiliate-level regressions. First, we rerun the regressions at the affiliate level using the continuous treatment variable of the FDI policy change. Tables E.1 and E.2 in Appendix E present the regression results which are similar to those reported in Tables 2 and 3. Next, we use bilateral tariffs (Japan-China and US-China) to rerun the affiliate-level regressions and find that it is the tariff that Japan imposes on Chinese imports that matters most for affiliate-level sales and employment, which is consistent with our previous finding on affiliate-level exports to Japan (see Tables E.3 and

[20] This is less of a concern, as we have shown that there is still substantial variation even between industries that belong to the same broad sector.

E.4 in Appendix E). Third, we use all affiliates (including those that entered China after 2002) to rerun the affiliate-level regressions, and obtain similar results (see Tables E.5 and E.6 in Appendix E). Finally, since there is another FDI policy change in 2007, we exclude observations in 2007 to rerun the affiliate-level regressions. Results reported in Tables E.7 and E.8 in Appendix E are similar to those reported in Tables 2 and 3.

Next, we conduct a series of robustness checks for the regression results obtained for MNC parents.[21] First, we replace the indicator treatment variable with its continuous counterpart and obtain similar effects (see Table E.9 in Appendix E). Second, we incorporate bilateral tariffs between Japan–China and the United States–China faced by affiliates into the regression, and find stronger and more statistically significant results (see Table E.10 in Appendix E). Third, we redefine the treatment variable based on the industry of the largest manufacturing affiliate operating before 2002, re-estimate the regressions, and obtain comparable results (see Table E.11 in Appendix E). Fourth, to account for another FDI policy change in 2007, we exclude observations from that year and re-estimate the regressions; the results, shown in Table E.12 in Appendix E, remain consistent with those in Table 4. Finally, we add industry–year fixed effects at the parent-firm level to control for industry-specific fluctuations in supply and demand.[22] Although this specification is particularly demanding, identification remains possible because roughly half of the first foreign affiliates are not in the same three-digit industry as their parent firms. The results, reported in Table E.13 in Appendix E, are again consistent with those presented in Table 4.

Third, although our model does not generate predictions regarding the extensive margin of firm entry, it is nonetheless interesting and important to examine how China's FDI liberalization affected the entry patterns of Japanese MNCs. To this end, we first calculate the number of newly entering affiliates in each industry–year cell. We then estimate an *industry-level* regression using equation (4.1), with the cumulative number of entering affiliates as the dependent variable. In this regression, both the indicator and continuous treatment variables for the FDI policy change are included as key independent variables. The results, reported in Table 5, indicate that treated industries experienced a higher number of FDI entries after 2002. Moreover, export and import tariffs have the expected negative effects on the number of entering affiliates.

[21] To save space, we exclude the variable for employment in "other services" from the regression and combine all parent-level results into a single table.

[22] In this specification, tariffs cannot be included at the parent-industry level.

Table 5: China's FDI Liberalization and Entries of Japanese Affiliates: 1998–2007

Dependent variable:	Cumulative Number of Entering Affiliates			
	(1)	(2)	(3)	(4)
$\text{Treat}_{a\,\text{ind}} \times \text{Post02}_t$	12.20	11.37		
	(5.562)	(5.457)		
$1\,(\text{Treat}_{a\,\text{ind}} > \text{median}) \times \text{Post02}_t$			4.988	5.929
			(3.429)	(3.441)
$\ln \tau^x_{a,t}$		-47.80		-45.66
		(46.07)		(45.80)
$\ln \tau^m_{a,t}$		-147.7		-152.8
		(33.97)		(35.65)
(Affiliate) Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	520	520	520	520
Adjusted R^2	0.939	0.941	0.938	0.941

Notes: The dependent variable is the cumulative number of Japanese manufacturing affiliates entering each three-digit industry in China over 1998–2007. $\text{Treat}_{a\,\text{ind}}$ is the continuous FDI policy exposure at the affiliate industry level, based on China's 2002 liberalization. In columns (3)–(4), we use an indicator variable $1\,(\text{Treat}_{a\,\text{ind}} > \text{median})$ that equals to one for industries above the median exposure. Post02_t is an indicator variable that takes the value of one for years after 2002. One industry with no observed entries is excluded from the sample. All regressions include year and affiliate-industry fixed effects. $\tau^m_{a,t}$ and $\tau^x_{a,t}$ denote applied import and export tariffs, respectively, measured at the same industry level. Robust standard errors in parentheses.

The evidence presented so far focuses on MNC affiliates and parents, which represent only a subset of firms in the Japanese economy. In the next step, we broaden the analysis to examine whether China's FDI policy change also had a sizable aggregate impact on all firms included in the BSJBSA, a comprehensive survey of Japanese firms. To this end, we construct an industry-level exposure measure to China's FDI policy change that captures both the extensive and intensive margins of Japanese FDI in China prior to 2002. The extensive margin is defined as the share of firms with a manufacturing affiliate in China ($\text{Share}_{\text{mnc}}$) before 2002, while the intensive margin corresponds to the average treatment of MNC parents whose first manufacturing affiliate entered China before 2002 ($\overline{\text{Treat}}_{\text{mnc}}$). The product of these two components defines the industry-level exposure measure, which enters the following regression:

$$y_{it} = \beta_0 + \beta_1 \cdot \text{Share}_{\text{mnc}} \times \overline{\text{Treat}}_{\text{mnc}} \times \text{Post02}_t + \gamma_1 \cdot \tau^{\text{m}}_{p\,\text{ind}(i),t} + \gamma_2 \cdot \tau^{\text{x}}_{p\,\text{ind}(i),t} + \delta_i + \delta_{rt} + \delta_{\text{ind}} + \epsilon_{it}, \quad (4.5)$$

where $\tau^{\text{m}}_{p\,\text{ind}(i),t}$ and $\tau^{\text{x}}_{p\,\text{ind}(i),t}$ denote the import and export tariffs faced by firm i in parent industry "$p\,$ind". All firms in the BSJBSA are included in the regression. To capture the aggregate impact of China's FDI policy change on the Japanese economy, observations are weighted by lagged firm sales. The regression results for equation (4.5) are reported in Table 6. Although most estimates are statistically insignificant, the final column shows that the share of R&D employment increased in Japanese industries that were more exposed to China's FDI policy shock after 2002.

Table 6: China's FDI Liberalization: Effect on Japanese Domestic Employment

Dependent variables:	Manufacturing	Non-Manufacturing	Manufacturing Share	R&D Share
	(1)	(2)	(3)	(4)
$\text{Share}_{\text{mnc}} \times \overline{\text{Treat}}_{\text{mnc}} \times \text{Post02}_t$	-0.994	-1.000	-0.580	0.334
	(0.717)	(1.294)	(0.346)	(0.175)
$\ln \tau^{\text{m}}_{p,t}$	-0.116	-0.025	0.044	-0.024
	(0.071)	(0.110)	(0.032)	(0.018
$\ln \tau^{\text{x}}_{p,t}$	0.094	0.118	0.018	-0.013
	(0.024)	(0.065)	(0.024)	(0.031)
Firm FE	Yes	Yes	Yes	Yes
Prefecture-year FE	Yes	Yes	Yes	Yes
(Parent) ind FE	Yes	Yes	Yes	Yes
Observations	213,786	122,816	213,786	213,786
Adjusted R^2	0.986	0.976	0.944	0.811

Notes: This table reports estimates of equation (4.5). The dependent variables are: logarithm of manufacturing employment (1), logarithm of non-manufacturing employment (2), manufacturing employment share (3), and R&D employment share (4). This regression includes all firms that exist in the Basic Survey of Japanese Business Structure and Activities for 1998-2007. $\text{Share}_{\text{mnc}}$ denotes the share of firms with a manufacturing affiliate in China before 2002, $\overline{\text{Treat}}_{\text{mnc}}$ denotes the average treatment of MNC parents whose first manufacturing affiliate entered China before 2002. Post02_t is an indicator variable that takes the value of one for years after 2002. All regressions use lagged firm sales as the weights. Standard errors in parentheses are clustered at the industry and year levels.

5 Structural Change and MNCs: An Accounting-Based Approach

The previous section used a quasi-experimental design to estimate the causal impact of China's 2002 FDI liberalization on the internal organization of Japanese multinational firms. We now take a broader view to ask whether multinationals systematically contribute to structural transformation—the long-run reallocation of employment away from manufacturing and toward services. To explore this, we conduct a descriptive accounting decomposition using firm-level data from five economies at different stages of development: China, Hungary, the United States, Japan, and France.

Our goal is not to estimate causal effects. Rather, it is to quantify how much of the aggregate change in manufacturing employment is associated with the evolution of *multinational firms*, *domestic manufacturers*, and the broader shift of employment toward the service sector.

These descriptive patterns provide context for our reduced-form results by situating firm-level adjustments within the wider reallocation of labor across firm types and sectors, and by extending the analysis beyond Japan to countries with varied structural dynamics.

We adopt the decomposition introduced by Foster et al. (2006), henceforth the FHK decomposition, which expresses the change in the aggregate manufacturing employment share, $\Delta\left(\frac{L_{m,t}}{L_t}\right)$, as the sum of five components: (i) within-firm changes in manufacturing intensity among continuing firms; (ii) between-firm reallocation, capturing shifts in employment toward or away from firms with above- or below-average manufacturing shares; (iii) a covariance term; and the contributions of (iv) entrants and (v) exits.

We extend this framework by computing all five components separately for multinationals and non-MNCs. A compact way to summarize the extended decomposition is:

$$\Delta\left(\frac{L_{m,t}}{L_t}\right) = \frac{1}{L_t}\left[\Delta L_{m,t}^{\text{MNC}} + \Delta L_{m,t}^{\text{NonMNC}} + l_{m,t-1}\cdot \Delta L_t^{\text{Manuf}}\right]$$

The first two terms capture the contribution of manufacturing multinationals and domestic producers, respectively. Each is decomposed using the full FHK methodology—accounting for within-firm changes, reallocation across firms (the between term), entry, exit, and the associated covariance term. The final term captures the contribution of reallocation across sectors: it reflects the decline in the share of employment in manufacturing firms (i.e., the shift into services), scaled by the initial manufacturing intensity $l_{m,t-1}$.[23]

Table 7 decomposes the decade-level change in manufacturing employment shares into contributions from multinationals (MNCs), domestic firms (non-MNCs), and the reallocation into services. Panel A reports overall contributions by group; Panel B breaks down the MNC component into within-firm changes, reallocation, entry, and exit.

Three patterns stand out. First, in advanced economies, the contraction in manufacturing employment is primarily driven by domestic firms. In the U.S., non-MNCs account for more than half of the decline in both decades, but MNCs also play a material role, contributing about 40% of the drop in the 2000s. In France and Japan, by contrast, the MNCs accounted for a third of the manufacturing decline in the 1990s but played a muted role in the 2000s, when domestic firms dominated the adjustment.

Second, the pattern reverses in developing economies. In Hungary (1990s) and China (2000s),

[23]Service firms—defined as firms with zero manufacturing employment—are not included in the decomposition of manufacturing dynamics. However, their growing share in total employment is what drives the reallocation term across sectors. We treat them as a residual group as their MNC status is generally not observed in the data.

the rise in manufacturing employment is mostly explained by MNCs, mainly through the entry of new affiliates.[24]

Finally, across all countries, a nontrivial share of employment reallocation occurs toward services. This component, captured by the "services shift," is especially large in the U.S. and France, consistent with broader trends in advanced economies.

Overall, multinationals emerge as active participants in structural transformation. In advanced economies, they contribute meaningfully to the decline in manufacturing employment—sometimes accounting for as much as 40% of the contraction—alongside larger domestic adjustments and rising service intensity. In developing countries, by contrast, MNCs are often the primary engine of manufacturing growth. The decomposition reveals that their role is not peripheral: whether stabilizing, contracting, or expanding, MNCs seem to shape the path of structural change.

Table 7: Contribution of Multinationals to Changes in Manufacturing Employment Shares

	Panel A: Overall			**Panel B:** Decomposition within MNCs			
Country	**Total**	MNC	NonMNC	**Total**	Cont.	Entry	Exit
Period: 1990s							
China	–	–	–	–	–	–	–
Hungary	0.050	0.040	-0.020	0.040	0.010	0.030	-0.010
U.S.	-0.045	-0.009	-0.029	-0.009	-0.012	0.003	0.000
Japan	-0.030	-0.010	-0.020	-0.010	-0.010	0.000	-0.010
France*	-0.040	-0.010	-0.020	-0.010	-0.030	0.020	0.000
Period: 2000s							
China	0.050	0.030	0.010	0.030	0.010	0.040	-0.010
Hungary	-0.050	0.002	-0.040	0.002	0.010	0.010	-0.020
U.S.	-0.029	-0.010	-0.015	-0.010	-0.008	0.003	-0.005
Japan	-0.030	0.000	-0.030	0.000	0.000	0.010	-0.010
France†	-0.020	0.000	-0.020	0.000	-0.020	0.030	-0.010

Notes: Entries report contributions to the decade-level change in the aggregate manufacturing employment share. Panel A shows the total contribution from multinationals (MNCs) and domestic non-MNC firms. Panel B decomposes the MNC component into within-firm adjustments (Cont.), MNC entry, and MNC exit. MNCs in China and Hungary correspond to foreign affiliates; in Japan, France, and the U.S. they correspond to domestic parent firms with cross-border operations. * and † refer to France's 2000s and 2010s decompositions; for the U.S., the 1990s and 2000s correspond to 1993–2003 and 2003–2013.

[24]MNC definitions vary across countries based on data availability. In China and Hungary, MNCs refer to foreign-owned affiliates. In Japan, France, and the United States, MNCs refer to domestic parent firms with operations both at home and abroad. In all cases, non-MNCs are the remaining firms with positive manufacturing employment. The decomposition is implemented at the decade level. For the United States, the 1990s and 2000s correspond to 1993–2003 and 2003–2013. For France, the periods correspond to the 2000s and 2010s. Appendix F reports the details of the decomposition.

6 Conclusion

This paper studies how multinational corporations shape structural transformation by reorganizing activity across borders. We develop a stylized model showing that when a host country lowers barriers to foreign investment in manufacturing, multinational firms expand their production capacity abroad while parent operations in advanced economies shift toward service and innovation activities. This mechanism links declining trade and FDI costs to divergent sectoral transitions across countries at different stages of development, offering a unified explanation for why manufacturing expands in some economies even as others shift toward services.

We test these predictions using confidential microdata from Japan and a quasi-exogenous reform that expanded foreign-investment opportunities in China. In liberalized industries, Japanese affiliates increased manufacturing employment. At the same time, parent firms in Japan reallocated employment out of manufacturing and into services, including R&D. These adjustments reflect a reorganization of activity within multinational firms and a strengthening of their cross-border production networks.

Because multinational firms structure production across countries in ways that shape entire supply networks and do so at a scale that amplifies their choices, their internal reallocations have aggregate consequences. Using microdata from several advanced and middle-income economies, we provide suggestive evidence that multinationals account for a meaningful share of the decline in manufacturing employment. Taken together, our findings indicate that the global organization of production within multinational firms is an important driver of structural transformation worldwide.

A natural next step is to embed these mechanisms into a quantitative framework combining trade, multinational production, and sectoral dynamics. Such a model would allow us to quantify the aggregate contribution of multinational firms to global structural transformation and evaluate counterfactual policies affecting FDI, trade costs, and multinational organizations.

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Online Appendix

"Multinationals and Structural Transformation"

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A Proof of Proposition 1

Proof. Parent-level manufacturing employment is given by:

$$l_i^* = \frac{m_i^*}{\left(\frac{w_m}{p_m}\right)^{\rho}(a_i s_i^*)^{\rho-1}} = \frac{1}{\left(\frac{w_m}{p_m}\right)^{\rho}(a_i s_i^*)^{\rho-1}}\left[\frac{\frac{\sigma-1}{\sigma}\left(a_i s_i^*\right)^{\frac{\sigma-1}{\sigma}}P^{\frac{\sigma-1}{\sigma}}E^{\frac{1}{\sigma}}}{\left[1+\left(\frac{p_m}{a_i s_i^* w_m}\right)^{\rho-1}\right]^{1-\frac{\rho(\sigma-1)}{(\rho-1)\sigma}}p_m}\right]^{\sigma}. \tag{A.1}$$

The above indicates that l_i^* is decreasing in a_i or e_a (equivalently, $\frac{1}{p_m}$) if and only if $\rho > \sigma$. Another way to see this is to first note that the manufacturing employment, l_i^* decreases if and only if $\frac{\rho(\sigma-1)}{(\rho-1)\sigma} < 1$. To see this, we transform the optimization problem defined in equation (2.3) using equation (2.5):

$$\max_{l_i}\left(1+\left(\frac{a_i s_i w_m}{p_m}\right)^{\rho-1}\right)^{\frac{\rho(\sigma-1)}{(\rho-1)\sigma}}P^{\frac{\sigma-1}{\sigma}}E^{\frac{1}{\sigma}}l_i^{\frac{\sigma-1}{\sigma}} - \left[1+\left(\frac{a_i s_i w_m}{p_m}\right)^{\rho-1}\right]w_m l_i.$$

Conditioning on s_i, if $\frac{\rho(\sigma-1)}{(\rho-1)\sigma} < 1$, an increase in a_i or e_a (leading to a decrease in p_m) induces a smaller optimal employment of manufacturing workers l_i^* and vice versa, which we assume it is the case. Moreover, since s_i^* increases (as we will show below), l_i^* decreases when $\frac{\rho(\sigma-1)}{(\rho-1)\sigma} < 1$ and vice versa. Essentially, what we need is a higher degree of substitutability between intermediates and manufacturing workers (relative to the substitutability between products).

Next, we consider the impact the on service workers (s_i^*). First, s_i^* increases with a_i, as $\frac{\partial^2 \Pi(s_i:a_i,p_m)}{\partial s_i^2} < 0$, $\frac{\partial^2 \Pi(s_i:a_i,p_m)}{\partial a_i \partial s_i} > 0$, and $\left.\frac{d\Pi(s_i:a_i,p_m)}{ds_i}\right|_{s_i=s_i^*} = 0$ where s_i^* is the solution of service employment in the firm's optimization problem.[25] Similarly, s_i^* decreases with p_m (and thus increases with e_a), as $\frac{\partial^2 \Pi(s_i:a_i,p_m)}{\partial s_i^2} < 0$, $\frac{\partial^2 \Pi(s_i:a_i,p_m)}{\partial p_m \partial s_i} < 0$, and $\left.\frac{d\Pi(s_i:a_i,p_m)}{ds_i}\right|_{s_i=s_i^*} = 0$.[26] Since the manufacturing employment and service employment (e.g., R&D and international business units) decrease and increase respectively, the employment share of service workers that complement multinational production increases in the MNC parent firm.

Third, we study the impact on imported intermediates, m_i^*. There are two cases, depending on the value of ρ. If $\frac{\rho(\sigma-1)}{(\rho-1)\sigma} \geq 1$, our result above shows that l_i^* increases (weakly) after the unilateral FDI liberalization. Then $m_i^* = \left(\frac{w_m}{p_m}\right)^{\rho} (a_i s_i^*)^{\rho-1} l_i^*$ increases even more, as s_i^* increase and p_m (a_i) decreases (increases). When $\rho > \sigma$, we transform the optimization problem defined in equation (2.3) to

$$\max_{m_i} \; (a_i s_i m_i)^{\frac{\sigma-1}{\sigma}} \left(1 + \left(\frac{p_m}{a_i s_i w_m}\right)^{\rho-1}\right)^{\frac{\rho(\sigma-1)}{(\rho-1)\sigma}} P^{\frac{\sigma-1}{\sigma}} E^{\frac{1}{\sigma}} - \left[1 + \left(\frac{p_m}{a_i s_i w_m}\right)^{\rho-1}\right] p_m m_i,$$

or equivalently

$$\max_{m_i} \left[(a_i s_i m_i)^{\frac{\sigma-1}{\sigma}} P^{\frac{\sigma-1}{\sigma}} E^{\frac{1}{\sigma}} - \left[1 + \left(\frac{p_m}{a_i s_i w_m}\right)^{\rho-1}\right]^{1-\frac{\rho(\sigma-1)}{(\rho-1)\sigma}} p_m m_i \right].$$

Thus, an increase in a_i and (the induced increase in s_i) increase the marginal benefit and reduces the marginal cost of importing. Additionally, a reduction in p_m reduces the marginal cost of importing. As a result, all three changes push up m_i^*. In total, an increase in a_i or e_a increases m_i^*.

Fourth, we discuss the impact the FDI liberalization on firm size and profitability. The revealed preference argument establishes the result that $\Pi^0(a_i, p_m)$ must increase after an increase in a_i or e_a (as the MNC could have replicated its pre-liberalization production and employment plans while obtaining a strictly higher profit). As s_i^* increases, $\pi^0(s_i^*, a_i, p_m)$ must increase as well. Therefore, both the final profit, $\Pi^0(a_i, p_m)$, and the operating profit,

[25] Note that $\frac{\partial^2 \Pi(s_i:a_i,p_m)}{\partial m_i \partial s_i} > 0$ and m_i^* increases when a_i increases (as we will show in what follows).

[26] The second inequality is true, as $\frac{\partial^2 \Pi(s_i:a_i,p_m)}{\partial m_i \partial s_i} > 0$ and m_i^* increases when e_a increases or p_m decreases (as we will show in what follows).

$\pi^0(s_i^*, a_i, p_m)$, increase. Optimization over m^* yields

$$m_i^* = \left[\frac{\frac{\sigma-1}{\sigma} \left(a_i s_i^*\right)^{\frac{\sigma-1}{\sigma}} P^{\frac{\sigma-1}{\sigma}} E^{\frac{1}{\sigma}}}{\left[1 + \left(\frac{p_m}{a_i s_i^* w_m}\right)^{\rho-1}\right]^{1-\frac{\rho(\sigma-1)}{(\rho-1)\sigma}} p_m} \right]^{\sigma}. \tag{A.2}$$

Substituting equation (A.2) back into the expression of firm sales leads to

$$\begin{aligned} & \left(a_i s_i^* m_i^*\right)^{\frac{\sigma-1}{\sigma}} \left(1 + \left(\frac{p_m}{a_i s_i^* w_m}\right)^{\rho-1}\right)^{\frac{\rho(\sigma-1)}{(\rho-1)\sigma}} P^{\frac{\sigma-1}{\sigma}} E^{\frac{1}{\sigma}} \\ = \quad & \left(\frac{\sigma-1}{\sigma}\right)^{\sigma-1} \left(a_i s_i^*\right)^{\sigma-1} \frac{\left(1 + \left(\frac{p_m}{a_i s_i^* w_m}\right)^{\rho-1}\right)^{\frac{(\sigma-1)}{(\rho-1)}}}{p_m^{\sigma-1}} P^{\sigma-1} E, \end{aligned} \tag{A.3}$$

which increases with a_i and e_a (noting that s_i^* also increases with a_i and e_a).

Finally, we show the impact on the affiliate. First, the value of intra-firm trade (which is also the affiliate-level sales) equals

$$p_m m_i^* = \left[\frac{\frac{\sigma-1}{\sigma} \left(\frac{a_i s_i^*}{p_m}\right)^{\frac{\sigma-1}{\sigma}} P^{\frac{\sigma-1}{\sigma}} E^{\frac{1}{\sigma}}}{\left[1 + \left(\frac{p_m}{a_i s_i^* w_m}\right)^{\rho-1}\right]^{1-\frac{\rho(\sigma-1)}{(\rho-1)\sigma}}} \right]^{\sigma}.$$

We can transform the above expression further to

$$p_m m_i^* = \left[\frac{\frac{\sigma-1}{\sigma} P^{\frac{\sigma-1}{\sigma}} E^{\frac{1}{\sigma}}}{\left[\left(\frac{p_m}{a_i s_i^*}\right)^{\frac{(\rho-1)(\sigma-1)}{\rho-\sigma}} + \left(\frac{p_m}{a_i s_i^*}\right)^{\frac{(\rho-1)^2}{\rho-\sigma}} \left(\frac{1}{w_m}\right)^{\rho-1}\right]^{\frac{\rho-\sigma}{(\rho-1)\sigma}}} \right]^{\sigma}, \tag{A.4}$$

which increases with a_i and decreases with p_m. Thus, affiliate-level sales and export value go up after the unilateral FDI liberalization. Next, employment of the affiliate, $l_a^* = \frac{m_i^*}{e_a}$, is given by:

$$l_a^* = \frac{p_m m_i^*}{w_a} = \frac{1}{w_a}\left[\frac{\frac{\sigma-1}{\sigma} P^{\frac{\sigma-1}{\sigma}} E^{\frac{1}{\sigma}}}{\left[\left(\frac{p_m}{a_i s_i^*}\right)^{\frac{(\rho-1)(\sigma-1)}{\rho-\sigma}} + \left(\frac{p_m}{a_i s_i^*}\right)^{\frac{(\rho-1)^2}{\rho-\sigma}} \left(\frac{1}{w_m}\right)^{\rho-1}\right]^{\frac{\rho-\sigma}{(\rho-1)\sigma}}}\right]^{\sigma}, \tag{A.5}$$

where s_i^* is the optimal number of service workers and $p_m = \frac{w_a}{e_a}$. Holding other variables constant, affiliate (manufacturing) employment is increasing in a_i, e_a (since $p_m = \frac{w_a}{e_a}$) and s_i^*. □

B Classification of Japanese Industries by the FDI Treatment

Table B.1: Industries Ranked by the FDI Policy Treatment

Industry Name	**Exposure**	**Industry Name (cont)**	**Exposure**
Electronic computer and related equipment	0.980	Other precision machinery and equipment	0.217
Pharmaceutical	0.925	Other transportation equipment	0.161
Special industrial machinery	0.788	Manufacturing of cosmetics, toothpaste, etc.	0.122
Communication equipment	0.724	Oil/fat products, detergents, surfactants, paint	0.122
Electronic parts/device	0.707	Other chemical industry	0.119
Automobile, automobile body	0.704	Printing and related industries	0.111
Office/service/consumer machinery/equipment	0.668	Metal processing machinery	0.109
Food	0.659	Consumer electrical equipment	0.085
Feed and organic fertilizer	0.621	Cement and related products	0.052
Watch and related parts	0.571	Other metal product	0.031
Optical equipment/lens	0.560	Other manufacturing industries	0.024
Non-ferrous metal smelting and refining	0.530	Furniture and equipment	0.017
Chemical fertilizer	0.498	Silk reeling/spinning	0.013
Other non-ferrous metal product	0.493	Other petroleum/coal products	0.011
Automotive parts and accessories	0.453	Oil refining	0.011
Pig iron/crude steel/steel	0.451	Glass and related product	0.010
Industrial electrical equipment	0.438	Textile/knit fabric	0.008
Other ceramics/earth and stone products	0.422	Plastic product	0.002
Electronic application equipment	0.407	Tobacco	0.000
Other electrical equipment	0.407	Clothing and other textile	0.000
Casting/forging products	0.399	Other textile	0.000
Paper products	0.377	Construction metal products	0.000
Pulp and paper	0.352	Rubber product	0.000
Beverage	0.345	Tanned leather/fur products	0.000
Chemical fiber	0.344	Timber and wood products	0.000
Organic chemical industry product	0.320		
Inorganic chemical industry product	0.320		
Other general machinery and equipment	0.217		

C Construction of the Industry-Level Treatment Variable

C.1 Overview

The 2002 revision of China's Catalogue for the Guidance of Foreign Investment Industries records changes in the restrictiveness of foreign investment at the level of Chinese product descriptions (chprod). Our objective is to translate these product-level policy changes into a continuous measure of exposure for Japanese industries (JSIC 3-digit), and subsequently for Japanese affiliates in China and their parent firms.

This conversion is non-straightforward since Catalogue product descriptions do not correspond to Japanese industries or to any international industrial classification. To bridge this gap, we construct a mapping between chprod and HS6 codes using a multi-stage, AI-assisted validation protocol. JSIC industries are separately linked to HS6 using established JSIC $\rightarrow$ NAICS $\rightarrow$ HS6 concordances. With both systems expressed in the same HS6 space, we can assign each JSIC industry a continuous exposure measure based on the HS6 products associated with it and their Catalogue policy labels. This appendix documents this full procedure.

C.2 Catalogue Product Classification and Policy Labels

Each Catalogue product is assigned a designation such as encouraged, restricted, or prohibited. Following Lu et al. (2017), we classify each product as *more welcome*, *less welcome*, or *unchanged* relative to its status in the 1997 Catalogue. These transitions form the basis of our policy variation. A product is deemed more welcome if it moves toward a less restrictive designation (e.g., "permitted" to "encouraged"), less welcome if it moves toward greater restriction, and unchanged otherwise.

C.3 Mapping Chinese Products (chprod) to HS6 Codes

Catalogue product descriptions are textual and non-standard. To match them to Japanese industries, we first map each *chprod* to the Harmonized System (HS) at the 6-digit level via a structured validation procedure operating at increasing levels of HS granularity.

C.3.1 AI-assisted multi-stage validation protocol

The mapping proceeds through HS2, HS4, and HS6. At each layer, we retain only assignments receiving unanimous confirmation from three independent AI validation queries.

(a) HS2 level. Each *chprod* is tentatively assigned to candidate HS2 manufacturing categories. For each candidate, we run the query:

> "Can any product or subproduct of *[chprod]* be assigned to HS2 category *[HS2]*? Answer Yes/No."

A mapping is retained only if all three validations return "Yes."

(b) HS4 level. Validated HS2 categories are expanded to HS4 candidates, each of which is subjected to the same triple-validation filter.

(c) HS6 level. Validated HS4 codes expand to the full set of HS6 codes. We perform a final triple-confirmation step using the query:

> "Is the HS6 product *[HS6 description]* mainly produced in the activity corresponding to *[chprod]*? Answer Yes/No."

Only unanimously validated HS6 assignments are kept, producing a high-confidence *chprod*–HS6 concordance.

C.4 Mapping JSIC 3-Digit Industries to HS6

To express Japanese industries in the same HS6 space, we map JSIC3 industries to NAICS4 and use official NAICS–HS concordances to obtain the corresponding HS6 codes.

JSIC3 to NAICS4. Each JSIC3 industry is manually assigned to one or more NAICS4 categories based on technical descriptions and production correspondence.

NAICS4 to HS6. Using standard crosswalks, we recover the HS6 codes associated with each NAICS4 category, yielding the set of HS6 codes relevant for each JSIC3 industry, denoted $\mathcal{J}(j)$.

C.5 Aggregating Catalogue Policy Changes into JSIC Exposure

With Catalogue products and JSIC industries both expressed in HS6 terms, we assign each HS6 code its Catalogue policy label (encouraged, less welcome, unchanged). For each JSIC3 industry j, the set $\mathcal{J}(j)$ comprises all HS6 codes associated with that industry.

Simple exposure. The simple exposure measure is the fraction of HS6 products in $\mathcal{J}(j)$ that became more welcome under the reform:

$$DTreat(j) = \frac{1}{|\mathcal{J}(j)|} \sum_{h \in \mathcal{J}(j)} 1(h \text{ encouraged}).$$

Value-weighted exposure. Let X_h denote China's export value for HS6 product h. The weighted exposure measure is:

$$DTreat^{w}(j) = \frac{\sum_{h \in \mathcal{J}(j)} 1(h \text{ encouraged}) \cdot X_h}{\sum_{h \in \mathcal{J}(j)} X_h}.$$

This gives greater weight to economically important HS6 products.

C.6 Assigning Exposure to Affiliates and Parent Firms

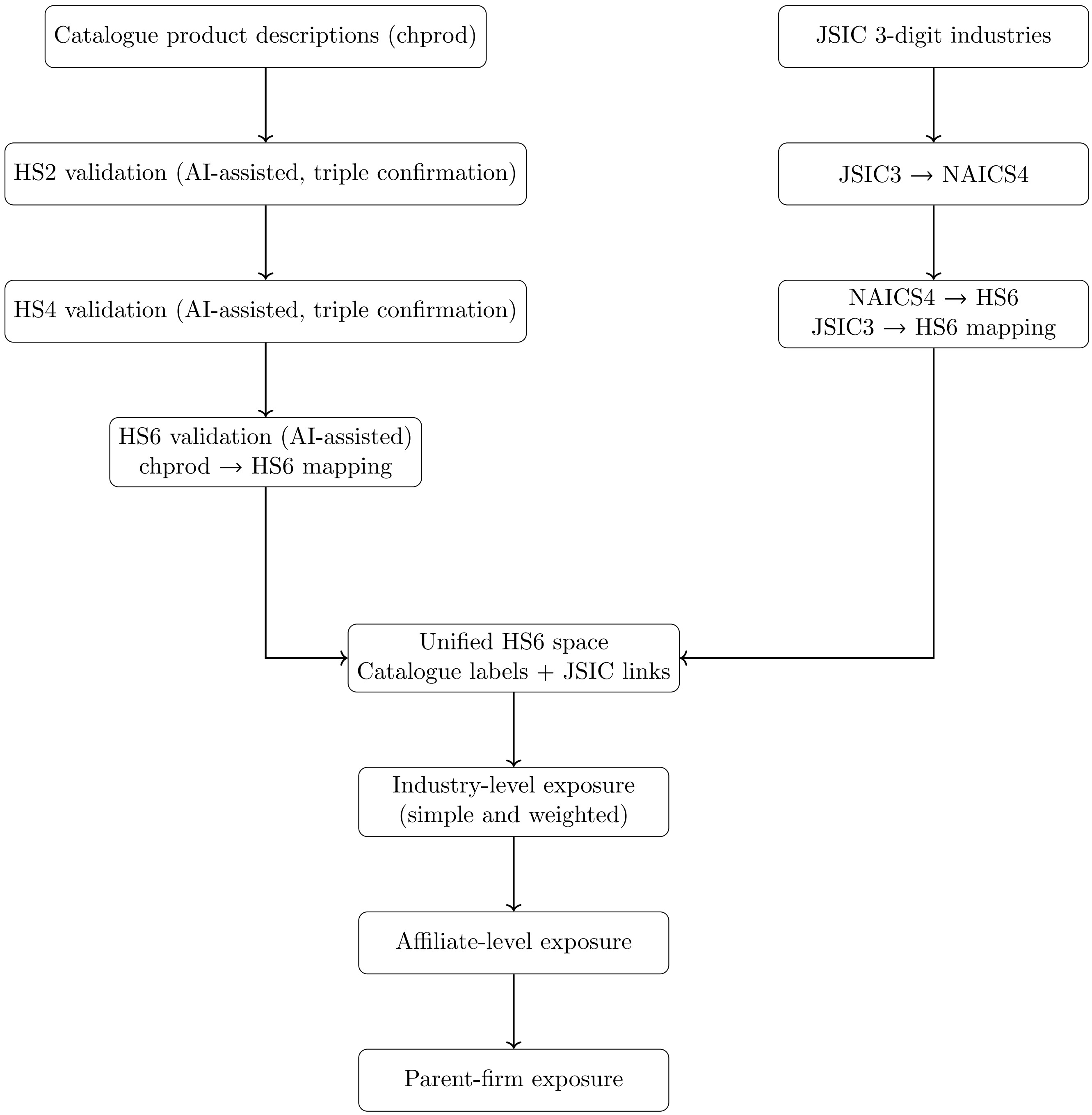
Each Japanese affiliate in China inherits the exposure of its JSIC3 industry. To assign exposure to parent firms, we use the industry of the parent's first manufacturing affiliate in China, which is substantially larger on average than later affiliates and typically entered before 2002. As a robustness check, we also construct parent exposure based on the largest pre-2002 affiliate.

C.7 Final Output

The final dataset includes, for each JSIC3 industry, its simple and value-weighted exposure measures and the corresponding affiliate-level and parent-level assignments derived from this unified HS6 framework.

Figure C.1 provides a visual summary of the entire construction process, illustrating how Catalogue product-level changes are translated into JSIC industry exposure and then assigned to affiliates and parent firms.

Figure C.1: Mapping Catalogue policy shifts to JSIC industries, affiliates, and parent firms.



D Tariff Changes and the FDI Treatment

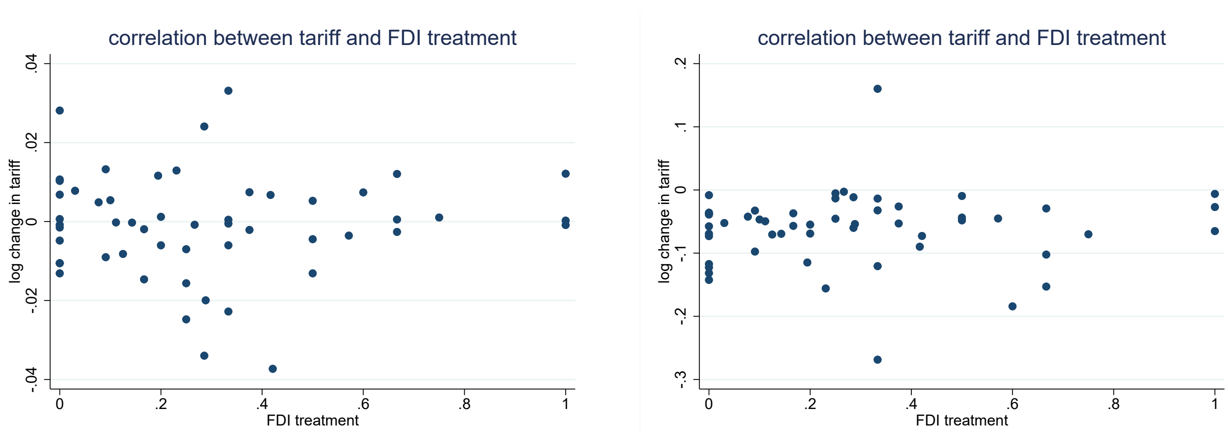
Table D.1 presents the correlation between the tariff changes from 1998-2001 to 2002-2007 and the change in FDI restrictions, represented by our affiliate treatment variable. The correlation is small and statistically insignificant. When we plot the changes in industry-level import/export tariffs (from 1998-2001 to 2002-2007) against the FDI treatment variable, we find no systematic patterns between the two sets of variables, as shown in Figure D.1, suggesting that tariff reductions do not confound the effects of FDI policies.

Table D.1: Correlation between the FDI policy change and the tariff change

	Treatment	$\Delta \ln \tau_m^{ROW}$	$\Delta \ln \tau_x^{ROW}$	$\Delta \ln \tau_m^{JPN}$	$\Delta \ln \tau_x^{JPN}$	$\Delta \ln \tau_m^{USA}$	$\Delta \ln \tau_x^{USA}$
Treatment	1						
$\Delta \ln \tau_m^{ROW}$	0.051	1					
$\Delta \ln \tau_x^{ROW}$	0.013	-0.391	1				
$\Delta \ln \tau_m^{JPN}$	0.042	0.828	-0.315	1			
$\Delta \ln \tau_x^{JPN}$	-0.121	-0.111	0.130	-0.380	1		
$\Delta \ln \tau_m^{USA}$	0.099	0.868	-0.384	0.690	-0.284	1	
$\Delta \ln \tau_x^{USA}$	-0.116	0.244	0.0250	0.231	0.0779	0.129	1

Notes: Treatment is FDI policy change defined at the affiliate's 3-digit industry level. $\Delta \ln \tau_x^{ROW}$ is the average change of China's export tariff (imposed by the rest of the world) from 1998-2001 to 2002-2007 at the affiliate's 3-digit industry level. $\Delta \ln \tau_m^{ROW}$ is the average change of China's import tariff (faced by the rest of the world) from 1998-2001 to 2002-2007 at the affiliate's 3-digit industry level. Other types of tariffs are defined in similar ways. ROW: rest of the world; JPN: Japan; USA: the United States.

Figure D.1: Correlation between the change in tariffs and FDI treatment



Note: These panels plot the change in (affiliate) industry-level export and import tariffs (against the rest of the world) from 1998-2001 to 2002-2007 against the FDI treatment variable.

E Robustness Checks

Table E.1: Effect of China's FDI Liberalization on Japanese Affiliates: Continuous Treatment

Dependent variables:	Employment		Sales		Equity Share	
	(1)	(2)	(3)	(4)	(5)	(6)
$\text{Treat}_a \times \text{Post02}_t$	0.239	0.226	0.347	0.298	0.035	0.034
	(0.134)	(0.129)	(0.226)	(0.191)	(0.011)	(0.011)
$\ln \tau^{\text{x}}_{a,t}$		-0.895		-3.809		-0.074
		(0.863)		(1.448)		(0.113)
$\ln \tau^{\text{m}}_{a,t}$		0.045		1.021		-0.051
		(0.607)		(1.112)		(0.050)
Affiliate FE	Yes	Yes	Yes	Yes	Yes	Yes
Province-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,598	11,598	11,704	11,704	11,704	11,704
Adjusted R^2	0.909	0.909	0.868	0.869	0.875	0.875

Notes: The dependent variables are: logarithm of employment (1)-(2), logarithm of total sales (3)-(4), and equity share defined as the ownership stake of the parent on the Chinese affiliate (5)-(6). Treat_a is the continuous (FDI) treatment variable defined at the affiliate's 3-digit industry level. Post02_t is an indicator variable that takes the value of one for years after 2002. We only include manufacturing affiliates that entered China before 2002. Import tariffs, $\tau^{\text{m}}_{a,t}$, represent the effectively applied tariff from China to the rest of the world, measured at the three-digit industry level. Export tariffs, $\tau^{\text{x}}_{a,t}$, represent the effectively applied tariff from the rest of the world to China. Standard errors in parentheses are clustered at the industry (affiliate) level.

Table E.2: Effect of China's FDI Liberalization on Japanese Affiliate Sales: Continuous Treatment

Dependent variables:	Sales			Exports		
	Total	Local	Local Share	Japan	Third Markets	Japan Share
	(1)	(2)	(3)	(4)	(5)	(6)
$\text{Treat}_a \times \text{Post02}_t$	0.298	0.084	-0.111	0.425	0.368	0.073
	(0.191)	(0.210)	(0.040)	(0.202)	(0.356)	(0.034)
$\ln \tau^{\mathrm{x}}_{a,t}$	-3.809	-2.001	0.057	-4.988	-3.401	-0.176
	(1.448)	(1.396)	(0.224)	(1.564)	(3.165)	(0.181)
$\ln \tau^{\mathrm{m}}_{a,t}$	1.021	0.268	-0.115	2.519	0.121	0.093
	(1.112)	(0.881)	(0.157)	(1.134)	(1.463)	(0.112)
Affiliate FE	Yes	Yes	Yes	Yes	Yes	Yes
Province-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,704	10,032	11,704	6,586	3,209	11,704
Adjusted R^2	0.869	0.826	0.778	0.818	0.766	0.808

Notes: The dependent variables are: logarithm of total sales (1), logarithm of local sales (2), share of local sales (3), logarithm of exports to Japan (4), logarithm of exports to third markets (5), and share of exports to Japan (6). Treat_a is the continuous (FDI) treatment variable defined at the affiliate's 3-digit industry level. Post02_t is an indicator variable that takes the value of one for years after 2002. We only include manufacturing affiliates that entered China before 2002. Import tariffs, $\tau^{\mathrm{m}}_{a,t}$, represent the effectively applied tariff from China to the rest of the world, measured at the three-digit industry level. Export tariffs, $\tau^{\mathrm{x}}_{a,t}$, represent the effectively applied tariff from the rest of the world to China. Standard errors in parentheses are also clustered at the industry (affiliate) and year levels.

Table E.3: Effect of China's FDI Liberalization on Japanese Affiliates: Bilateral Tariffs

Dependent variables:	Employment		Sales		Equity Share	
	(1)	(2)	(3)	(4)	(5)	(6)
$1(\text{Treat}_a) \times \text{Post02}_t$	0.144	0.132	0.278	0.245	0.017	0.015
	(0.076)	(0.069)	(0.130)	(0.115)	(0.007)	(0.008)
$\ln \tau_{a,t}^{\text{m JPN} \leftarrow \text{CHN}}$		-0.398		-0.049		-0.038
		(0.565)		(1.043)		(0.061)
$\ln \tau_{a,t}^{\text{x CHN} \leftarrow \text{JPN}}$		-1.495		-3.341		-0.268
		(0.969)		(1.393)		(0.184)
$\ln \tau_{a,t}^{\text{m USA} \leftarrow \text{CHN}}$		0.336		0.844		-0.019
		(0.436)		(0.766)		(0.034)
$\ln \tau_{a,t}^{\text{x CHN} \leftarrow \text{USA}}$		-0.687		-1.808		0.069
		(0.765)		(1.420)		(0.169)
Affiliate FE	Yes	Yes	Yes	Yes	Yes	Yes
Province-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,598	11,595	11,704	11,701	11,704	11,701
Adjusted R^2	0.909	0.909	0.869	0.869	0.875	0.875

Notes: The dependent variables are: logarithm of employment (1)-(2), logarithm of total sales (3)-(4), and equity share defined as the ownership stake of the parent on the Chinese affiliate (5)-(6). $1(\text{Treat}_a)$ is an indicator (FDI) treatment variable defined at the affiliate's 3-digit industry level (above or below the median). Post02_t is an indicator variable that takes the value of one for years after 2002. We only include manufacturing affiliates that entered China before 2002. Import tariffs, $\ln \tau_{a,t}^{\text{m USA} \leftarrow \text{CHN}}$, represent the effectively applied tariff from China to the U.S. (faced by the affiliate), measured at the three-digit industry level. Import tariffs, $\ln \tau_{a,t}^{\text{m JPN} \leftarrow \text{CHN}}$, represent the effectively applied tariff from China to Japan (faced by the affiliate), measured at the three-digit industry level. Export tariffs, $\ln \tau_{a,t}^{\text{x CHN} \leftarrow \text{USA}}$, represent the effectively applied tariff from the U.S. to China (faced by the affiliate), measured at the three-digit industry level. Export tariffs, $\ln \tau_{a,t}^{\text{x CHN} \leftarrow \text{JPN}}$, represent the effectively applied tariff from Japan to China (faced by the affiliate), measured at the three-digit industry level. Standard errors in parentheses are clustered at the industry (affiliate) and year levels.

Table E.4: Effect of China's FDI Liberalization on Affiliate Sales: Bilateral Tariffs

Dependent variables:	Sales			Exports		
	Total	Local	Local Share	Japan	Third Markets	Japan Share
	(1)	(2)	(3)	(4)	(5)	(6)
$1\left(\text{Treat}_a\right) \times \text{Post02}_t$	0.245	0.144	-0.056	0.239	0.257	0.029
	(0.115)	(0.131)	(0.023)	(0.124)	(0.209)	(0.019)
$\ln \tau_{a,t}^{\text{m}\ \text{JPN} \leftarrow \text{CHN}}$	-0.049	0.006	0.250	1.212	2.103	-0.141
	(1.043)	(0.902)	(0.136)	(1.651)	(1.687)	(0.123)
$\ln \tau_{a,t}^{\text{x}\ \text{CHN} \leftarrow \text{JPN}}$	-3.341	-2.015	0.313	-4.049	0.180	-0.490
	(1.393)	(1.835)	(0.391)	(1.784)	(4.137)	(0.347)
$\ln \tau_{a,t}^{\text{m}\ \text{USA} \leftarrow \text{CHN}}$	0.844	0.143	-0.224	0.703	-1.316	0.155
	(0.766)	(0.670)	(0.074)	(1.327)	(1.235)	(0.069)
$\ln \tau_{a,t}^{\text{x}\ \text{CHN} \leftarrow \text{USA}}$	-1.808	0.066	-0.324	-1.835	-7.689	0.302
	(1.420)	(1.904)	(0.292)	(1.725)	(3.626)	(0.226)
Affiliate FE	Yes	Yes	Yes	Yes	Yes	Yes
Province-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,701	10,029	11,701	6,586	3,209	11,701
Adjusted R^2	0.869	0.826	0.777	0.817	0.767	0.808

Notes: The dependent variables are: logarithm of total sales (1), logarithm of local sales (2), share of local sales (3), logarithm of exports to Japan (4), logarithm of exports to third markets (5), and share of exports to Japan (6). $1\left(\text{Treat}_a\right)$ is an indicator (FDI) treatment variable defined at the affiliate's 3-digit industry level (above or below the median). Post02_t is an indicator variable that takes the value of one for years after 2002. We only include manufacturing affiliates that entered China before 2002. Import tariffs, $\ln \tau_{a,t}^{\text{m}\ \text{USA} \leftarrow \text{CHN}}$, represent the effectively applied tariff from China to the U.S. (faced by the affiliate), measured at the three-digit industry level. Import tariffs, $\ln \tau_{a,t}^{\text{m}\ \text{JPN} \leftarrow \text{CHN}}$, represent the effectively applied tariff from China to Japan (faced by the affiliate), measured at the three-digit industry level. Export tariffs, $\ln \tau_{a,t}^{\text{x}\ \text{CHN} \leftarrow \text{USA}}$, represent the effectively applied tariff from the U.S. to China (faced by the affiliate), measured at the three-digit industry level. Export tariffs, $\ln \tau_{a,t}^{\text{x}\ \text{CHN} \leftarrow \text{JPN}}$, represent the effectively applied tariff from Japan to China (faced by the affiliate), measured at the three-digit industry level. Standard errors in parentheses are clustered at the industry (affiliate) and year levels.

Table E.5: Effect of China's FDI Liberalization on Japanese Affiliates: All Affiliates

Dependent variables:	Employment		Sales		Equity Share	
	(1)	(2)	(3)	(4)	(5)	(6)
$1(\text{Treat}_a) \times \text{Post02}_t$	0.146	0.140	0.284	0.254	0.017	0.017
	(0.077)	(0.075)	(0.134)	(0.120)	(0.007)	(0.007)
$\ln \tau^{\text{x}}_{a,t}$		-0.736		-3.198		-0.042
		(0.958)		(1.798)		(0.109)
$\ln \tau^{\text{m}}_{a,t}$		0.032		0.993		-0.075
		(0.703)		(1.352)		(0.048)
Affiliate FE	Yes	Yes	Yes	Yes	Yes	Yes
Province-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,504	14,504	14,654	14,654	14,654	14,654
Adjusted R^2	0.914	0.914	0.833	0.833	0.885	0.885

Notes: The dependent variables are: logarithm of employment (1)-(2), logarithm of total sales (3)-(4), and equity share defined as the ownership stake of the parent on the Chinese affiliate (5)-(6). $1(\text{Treat}_a)$ is an indicator (FDI) treatment variable defined at the affiliate's 3-digit industry level (above or below the median). Post02_t is an indicator variable that takes the value of one for years after 2002. We only include manufacturing affiliates that entered China before 2002. Import tariffs, $\tau^{\text{m}}_{a,t}$, represent the effectively applied tariff from China to the rest of the world, measured at the three-digit industry level. Export tariffs, $\tau^{\text{x}}_{a,t}$, represent the effectively applied tariff from the rest of the world to China. Standard errors in parentheses are clustered at the industry (affiliate) and year levels.

Table E.6: Effect of China's FDI Liberalization on Affiliate Sales: All Affiliates

Dependent variables:	Sales			Exports		
	Total	Local	Local Share	Japan	Third Markets	Japan Share
	(1)	(2)	(3)	(4)	(5)	(6)
$1\left(\text{Treat}_a\right) \times \text{Post02}_t$	0.254	0.152	-0.053	0.234	0.260	0.028
	(0.120)	(0.131)	(0.024)	(0.118)	(0.213)	(0.020)
$\ln \tau^{\text{x}}_{a,t}$	-3.198	-1.447	0.070	-5.223	-3.300	-0.171
	(1.798)	(1.715)	(0.234)	(2.091)	(3.270)	(0.180)
$\ln \tau^{\text{m}}_{a,t}$	0.993	0.111	-0.107	2.530	0.190	0.082
	(1.352)	(1.087)	(0.154)	(1.444)	(1.466)	(0.112)
Affiliate FE	Yes	Yes	Yes	Yes	Yes	Yes
Province-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,654	12,440	14,654	7,953	3,726	14,654
Adjusted R^2	0.833	0.800	0.778	0.807	0.761	0.805

Notes: The dependent variables are: logarithm of total sales (1), logarithm of local sales (2), share of local sales (3), logarithm of exports to Japan (4), logarithm of exports to third markets (5), and share of exports to Japan (6). $1\left(\text{Treat}_a\right)$ is an indicator (FDI) treatment variable defined at the affiliate's 3-digit industry level (above or below the median). Post02_t is an indicator variable that takes the value of one for years after 2002. We only include manufacturing affiliates that entered China before 2002. Import tariffs, $\tau^{\text{m}}_{a,t}$, represent the effectively applied tariff from China to the rest of the world, measured at the three-digit industry level. Export tariffs, $\tau^{\text{x}}_{a,t}$, represent the effectively applied tariff from the rest of the world to China. Standard errors in parentheses are clustered at the industry (affiliate) and year levels.

Table E.7: Effect of China's FDI Liberalization on Japanese Affiliates: 1998-2006

Dependent variables:	Employment		Sales		Equity Share	
	(1)	(2)	(3)	(4)	(5)	(6)
$1\,(\text{Treat}_a) \times \text{Post02}_t$	0.143	0.140	0.269	0.242	0.016	0.016
	(0.074)	(0.073)	(0.124)	(0.114)	(0.007)	(0.007)
$\ln \tau^{\mathrm{x}}_{a,t}$		-0.538		-3.250		-0.088
		(0.897)		(1.449)		(0.122)
$\ln \tau^{\mathrm{m}}_{a,t}$		-0.214		0.594		-0.055
		(0.592)		(1.051)		(0.054)
Affiliate FE	Yes	Yes	Yes	Yes	Yes	Yes
Province-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,394	10,394	10,485	10,485	10,485	10,485
Adjusted R^2	0.911	0.911	0.871	0.871	0.874	0.874

Notes: The dependent variables are: logarithm of employment (1)-(2), logarithm of total sales (3)-(4), and equity share defined as the ownership stake of the parent on the Chinese affiliate (5)-(6). $1\,(\text{Treat}_a)$ is an indicator (FDI) treatment variable defined at the affiliate's 3-digit industry level (above or below the median). Post02_t is an indicator variable that takes the value of one for years after 2002. We only include manufacturing affiliates that entered China before 2002. Import tariffs, $\tau^{\mathrm{m}}_{a,t}$, represent the effectively applied tariff from China to the rest of the world, measured at the three-digit industry level. Export tariffs, $\tau^{\mathrm{x}}_{a,t}$, represent the effectively applied tariff from the rest of the world to China. Standard errors in parentheses are clustered at the industry (affiliate) and year levels.

Table E.8: Effect of China's FDI Liberalization on Affiliate Sales: 1998-2006

Dependent variables:	Sales			Exports		
	Total	Local	Local Share	Japan	Third Markets	Japan Share
	(1)	(2)	(3)	(4)	(5)	(6)
$1\,(\text{Treat}_a) \times \text{Post02}_t$	0.242	0.131	-0.053	0.246	0.283	0.025
	(0.114)	(0.123)	(0.023)	(0.120)	(0.206)	(0.020)
$\ln \tau^{\text{x}}_{a,t}$	-3.250	-2.168	-0.033	-4.833	-2.386	-0.172
	(1.449)	(1.614)	(0.247)	(1.993)	(2.859)	(0.214)
$\ln \tau^{\text{m}}_{a,t}$	0.594	0.237	-0.026	2.139	-0.167	0.036
	(1.051)	(0.912)	(0.157)	(1.314)	(1.662)	(0.121)
Affiliate FE	Yes	Yes	Yes	Yes	Yes	Yes
Province-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,485	8,968	10,485	5,810	2,723	10,485
Adjusted R^2	0.871	0.826	0.777	0.817	0.768	0.810

Notes: The dependent variables are: logarithm of total sales (1), logarithm of local sales (2), share of local sales (3), logarithm of exports to Japan (4), logarithm of exports to third markets (5), and share of exports to Japan (6). $1\,(\text{Treat}_a)$ is an indicator (FDI) treatment variable defined at the affiliate's 3-digit industry level (above or below the median). Post02_t is an indicator variable that takes the value of one for years after 2002. We only include manufacturing affiliates that entered China before 2002. Import tariffs, $\tau^{\text{m}}_{a,t}$, represent the effectively applied tariff from China to the rest of the world, measured at the three-digit industry level. Export tariffs, $\tau^{\text{x}}_{a,t}$, represent the effectively applied tariff from the rest of the world to China. Standard errors in parentheses are clustered at the industry (affiliate) and year levels.

TABLE E.9: Effect of China's FDI Liberalization on Japanese MNC parents: Continuous Treatment

Dependent variables:	Services Employment			Sales		Labor Productivity		Imports	
	Total Share	R&D + Intl. Bus. Share	Others Share	Total	Manuf.	Total	Manuf.	From Asia	From All Affiliates
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\text{Treat}_a \times \text{Post02}_t$	0.001	0.019	-0.018	0.278	0.387	0.231	0.318	0.216	0.248
	(0.015)	(0.011)	(0.015)	(0.084)	(0.103)	(0.090)	(0.123)	(0.198)	(0.244)
Aff.-level tariffs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Par.-level tariffs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prefecture-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8,442	8,442	8,442	8,434	8,030	7,786	6,398	5,871	4,876
Adjusted R^2	0.811	0.770	0.807	0.982	0.972	0.622	0.599	0.831	0.824

Notes: The dependent variables are: total service employment share (1), service employment share in the Research and Development (R&D) department and International Business (Intl. Bus.) department (2), others service employment share (3), logarithm of total sales (4), logarithm of manufacturing sales (5), total labor productivity is measured as total sales minus inputs, all divided by total employment (6), manufacturing labor productivity is measured as manufacturing sales minus inputs, all divided by total employment (7), total imports to Asia (8), and total imports to all affiliates (9). Treat_a is a continuous treatment variable defined at the affiliate's 3-digit industry level (above or below the median). Post02_t is an indicator variable that takes the value of one for years after 2002. For the parent firm, we use its first affiliate to define the treatment. We only include manufacturing affiliates that entered China before 2002 and their parent firms. Parent firms with zero manufacturing employment before the FDI policy shock in 2002 or zero manufacturing employment after 2002 are excluded from the regressions. All regressions account for overall import and export tariffs faced by both the parent firms ($\tau^{\mathrm{m}}_{p,t}$ and $\tau^{\mathrm{x}}_{p,t}$) and their first manufacturing affiliates in China at the three-digit industry level ($\tau^{\mathrm{m}}_{a(p),t}$ and $\tau^{\mathrm{x}}_{a(p),t}$). Standard errors in parentheses are also clustered at the industry (affiliate) and year levels.

TABLE E.10: China's FDI Liberalization and Japanese MNC parents: Bilateral Tariffs

Dependent variables:	Services Employment			Sales		Labor Productivity		Imports	
	Total Share	R&D + Intl. Bus. Share	Others Share	Total	Manuf.	Total	Manuf.	From Asia	From All Affiliates
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$1\,(\text{Treat}_a) \times \text{Post02}_t$	-0.001	0.012	-0.013	0.134	0.157	0.121	0.134	0.228	0.175
	(0.009)	(0.005)	(0.008)	(0.045)	(0.054)	(0.048)	(0.075)	(0.098)	(0.104)
Aff.-level bilateral tariffs included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Par.-level tariffs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prefecture-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8,434	8,434	8,434	8,434	8,030	7,786	6,398	5,871	4,876
Adjusted R^2	0.812	0.771	0.809	0.981	0.972	0.623	0.598	0.832	0.824

Notes: The dependent variables are: total service employment share (1), service employment share in the Research and Development (R&D) department and International Business (Intl. Bus.) department (2), others service employment share (3), logarithm of total sales (4), logarithm of manufacturing sales (5), total labor productivity is measured as total sales minus inputs, all divided by total employment (6), manufacturing labor productivity is measured as manufacturing sales minus inputs, all divided by total employment (7), total imports to Asia (8), and total imports to all affiliates (9). $1\,(\text{Treat}_a)$ is an indicator (FDI) treatment variable defined at the affiliate's 3-digit industry level (above or below the median). Post02_t is an indicator variable that takes the value of one for years after 2002. For the parent firm, we use its first affiliate to define the treatment. We only include manufacturing affiliates that entered China before 2002 and their parent firms. Parent firms with zero manufacturing employment before the FDI policy shock in 2002 or zero manufacturing employment after 2002 are excluded from the regressions. All regressions account for overall import and export tariffs faced by both the parent firms ($\tau^{\text{m}}_{p,t}$ and $\tau^{\text{x}}_{p,t}$) and their first manufacturing affiliates in China at the three-digit industry level ($\tau^{\text{m}}_{a(p),t}$ and $\tau^{\text{x}}_{a(p),t}$). Standard errors in parentheses are also clustered at the industry (affiliate) and year levels.

Table E.11: China's FDI Liberalization and Japanese MNC parents: Using the Largest Affiliate to Define the Treatment

Dependent variables:	Services Employment			Sales		Labor Productivity		Imports	
	Total Share	R&D + Intl. Bus. Share	Others Share	Total	Manuf.	Total	Manuf.	From Asia	From All Affiliates
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$1\,(\text{Treat}_a) \times \text{Post02}_t$	-0.001	0.010	-0.010	0.129	0.151	0.103	0.121	0.262	0.209
	(0.008)	(0.004)	(0.007)	(0.045)	(0.053)	(0.055)	(0.074)	(0.111)	(0.107)
Aff.-level tariffs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Par.-level tariffs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pref.-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8,516	8,516	8,516	8,508	8,084	7,856	6,437	5,918	4,911
Adjusted R^2	0.811	0.770	0.806	0.981	0.972	0.620	0.595	0.834	0.822

Notes: The dependent variables are: total service employment share (1), service employment share in the Research and Development (R&D) department and International Business (Intl. Bus.) department (2), others service employment share (3), logarithm of total sales (4), logarithm of manufacturing sales (5), total labor productivity is measured as total sales minus inputs, all divided by total employment (6), manufacturing labor productivity is measured as manufacturing sales minus inputs, all divided by total employment (7), total imports to Asia (8), and total imports to all affiliates (9). $1\,(\text{Treat}_a)$ is an indicator (FDI) treatment variable defined at the affiliate's 3-digit industry level (above or below the median). Post02_t is an indicator variable that takes the value of one for years after 2002. For the parent firm, we use its largest affiliate (before 2002) to define the treatment. We only include manufacturing affiliates that entered China before 2002 and their parent firms. Parent firms with zero manufacturing employment before the FDI policy shock in 2002 or zero manufacturing employment after 2002 are excluded from the regressions. All regressions account for overall import and export tariffs faced by both the parent firms ($\tau^{\mathrm{m}}_{p,t}$ and $\tau^{\mathrm{x}}_{p,t}$) and their first manufacturing affiliates in China at the three-digit industry level ($\tau^{\mathrm{m}}_{a(p),t}$ and $\tau^{\mathrm{x}}_{a(p),t}$). Standard errors are also clustered at the industry (affiliate) and year levels.

Table E.12: China's FDI Liberalization and Japanese MNC parents: 1998-2006

Dependent variables:	Services Employment			Sales		Labor Productivity		Imports	
	Total Share	R&D + Intl. Bus. Share	Others Share	Total	Manuf.	Total	Manuf.	From Asia	From All Affiliates
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$1\,(\text{Treat}_a) \times \text{Post02}_t$	0.002	0.011	-0.009	0.117	0.146	0.092	0.111	0.206	0.190
	(0.009)	(0.005)	(0.008)	(0.040)	(0.052)	(0.050)	(0.073)	(0.096)	(0.110)
Aff.-level tariffs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Par.-level tariffs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pref.-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,613	7,613	7,613	7,613	7,258	6,998	5,736	5,278	4,372
Adjusted R^2	0.828	0.781	0.827	0.983	0.973	0.633	0.610	0.837	0.826

Notes: The dependent variables are: total service employment share (1), service employment share in the Research and Development (R&D) department and International Business (Intl. Bus.) department (2), others service employment share (3), logarithm of total sales (4), logarithm of manufacturing sales (5), total labor productivity is measured as total sales minus inputs, all divided by total employment (6), manufacturing labor productivity is measured as manufacturing sales minus inputs, all divided by total employment (7), total imports to Asia (8), and total imports to all affiliates (9). $1\,(\text{Treat}_a)$ is an indicator (FDI) treatment variable defined at the affiliate's 3-digit industry level (above or below the median). Post02_t is an indicator variable that takes the value of one for years after 2002. For the parent firm, we use its first affiliate to define the treatment. We only include manufacturing affiliates that entered China before 2002 and their parent firms. Parent firms with zero manufacturing employment before the FDI policy shock in 2002 or zero manufacturing employment after 2002 are excluded from the regressions. All regressions account for overall import and export tariffs faced by both the parent firms ($\tau^{\text{m}}_{p,t}$ and $\tau^{\text{x}}_{p,t}$) and their first manufacturing affiliates in China at the three-digit industry level ($\tau^{\text{m}}_{a(p),t}$ and $\tau^{\text{x}}_{a(p),t}$). Standard errors in parentheses are also clustered at the industry (affiliate) and year levels.

TABLE E.13: China's FDI Liberalization and Japanese MNC parents: Including Industry-year Fixed Effects

Dependent variables:	Services Employment			Sales		Labor Productivity		Imports	
	Total Share	R&D + Intl. Bus. Share	Others Share	Total	Manuf.	Total	Manuf.	From Asia	From All Affiliates
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$1\,(\text{Treat}_a) \times \text{Post02}_t$	0.005	0.017	-0.012	0.027	0.028	0.047	-0.031	0.142	0.227
	(0.010)	(0.006)	(0.010)	(0.029)	(0.029)	(0.064)	(0.092)	(0.082)	(0.103)
Aff.-level tariffs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Par.-level tariffs	No	No	No	No	No	No	No	No	No
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pref.-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(Parent) ind.-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8,350	8,350	8,350	8,350	7,940	7,705	6,301	5,743	4,768
Adjusted R^2	0.809	0.766	0.806	0.984	0.976	0.627	0.605	0.838	0.831

Notes: The dependent variables are: total service employment share (1), service employment share in the Research and Development (R&D) department and International Business (Intl. Bus.) department (2), others service employment share (3), logarithm of total sales (4), logarithm of manufacturing sales (5), total labor productivity is measured as total sales minus inputs, all divided by total employment (6), manufacturing labor productivity is measured as manufacturing sales minus inputs, all divided by total employment (7), total imports to Asia (8), and total imports to all affiliates (9). $1\,(\text{Treat}_a)$ is an indicator (FDI) treatment variable defined at the affiliate's 3-digit industry level (above or below the median). Post02_t is an indicator variable that takes the value of one for years after 2002. For the parent firm, we use its first affiliate to define the treatment. We only include manufacturing affiliates that entered China before 2002 and their parent firms. Parent firms with zero manufacturing employment before the FDI policy shock in 2002 or zero manufacturing employment after 2002 are excluded from the regressions. All regressions account for overall import and export tariffs faced by both the parent firms ($\tau^{\text{m}}_{p,t}$ and $\tau^{\text{x}}_{p,t}$) and their first manufacturing affiliates in China at the three-digit industry level ($\tau^{\text{m}}_{a(p),t}$ and $\tau^{\text{x}}_{a(p),t}$). Standard errors in parentheses are also clustered at the industry (affiliate) and year levels.

F Decomposition of the Change in Manufacturing Employment Share: The Role of Multinationals

This Appendix attempts to quantify the role of multinationals as a driver of structural transformation for several countries in varied stages of development. We use firm and establishment-level data from five countries in different stages of development to evaluate whether MNCs have a quantitatively important role – in an accounting sense – in the observed structural transformation path of these countries.

Specifically, we decompose the change of a country's total manufacturing employment into a multinational and a non-multinational component. In addition, for each group, we calculate the contribution of firms that continue operations, those that enter, and those that exit the market. These types of decomposition exercises, developed by Foster et al. (2006) and Melitz and Polanec (2015), have been extensively used in the literature on firm dynamics. We apply this approach to study the role of multinationals in structural change for a broader set of countries than what is used in the causal analysis in the next section.

While our approach allows us to carefully account for the process of structural transformation at a micro level, both into and out of manufacturing, it also poses challenges. First, micro-data in different countries features information collected in a non-uniform way.[27] Second, although we have information on firm-level employment for manufacturing firms in all countries in our sample, most countries do not have firm-level employment information for services firms; this information is required to apply the Melitz and Polanec (2015) decomposition. We therefore choose the Foster et al. (2006) (FHK) decomposition as our baseline, as it can be best applied to all countries in our analysis. Section G discusses each micro-dataset in detail, and highlights features that are common across countries and that are unique to each dataset we consider.

F.1 FHK Decomposition

The FHK decomposition method separates the aggregate change in manufacturing employment in five components indicated in the right-hand side of equation (F.1):

[27]Notice that the confidential nature of the firm level datasets precludes us from linking information across countries.

$$
\begin{aligned}
\Delta \frac{L_{m,t}}{L_t} = & \underbrace{\sum_{i \in C} w_{it-1} \Delta \frac{L_{i,m,t}}{L_{i,t}}}_{\text{within effect}} + \underbrace{\sum_{i \in C} \left(\frac{L_{i,m,t-1}}{L_{i,t-1}} - l_{m,t-1} \right) \Delta w_{it}}_{\text{between effect}} + \underbrace{\sum_{i \in C} \Delta w_{it} \Delta \frac{L_{i,m,t}}{L_{i,t}}}_{\text{covariance}} \\
& + \underbrace{\sum_{i \in N} w_{it} \left(\frac{L_{i,m,t}}{L_{i,t}} - l_{m,t-1} \right)}_{\text{entry}} - \underbrace{\sum_{i \in X} w_{it-1} \left(\frac{L_{i,m,t-1}}{L_{i,t-1}} - l_{m,t-1} \right)}_{\text{exit}}
\end{aligned}
\tag{F.1}
$$

where $L_{m,t}$ and L_t denote aggregate manufacturing employment and aggregate total employment in period t; $L_{i,m,t}$ and $L_{i,t}$ denote firm i's manufacturing employment and firm i's total employment in period t, with $\frac{L_{i,m,t}}{L_{i,t}}$ representing the share of manufacturing in firm's i's total employment. Further, w_{it} represents firm i's employment share in period t aggregate total employment, $\frac{L_{it}}{L_t}$. Finally, $l_{m,t-1} = \frac{L_{m,t-1}}{L_{t-1}}$ is the aggregate manufacturing employment share at the beginning of the period. Subscripts C, N, and X denote continuing, new, and exiting firms.

The first three terms in the right-hand side of equation (F.1) involve continuing firms only. The first term, $\sum_{i \in C} w_{it-1} \Delta \frac{L_{i,m,t}}{L_{i,t}}$, captures the "within" effect for continuing firms. That is, it captures the change in the share of manufacturing employment in the aggregate that comes from increases or decreases in manufacturing employment *within* continuing firms. The second term, $\sum_{i \in C} \left(\frac{L_{i,m,t-1}}{L_{i,t-1}} - l_{m,t-1} \right) \Delta w_{it}$, captures the "between" effect for continuing firms. This reflects the change in the aggregate share of manufacturing that arises due to the reallocation of employment towards or away from above-average size firms, represented by the change in their economy-wide employment share, Δw_{it}. The third term captures a covariance or cross-term across these two effects.

The final two terms of equation F.1 capture entry and exit. The effect of entry is the weighted sum of the manufacturing employment share of all those firms that started operations in period t less the aggregate manufacturing employment share in the previous period, $t-1$. The effect of exit is the weighted sum of each exiting firm i's manufacturing employment share in period $t-1$ less the aggregate manufacturing employment share in the same period. Therefore, the net effect of entry and exit depends on whether the manufacturing employment of new firms is on average greater than or less than the manufacturing employment of those firms that exit the market. Notice that the decomposition below also captures the employment dynamics of "services" firms, which here are defined as firms with zero manufacturing employment.[28]

While implementing equation (F.1) provides a clear portrait of the sources of the decline or increase in the aggregate manufacturing employment share, it does not show the specific role of MNCs in these changes. Next, we extend this decomposition to distinguish changes in manufacturing employment that can be attributed to changes in the manufacturing employment of MNCs and non-MNCs.

F.1.1 FHK Decomposition with Multinationals and a Service Sector

We begin with the decomposition in equation (F.1) and then separate the firms into MNCs and non-MNCs groups:

$$\begin{aligned}
\Delta\frac{L_{m,t}}{L_t} = & \underbrace{\sum_{i\in C_{MNC}} w_{it-1}\Delta\frac{L_{i,m,t}}{L_{i,t}} + \sum_{i\in C_{MNC}}\left(\frac{L_{i,m,t-1}}{L_{i,t-1}} - l_{m,t-1}\right)\Delta w_{it} + \sum_{i\in C_{MNC}}\Delta w_{it}\Delta\frac{L_{i,m,t}}{L_{i,t}}}_{\text{MNC effect}} \\
& + \underbrace{\sum_{i\in N_{MNC}} w_{it}\left(\frac{L_{i,m,t}}{L_{i,t}} - l_{m,t-1}\right) - \sum_{i\in X_{MNC}} w_{it-1}\left(\frac{L_{i,m,t-1}}{L_{i,t-1}} - l_{m,t-1}\right)}_{\text{MNC effect (cont.)}} \\
& + \underbrace{\sum_{i\in C_{Non-MNC}} w_{it-1}\Delta\frac{L_{i,m,t}}{L_{i,t}} + \sum_{i\in C_{Non-MNC}}\left(\frac{L_{i,m,t-1}}{L_{i,t-1}} - l_{m,t-1}\right)\Delta w_{it} + \sum_{i\in C_{Non-MNC}}\Delta w_{it}\Delta\frac{L_{i,m,t}}{L_{i,t}}}_{\text{Non-MNC effect}} \\
& + \underbrace{\sum_{i\in N_{Non-MNC}} w_{it}\left(\frac{L_{i,m,t}}{L_{i,t}} - l_{m,t-1}\right) - \sum_{i\in X_{Non-MNC}} w_{it-1}\left(\frac{L_{i,m,t-1}}{L_{i,t-1}} - l_{m,t-1}\right)}_{\text{Non-MNC effect (cont.)}} \\
& + \underbrace{l_{m,t-1}(w_{mt} - w_{mt-1})}_{\text{service effect}} \qquad \text{(F.2)}
\end{aligned}$$

This decomposition, which we implement on our data, contains eleven terms. The first five terms are associated with manufacturing MNCs, the next five terms are associated with manufacturing non-MNCs, and the final term is the employment shift from the service sector into manufacturing; where a firm is considered manufacturing if it has one or more employees in a manufacturing sector, and is consider a service firm otherwise. As before, w_{it} captures

[28] For services firms $\frac{L_{i,m,t}}{L_{i,t}}$ and $\Delta\frac{L_{i,m,t}}{L_{i,t}}$ are zero and therefore the within and between a component of the decomposition are 0 and $\sum_{i\in C}\left(0 - l_{m,t-1}\right)\Delta w_{it}$, respectively.

firm i's employment share in aggregate total employment in period t.

While the terms capturing MNCs and non-MNCs are similar to those in equation (F.1) this decomposition differs from (F.1) in that it explicitly distinguish the contribution of manufacturing firms, MNCs or non-MNCs, from the contribution of services firms, regardless of their MNC status. The reason why we explicitly separate manufacturing from services firms is because for most countries in our sample the available data lack information on MNC/non-MNC in the service sector, so we treat services firms as a third aggregate category. Conveniently, in the decomposition presented in equation (F.2) the net contribution of services firms to the observed changes in the share of aggregate manufacturing employment in the economy is expressed only as function of the aggregate manufacturing employment share and its changes over time, which are easily observed for all countries in our sample.[29]

China's decomposition: the Manufacturing Survey and the Census of Manufactures in China does not breakdown firm employment in their manufacturing and services components. Therefore, to implement the FHK decomposition exercise for China we modify equation (F.2) and assume that all jobs in firms classified as manufacturing firms are manufacturing jobs.[30]

Under this assumption there is no within-group change in the manufacturing employment share, since $\frac{L_{i,m,t}}{L_{i,t}} = \frac{L_{i,m,t-1}}{L_{i,t-1}} = 1$ and thus $\Delta\frac{L_{i,m,t}}{L_{i,t}} = 0$. Substituting in equation (F.2) the decomposition for China becomes:

$$\Delta\frac{L_{m,t}}{L_t} = \underbrace{\left(1 - l_{m,t-1}\right)\left(\sum_{i\in C_{non-MNC}} \Delta w_{it} + \sum_{i\in N_{non-MNC}} w_{it} - \sum_{i\in X_{non-MNC}} w_{it-1}\right)}_{\text{manuf Non-MNCs}}$$
$$+ \underbrace{\left(1 - l_{m,t-1}\right)\left(\sum_{i\in C_{MNC}} \Delta w_{it} + \sum_{i\in N_{MNC}} w_{it} - \sum_{i\in X_{MNC}} w_{it-1}\right)}_{\text{manuf MNCs}} + \underbrace{l_{m,t-1}(w_{mt} - w_{mt-1})}_{\text{services}}. \tag{F.3}$$

F.2 Data used in the decomposition exercise

We describe the five microdata sources used in the analysis in great detail in Appendix G. Table F.1 below summarizes the start and end years of the sample in each country in our

[29] Appendix A present the details of the derivation of the service term in equation F.2.

[30] While this could potentially overstate the manufacturing jobs in these firms, reforms of state-owned enterprises in the late 1990s and early 2000s had made services departments of many large manufacturing firms (most of which were state owned) independent private services firms. Therefore, we believe the upward bias in China's manufacturing employment is relatively small in our sample period.

Table F.1: Multinational Share of Manufacturing Employment

	Start Year	MNCs Share	End Year	MNCs Share
China	1998	0.05	2013	0.18
Hungary	1992	0.24	2010	0.49
U.S.	1993	0.27	2013	0.31
Japan	1995	0.16	2016	0.16
France	1999	0.34	2016	0.35

Notes: MNCs in China and Hungary correspond to affiliates of foreign parents operating in China and Hungary, respectively. MNCs in Japan, France and the U.S. correspond to domestic parent companies with operations across borders. In each case, Non-MNCs correspond to the remaining firms with some production in manufacturing.

data, together with the share of manufacturing employment in MNCs in each of these years.

Notice that for the U.S., Japan and France, MNCs are defined as parent companies from these countries that also operate overseas; whereas for China and Hungary, MNCs correspond to affiliates of foreign parents operating in these countries.[31] We made this distinction in order to separate the relative importance and role of MNCs in economies with different levels of development. Large multinationals from the U.S., Japan and France have started and increased their level of operations in countries like China and Hungary after they have reduced their barriers to foreign investment in the last decades.[32]

As is clear from the table, the share of manufacturing employment in multinationals increased by more than a factor of three in China during this time period. On the other hand, the multinational manufacturing employment share in the advanced economies stayed stable (Japan and France) or experienced only a small increase (the U.S.). The share of manufacturing employment in multinationals also doubled in Hungary, a middle income economy that received inward FDI following the collapse of the Soviet Union and its EU accession.

F.3 Results

Table F.2 presents the results of the decomposition in equation (F.2), and equation (F.3) for China. Panel A includes the total change, as well as the sum of all the terms related to multinationals and non-multinationals, and Panel B breaks down the multinational component into the role of (multinational) continuing firms, entry and exit. [33] For some countries in our

[31] For further details see Appendix G.

[32] Notice that for the U.S., Japan, and France, non-MNCs include domestic companies that only operate at home as well as foreign affiliates operating in these countries. For China and Hungry, non-MNCs include domestic companies that only operate at home, and domestic companies that also operate abroad.

[33] Notice that in panel A, the MNC and Non-MNC components do not sum the Total (first column). This is because Total also includes the contribution of services to the observed change in manufacturing

Table F.2: FHK Decomposition: Role of Multinationals

	Panel A			Panel B: MNCs			
	Total	MNC	NonMNC	Total	Cont.	Entry	Exit
	Period: 1990's						
China	-	-	-	-	-	-	-
Hungary	0.05	0.04	-0.02	0.04	0.01	0.03	-0.01
U.S.	-0.045	-0.009	-0.029	-0.009	-0.012	0.003	0.000
Japan	-0.03	-0.01	-0.02	-0.01	-0.01	0.00	-0.01
France*	-0.04	-0.01	-0.02	-0.01	-0.03	0.02	0.00
	Period: 2000's						
China	0.05	0.03	0.01	0.03	0.01	0.04	-0.01
Hungary	-0.05	0.002	-0.04	0.002	0.01	0.01	-0.02
U.S.	-0.029	-0.010	-0.015	-0.010	-0.008	0.003	-0.005
Japan	-0.03	0.00	-0.03	0.00	0.00	0.01	-0.01
France†	-0.02	0.00	-0.02	0.00	-0.02	0.03	-0.01

Notes: MNCs in China and Hungary correspond to affiliates of foreign parents operating in these countries. MNCs in Japan, France and the U.S. correspond to domestic parent companies with operations at home and also across borders. In each case, Non-MNCs correspond to the remaining firms with some production in manufacturing. * and † correspond to France decomposition results for 2000's and 2010's decades, respectively. For the U.S. the 1990's and the 2000's corresponds to the period (2003-1993) and (2013-2003) respectively.

sample, the analogous breakdown for non-MNCs and the service component (the remaining terms in the decomposition) are contained in Appendix G.

The table makes clear that multinational parents accounted for about a third of the decline in manufacturing employment in the US in the 2000's (and about one-fifth in the 1990's), and foreign affiliates in China account for the majority of the manufacturing employment in China post its WTO accession. In the U.S., the net negative effects of MNCs are due to both declines by continuing firms and firms exiting the market. In China, the expansion is largely due to the entry of MNCs.[34]

For both France and Japan, the net (negative) effect of MNCs on manufacturing employ-

employment.

[34] In the decomposition exercise, we abstract from the case of an non-MNC firm becoming an MNC firm, or vice versa. Therefore, entry and exit in the MNC and non-MNC component simply refers to firms entering into, or exiting from, the *market*. In other words, when a firm switches from a Non-MNC in the previous year to an MNC in the current year (i.e., a *mode* switching), we treat it as a continuing MNC. Similarly, when a firm switches from an MNC in the previous year to a non-MNC in the current year, we treat it as a continuing non-MNC (i.e., an exporter). As a result, a part of the decline in the manufacturing employment share of continuing MNCs comes from those MNCs that have switched from Non-MNCs. This is consistent with our model's assumptions.

ment share is substantial in the 1990s, largely coming from structural transformation among continuing MNCs. The picture is different, when we focus on the 2000s. In France, while the net effect of MNCs is close to zero, this is for most part due to the offsetting effects of entry on the declines within continuing MNCs. In Japan, the net effect of MNCs is close to zero as well, as entering MNCs offset the negative effect of MNCs exiting the market, and continuing MNCs stop reducing the share of manufacturing employment.[35] Turning to Hungary, MNCs were a net positive contributor to the manufacturing employment share in both decades, even though Hungary's overall manufacturing employment share actually declined in the 2000s. The role of MNCs in offsetting the manufacturing decline in Hungary in the 2000s comes from both entry and continuing firms, while their large role in the expansion in Hungary in the 1990s comes primarily due to entry.

G Data Description and Additional Results for the Decomposition Exercise

G.1 China

We use the Annual Survey of Industrial Firms (ASIF) complied by the National Bureau of Statistics (NBS) of China, a production firm-level dataset of Chinese manufacturing firms covering the period (1998-2013). All state-owned enterprises and "above-scale" non-state-owned enterprises (i.e., private firms) are included in the dataset.[36] This dataset is commonly used in the literature and uses a unique numerical identifiers to link firms over time. (Brandt et al. (2012), and Yu (2015)).

Admittedly, the ASIF dataset is a survey, and as such, it does not cover the entire population of manufacturing firms in the economy and it is bias towards relatively large firms. However, Brandt et al. (2012) showed that, in 2004, ASIF accounted for more than 80% of the total output and 60% of the total employment reported in the Chinese Census data that year. In addition, we repeat our decomposition exercise using China's manufacturing Census in 2004 and 2008, and show that it yields similar results as the one obtained from using the manufacturing survey for the period (1998-2013).

The ASIF dataset reports firm's total employment, but does not provide information on

[35] Data from World Bank show that the export share in Japan's GDP had increased from 10.5% in 2000 to 17.2% in 2008. As most MNCs are engaged in exporting activities and most exports from Japan are manufacturing goods, the exporting boom in the 2000s helps explain why continuing MNCs had stopped reducing manufacturing employment in 2000s.

[36] The "above-scale" firms are defined as firms with annual sales above RMB 5 million before 2010 and above RMB 20 million thereafter.

the breakdown of total firm employment into manufacturing and services. As explained in section F.1.1, we have modify our FHK decomposition to account for this feature of the data. The ASIF dataset also contains information on firms' equity structure. Specifically, each firm is required to report its equity into the following six categories: state equity, collective equity, equity held by individual persons, equity held by legal persons, equity held by Hong Kong, Macau and Taiwan entities (HMT), and equity held by foreign entities. China's laws concerning foreign direct investment treat firms with more than 25% equity held by HMT or foreign entities as foreign invested enterprises (FIEs). We use the same definition as the official definition of FIEs in China to define foreign MNCs with operations in China.

Table G.1 reports the average employment of all firms in the economy as well as the average employment of foreign MNCs during our sample period. On average, 20% of our observations are foreign MNCs, and the average employment is higher for foreign MNCs than for domestic firms. Table G.2 shows information on employment by all firms and by foreign MNCs for each year of the period (1998-2013). Two patterns arise from this table. First, the number of foreign affiliates in China had increased substantially during our sample period, while their share in the total number of firms had increased from 1998 to 2004, and flattened afterwards. Second, the average employment for foreign MNCs was lower than for the average firm in the economy in early years, but this pattern was reversed after 2001.

Table G.1: Summary Statistics of Chinese Manufacturing Firms

	Obs.	Mean	Std. dev.	Median
Employment	4,026,129	275.6	981.6	125
Employment by MNCs	800,961	385.1	1108.6	182
MNC status	4,042,217	0.20	0.40	0

Notes: MNCs are defined as firms with more than 25% equity held by Hong Kong-Macau-Taiwan or foreign entities.

Since ASIF has no information on the breakdown of firm's employment into manufacturing and service jobs, we use equation (F.3) to implement the decomposition exercise. For this We obtain information on overall employment and manufacturing employment share from the China's Bureau of Statistics (i.e., China Statistical Yearbook). Based on these aggregate statistics, we calculate the total change in the share of manufacturing employment and employment shift from other sectors into manufacturing. We utilize observations of MNC affiliates in ASIF and the aggregate statistics from the Yearbook to calculate the three terms in the decomposition that are related to MNCs, as well as the last term in equation (F.3). We then calculate the three terms related to Non-MNCs firms in equation (F.3) by subtracting the MNC terms and the service terms from the total change in the manufacturing

Table G.2: Summary Statistics for Employment and Number of firms by year

	All firms			Foreign MNCs		
Year	Mean	Median	Number of firms	Mean	Median	Number of firms
1998	341	133	148,683	294	148	26,045
1999	324	129	146,079	296	150	26,376
2000	311	125	147,207	301	150	27,950
2001	289	120	155,572	299	150	30,860
2002	277	116	165,668	306	150	33,889
2003	270	113	180,940	327	153	37,997
2004	221	93	256,201	308	143	56,209
2005	238	100	247,798	339	152	55,009
2006	228	95	278,346	349	153	59,807
2007	219	90	311,981	350	153	66,264
2008	193	80	385,594	333	140	74,809
2009	190	79	404,314	326	135	74,344
2010	356	123	321,604	518	220	75,434
2011	326	194	265,098	504	265	50,320
2012	320	200	289,879	499	269	52,652
2013	417	325	321,165	616	401	52,996

employment share.

Figure G.1 presents the decomposition result for each 5-year interval (from year t to year $t-5$) starting from 1998 ending in 2008. Overall, it is clear that MNC affiliates had contributed substantially to the manufacturing employment share increase in China for the period 1998-2013.[37] Figure G.2 decompose the overall contribution by MNC affiliates into contributions by entering, continuing and exiting MNC affiliates for each 5-year interval. It is apparent that the driving force of the MNCs contribution to manufacturing employment is lead by MNC affiliates entering the market during the period of 1998-2013.

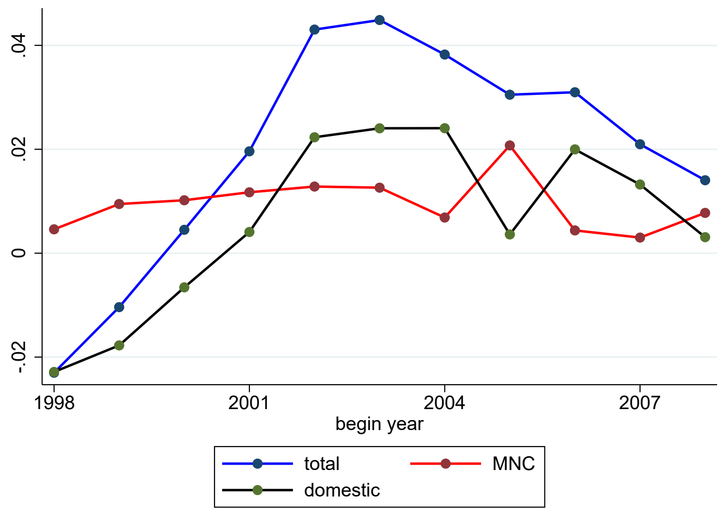
Finally, we repeat the decomposition exercise, but this time using the Census data in 2004 and 2008 instead of teh Survey data. The result show that MNC affiliates contributed by 0.61%, of the 2.42% overall change experience by the manufacturing employment during this period.

G.2 Japan

The firm-level dataset used in the decomposition exercise is called the Basic Survey of Japanese Business Structure and Activities (BSJBSA) and obtained from the Ministry of Economy, Trade and Industry (METI) of Japan. Its time span is from 1995 to 2016 with

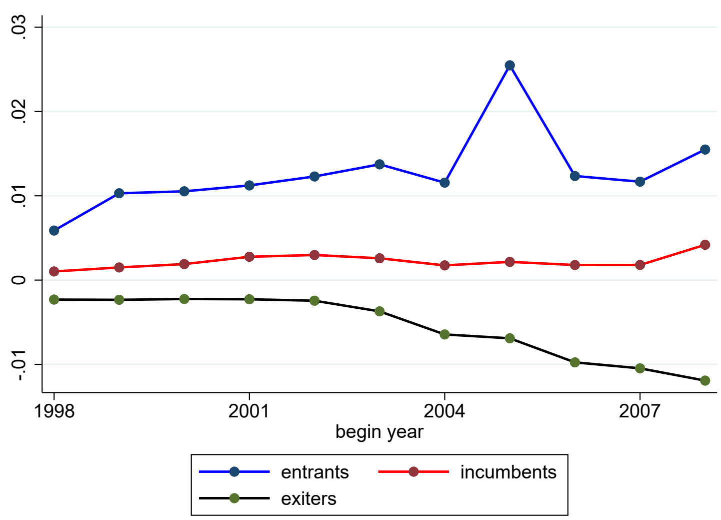
[37]The manufacturing employment share shrank substantially in late 1990s and early 2000s due to the large scale of privatizations of state owned enterprises. However, MNC affiliates still had contributed positively during this period.

Figure G.1: Decomposition Result for China (5-year window)



Note: The change in the manufacturing employment share is decomposed between foreign MNCs and domestic firms. The difference between the total change and the sum of the contributions made by domestic firms and MNC foreign affiliates is the employment shift from other sectors to the manufacturing sector.

Figure G.2: Contributions by MNCs in China (5-year window)



Note: We present the contributions by entering, continuing and exiting MNC foreign affiliates for each 5-year interval starting from 1998. The sum of these three components equals the overall contribution by MNC foreign affiliates.

around 28,000 firms a year. This firm-level dataset provides information about business activities of Japanese firms and covers firms from a large set of industries that employ more than 50 workers and have more than 30 million Japanese yen in total assets.[38] We restrict our sample to manufacturing firm which account for roughly 45% of all observations. In the survey, firms also report the number of its domestic and foreign affiliate(s) in manufacturing and non-manufacturing sectors. Based on this information, we can identify whether the firm is a MNC parent with manufacturing affiliate(s) abroad. Finally, BSJBSA report employment on manufacturing/services/R&D employment at the headquarters.

The dataset we use in our difference-in-differences analysis is called the Basic Survey on Overseas Business Activities (BSOBA) and also obtained from METI also for the period (1995-2016). This survey contains information about overseas subsidiaries of Japanese MNCs and covers two types of overseas subsidiaries: (1) direct subsidiaries with ratios of investment by Japanese enterprises' being 10% or higher by end of the year, and (2) second-generation subsidiaries with a ratio of investment by Japanese subsidiaries of 50% or higher. Tracing the identification codes over time, we are able to construct a panel of affiliates and parent firms from 1995 to 2016. The matched dataset contains on average 2,300 parent firms and 15,000 foreign affiliates each year. Based on this matched dataset (and further matched with China's ASIF), we are able to identify the 4-digit industry affiliations of Japanese MNCs' manufacturing affiliates in China for the period of 1998-2007.

Table G.3 reports, the MNCs status of the firm, the average employment of all firms, as well as the average employment of MNC parents during our sample period. On average, there are $13,000$ manufacturing firms in BSJBSA each year, 11% of which are MNCs. The mean and the median employment of MNCs is about 2.5-3 times higher than for non-MNCs. Since there is information on the breakdown of total employment into manufacturing and services jobs in BSJBSA, we use equation (F.2) to implement the decomposition exercise. We obtain information on overall employment and employment share of the manufacturing sector from the website of Japan's Bureau of Statistics (i.e., survey of employment by sectors). Based on these aggregate statistics, we calculate the total change in the manufacturing employment share and employment shift from other sectors into the manufacturing sector.

Figure G.3 presents the decomposition result for each 5-year interval starting from 1995 and ending in 2011. Overall, it is clear that MNC parent firms had contributed substantially to the overall decline of manufacturing employment share in Japan during the first half of our sample period (i.e., 1995-2005). However, the contribution of MNC parents to the overall

[38]The industries included are mining, manufacturing, wholesale and retail trade, and eating and drinking places (excluding "Other eating and drinking places").

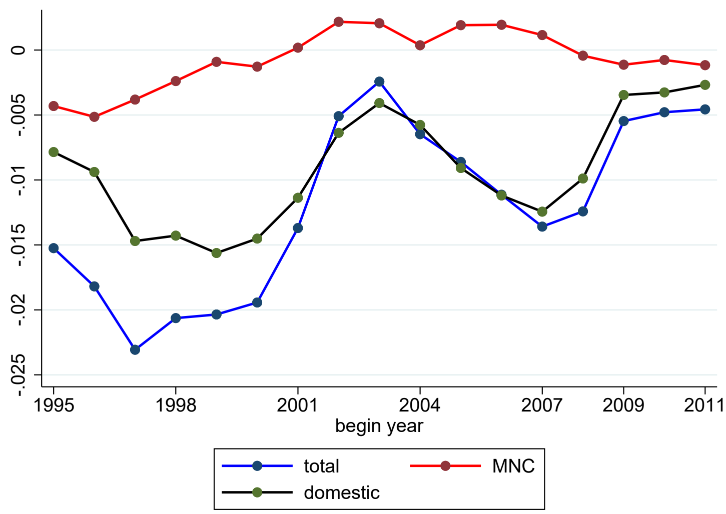
Table G.3: Summary Statistics of Japanese Manufacturing Firms

	Obs.	Mean	Std. dev.	Median
Employment	288,977	399.5	1646.7	140
Employment by MNCs	32,025	1572.6	4530.0	435
MNC Status	288,979	.11	.31	0

Notes: MNCs are defined as parent firms that have manufacturing affiliates abroad.

decline of manufacturing employment share is small and sometimes even negative in the second half of our sample period. A further look a Figure G.4 shows that the continuing MNC parent firms are the ones driving these results. Specifically, continuing MNCs parents have contributed substantially to the decline of manufacturing employment in the early years, but not so in later years.

Figure G.3: Decomposition Result for Japan (5-year window)



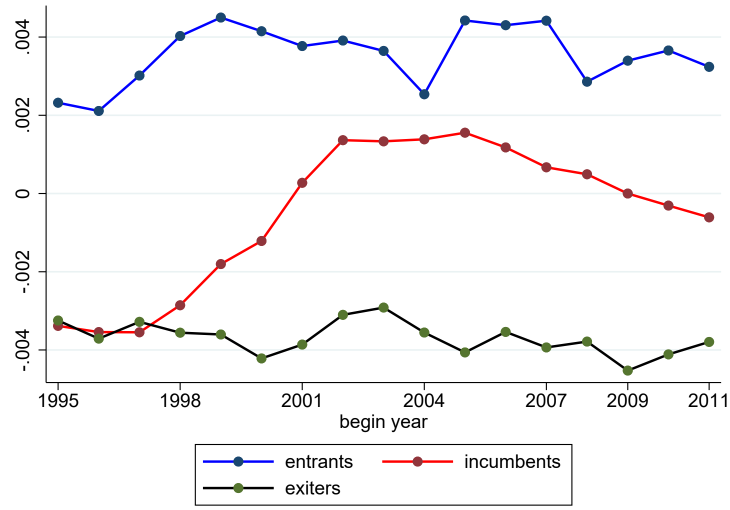
Note: the figure shows the decomposition of the change in the manufacturing employment MNCs and domestic firms starting from 1995. The difference between the total change and the sum of the contributions made by domestic firms and MNC parent firms is the employment shift from other sectors to the manufacturing sector..

G.3 Hungary

The Hungarian data comes from the APEH dataset, a firm-level data on balance sheets reported to tax authorities for all firms subject to capital taxation in agriculture, manufacture and services activities over the period 1992-2008. This is a panel dataset that allows to track the evolution of firms over time.

The database reports information on firms' value added, sales, output, stock of capital, employment, wages and materials. Additionally, the dataset reports a firm's ownership

Figure G.4: Contributions by Multinational Parent Firms in Japan (5-year window)



Note: the figure depicts the contributions of entering, continuing and exiting MNC parent firms for each 5-year interval. The sum of these three components equals the overall contribution by MNC parents.

status, which we use to construct a variable for multinational firms. Following the standard literature, we define a firm as foreign MNC if more than 10% of their shares belong to foreign owners. Firm size varies significantly in the database, spanning from single-employee firms to corporations employing thousands of workers. Since micro firms are more prone to measurement error problems, we keep in the sample firms that have three employees or more in their lifetime. After this, our data covers approximately all employment in manufacturing and service activities –95% and 93% respectively– and more than 98% and 85% of their value added when compared to EU-KLEMS data.

Table G.4 presents the summary statistics of the Hungarian data. The average number of employees in the sample is 26 and its median is 6 with a standard deviation of 311 workers. MNC account for 14% of observations and 9% of firms in the sample. As expected, MNC are larger and employ –on average– 80 employees.

Table G.4: Hungary: Descriptive Statistics

	Observations	Mean	Std. Dev.	Median
	(1)	(2)	(3)	(4)
Employment	1,334,225	26	311	6
MNC	1,334,225	0.14	0.34	0.00
Employment by MNC	242,014	80	350	13

Notes: Source: APEH.

G.4 France

Data for France comes from different sources collected by the French Statistic Institute (INSEE). The first source is the Financial linkages between enterprises survey, referred as *LIFI*. This survey collects information from French companies in the private sector, whose portfolio of equity securities exceeds 1.2 million, and whose turnover exceeds 60 million, or whose salaried workforce exceeds 500 people, regardless of the sector of activity. Besides, the heads of groups from the previous year or companies directly owned by a foreign company are questioned. From the *LIFI* database, we obtain information regarding the firm's capital holding links between enterprises. Data on linkages are recorded at the end of the year to construct groups of enterprises and establish statistics concerning these groups and the enterprises within them.

The second database used is the *FICUS-FARE* and contains information on firms' balance sheets. It corresponds to the file approaching the results of the Elaboration of Annual Statistics of companies. From the *FICUS-FARE*, we obtain data for each enterprise that is recorded using the unique business identifier *Siren*. This data provide information regarding the firm's sector of operation (NAF classification) and total employment.[39]

G.4.1 Specifics on the LIFI

LIFI is composed of various databases that can be linked to each other. For our purposes, we rely on the entities source which contains all relevant information on each affiliate including the country of origin and the relation concerning the head of the group.[40] The second data we use is the head of group data. We use the information herein to know the country of origin of the Head.

G.4.2 Specifics on the FICUS-FARE

FICUS-FARE are enterprises recorders with their respective identifier, *Siren*. We use the firms' sector recorded using the NAF french classification. For the specific case of the EP's

[39] As of 2012 there are some changes to five mayor groups relabelled as *entreprises profilées* (EP). These five groups are: Accor, Renault, Ceux de SEB, Saint Gobain, PSA DAF (Peugeot) and Adia. To have a continuous series before 2012, we collapse in a group all the enterprises belonging to the EPs.

[40] In particular, the variable that allows to identify the relationship with the head, if any, is called the *contour*. Particularly, each enterprise can be classified as any of the following: a Head of group (T) or as we call it a Head Quarter (HQ), an affiliate (C), a joint venture (JV), an Aggregated (E) and a Moving (M). We only keep firms that are either an 'HQ' or a 'C'. The remaining types we do not use since they are firms that don't belong to any group, or are in some transition e.g. changing their HQ or becoming independent of the group. Enterprises classified as joint ventures stop being recorded as such in 2009, from this year onward they are considered individual firms if they do not belong to a specific group.

TABLE G.5: Summary statistics France

	2000	2005	2010	2015
	Total/Mean/P50/Count			
All Firm's Employment	14,611,434	15,333,296	15,101,981	16,175,534
	(14.37)	(14.23)	(14.65)	(20.89)
	(3.29)	(2.51)	(3.44)	(3.86)
	[1,206,467]	[1,249,953]	[1,164,408]	[882,052]
Local MNC Employment	2,776,447	3,063,170	3,016,458	3,325,442
	(244)	(228)	(200)	(152)
	(41.92)	(35)	(34)	(27)
	[17,609]	[19,453]	[21,830]	[31,523]
Foreign MNC Employment	2,211,732	2,461,047	2,562,229	2,654,709
	(183)	(165)	(160)	(135)
	(48)	(43)	(36)	(31)
	[12,611]	[15,561]	[16,350]	[20,657]

Notes: Mean in parenthesis, median in parenthesis and count in square brackets.

we use the sector of the largest sized firm before collapsing before 2012.

G.4.3 Definition of Multinationals

Using the information from the LIFI about the country of the affiliates and the head of the group, we establish the definition of a multinational firm.[41] More precisely defining a multinational is based on the following criteria:

- A Multinational is either local or foreign depending on the Head Quarter's nationality. A local MNC has French HQ while a foreign MNC has foreign HQ.
- To identify local MNC we establish that if inside the group, the HQ is french but there is one or more affiliates that are not in french territory, then the HQ and the affiliates make part of a parent MNC. For example, Peugeot HQ is located in France but has some affiliates outside the French territory. Then we classify Pegeout as a parent MNC.
- To identify a foreign MNC we check that the HQ is not in french territory. Hence, all affiliates of this HQ in France will be identified as foreign MNC. For example, Airbus HQ is in the Netherlands but since some affiliates are in France, we classify Airbus as a foreign MNC. In the analysis we consider a MNCs a parent company HQ in France with cross-border operations.

[41] We tried to use the information regarding shareholding to elaborate the definition of multinationals but the information is widely underreported for most of the affiliates. i.e 80% of missing values.

G.5 USA

The information for the U.S. comes from the restricted-use microdata from the U.S. Census Bureau. For this analysis we use the Longitudinal Business Dataset (LBD), the Linked/Longitudinal Firm Trade Transaction Database (LFTTD), and the Orbis dataset linked to the U.S. Census.

The LBD provides employment and payroll information for the universe of establishments, covering all industries and all U.S. States, with each establishment having a unique firm identifier. To calculate firm's total employment we sum the number of employees for all establishments that share the same firm identifier. Then, we calculate the share of manufacturing employment within the firm by summing the employment in all establishments which primary activity is classified in sectors 31, 32 or 33 of the NAICS 2-digit industry code, and dividing it by firm's total employment. Firms with positive manufacturing employment shares are label as manufacturing firms. All other firms are labeled as services.[42]

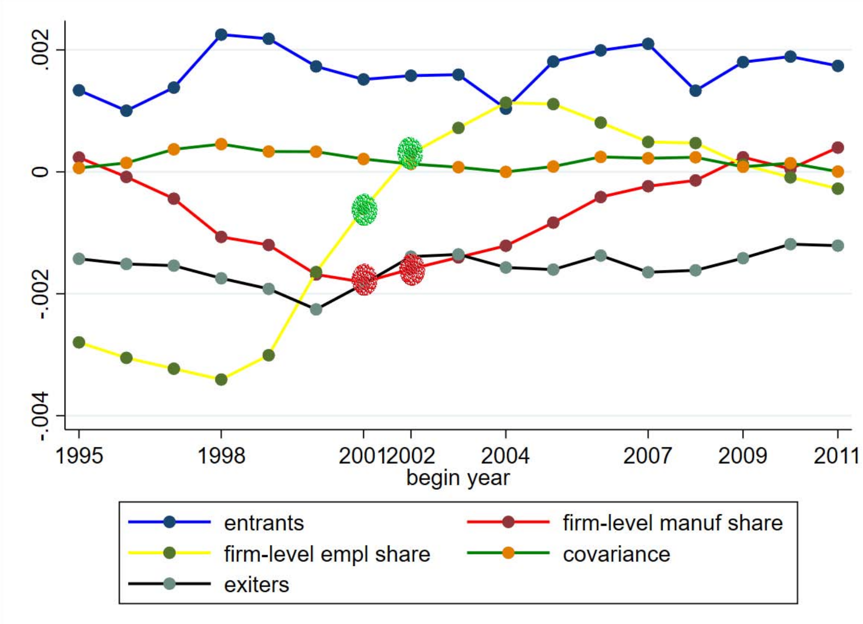
To classify firms as MNCs and Non-MNCs we rely on ORBIS, a worldwide dataset maintained by Bureau van Dijk. The main advantage of ORBIS is the scope and accuracy of its ownership information: it details the full list of direct and indirect subsidiaries and shareholders of each company in the dataset, along with a company's global ultimate owner and other companies in the same corporate family. This information allows us to build ownership links between affiliates of the same MNE, which identifies the nationality of the parent company, as well as the location of its network of foreign affiliates. ORBIS allow us to distinguish US parent companies in the U.S. from affiliates of foreign parents operating in the U.S. (which is not possible by using the related party trade indicator from the LFTTD Census data). In our analysis of U.S we define a MNCs as a parent company in the U.S. that also have operations overseas.

G.6 Within-firm Decomposition for Japan

Figure G.5 presents the decomposition result for Japanese MNC parents firms which consists the first five terms in equation (F.2) for (manufacturing) MNC parent firms. Each year represents the contribution to the change from the that year to five years forward. E.g., the point for 1998 represents the contribution from 1998 to 2003. The red curve shows that the manufacturing employment share within MNC parent firms had had negative changes during 2001-2006 (around -0.19%) and 2002-2007 (around -0.18%), which is consistent with our empirical finding in Section 4.2 that manufacturing employment share of MNC parent firms

[42]Establishments in agriculture NAICS codes are dropped from the sample.

Figure G.5: Within-firm Employment Decomposition of Multinational Parent Firms in Japan



Note: We present the contributions by entering, continuing (middle three terms) and exiting MNC parent firms for each 5-year interval starting from 1995. The sum of the five terms equals the overall contribution by MNC parents.

had decreased in the treatment group for 2002-2007. Moreover, the yellow curve shows that the share of MNC parent firms' overall employment in total employment had had a slightly negative or even no change during 2001-2006 or 2002-2007. This is also consistent with our empirical finding in Section 4.2 that the overall employment effect of China's FDI policy change on MNC parent firms' domestic employment is small.