Managers, Firm Expansion, and Economic Development: Evidence from Japan's Postwar Repatriation

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Abstract

Does managerial scarcity keep firms small and local, slowing economic development? I study this question using Japan's forced postwar repatriation of six million nationals from former colonies, many with experience relevant to management and supervision. I exploit settlement variation generated by predetermined family-registry locations and Allied-directed landing-port routing. Districts receiving more repatriates with such experience shifted employment toward wage work, manufacturing, and services. Firms grew larger, expanded beyond their headquarters cities, and participated more in overseas programs teaching modern U.S. management practices. I develop a spatial model in which greater manager supply lowers the cost of supervising establishments and adopting firm-wide practices reusable across them, enabling modern firms to expand across markets and draw workers out of agriculture and self-employment into wage work. Removing the inflow of workers with managerial and supervisory experience would have lowered aggregate output per worker by 4.1 percent, one quarter of which operates through multi-establishment networks.

Keywords: Economic development, management practices, managers, migration, multi-establishment firms

JEL Classification: D22, F22, J24, L23, O12, O14, R12

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1 Introduction

Why do firms remain small in developing economies when large firms play a central role in economic development? In poor economies, much employment remains in agriculture and self-employment while firms are typically small, owner-managed, and confined to a single establishment (Gollin, 2008; Engbom et al., 2025; Gottlieb et al., 2025). Larger firms create wage jobs and help move workers into manufacturing and services. One explanation for small firms emphasizes demand. Existing work shows that when transportation improvements, trade liberalization, or demand shocks expand the markets firms can serve, firms grow and reorganize by adding hierarchical layers or professional managers (Caliendo and Rossi-Hansberg, 2012; Caliendo et al., 2020; You, 2021).

This paper argues that managerial scarcity is another constraint on firm size and economic development. Demand creates opportunities for firm growth, but managers may determine whether firms can organize production to exploit those opportunities. If the supply of people capable of coordinating and managing production is too low, firms may be unable to grow beyond what a single owner can oversee even when demand exists. Managers may also matter when local demand is limited by enabling firms to delegate and coordinate production across establishments in other districts. This paper asks two related questions. First, does relaxing managerial scarcity by expanding the local pool of workers with prior managerial and supervisory experience allow firms to grow and thereby contribute to economic development? Second, does greater managerial capacity allow firms to reach nonlocal demand through spatial expansion, and how much does this network channel contribute to the economy-wide effects of relaxing managerial scarcity?

First, I provide new empirical evidence on whether managerial scarcity constrains firm size and economic development using Japan's forced postwar repatriation. Identifying this effect is difficult because managers sort toward places where firms are already growing. Japan's defeat forcibly returned more than six million nationals—nearly 9% of the home population—from former colonies. Many returnees had acquired managerial and supervisory experience in colonial labor markets, where Japanese workers were disproportionately employed in upper-tier positions while local workers were concentrated in lower-tier roles. Using newly digitized repatriation records, I measure each district's inflow of manager-experienced repatriates. I instrument the inflow using predetermined family-registry locations (*honseki*) and administratively assigned landing ports, which affected settlement through historical ties and repatriation logistics. Finally, strict limits on the cash and liquid assets

returnees could bring help distinguish the inflow of managerial experience from an inflow of financial or physical capital.[1]

Second, I develop and estimate a spatial model to quantify aggregate effects because regional comparisons cannot recover aggregate effects when manager inflows propagate through firms' establishment networks. The effects of manager supply may not remain local. If managers allow firms to operate establishments across districts as Chandler (1977) suggests, then relaxing managerial scarcity in one district can affect production and employment elsewhere. Cross-district comparisons therefore may miss effects transmitted through firm networks and therefore cannot by themselves quantify the aggregate effect of relaxing managerial scarcity. The model incorporates these firm networks, connecting manager supply to firm growth, spatial expansion, structural transformation, and aggregate output. I use counterfactuals to quantify the aggregate effects of the manager-supply shock and how much of the response operates through firms' establishment networks.

To test whether relaxing managerial scarcity affects firm scale and economic development, I estimate the effects of managerial repatriate inflows and find that they increased firm scale and contributed to structural transformation. Districts receiving more managerial repatriates experienced larger increases in average establishment size, wage employment, and the number of establishments per firm. These districts also shifted away from agriculture, self-employment, and family labor and toward manufacturing, services, and wage work. Inflows of production workers did not produce comparable changes on these margins.[2] The reduced-form estimates therefore show that relaxing managerial scarcity helped move local economies from small-scale traditional production toward larger wage-paying firms.

Because local demand can limit firm scale even after managerial scarcity is relaxed, I empirically test whether manager inflows allowed firms to reach nonlocal demand through spatial expansion. If firms can serve only their home market, relaxing managerial scarcity may have limited effects where local demand is small; spatial expansion allows firms to use managerial capacity to operate in other markets. I find that managerial repatriate inflows made firms more spatially extensive. Firms headquartered in high-inflow districts were more likely to operate establishments outside the headquarters city, and the maximum distance between headquarters and establishments increased. These results show that district manager-supply shocks propagated elsewhere through firms' cross-city establishment

[1]This contrasts with Dinkelman et al. (2024), who show that return-induced investments in physical and human capital reshaped local economic structure in Malawi. Japan's strict asset limits help isolate the labor-supply channel.

[2]The null effects of production worker repatriate inflows are more consistent with a manager supply channel than with a consumption demand channel, as in Caliendo and Rossi-Hansberg (2012).

networks, allowing managerial capacity to help firms grow by reaching demand outside the home market rather than only by expanding production locally.[3]

To understand how managers supported spatial expansion, I examine whether manager inflows increased adoption of firm-wide management practices. Firm-wide practices are relevant for spatial expansion because, once adopted, they can be reused across establishments and raise the productivity of both existing and potential establishments. I measure this margin using participation in Japan Productivity Center overseas study missions, a postwar program that sent Japanese managers to the U.S. to study modern management practices. I find that manager inflows increased participation in these programs, consistent with firms adopting organizational practices that support larger establishment networks. This finding suggests that manager supply contributed to firm growth not only through span-of-control supervision, but also by expanding firms' stock of reusable organizational inputs.[4]

To connect the documented changes in firm organization to firm growth and structural transformation, the model combines sectoral and occupational choice with spatial firm organization and management-practice adoption. Sectoral choice captures workers' movement between agriculture and non-agriculture. Within non-agriculture, production occurs through either self-employment or modern firms, allowing the model to capture the shift from small owner-managed production to larger wage-paying firms. Building on Lucas (1978), individuals differ in skill and choose among production work, self-employment, management, and entrepreneurship, so relaxing managerial scarcity can reallocate workers from self-employment into wage work. Modern firms choose where to operate establishments across markets, allowing the model to capture how greater managerial capacity helps firms reach demand beyond their home markets when local demand is limited. Finally, firms use headquarters manager time to adopt management practices that can be reused across establishments, linking manager supply to firm-wide productivity and spatial expansion.

The model shows how relaxing managerial scarcity expands modern firms and shifts workers out of agriculture and self-employment into wage work. An increase in manager supply lowers the local manager wage. Modern firms respond along two organizational margins: they hire more managers to supervise production, increasing establishment size, and devote more headquarters manager time to management practices, raising firm-wide productivity. Because these practices can be reused across establishments, higher firm-wide productivity raises the return to operating in additional markets, allowing firms to expand

[3]This mechanism is consistent with Giroud et al. (2024), who show that large multi-region firms transmit local productivity shocks to distant plants through shared knowledge networks.

[4]The link between management training, practice adoption, and firm growth is supported by Giorcelli (2019), who shows that participating firms from Italy adopted American management practices and experienced persistent gains in employment and productivity.

spatially and reach nonlocal demand. As modern firms grow, their demand for production workers raises the local production wage and draws workers out of agriculture. When this wage increase is sufficiently large relative to changes in local demand and manager wages, it also draws marginal self-employed producers into wage work. Hence, the model reproduces the key empirical findings: relaxing managerial scarcity reduces agricultural employment and self-employment, increases wage employment and firm size, broadens establishment networks, and promotes management-practice adoption.

I use the estimated model to answer two quantitative questions: how much the managerial repatriate shock mattered for the economy as a whole, and how much of that effect required firms to expand beyond their home markets. First, I remove the managerial repatriate shock to headquarters-manager supply while holding other fundamentals fixed. Second, I shut down non-HQ establishment expansion to isolate the role of multi-establishment networks. The model implies that without the managerial repatriate shock, output per worker would have been 4 percent lower. About one quarter of the output effect is transmitted through firms' establishment networks. These counterfactuals show that managerial abundance contributes more to development when firms can use managers to reach demand beyond their home market.

Related Literature. First, I show that local manager supply shapes firm scale and organization rather than merely responding to firm growth. Classic theories identify managers as essential inputs into firm scale, hierarchy, and coordination (Kaldor, 1934; Penrose, 1959; Chandler, 1977; Lucas, 1978). Existing theoretical and empirical work, however, has largely examined the opposite direction: product-market and productivity shocks induce firms to grow and add managerial layers (Caliendo and Rossi-Hansberg, 2012; Caliendo et al., 2020) while transportation improvements and competition reduce the prevalence of owner- or family-managed firms (You, 2021; Kotia, 2026). Related firm-level evidence shows that modern management practices raise productivity and plant expansion and that managerial human capital is associated with practice quality (Bloom et al., 2013; Bender et al., 2018; Giorcelli, 2019). By exploiting an exogenous increase in the local pool of workers with managerial and supervisory experience, I show that greater managerial capacity increases establishment size, broadens cross-district establishment networks, and increases participation in programs teaching modern management practices. These findings complement this literature by identifying managerial human capital as a supply-side input into scalable organization. Firms do not merely add managers as they grow. Access to potential managers can itself determine whether they grow and modernize.

Second, I show that managerial scarcity shapes economic development through occupational reallocation and firms' spatial expansion into nonlocal markets. Cross-country evidence

documents that poorer economies have smaller establishments and more self-employment (Gollin, 2008; Bento and Restuccia, 2021; Eslava, 2026). Recent models explain these patterns using limits to delegation, high management costs, and shortages of professional skills (Akcigit et al., 2021; Hjort et al., 2026; Engbom et al., 2025; Gottlieb et al., 2025). I complement these quantitative explanations with evidence from a manager-supply shock, tracing how greater managerial capacity changes firm organization and shifts workers from agriculture and self-employment into wage work. Related research shows that managerial organization links establishments within firms and allows local shocks and non-rival headquarters inputs to propagate through firm networks (Gumpert et al., 2022; Giroud et al., 2024; Kleinman, 2025). My model combines these multi-establishment links with Lucas-style occupational choice to quantify how manager supply reallocates workers into modern firms and how access to nonlocal demand amplifies the aggregate effect.

Third, I show that the occupational composition of migrant inflows matters for development because migrants with managerial experience expand the local pool of potential managers. Prior studies show that migration can accelerate sectoral reallocation (Braun and Kvasnicka, 2014), expand local markets (Peters, 2022), increase idea creation (Terry et al., 2026), transfer capital (Dinkelman et al., 2024), and diffuse technology (Hornung, 2014). I identify a distinct organizational channel in which returnees with managerial and supervisory experience enable firms to grow and operate establishments across districts. The absence of comparable effects from production-worker inflows, combined with strict limits on the assets returnees could bring, distinguishes this channel from generic population, demand, and capital shocks. The paper therefore shows that migrants can transform economies through the organizational capabilities they bring, not only through market size, capital, technology, or ideas.

The remainder of the paper is organized as follows. Section 2 provides historical background on the repatriation. Section 3 presents the empirical analysis. Section 4 develops a general equilibrium spatial model that connects the empirical findings to aggregate effects. Section 5 estimates the model and conducts counterfactual analyses. Section 6 concludes.

2 Historical Context

This section establishes the historical facts needed to use Japan's postwar repatriation to study how relaxing managerial scarcity affects firm size and economic development. Japan's defeat and Allied policy forced Japanese nationals to return from the former colonies, and strict asset limits meant that they returned with labor and experience but little financial or physical capital. Two features of the process influenced where they settled without being chosen in response to postwar local opportunities: Allied-assigned landing ports and inherited family-registry locations. These features form the historical basis for the instrument introduced in the empirical section. Colonial employment hierarchies also gave many returnees managerial and supervisory experience, so their arrival expanded the local pool of potential managers. Finally, because agriculture and self-employment remained prevalent when the repatriates arrived, postwar Japan provides a setting for studying whether greater managerial capacity accelerated the transition toward larger wage-paying firms.

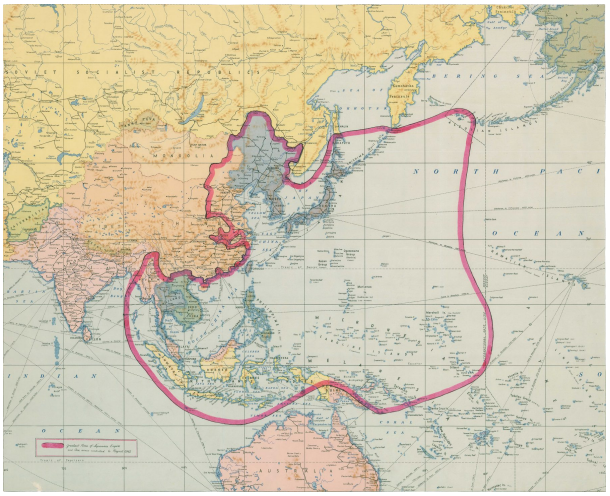
2.1 Forced Repatriation Created a Labor-Supply Shock

This subsection establishes that postwar repatriation generated a large, compulsory increase in civilian labor supply with little accompanying capital. I document three features of the repatriation that support this interpretation: its scale, its compulsory nature, and strict restrictions on the assets returnees could bring. Together, these facts explain why repatriation changed national labor supply.

Japan's imperial collapse generated a return migration large enough to shift the country's labor supply. By the end of World War II, roughly three million Japanese civilians lived in the colonies while another three million military personnel were stationed overseas. Japan's defeat eliminated its overseas territories and brought both groups back under Allied supervision (Ministry of Health and Welfare Relief Bureau, 1977). This inflow was equivalent to nearly 9% of Japan's home-island population. Figure 1 illustrates the territorial collapse behind this population movement.

The empirical analysis focuses on civilian returnees because the repatriation records were created to document private assets that Japanese households had left in the former colonies. The records therefore primarily cover people who had established lives overseas and describe both their colonial and post-repatriation circumstances, including colonial occupations, income and assets, landing ports, and first settlements in Japan. Most soldiers are absent because they were deployed overseas for wartime service rather than to establish households and accumulate private assets. The analysis therefore captures civilians returning from colonial labor markets, not the broader demobilization of Japan's armed forces.

Figure 1: The Japanese Empire at Its Maximum Extent Compared to Modern Japan



(A) Japanese Empire (August 1942)

(B) Modern Japan

Notes: Panel (A) depicts the territorial extent of the Japanese Empire in August 1942. The area enclosed by the pink boundary indicates regions under Japanese control at the time, including the Japanese home islands, Korea, Taiwan, Manchuria, southern Sakhalin, Pacific mandate islands, and territories occupied during the early phase of the Pacific War such as Indochina, the Philippines, the Dutch East Indies, Burma, and large parts of coastal China. Panel (B) shows modern-day Japan. Source: Panel (A) is "Map of Japanese Empire, August 1942," Docsteach (NARA), taken from https://docsteach.org/document/map-of-japanese-empire-august-1942/. Panel (B) is based on country boundaries from Natural Earth, https://www.naturalearthdata.com/.

The return of these civilians was forced by collapsing security and Allied policy rather than by economic opportunities within Japan. Although the Japanese government initially attempted to preserve its overseas settlements, growing violence against Japanese civilians, particularly in Manchuria under Soviet occupation, forced a policy reversal (Nishizaki, 2016). A December 1945 U.S. directive further stated that "all Japanese nationals whose place of origin was the main Japanese islands … should be repatriated to Japan" (U.S. Office of the Historian, 1945). Remaining abroad had therefore become both unsafe and inconsistent with Allied policy, leaving Japanese civilians with essentially no choice but to return.

Strict asset restrictions made civilian repatriation primarily a shock to labor and experience rather than a capital inflow. The Supreme Commander for the Allied Powers (SCAP) limited civilians to ¥1,000 in cash and instructed reception-center officials to take up excess currency and most financial assets at landing ports (Supreme Commander for the Allied Powers, 1945, 1946a,b). For perspective, average monthly living expenses for a four-person Tokyo household were about ¥1,130 in March 1946, so the cash allowance covered less than one month (Choi, 2013). Japanese government sources further emphasized that many repatriates had been forced to abandon property overseas (Ministry of Health and Welfare, 1957). These

restrictions sharply limited the scope for repatriation to affect local economies through imported wealth or physical capital.

2.2 Family Registry Ties and Administrative Routing Shaped Settlement

This subsection establishes the historical basis for using family-registry ties and administrative routing to study where returnees settled. I first show that the repatriation records capture each household's registered domicile (*honseki*) at the end of World War II and that this location often represented persistent family origin rather than current residence. I then document how Allied landing-port assignments constrained where returnees entered Japan. Together, these institutions created an ancestral pull and a geographic constraint before returnees chose their postwar destinations.

The repatriation records measure a predetermined family tie by asking each household to report its *honseki* as of August 15, 1945. The same record separately reports the household's first address after repatriation. The recorded *honseki* therefore refers to a date before postwar settlement and is distinct from the household's eventual destination.

Honseki captured family origin because it was a legal domicile rather than a record of current residence. Japan's family-registry system, formalized under the 1898 Civil Code, linked each household to a registered *honseki* location (Krogness, 2014). This was the location where the household's *koseki* was maintained, even when household members lived elsewhere. Families could retain the same *honseki* for generations after moving within Japan or abroad (Taeuber and Beal, 1946; Mori, 2014; Arakida, 2000). The 1945 *honseki* therefore captures a pre-existing family tie to place rather than where a household happened to live before or after repatriation.

Historical evidence confirms that *honseki* often remained attached to an ancestral location after families moved. Historical accounts describe families as maintaining an "ancestral *honseki*" and treating it as a marker of familial and territorial origin (Chapman, 2011; Krogness, 2014). Between 1891 and 1920, only 52% to 67% of Tokyo residents held a Tokyo *honseki* (Sawada, 1996). Japanese residents of prewar New York remained registered by their *honseki* in Japan, while most Japanese settlers in Karafuto retained registrations in their home prefectures (Sawada, 1996; Ivings, 2014). These patterns show that *honseki* often persisted when residence changed.

Allied-assigned landing ports created a second, geographic influence on settlement. SCAP designated authorized reception ports and required repatriation vessels to land only at those ports. The Ministry of Welfare operated the reception centers at capacities determined from shipping schedules supplied by the Shipping Control Authority for the Japanese Merchant Marine (Supreme Commander for the Allied Powers, 1946b). Routes often connected

particular colonial origins to particular ports. For example, SCAP authorized a dedicated route from China to Sasebo, while Maizuru received roughly 660,000 returnees from Siberia and northeastern China (Frank and Shaw, 1968; UNESCO, 2014). Public-health needs could override these routes: during the April 1946 cholera outbreak, ships from South China were directed to Uraga, with Sasebo serving as an alternate port (Supreme Commander for the Allied Powers, 1946c). Port assignments therefore reflected colonial origin, shipping logistics, and public-health controls rather than returnees' destination preferences. They were administratively determined but not random across colonial origins.

2.3 Repatriation Increased Potential Manager Supply

This subsection explains why postwar repatriation relaxed managerial scarcity by increasing the supply of workers with prior managerial, supervisory, and organizational experience. Many returnees acquired this experience in colonial labor markets where Japanese employees were disproportionately placed in upper-tier managerial and supervisory positions relative to local workers. Returnees also had a different occupational background from the incumbent workforce in Japan proper, which remained concentrated in agriculture. The evidence below suggests that repatriation increased managerial capacity rather than merely adding workers with the same occupational composition as the mainland labor force.

Building colonial governments and firms created demand for Japanese managers, administrators, and supervisors. Japanese authorities and firms established bureaucracies, railways, schools, police forces, mines, factories, and other large organizations in the colonies. In many colonial organizations, they used administrative procedures, job hierarchies, and chains of command developed in metropolitan Japan. The Korean Government Railways, for example, adopted the Japanese government-employee system in its upper and middle ranks, while the South Manchuria Railway separated administrative and technical staff from lower-tier workers through its career hierarchy (Lim, 2024; Nishizaki, 2022). Colonial expansion therefore transferred not only equipment and production methods but also organizational structures that required workers to implement them.

Practical staffing needs made workers familiar with Japanese technologies and administrative procedures valuable to new colonial organizations. These workers could establish operations, train less-experienced employees, and coordinate work across organizational levels. The Korean Government Railways relied on Japanese superiors to transfer technical knowledge to Korean workers (Lim, 2024). Japanese-run factories likewise initially employed Japanese workers with greater technical training while providing company training to Korean workers (Sun, 1995).

Discriminatory colonial institutions separately restricted local workers' access to managerial and supervisory positions. Korean workers at Onoda Cement became more skilled but were not promoted to supervisory positions. The Korean Government Railways also continued to favor Japanese employees in promotion, wages, and access to training (Sun, 1995; Lim, 2024). The concentration of Japanese workers in upper and middle positions therefore reflected both organizational needs and nationality-based discrimination, not an inherent inability of local workers to perform these jobs.

Colonial labor markets disproportionately placed Japanese workers in managerial and supervisory roles. Figure 2 shows that Japanese workers in Manchuria, Taiwan, and Korea were concentrated in public and other services, while local workers were concentrated in agriculture. This hierarchy also operated within major colonial employers. Table 1 shows that Japanese workers at the South Manchuria Railway, one of the largest firms in the colonies, were concentrated in the career-track *shokuin* category, whereas the lower-tier *yoin* category consisted entirely of non-Japanese workers. Similarly, Japanese workers held 98% of senior-official positions in the Korean Government Railways but only 5% of low-ranked positions. Because senior officials supervised junior officials and lower-ranked employees, the railway evidence shows that Japanese workers were not merely employed in different sectors but disproportionately occupied supervisory positions (Nishizaki, 2022; Lim, 2024).

Table 1: Japanese Concentration in Upper-Tier Colonial Railway Employment, 1944

Panel A: South Manchuria Railway

Track	Japanese	Non-Japanese
Shokuin (career track)	39,428	5,567
Yoin (lower-tier track)	0	195,041

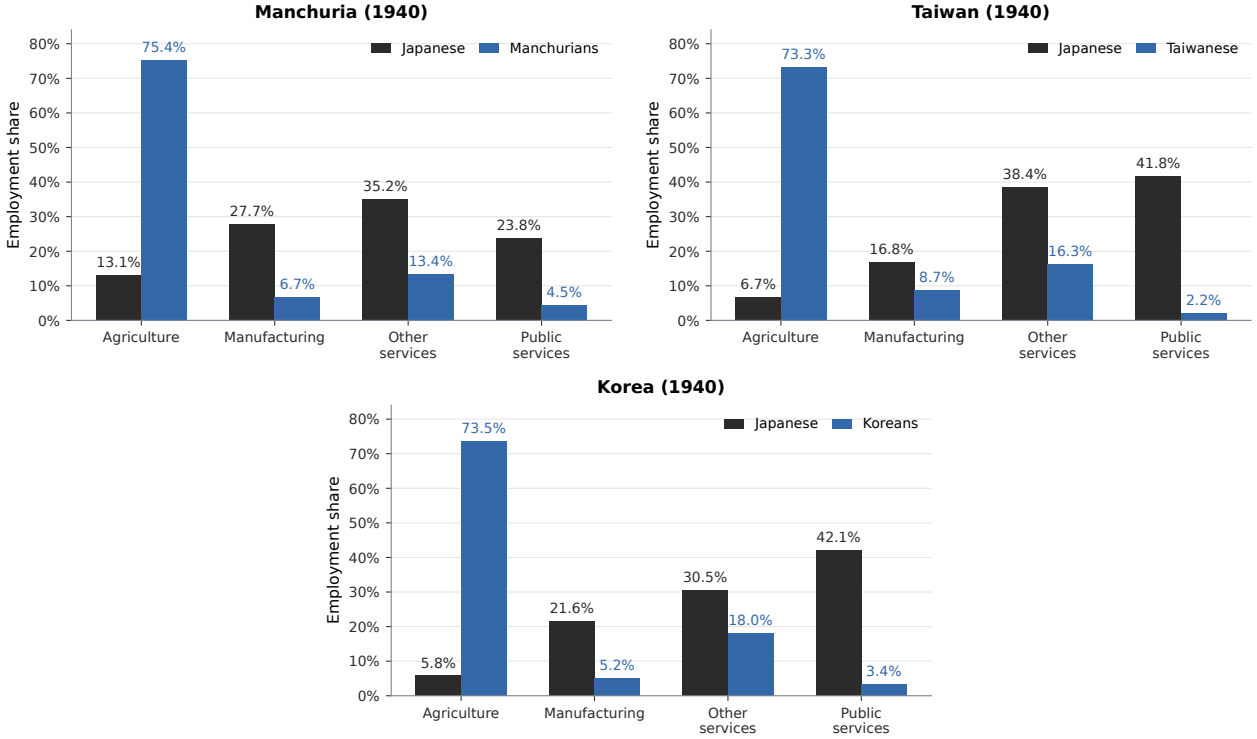
Panel B: Korean Government Railways

Rank	Japanese	Korean
Senior officials	98%	2%
Low-ranked workers	5%	95%

Notes: Panel A reports employee counts; Panel B reports within-rank nationality shares. The categories differ across the two organizations. The comparison documents nationality sorting across upper- and lower-tier positions rather than identical job classifications. Sources: Nishizaki (2022) and Lim (2024, Table 1, pp. 613–614).

Corporate career-track titles provide the clearest mapping from the colonial hierarchy to occupations recorded in the repatriate survey. *Shain* and *shokuin* were salaried career-track employees, whereas *koin* and *yoin* occupied lower production tracks (Ujihara, 1959; Aso, 1983). Ujihara (1968) characterizes *shain* as members of the management core, staff supporting that core, or candidates for future managerial positions. Not every *shain* or

FIGURE 2: SECTORAL EMPLOYMENT SHARES IN COLONIES, 1940



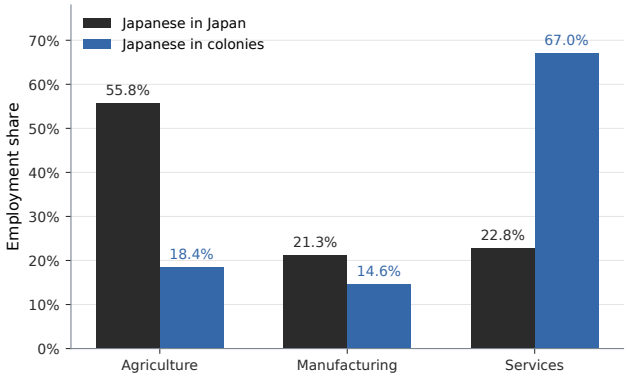
Notes: This figure shows the sectoral employment shares in three major colonies—Manchuria, Taiwan, and Korea—in 1940 by natives and Japanese. Blue bars represent natives while black bars represent Japanese.

shokuin already managed other employees, but these titles identify workers who followed administrative and managerial career tracks rather than manual-production tracks.

Relative to workers in Japan proper, colonial Japanese came from an occupational environment with greater exposure to administrative, managerial, and supervisory work. Figure 3 shows that Japanese workers in Japan proper were concentrated in agriculture, whereas Japanese workers in the colonies were concentrated in services. Combined with the within-organization evidence, this comparison indicates that repatriation changed the composition as well as the size of Japan's labor supply. Returnees were drawn from a population with greater exposure to administrative, technical, and supervisory work than the population remaining in Japan proper.

Based on this historical evidence, I classify repatriates according to the managerial and supervisory experience associated with their prewar occupations. As shown in Table 2, the white-collar category includes *shain*, *shokuin*, bureaucrats, police, and teachers and accounts for 62.7% of repatriates. The production-worker category includes *koin*, *yoin*, agricultural workers, and manual-service workers and accounts for 22.3%. I exclude the remaining 15.0% because their occupational titles cannot be classified consistently. I therefore interpret the

Figure 3: Employment in Japan Proper and among Japanese Workers in the Colonies, 1940



Notes: The figure compares sectoral employment shares for Japanese workers in Japan proper and Japanese workers in the colonies in 1940. It does not use the retrospective repatriate survey. Source: author's calculations from 1940 Japanese and colonial employment tabulations.

white-collar repatriate share as the inflow of workers with experience relevant to managerial services.

Table 2: Classifying Repatriates by Prewar Occupation

White-collar repatriates (62.7%)		**Production-worker repatriates (22.3%)**	
Title	**Description**	**Title**	**Description**
Shain / Shokuin	Salaried career-track staff; supervisory and managerial roles	*Koin*	Blue-collar production workers
Jun-shain	Lower white-collar administrative employees	*Yoin*	Bottom-tier manual workers
Bureaucrats, police, teachers	Colonial administration, policing, and education	Agriculture, manual services	Farm labor and low-skilled manual services

Notes: Other titles account for 15.0% of repatriates and are hard to classify consistently. Ujihara (1968) describes *shain* as "the management core, their staff, or their future candidates" and as workers expected to become future senior managers.

The white-collar repatriate share therefore measures a manager-biased labor-supply shock, not the number of repatriates who became managers after returning to Japan. The measure captures an inflow of workers with greater prior exposure to administration, supervision, and organizational routines. Their postwar occupational choices remain endogenous: some became managers, while others entered different occupations.[5] The empirical analysis tests whether increasing this potential supply of managerial services relaxed local managerial scarcity and changed firm organization and economic development.

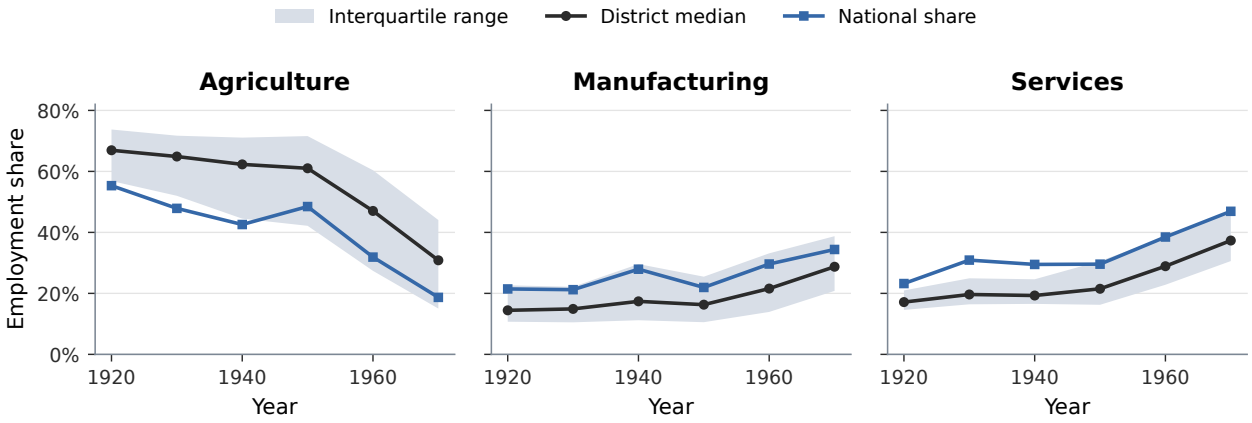
[5]About 40% of white-collar repatriates were managers in 1964 while 8% of production-worker repatriates were managers.

2.4 Postwar Japan Was Undergoing Structural and Organizational Transformation

To establish why postwar Japan can answer the paper's development question, this subsection shows that repatriation occurred while the economy was undergoing two central development transitions. Workers were moving out of agriculture and into manufacturing and services while employment was shifting from self-employment toward wage-paying firms. This setting allows me to study whether relaxing managerial scarcity accelerated these sectoral and organizational changes.

Postwar Japan is informative about economic development because repatriation occurred near the beginning of the country's transition out of agriculture. As shown in Figure 4, agriculture still accounted for approximately 48% of employment in 1950. By 1970, its share had fallen to 19%, while manufacturing and services had expanded. Repatriation therefore occurred before Japan's sectoral transformation was complete.

Figure 4: Sectoral Employment Shares in Japan, 1920–1970



Notes: This figure shows the evolution of employment shares across three sectors (primary, secondary, and tertiary) in Japan from 1920 to 1970. Blue lines represent national rates, while grey lines show the median and grey shaded areas show the interquartile range of district-level employment shares.

Economic development during this period also changed how production was organized, from self-employment and family labor toward wage employment. In 1950, self-employed and family workers together accounted for 65.2% of employment, while wage workers accounted for only 34.7% (Table 3). By 1970, the wage-worker share had risen to 55.7%, and the manager share had increased from 1.5% to 2.8%. These initial conditions make it possible to study whether greater managerial capacity accelerated both the movement out of agriculture and the shift from small-scale family production into wage-paying firms.

Table 3: Employment Shares in 1950 and 1970

	1950		1970	
Category	Mean	S.D.	Mean	S.D.
Employment Status				
Self-employed	0.272	(0.051)	0.219	(0.067)
Wage workers	0.347	(0.171)	0.557	(0.160)
Occupation				
Managers	0.015	(0.012)	0.028	(0.017)

Notes: This table reports the mean and standard deviation of employment shares across districts in 1950 and 1970.

2.5 Data

The analysis draws on three main data sources: Section A provides comprehensive documentation.

Repatriate Data. I construct a novel micro-level dataset from the 1964 *Survey of Overseas Private Assets*, preserved at the Kanagawa Prefectural Archives. Originally commissioned for compensation purposes, this survey offers granular information on repatriate households, including pre-repatriation occupations, colonial residence locations, and initial settlement destinations in Japan.

Firm Data. To quantify firm modernization, I digitize the *Teikoku Bank and Company Directory* (*Teikoku Ginkou Kaisha Yoroku*) for 1938 and 1970. This directory covers the near universe of medium and large enterprises and contains firm-level records on establishment counts and locations. I use these records to measure firm size, multi-establishment status, and spatial expansion. I also use the unpublished *Japan Productivity Center Overseas Study Mission Database, 1955–1975*, which records firms that participated in overseas study missions designed to transmit modern management practices.

Census, Manufacturing, and Other Data. I construct district-level economic and demographic panels using the Population Census (1920–1970), Manufacturing Census (1950, 1960), Census of Commerce (1952, 1960), Prefectural Statistical Yearbooks (1940), and 1934 Tax Statistics. Additionally, I integrate data on war destruction, transportation infrastructure, university locations, patent applications, and household expenditure from the National Survey of Family Income and Expenditure.

3 Manager Supply, Firm Growth, and Development

This section tests whether expanding the local pool of people with managerial experience increased firm scale and accelerated economic development. I first use predetermined family-registry ties and Allied landing-port logistics to isolate shifts in the settlement of white-collar and production-worker repatriates. I then estimate whether white-collar inflows expanded modern production and moved workers out of agriculture and household production into wage work. Finally, I examine whether firms reached demand outside their home markets through spatial expansion and increased their exposure to modern management practices.

3.1 Empirical Strategy and Identification

To distinguish managerial capacity from a broader population or labor-supply shock, I compare instrument-induced inflows of white-collar and production-worker repatriates. The unit of analysis for local outcomes is a district, defined as a 1960 administrative city (*shi*) or county (*gun*). Throughout the empirical analysis, r indexes a district and $p(r)$ denotes its prefecture. I use city only for the firm-network outcome that records whether a firm operates outside its headquarters city. I measure each inflow relative to the district's pre-repatriation labor force:

$$WC_r \equiv \frac{N^{WC}_{r,1950}}{L_{r,1940}}, \qquad PW_r \equiv \frac{N^{PW}_{r,1950}}{L_{r,1940}}, \tag{1}$$

where $N^{WC}_{r,1950}$ and $N^{PW}_{r,1950}$ are the numbers of white-collar and production-worker repatriates who settled in district r, and $L_{r,1940}$ is its 1940 labor force. The white-collar share measures exposure to returnees with prior managerial and supervisory experience. The production-worker share is a comparison treatment that helps distinguish managerial experience from an increase in labor supply more generally.

To estimate how repatriate inflows changed district outcomes, I use the following second-stage specification:

$$\Delta Y_r = \beta_{WC} WC_r + \beta_{PW} PW_r + \boldsymbol{X}_r'\Gamma + \mu_{p(r)} + \varepsilon_r, \tag{2}$$

where $\Delta Y_r \equiv Y_{r,t_1} - Y_{r,t_0}$ is the change in an outcome in district r, $\boldsymbol{X}_r$ contains the corresponding baseline controls, and $\mu_{p(r)}$ denotes prefecture fixed effects. Each results subsection states the outcome, endpoints t_0 and t_1, and controls. For management-practice outcomes observed at the firm level, I use the same specification with the firm outcome measured by 1970 on the left-hand side and assign each firm the repatriate shares, controls, and prefecture fixed effect of its headquarters district. In both cases, standard errors are clustered by district.

For firm outcomes observed in repeated cross sections before and after repatriation, let f index a firm listed in directory year t and let $r(f,t)$ denote its headquarters district. I estimate

$$Y_{ft} = \theta_{WC}\left(WC_{r(f,t)} \times \text{Post}_t\right) + \theta_{PW}\left(PW_{r(f,t)} \times \text{Post}_t\right) + \delta_{r(f,t)} + \lambda_t + \varepsilon_{ft}, \tag{3}$$

where $\delta_{r(f,t)}$ denotes headquarters-district fixed effects and λ_t denotes year fixed effects. Firm records are not linked across directory years, so f indexes a firm within year t, not a panel unit followed over time. The coefficients therefore capture differential postwar changes in the average organization of firms headquartered in districts with different repatriate exposure. They do not measure within-firm changes.

Settlement choices make both repatriate shares endogenous to postwar local growth. White-collar returnees, in particular, may have moved toward districts with stronger employment prospects, producing a positive relationship between white-collar inflows and later growth even if managerial scarcity did not constrain firms. I therefore instrument actual inflows with predicted settlement based on the family-registry and landing-port institutions described in Section 2.1 and Section 2.2.

The instruments combine two predetermined influences on postwar settlement. First, each repatriate's *honseki*, recorded at the end of World War II, created a family-registry tie to a particular district before postwar outcomes were realized. Second, Allied authorities routed repatriates to landing ports according to colonial origin, shipping logistics, and public-health considerations, making some districts easier to reach than others. These shifters vary at the individual-district level, so a destination-choice model is needed to aggregate them into predicted district inflows.

For each occupational group $g \in \{WC, PW\}$, repatriate i, whose assigned landing port is $\ell(i)$, chooses a destination district $r \in \mathcal{R}$. The settlement model is

$$U_{ir}^{g} = \beta_h^g \mathbf{1}\{r = h_i\} + \beta_d^g \log d_{\ell(i)r} + \varepsilon_{ir}^{g}, \tag{4}$$

where h_i is repatriate i's predetermined *honseki* district, $d_{\ell(i)r}$ is the distance from the assigned landing port to district r, and ε_{ir}^{g} follows an i.i.d. Type-I extreme-value distribution. I estimate the model separately by occupational group because family ties and transportation constraints may influence their settlement differently. This model lets the data determine the relative importance of *honseki* and port distance instead of imposing an arbitrary district-level aggregation. Table A3 reports the estimates.

The estimated choice parameters generate the probability that repatriate i in group g settles in district r:

$$\widehat{P}_{ir}^{g} = \frac{\exp\left[\widehat{\beta}_{h}^{g}\mathbf{1}\{r = h_i\} + \widehat{\beta}_{d}^{g}\log d_{\ell(i)r}\right]}{\sum_{s\in\mathcal{R}}\exp\left[\widehat{\beta}_{h}^{g}\mathbf{1}\{s = h_i\} + \widehat{\beta}_{d}^{g}\log d_{\ell(i)s}\right]}. \tag{5}$$

I aggregate these probabilities across repatriates and normalize them by the district's 1940 labor force:

$$Z_{r}^{g} \equiv \frac{1}{L_{r,1940}}\sum_{i\in g}\widehat{P}_{ir}^{g}. \tag{6}$$

The resulting variables Z_r^{WC} and Z_r^{PW} are the predicted white-collar and production-worker repatriate shares.

I use both predicted shares jointly as instruments for the corresponding actual shares. In Equation (2), Z_r^{WC} and Z_r^{PW} instrument WC_r and PW_r. In Equation (3), the predicted shares interacted with Post_t instrument the corresponding actual-share interactions. Each first stage uses the sample and controls of its second stage. Weak-identification statistics can therefore differ across outcomes when samples or baseline controls differ. Figure 5 compares the honseki-based and actual settlement shares of manager-experienced repatriates, and each results table reports the relevant weak-identification statistic.

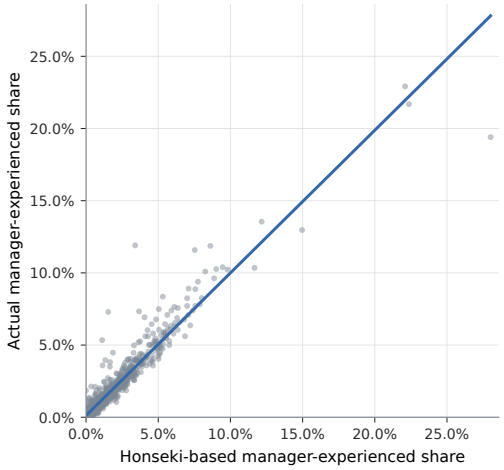
Identification requires predicted settlement to affect postwar outcomes only through repatriate settlement, conditional on prefecture fixed effects and prewar district characteristics. The historical basis for this restriction is that *honseki* predates postwar outcomes and access from landing ports reflects repatriation logistics. Prewar outcome specifications below test whether instrumented exposure predicts earlier changes in local development. The resulting 2SLS coefficients identify relative effects across districts receiving greater and smaller instrument-induced inflows. They do not identify the nationwide effect when firms can transmit local shocks through establishment networks; the model later quantifies that aggregate response.

3.2 White-Collar Inflows Expanded Firms and Accelerated Development

The main estimates show that white-collar inflows expanded modern production and shifted local economies toward wage-paying firms. I establish this result using three sets of outcomes: establishment scale and output per worker, sectoral employment, and employment status. Together, these outcomes connect the manager-supply shock to the paper's development margins: larger firms, movement out of agriculture, and movement from household production into wage work.

White-collar inflows increased the scale and productivity of non-agricultural production. I apply Equation (2) to changes in the log number of establishments and log employees

Figure 5: Honseki-Based versus Actual Manager-Experienced Repatriate Shares



Notes: Each point is a district. The x-axis is the number of manager-experienced repatriates whose honseki was in the district, divided by the district's 1940 labor force. The y-axis is the realized settlement share of the same occupational group. The category covers career-track corporate and government employees, owners, organizational and technical workers, nonmanual railway workers, teachers, police, and corrections workers; production workers are excluded. The solid line is the fitted linear relationship.

per establishment between 1950 and 1960 and to the change in log revenue per worker between 1940 and 1960.[6] These outcomes measure the extensive margin of local production, establishment size, and non-agricultural output per worker. Each specification includes prefecture fixed effects, war destruction, 1940 population density, and the baseline value of the outcome.

The estimates in Table 4 show increases on all three margins. Raising the white-collar repatriate share from the 10th to the 90th percentile is associated with about 20 percent more establishments, 13 percent more employees per establishment, and 12 percent higher output per worker. The production-worker coefficients are smaller and statistically indistinguishable from zero. The contrast indicates that these changes were associated with the occupational composition of the inflow rather than with additional production labor alone.

The expansion of modern production was accompanied by a shift from agriculture into manufacturing and services. I apply Equation (2) to changes in log labor force and sectoral employment shares between 1940 and 1960, using the same baseline controls as above. A 6 percentage point increase in the white-collar repatriate share, approximately the difference between the 10th and 90th percentiles, is associated with a 5.9 percentage point decline in the agricultural share, a 1.6 percentage point increase in the manufacturing share, and a 4.3 percentage point increase in the service share (Table 5). Production-worker inflows do not significantly change any of the three sectoral shares.

[6]The number of establishments is not available before 1950.

Table 4: Repatriate Inflows, Establishment Scale, and Output per Worker (IV)

	Log number of establishments (1960–1950)	Log employees per establishment (1960–1950)	Log revenue per worker (1960–1940)
	(1)	(2)	(3)
Production-worker repatriate share	1.10	-1.23	-0.89
	(1.04)	(0.92)	(0.71)
White-collar repatriate share	3.03***	2.11***	1.89***
	(0.67)	(0.68)	(0.51)
N	1,100	1,090	1,102
F-statistic	56.76	55.55	52.05

Notes: This table reports 2SLS estimates of Equation (2). The dependent variables are changes in log establishments and log employees per establishment from 1950 to 1960. Column 3 instead reports the change in log revenue per worker from 1940 to 1960. White-collar and production-worker repatriate shares are instrumented with their predicted settlement shares. Controls include prefecture fixed effects, log population density in 1940, war damage, and the baseline value of the corresponding outcome. Standard errors are clustered by district and reported in parentheses. The F-statistic is the Kleibergen–Paap rk Wald weak-identification statistic.

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Prewar outcomes test whether the instruments predict sectoral reallocation before repatriation. Columns 4 and 5 of Table 5 show no consistent relationship between instrumented exposure and prewar changes in the agriculture, manufacturing, or service shares. The labor-force check is not uniformly null: instrumented white-collar exposure predicts lower labor-force growth from 1930 to 1940 but not from 1920 to 1930. Because the significant prewar coefficient has the opposite sign from the postwar estimate, it does not reproduce the postwar population response, but it warrants more caution for the labor-force result than for the sectoral-share results.

White-collar inflows also changed how work was organized, moving workers from household production toward wage-paying firms. I apply Equation (2) to changes between 1950 and 1970 in the shares of self-employed workers, family workers, wage workers, and managers.[7] These outcomes capture the shift from owner-managed production using family labor toward firms that separate ownership, management, and production work. The controls include prefecture fixed effects, 1940 population density, war destruction, and the 1950 value of the outcome.

The estimates in Table 6 show a broad shift toward wage employment. Moving from the 10th to the 90th percentile of the white-collar repatriate share is associated with a 1.6 percentage point decline in self-employment, a 0.8 percentage point decline in family

[7]The Population Census first reports these employment categories in 1950.

Table 5: Repatriates and Local Structural Transformation (IV)

Panel A: Log labor-force change	1960–1940			1940–1930	1930–1920
	(1)	(2)	(3)	(4)	(5)
Production-worker repatriate share	2.77***	2.54***	0.73	0.50	-0.34
	(0.86)	(0.82)	(0.86)	(0.57)	(0.35)
White-collar repatriate share	4.24***	4.05***	2.62***	-1.94**	0.26
	(0.67)	(0.64)	(0.82)	(0.82)	(0.17)
F-statistic	45.09	40.91	48.46	48.46	48.46
Panel B: Agriculture employment-share change					
	(1)	(2)	(3)	(4)	(5)
Production-worker repatriate share	-0.15	-0.15	-0.14	-0.13	0.17**
	(0.34)	(0.34)	(0.34)	(0.11)	(0.07)
White-collar repatriate share	-0.97***	-0.97***	-0.98***	0.05	-0.03
	(0.25)	(0.25)	(0.25)	(0.10)	(0.06)
F-statistic	56.22	56.11	56.05	56.05	56.05
Panel C: Manufacturing employment-share change					
	(1)	(2)	(3)	(4)	(5)
Production-worker repatriate share	0.38	0.38	0.38	0.03	-0.07
	(0.23)	(0.23)	(0.23)	(0.05)	(0.06)
White-collar repatriate share	0.26*	0.26*	0.26**	-0.01	0.00
	(0.14)	(0.14)	(0.13)	(0.04)	(0.03)
F-statistic	56.22	56.11	56.28	56.28	56.28
Panel D: Service employment-share change					
	(1)	(2)	(3)	(4)	(5)
Production-worker repatriate share	-0.24	-0.23	-0.24	0.10	-0.11***
	(0.16)	(0.16)	(0.15)	(0.09)	(0.03)
White-collar repatriate share	0.71***	0.71***	0.72***	-0.03	0.03
	(0.14)	(0.14)	(0.14)	(0.06)	(0.03)
N	1,107	1,107	1,107	1,107	1,107
F-statistic	56.22	56.11	56.90	56.90	56.90
Prefecture fixed effects	✓	✓	✓	✓	✓
Log density, 1940	✓	✓	✓	✓	✓
War destruction		✓	✓	✓	✓
Baseline outcome			✓	✓	✓

Notes: This table reports 2SLS estimates of Equation (2). Panel A reports changes in log labor force. Panels B–D report changes in the agriculture, manufacturing, and service employment shares. Columns 1–3 use changes from 1940 to 1960. Columns 4–5 use pre-repatriation changes from 1930 to 1940 and 1920 to 1930. White-collar and production-worker repatriate shares are instrumented with their predicted settlement shares. Controls are indicated at the bottom of the table. Standard errors are clustered by district and reported in parentheses. The F-statistic is the Kleibergen–Paap rk Wald weak-identification statistic.

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

work, a 2.0 percentage point increase in wage work, and a 0.2 percentage point increase in management. For comparison, the wage-worker and manager shares rose nationally by about 20 and 1.3 percentage points, respectively, between 1950 and 1970. Production-worker inflows do not significantly change any of these employment shares. Thus, the same white-collar inflows that expanded establishments also moved workers away from small household production and into wage-paying firms.

Table 6: Repatriate Inflows and Employment Organization (IV)

	Self-employed share (1970–1950)	Family-worker share (1970–1950)	Wage-worker share (1970–1950)	Manager share (1970–1950)
	(1)	(2)	(3)	(4)
Production-worker repatriate share	0.08	0.14	-0.23	-0.01
	(0.07)	(0.09)	(0.14)	(0.01)
White-collar repatriate share	-0.27***	-0.13***	0.34***	0.03***
	(0.04)	(0.05)	(0.08)	(0.01)
N	1,107	1,107	1,107	1,107
F-statistic	55.88	55.66	55.11	56.16

Notes: This table reports 2SLS estimates of Equation (2). The dependent variables are changes from 1950 to 1970 in the shares of self-employed workers, family workers, wage workers, and managers, including public-sector managers. White-collar and production-worker repatriate shares are instrumented with their predicted settlement shares. Controls include prefecture fixed effects, log population density in 1940, war damage, and the 1950 value of the corresponding outcome. Standard errors are clustered by district and reported in parentheses. The F-statistic is the Kleibergen–Paap rk Wald weak-identification statistic.
$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

3.3 White-Collar Inflows Expanded Firms Across Space

Because local demand can limit firm scale even when managers are available, I test whether white-collar inflows allowed firms to reach other markets through spatial expansion. If a firm can serve only its home market, relaxing managerial scarcity may have little effect where local demand is small. Operating establishments elsewhere offers an escape from this constraint, but doing so requires the capacity to coordinate production across locations (Chandler, 1977; Gumpert et al., 2022). I therefore examine the number of establishments per firm, whether a firm operates outside its headquarters city, and the maximum distance between headquarters and its establishments.

The firm directories provide repeated cross sections for 1938 and 1970 rather than a panel of continuing firms. I apply Equation (3), defining Post_t as one in 1970. Headquarters-district and year fixed effects absorb permanent differences across headquarters locations and common changes over time. The coefficients measure how the average organization of

firms headquartered in more exposed districts changed after repatriation relative to firms headquartered elsewhere.

White-collar inflows increased both the number and geographic reach of establishments operated by firms headquartered in exposed districts. Moving from the 10th to the 90th percentile of the white-collar repatriate share is associated with 36 percent more establishments per firm, a 32 percentage point increase in the probability of operating outside the headquarters city, and a 69 kilometer increase in maximum headquarters-establishment distance (Table 7). Production-worker inflows have effects of the opposite sign on all three outcomes.

These estimates show that the headquarters location's exposure to potential managers changed firms' decisions to operate in other markets. They do not directly estimate effects on destination districts or establish where each manager worked. They do, however, identify an establishment-network channel through which a local manager-supply shock can affect production outside the directly exposed district.[8] Once districts are connected through firm networks, the reduced-form comparisons cannot by themselves aggregate the shock's nationwide effects.

Table 7: Repatriate Inflows and Firms' Spatial Expansion (IV)

	Log number of establishments	Operates outside HQ city	Maximum HQ–establishment distance (km)
	(1)	(2)	(3)
Post × production-worker repatriate share	-4.46*	-4.66**	-1068.59**
	(2.45)	(1.89)	(497.43)
Post × white-collar repatriate share	5.12*	5.30**	1144.40*
	(2.85)	(2.24)	(585.41)
N	78,455	78,455	78,455
F-statistic	40.94	40.94	40.94

Notes: This table reports repeated-cross-section 2SLS estimates of Equation (3). The dependent variables are log establishments per firm, an indicator for operating at least one establishment outside the headquarters city, and maximum headquarters-establishment distance in kilometers. The sample consists of firm cross sections from 1938 and 1970. The specification includes headquarters-district and year fixed effects. Postwar interactions with actual repatriate shares are instrumented with the corresponding predicted-share interactions. Standard errors are clustered by district and reported in parentheses. The F-statistic is the Kleibergen–Paap rk Wald weak-identification statistic.

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

[8] Multi-unit firms can transmit local shocks through internal networks (Atalay et al., 2014; Gumpert et al., 2022; Giroud et al., 2024; Kleinman, 2025).

3.4 White-Collar Inflows Increased Exposure to Management Practices

To investigate how firms supported larger establishment networks, I examine a firm-wide organizational input that can be reused across locations: management practices. Unlike local supervision, accounting systems, personnel policies, inventory routines, and reporting procedures can be developed once and applied throughout a firm. Greater managerial capacity may therefore support spatial expansion by helping firms acquire and implement such practices.

I measure exposure to modern management practices using participation in the Japan Productivity Center's overseas study missions. The missions sent Japanese firms abroad to study management, production, labor relations, marketing, and organization. Participation measures access to this training rather than practice adoption itself. Evidence from a similar Italian program makes the proxy informative: participating firms adopted American management practices and experienced persistent employment and productivity gains (Giorcelli, 2019). Firm-level evidence also links managerial human capital to management quality and technology choice (Bender et al., 2018; Rubens, 2023).

White-collar inflows increased firms' participation in the study missions. I apply Equation (2) to an indicator for participating by 1970 and the number of missions attended by 1970. The white-collar coefficient is positive and statistically significant for both outcomes, while the production-worker coefficient is negative (Table 8). These estimates show that firms headquartered in districts receiving more instrument-induced white-collar inflows gained greater exposure to modern management practices. They do not establish that mission participation caused the spatial expansion documented above, but they identify a firm-wide organizational margin that moved with managerial capacity.

Table 8: Repatriate Inflows and Exposure to Modern Management Practices (IV)

	Participated in a JPC study mission	Number of JPC study missions
	(1)	(2)
Production-worker repatriate share	-0.08*	-0.65**
	(0.05)	(0.31)
White-collar repatriate share	0.11*	0.96**
	(0.07)	(0.47)
N	111,940	111,940
F-statistic	23.20	23.20

Notes: This table reports firm-level 2SLS estimates of Equation (2). The dependent variables are an indicator for participation in a Japan Productivity Center overseas study mission by 1970 and the number of missions attended by 1970. White-collar and production-worker repatriate shares in the firm's headquarters district are instrumented with their predicted settlement shares. Controls include prefecture fixed effects, log population density in 1940, and war damage. Standard errors are clustered by district and reported in parentheses. The F-statistic is the Kleibergen–Paap rk Wald weak-identification statistic.

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

3.5 Alternative Channels

I next test three alternative explanations for the effects of white-collar inflows: university expansion, idea creation, and transportation investment. Each could raise firm scale or output without operating through the organizational margins documented above. Section B.8 reports the specifications and estimates.

Universities. The structural transformation literature highlights universities as engines of local economic development. Two mechanisms emphasized in recent work are particularly relevant. First, universities shape local human-capital supply. Dziadyk (2025) shows that the opening of new universities can increase the stock of skilled workers in a region by attracting students, retaining graduates, and raising local productivity. Universities thus function as persistent sources of skilled labor and can catalyze long-run growth.

Second, universities act as intellectual and organizational hubs. Liu and Takeda (2025) demonstrate that universities accelerate local innovation by facilitating knowledge diffusion and generating interaction between researchers and firms. In their framework, universities serve as anchor institutions. They upgrade local capabilities, raise the quality of management, and stimulate firm formation and expansion.

These papers suggest that if repatriates had expanded the university sector, this could have created a complementary mechanism through which white-collar inflows increased

growth. Universities could have amplified managerial talent, raised the supply of skilled workers, and stimulated local knowledge creation, any of which might explain part of the structural transformation and economic growth documented earlier.

Motivated by this mechanism, I examine whether districts receiving more white-collar repatriates experienced differential growth in their university sector. Specifically, I estimate difference-in-differences regressions of the number of universities per capita on the white-collar and production-worker repatriate shares, controlling for prefecture fixed effects. The estimated white-collar coefficient is small and statistically indistinguishable from zero. Districts receiving more white-collar repatriates did not experience detectable growth in universities per capita. This result provides no evidence that university expansion accounts for the main effects, although it cannot rule out changes in educational quality or other human-capital channels.

Innovation. I also examine whether white-collar repatriates increased idea creation, using district-level patenting as an innovation proxy. Regressions analogous to the main specification, with patents per capita as outcomes, yield coefficients on both the white-collar and production-worker shares that are small and statistically indistinguishable from zero. This test speaks to growth mechanisms in which population inflows raise income through idea creation, including those emphasized by Peters (2022) and Terry et al. (2026). In this setting, white-collar inflows expanded firms and increased their exposure to modern management practices without increasing measured local patenting. The patent estimates do not establish that innovation was absent or that organizational change alone caused output growth. They instead provide no evidence that greater local patenting accounts for the main effects and motivate examining firm organization as a separate mechanism.

Transportation. Finally, I examine whether white-collar repatriates improved transportation access, which could stimulate growth by reducing trade costs. This is a plausible alternative mechanism in the spirit of Chandler (1977) and You (2021): improvements in transportation can enlarge effective market size and make larger, more modern firms profitable. I therefore estimate difference-in-differences regressions using train stations and highway exits per capita in each district as outcomes. The estimates are not positive and are statistically significant and negative in some specifications. Districts receiving larger white-collar inflows did not experience greater expansion of measured transportation infrastructure. This result provides no evidence that new stations or highway exits account for firm growth and spatial expansion, although it cannot rule out other changes in market access.

Taken together, these estimates provide no evidence that university expansion, measured innovation, or transportation investment explains the main effects. They cannot eliminate every version of these mechanisms, but they direct attention toward the changes in firm organization documented above.

The reduced-form evidence therefore establishes the paper's central empirical result but leaves two tasks for the model. White-collar inflows expanded firms, shifted workers out of agriculture and household production, increased firms' spatial reach, and raised their exposure to modern management practices. The estimates do not show how these organizational margins jointly produce firm growth and structural transformation, and district comparisons cannot quantify nationwide effects when firms operate across districts. The next section develops a model to connect these margins and aggregate their effects.

4 Theory

This section develops a spatial general-equilibrium model to explain how relaxing managerial scarcity changes firm organization and moves workers out of agriculture and self-employment into wage work. The model links manager supply to the empirical findings through two firm margins: local supervision raises establishment size, while headquarters management practices can be reused across establishments and support spatial expansion. Sectoral and occupational choice then translate modern-firm growth into structural transformation. Section 5 estimates the model to quantify the aggregate effects, including the contribution of multi-establishment networks.

4.1 Environment

The model combines regional markets with sectoral and occupational choice. There are R regions indexed by $r, s \in \{1, \ldots, R\}$. In bilateral firm decisions, r denotes the headquarters region and s denotes the destination region. Modern firms can operate establishments in any region, and their establishment networks determine how much destination demand they can reach. Regional demand varies through the demand shifter defined below. The economy has two sectors: tradable agriculture and non-tradable non-agriculture.

Agriculture creates the model's margin of structural transformation. Competitive farmers in each region use land and production labor to produce a homogeneous good. Agricultural trade is frictionless across regions, so the agricultural price is common and serves as the numéraire.

Non-agriculture creates the two firm-growth margins observed in the data. Differentiated goods are produced either by self-employed workers or firms. Firms can serve multiple regions by operating establishments outside their headquarters region. Establishments use

local managers for supervision, monitoring, and coordination. Headquarters use managers to adopt practices that raise productivity throughout the firm and can be deployed across establishments, as in Kleinman (2025). Manager supply can therefore affect both establishment size and firms' spatial reach.

Occupational choice connects these firm responses to employment organization. Individuals differ in skill z and choose among production work, traditional self-employment, management, and modern entrepreneurship. Production workers supply homogeneous local labor, self-employed producers operate small owner-managed varieties, managers supply managerial labor to modern firms, and modern entrepreneurs organize production across establishments.

4.2 Preferences and Demand

Regional demand determines the revenue available to firms in each destination market. Individuals consume the agricultural good and a CES aggregate of non-agricultural varieties. Preferences for an individual in region s are

$$U_s = c_s^{1-\phi} Q_s^{\phi}, \qquad \phi \in (0,1), \tag{7}$$

where c_s is agricultural consumption and Q_s is non-agricultural consumption. The agricultural good is the numeraire. Non-agricultural consumption is a CES aggregate of differentiated varieties:

$$Q_s = \left(\int_{\omega \in \Omega_s} q_s(\omega)^{\frac{\theta-1}{\theta}} \, d\omega \right)^{\frac{\theta}{\theta-1}}, \qquad \theta > 1. \tag{8}$$

Let E_s denote aggregate expenditure on non-agricultural varieties in region s, and let P_s denote the corresponding CES price index. The usual CES demand system implies that revenue from selling quantity q of a variety in region s can be written as

$$r_s(q) = \Xi_s q^{\delta}, \qquad \delta \equiv \frac{\theta - 1}{\theta} \in (0,1), \tag{9}$$

where

$$\Xi_s \equiv E_s^{1/\theta} P_s^{(\theta-1)/\theta}. \tag{10}$$

The term Ξ_s summarizes total demand in region s, and $r_s(q)$ is the revenue a firm would earn if it reached the entire destination market. Following the consumer-reach logic in Arkolakis (2010), let $x_{rs}(z) \in [0,1]$ denote the share of destination demand reached by a firm with productivity z headquartered in r. Whereas Arkolakis models reach through marketing effort, here reach is generated by the firm's establishment network. Realized revenue in destination

s is therefore $x_{rs}(z)\Xi_s q_{rs}(z)^{\delta}$. The next subsection maps establishment intensity into $x_{rs}(z)$. Firms can access demand outside their headquarters region only by operating in additional destination markets.

4.3 Agriculture

Agriculture links modern-firm labor demand to the movement of workers across sectors. Agriculture in region s uses local production workers L_{As} and fixed land T_s:

$$Y_{As} = A_{As} L_{As}^{\alpha_A} T_s^{1-\alpha_A}, \qquad \alpha_A \in (0,1). \tag{11}$$

Agricultural goods are freely traded. Under perfect competition, agricultural labor demand satisfies

$$w_{Ps} = \alpha_A A_{As} L_{As}^{\alpha_A - 1} T_s^{1-\alpha_A}, \tag{12}$$

where w_{Ps} is the local production worker wage. Since land is fixed and $\alpha_A < 1$, agricultural labor demand is downward sloping in w_{Ps}. Production workers are mobile across sectors within a region, so agriculture and non-agriculture pay the same local production wage. When modern firms expand, their demand for production workers raises w_{Ps} and reduces agricultural employment. This labor reallocation is the model's structural-transformation channel. Payments to land accrue to immobile absentee landowners.

4.4 Non-agriculture

Non-agriculture distinguishes traditional owner-managed production from modern firms that use managers to scale within and across markets. Traditional self-employed producers operate local varieties without hired managers or establishment networks. Modern firms hire local managers to supervise production and use headquarters managers to adopt practices that raise productivity across establishments.

Production Technology. Local managerial services provide the direct intensive-margin channel of firm growth. A modern firm with headquarters in region r and productivity z can produce for market s. Its output intensity in destination s is

$$q_{rs}(z) = zA(M_r(z))S_{rs}(z)^{\alpha} L_{rs}(z)^{\beta}, \qquad \alpha, \beta > 0, \quad \alpha + \beta < 1, \tag{13}$$

where $L_{rs}(z)$ is local production-labor intensity, $S_{rs}(z)$ is local managerial-service intensity, and $M_r(z)$ is the measure of management practices adopted at headquarters. The variable $L_{rs}(z)$ captures establishment scale, while $S_{rs}(z)$ captures the supervision used to support

that scale. The market-reach term defined below scales the firm's destination-level operating profit and total local input use.

The local managerial input extends the span-of-control logic in Lucas (1978). If $\alpha = 0$ and $A(M_r(z)) = 1$, entrepreneur skill scales production but decreasing returns to production labor limit establishment size. Allowing $\alpha > 0$ lets hired managers relax this constraint through supervision, monitoring, and coordination.

Headquarters management practices create the firm-wide margin that links manager supply to spatial expansion. These practices include accounting systems, personnel rules, inventory routines, and branch-reporting systems. This margin is related to Engbom et al. (2025), who model professional workers performing administrative tasks. I hold production curvature fixed and instead let manager-intensive practices raise productivity through $A(M_r(z))$. Because a practice adopted at headquarters raises productivity in every establishment, adoption increases both existing-establishment productivity and the return to entering additional markets.

Management practices raise firm productivity through

$$A(M_r(z)) = A_0 \exp\left(\int_0^{M_r(z)} \log b(m) dm\right), \qquad b(m) > 1. \tag{14}$$

The variable $M_r(z)$ denotes the measure of management practices adopted by the headquarters of a firm with productivity z in region r. Management practices are indexed by $m \in [0, \bar{M}]$. A firm that chooses $M_r(z)$ adopts all practices $m \in [0, M_r(z)]$. Each adopted practice m raises productivity by a factor $b(m) > 1$.

Adopting more advanced practices requires increasingly costly headquarters manager time. Let $c(m)$ denote the managerial efficiency units required for practice m, with $c(m) > 0$ and $c'(m) > 0$. The total headquarters managerial services required to adopt practices up to $M_r(z)$ are

$$C(M_r(z)) = \int_0^{M_r(z)} c(m)\, dm. \tag{15}$$

The cost of management practice adoption is therefore $w_{Mr} C(M_r(z))$, where w_{Mr} is the wage per managerial efficiency unit in the headquarters region.

This cost structure links managerial input to management-practice quality. Since

$$\frac{\partial C(M_r(z))}{\partial M_r(z)} = c(M_r(z)) > 0, \tag{16}$$

firms that adopt more management practices demand more headquarters managerial services. This is consistent with Bender et al. (2018), who show that firms with higher quality managers also have better management practices. Moreover,

$$\frac{\partial^2 C(M_r(z))}{\partial M_r(z)^2} = c'(M_r(z)) > 0, \tag{17}$$

so the marginal managerial services required for adoption rise with the sophistication of the practice.

The distinction between S_{rs} and M_r separates the two roles of managers. Local managerial services S_{rs} are rival inputs used in one destination, while practices M_r are adopted at headquarters and reused across establishments. Treating organizational inputs as firm-wide is consistent with Atalay et al. (2014), who show that intangible managerial and organizational inputs connect establishments within firms more strongly than internal shipments of physical goods.

Market Reach, Establishment Intensity, and Expansion Costs. To reach demand outside its headquarters region, a modern firm chooses its establishment footprint in every destination market. Following the continuous spatial-expansion approach in Kleinman (2025), I represent this footprint using establishment intensity $n_{rs}(z) \in [0, \infty)$ for a firm with headquarters in r, productivity z, and destination s. This variable is a continuous counterpart to the number of establishments the firm operates in that destination. The continuous formulation is a tractability device. A literal choice over interdependent combinations of establishment locations would create a combinatorial discrete-choice problem (Arkolakis et al., 2026), whereas continuous intensity yields smooth first-order conditions suitable for estimation and counterfactual analysis. Accordingly, $n_{rs}(z)$ should be interpreted as establishment intensity rather than a literal fractional establishment; its aggregate model counterpart is establishments per firm. Establishment intensity determines market reach:

$$x_{rs}(z) = x(n_{rs}(z)) \equiv \frac{n_{rs}(z)}{1 + n_{rs}(z)} \in [0, 1). \tag{18}$$

The bounded and concave market-reach function captures limited destination demand and saturation within that market. The variable $x_{rs}(z)$ is the share of demand in region s accessible to the firm and is a reduced-form measure of distribution coverage generated by its establishment network. It satisfies $x(0) = 0$, $x'(n) > 0$, $x''(n) < 0$, and $\lim_{n\to\infty} x(n) = 1$. The upper bound captures limited destination demand: even a dense establishment footprint cannot reach more than the entire market, whose size is determined by Ξ_s. Concavity captures saturation and overlap in customer coverage, a reduced-form representation of

within-firm cannibalization. When n_{rs} is low, an additional establishment reaches many new customers; when n_{rs} is high, it increasingly overlaps with the firm's existing network and reaches fewer new customers. Thus, reached demand $x(n_{rs})\Xi_s$ rises at a diminishing rate and approaches Ξ_s. This saturation creates a motive for spatial expansion: as a firm approaches the demand limit in one region, the return to another establishment there falls relative to opening an establishment in a less-covered region. Destination-level operating profit and local input use are scaled by $x_{rs}(z)$ in the firm problem and market-clearing conditions below.

Distance and firm-wide scope costs limit spatial expansion. Expansion costs are

$$C_r^n\left(\{n_{rs}\}_{s=1}^R\right) = \sum_{s\neq r} \tau_{rs} n_{rs} + \frac{\kappa}{2}\left(\sum_{s=1}^R n_{rs}\right)^2, \tag{19}$$

where τ_{rs} increases with distance d_{rs} and $\kappa > 0$ governs the firm-wide cost of managing a larger network. The distance term generates a gravity force in establishment links, while the quadratic term limits total scope. Higher destination profits raise desired establishment intensity. Because headquarters practices raise potential profits in every destination, greater headquarters managerial capacity can increase both the number and geographic reach of establishments.

Modern Firm. The modern firm's problem combines local supervision, firm-wide practices, and spatial expansion. A firm with headquarters in region r and productivity z chooses headquarters practices M_r, production workers L_{rs}, local managerial services S_{rs}, and establishment intensity n_{rs} in each destination s:

$$\begin{aligned}\Pi_r^M(z) = \max_{M_r\in[0,\bar{M}],\ \{S_{rs},L_{rs}\}_{s=1}^R\geq 0,\ \{n_{rs}\}_s\geq 0} \quad & \sum_s \underbrace{x(n_{rs})\left[\Xi_s\left(z\,A(M_r)S_{rs}^{\alpha}L_{rs}^{\beta}\right)^{\delta} - w_{Ms}S_{rs} - w_{Ps}L_{rs}\right]}_{\text{Reach-adjusted operating profit in } s} \\ & - \underbrace{w_{Mr}C(M_r)}_{\substack{\text{Management practice}\\ \text{adoption cost}}} - \underbrace{\left[\sum_s \tau_{rs}n_{rs} + \frac{\kappa}{2}\Big(\sum_{s=1}^R n_{rs}\Big)^2\right]}_{\text{Expansion cost}}.\end{aligned} \tag{20}$$

Here, $\tau_{rr} = 0$, τ_{rs} increases with distance from headquarters for $s \neq r$, and $\kappa > 0$ governs the firm-wide scope cost.

The objective makes the two manager channels explicit. Lower destination manager wages reduce the cost of supervising production and increase establishment size. Lower headquarters manager wages reduce the cost of adopting practices and raise productivity in every destination. Higher firm-wide productivity then raises the return to establishment intensity, subject to diminishing market reach and network scope costs.

Traditional Self-Employment. Traditional self-employment provides the non-scalable alternative needed to study movement into wage work. The term includes literal self-employment, family businesses, and small owner-managed firms that do not separate ownership, management, and production. This interpretation is consistent with Bassi et al. (2023), who show that many small firms in low-income settings are close to "self-employment within the firm."

A self-employed producer in region r with skill z produces a differentiated local variety using own skill:

$$q_r^T(z) = z. \tag{21}$$

Self-employed producers do not hire managers, adopt headquarters practices, or build establishment networks. They sell only in their home region.

To allow traditional producers to have a smaller local customer base than modern firms, let $\lambda_T \in (0, 1]$ denote their fixed local reach. Under CES demand, revenue from traditional self-employment is

$$V_r^T(z) = \lambda_T \Xi_r z^\delta, \qquad \delta = \frac{\theta - 1}{\theta} \in (0, 1). \tag{22}$$

Self-employment income increases with skill but less than proportionally because producers face downward-sloping demand and cannot use managers or establishment networks to scale. This limited scalability distinguishes traditional self-employment from modern entrepreneurship.

Occupational Choice. Occupational choice determines whether an inflow of workers with white-collar backgrounds expands effective manager supply and how modern-firm growth reallocates employment. Each region r contains two predetermined background types $g \in \{B, W\}$. Type B comprises non-repatriate incumbents and production-worker repatriates, who are behaviorally identical in the model. Type W comprises repatriates classified as white-collar based on their prewar occupations. Let H_{gr} denote the mass of type g in region r, so total population is $H_r = H_{Br} + H_{Wr}$. Both types draw general skill z from the same Pareto distribution:

$$G(z) = 1 - \left(\frac{\underline{z}}{z}\right)^{\nu_z}, \qquad z \geq \underline{z}, \qquad \nu_z > 1. \tag{23}$$

Each individual chooses among four occupations: production worker, traditional self-employed producer, manager, and modern entrepreneur.

Background type affects only managerial productivity, isolating the manager-supply channel. If an individual of type g chooses management, she supplies $a_g z$ managerial efficiency units. I normalize $a_B = 1$ and assume $a_W > a_B$. This difference represents manager-specific human capital associated with white-collar prewar occupations, as motivated by the

historical evidence in Section 2.3. The multiplier a_g is fixed before postwar occupational choice; it is not acquired by becoming a manager.

Individuals choose the occupation that offers the highest payoff. A production worker earns w_{Pr}, while a traditional self-employed producer earns

$$V_r^T(z) = \lambda_T \Xi_r z^{\delta}. \tag{24}$$

A manager of type g earns

$$V_{gr}^M(z) = w_{Mr} a_g z. \tag{25}$$

A modern entrepreneur operates a modern firm headquartered in region r and earns $\Pi_r^M(z)$. Payoffs outside management do not depend on background type. The payoff of an individual with background g and skill z in region r is therefore

$$V_{gr}(z) = \max\left\{w_{Pr},\ \lambda_T \Xi_r z^{\delta},\ w_{Mr} a_g z,\ \Pi_r^M(z)\right\}. \tag{26}$$

White-collar background therefore shifts effective manager supply without mechanically assigning returnees to management. At fixed wages and skill, type W has a higher managerial payoff than type B, while the other occupational payoffs are identical. Type-W individuals remain free to choose another occupation, but those who select management supply more efficiency units. An inflow of type W therefore shifts manager supply farther outward than an equal-sized type-B inflow.

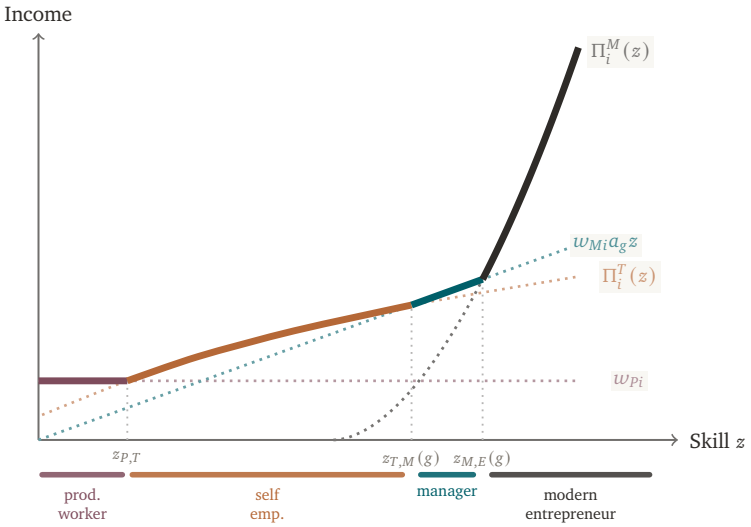
Self-employment is an active occupational choice rather than a residual category. Unlike in Engbom et al. (2025), self-employed producers and wage workers need not be indifferent except at their occupational cutoff. Self-employed producers choose own production when its skill-dependent return exceeds the production wage. This interpretation is consistent with Cerkez et al. (2025), who show that many household-enterprise owners report earning more than wage earners and would accept wage work only at comparable earnings.

Figure 6 shows how these choices generate the employment transitions observed in the data. Panel A plots the four income schedules and the occupation chosen at each skill level. Panel B shows the reserve-pool mechanism: when modern firms raise production-labor demand, the production wage rises and draws marginal self-employed workers into wage employment.

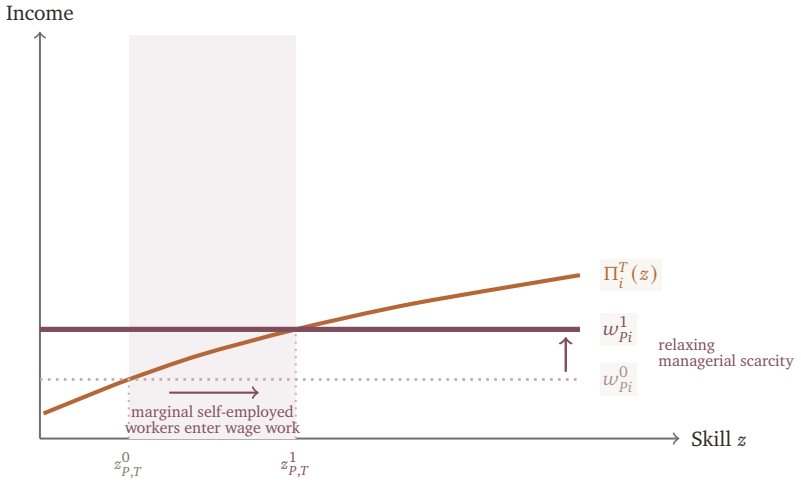
Labor Market Clearing. Labor-market clearing translates modern-firm growth into wages and employment reallocation. For each background type g in region s, let

$$\mathcal{P}_{gs} = \{z : w_{Ps} = V_{gs}(z)\}, \qquad \mathcal{M}_{gs} = \{z : w_{Ms} a_g z = V_{gs}(z)\}, \qquad \mathcal{E}_{gs} = \{z : \Pi_s^M(z) = V_{gs}(z)\}$$

FIGURE 6: OCCUPATIONAL CHOICE AND SELF-EMPLOYMENT AS A RESERVE POOL



(A) OCCUPATIONAL CHOICE



(B) RESERVE POOL

Notes: This figure illustrates the occupational-choice mechanism in the model. Panel A plots stylized income schedules for a fixed background type g. Dotted lines show potential income in each occupation, and thick solid segments trace the upper envelope chosen by workers of skill z. The vertical lines mark the cutoffs between production work, self-employment, management, and modern entrepreneurship. The managerial schedule is $w_{Mr}a_g z$ and is therefore steeper for white-collar-background workers. Panel B shows how an increase in modern-firm demand for production labor raises the production wage from w_p^0 to w_p^1. The production-worker cutoff moves right, drawing marginal self-employed workers into wage work. In this sense, self-employment serves as a reserve pool for the wage sector. The curves are stylized and are not calibrated.

denote the sets of individuals who choose production work, management, and modern entrepreneurship, respectively.

Production-worker market clearing links modern establishments to the local production wage. Supply from occupational choice equals demand from agriculture and all modern establishments operating in region s:

$$\sum_{g\in\{B,W\}} H_{gs} \int_{\mathcal{P}_{gs}} dG(z) = L_{As} + \sum_{r=1}^{R} \sum_{g\in\{B,W\}} H_{gr} \int_{\mathcal{E}_{gr}} x\left(n_{rs}^*(z)\right) L_{rs}^*(z)\, dG(z). \tag{27}$$

Manager-market clearing allocates local managerial efficiency units between establishment supervision and headquarters practice adoption. Since a type-g manager with skill z supplies $a_g z$ efficiency units, market clearing requires

$$\begin{aligned}\sum_{g\in\{B,W\}} H_{gs} \int_{\mathcal{M}_{gs}} a_g z\, dG(z) = &\sum_{r=1}^{R} \sum_{g\in\{B,W\}} H_{gr} \int_{\mathcal{E}_{gr}} x\left(n_{rs}^*(z)\right) S_{rs}^*(z)\, dG(z) \\ &+ \sum_{g\in\{B,W\}} H_{gs} \int_{\mathcal{E}_{gs}} C\left(M_s^*(z)\right)\, dG(z).\end{aligned} \tag{28}$$

The first term on the right is supervision demand from establishments located in region s. The second is manager time used by firms headquartered in region s to adopt firm-wide practices.

4.5 Equilibrium

An equilibrium combines occupational choice, firm optimization, and regional market clearing. Regional type masses $\{H_{gr}\}_{g\in\{B,W\},r=1}^{R}$, land endowments $\{T_r\}_{r=1}^{R}$, and agricultural productivity $\{A_{Ar}\}_{r=1}^{R}$ are given. Endogenous objects include production and manager wages $\{w_{Pr}, w_{Mr}\}_{r=1}^{R}$, demand shifters $\{\Xi_r\}_{r=1}^{R}$, occupational choices, agricultural labor allocations, and modern-firm decisions $\{M_r^*(z), S_{rs}^*(z), L_{rs}^*(z), n_{rs}^*(z)\}_{r,s,z}$. First, individuals of each background type choose occupations to maximize

$$V_{gr}(z) = \max\left\{w_{Pr},\ \lambda_T \Xi_r z^{\delta},\ w_{Mr} a_g z,\ \Pi_r^M(z)\right\}. \tag{29}$$

Second, modern firms maximize $\Pi_r^M(z)$, taking wages and demand shifters as given. Third, production worker markets, manager markets, and goods markets clear in every region.

4.6 Comparative Statics

White-collar repatriate inflows relax managerial scarcity by increasing the mass of workers with greater managerial efficiency. To characterize this mechanism, I consider comparative statics around a symmetric equilibrium. Production-worker repatriates enter the baseline mass H_{Br} because they have the same occupational payoffs as incumbents, while white-collar repatriates raise H_{Wr}. Since $a_W > a_B$, a white-collar inflow shifts effective manager supply farther outward than an equal-sized baseline inflow.

Proposition 1 (Manager supply, firm growth, and economic development)**.** *Consider a region r. Suppose an increase in H_{Wr} shifts effective manager supply outward and lowers the local manager wage w_{Mr}. Under an interior solution for modern firms, holding demand shifters fixed, and assuming induced input-wage responses do not overturn the direct firm-productivity effect, the shock implies:*

(i) management practice adoption increases;
(ii) establishment size increases;
(iii) establishment intensity increases;
(iv) agricultural employment falls;
(v) production-worker employment in modern firms rises, and total wage employment rises if this increase is not offset by a decline in manager headcount;
(vi) traditional self-employment falls if the induced increase in the production worker wage is sufficiently large relative to changes in local demand and manager wages.

Proof. Proofs are in Section C. □

Proposition 1 traces the mechanism from manager supply to firm growth and structural transformation. A lower manager wage induces firms to use more local managerial services, increasing establishment size, and to adopt more headquarters practices, increasing firm-wide productivity. Higher productivity raises the return to reaching additional markets, so firms expand their establishment networks. Growing modern firms demand more production workers, which raises the local production wage and pulls workers out of agriculture. Total wage employment rises whenever this increase in production employment exceeds any decline in manager headcount. When the production-wage response is sufficiently strong, marginal self-employed producers also enter wage work.

Spatial expansion also amplifies the manager-supply channel because headquarters practices are reusable across establishments.

Proposition 2 (Manager-complementary organizational change)**.** *Consider a modern firm headquartered in region r. Establishment scope and headquarters management practice adoption*

are complements. Holding wages and demand shifters fixed, an increase in establishment intensity in any destination region raises the marginal benefit of adopting headquarters management practices. Since adopting these practices requires headquarters managerial services, a larger establishment network raises the marginal product of headquarters managers.

Proof. Proofs are in Section C. □

Together, the two propositions generate feedback between manager abundance and spatial organization. A larger manager supply lowers the cost of adopting headquarters practices, which raises profits across destinations and expands establishment networks. A broader network, in turn, raises the return to additional practices because the same organizational improvement can be used in more establishments. This manager-complementary mechanism, emphasized by Kleinman (2025), amplifies the effect of relaxing managerial scarcity. It also motivates the network counterfactual in Section 5.3, which measures how much multi-establishment expansion contributes to the aggregate manager-supply effect.

5 Structural Estimation and Counterfactual Analysis

The empirical estimates identify the relative effects of local manager-supply shocks, but they cannot recover the aggregate effect of repatriation because firms transmit these shocks across districts through their establishment networks. I therefore estimate the model to answer two quantitative questions: how much the repatriate-induced increase in manager supply raised aggregate output and shifted employment into wage work, and how much of this effect depended on firms' cross-district expansion. I first explain how the data discipline the model and then report the parameter estimates and counterfactual results.

5.1 Estimation

The quantitative exercise measures how much white-collar repatriates changed aggregate outcomes through occupational choice, firm organization, and spatial expansion. The empirical estimates in Section 3 identify relative local effects across districts, but they do not recover the economy-wide effect of a nationwide change in manager supply. The structural model fills this gap by solving the 1970 spatial equilibrium with observed manager supply and comparing it to counterfactual equilibria in which the white-collar repatriate component of manager supply is removed.

The estimation separates the two manager channels in the model. Modern firms use managers as rival inputs in establishment production and as headquarters inputs for non-rival management-practice adoption. I therefore estimate or calibrate

$$\Omega = \{ \underbrace{\theta, \phi}_{\text{Demand}} , \underbrace{\alpha_A}_{\text{Agriculture}} , \underbrace{\nu_z, \lambda_T}_{\text{Occupational choice}} , \underbrace{\alpha, \beta, \eta_M, \rho, \kappa, c_M}_{\text{Modern firms}} \}.$$

I normalize the lower bound of the skill distribution, $\underline{z}$, to one. The management-practice productivity shifter is normalized so that $A_0 = 1$ and parameterized as $A(M_r) = \exp(\eta_M M_r)$. For the quantitative implementation, I set the headquarters managerial-services requirement for practice adoption to $C(M_r) = \frac{1}{2} c_M M_r^2$. This is the parametric counterpart of the theory's marginal adoption requirement $c(m)$: it implies $c(m) = c_M m$ and therefore $c'(m) = c_M > 0$ when $c_M > 0$.

Demand and Agriculture. I estimate the demand and agricultural-production parameters directly from aggregate and district data. I set the CES elasticity across non-agricultural varieties to $\theta = 5$, which implies $\delta = (\theta - 1)/\theta = 0.8$. With Cobb–Douglas preferences over agriculture and non-agriculture, the non-agriculture expenditure share equals ϕ, so I set ϕ to the observed non-agriculture expenditure share. I estimate the agricultural labor share α_A from district-level agricultural output, agricultural labor, and cultivated land using

$$\ln Y_{As} = \ln A_{As} + \alpha_A \ln L_{As} + (1 - \alpha_A) \ln T_s,$$

and recover district agricultural productivity A_{As} from the fitted production function.

Occupational Choice. I use employment-status moments and the firm-size tail to discipline occupational choice. The upper tail of the firm-size distribution identifies the tail parameter ν_z, since the highest-skill individuals select into modern entrepreneurship in the model. The traditional-sector parameter λ_T governs the return to traditional self-employment. I calibrate it to match the 1950 share of self-employed and family workers in Table 3, approximately $0.27 + 0.38 = 0.65$. This moment anchors the reserve pool of traditional workers who can move into wage employment when modern firms expand.

Modern Production and Management Practices. I discipline the modern-firm block by combining external production elasticities with Japanese firm-network and management-practice moments. I take the rival-input elasticities from the manufacturing calibration in Engbom et al. (2025): $\alpha = 0.44$ for broad managerial and administrative services and $\beta = 0.36$ for production labor. I use these external values because the Japanese historical

wage-bill data do not cleanly separate production labor from managerial and administrative labor.

I calibrate the productivity return to management-practice adoption from experimental evidence. The benchmark sets $\eta_M = 0.49$, based on the TFP effect of management-practice adoption in Bloom et al. (2013). This parameter governs the productivity gain from a given level of adoption through $A(M_r) = \exp(\eta_M M_r)$. The Japan Productivity Center data instead discipline the cost side of adoption. I use JPC participation as a proxy for adoption effort, estimate the district-level response of JPC participation to local manager abundance, and normalize this response by mean participation. I then choose the adoption-cost scale c_M so that the model-implied response of M_r to manager abundance matches this normalized JPC slope. Thus, Bloom et al. (2013) disciplines the return to practices, while JPC disciplines how strongly practice adoption responds to manager scarcity.

I estimate the spatial and scope parameters from the firm-network data. The distance elasticity ρ is estimated from 1970 HQ-destination branch links, keeping outside-HQ-city links and matching the branch-gravity slope. Conditional on the externally calibrated production elasticities, the calibrated value of η_M, and the estimated distance elasticity, I estimate the establishment scope-cost parameter κ and the adoption-cost scale c_M jointly by minimum distance. The targeted moments are the share of firms with any outside-HQ establishment, average establishments per firm, average different-city facilities, and the normalized response of JPC participation to manager abundance.

District Fundamentals. In the quantitative implementation, each model region corresponds to a district defined by its 1960 boundaries. Conditional on the common parameters, I recover district fundamentals so that the model matches the 1970 distribution of population, agricultural activity, employment status, and manager employment. Demand shifters Ξ_s rationalize district non-agricultural expenditure and local market size. Agricultural productivity A_{As} is recovered from district output, land, and labor. Effective manager-supply shifters are recovered from observed 1970 manager counts. In the counterfactual analysis, I remove the white-collar repatriate component from these observed manager counts using the district-level non-low-skilled repatriate exposure converted to counts with the 1940 labor force.

5.2 Estimation Results

Table 9 reports the benchmark parameterization. The demand and agriculture estimates are $\phi = 0.80$ and $\alpha_A = 0.61$, and the externally calibrated elasticity $\theta = 5$ implies $\delta = 0.80$. The upper-tail estimate for skill and entrepreneurial productivity is $\nu_z = 6.87$. The traditional-sector parameter is $\lambda_T = 0.65$, matching the 1950 self-employed plus family-worker share.

The production and management-practice block separates rival managerial services from non-rival practice adoption. I set $\alpha = 0.44$ and $\beta = 0.36$ using the manufacturing calibration in Engbom et al. (2025). I set $\eta_M = 0.49$ using the TFP effect of management-practice adoption in Bloom et al. (2013). The Japanese firm-network data imply a branch-distance elasticity of $\rho = 1.45$. The minimum-distance estimator yields $\kappa = 4.68$ for the scope-cost parameter and $c_M = 0.99$ for the management-practice adoption-cost scale.

Table 9: Benchmark Structural Parameterization

Parameter	Description	Value or target
Demand and Agriculture		
θ	CES elasticity across varieties	5
δ	CES revenue curvature $(\theta - 1)/\theta$	0.80
ϕ	Non-agriculture expenditure share	0.80
α_A	Agriculture labor share	0.61
Occupational Choice		
ν_z	Skill and entrepreneur-productivity tail	6.87
λ_T	Traditional self-employment reach	0.65
Production and Management Block		
α	Rival managerial-services elasticity	0.44
β	Production-labor elasticity	0.36
η_M	Management-practice productivity return	0.49
ρ	Distance elasticity of remote expansion	1.45
κ	Scope-cost parameter	4.68
c_M	Management-practice adoption-cost scale	0.99

Notes: This table reports the parameterization used in the quantitative model. The parameter ϕ is estimated from the non-agriculture expenditure share, and α_A is estimated from district agricultural output, labor, and land. The tail parameter ν_z is estimated from the upper tail of the firm-size distribution. The parameter λ_T is calibrated to match the 1950 share of self-employed and family workers, approximately $0.27 + 0.38 = 0.65$, reported in Table 3. The elasticities α and β are externally calibrated from Engbom et al. (2025). The management-practice productivity return η_M is calibrated from Bloom et al. (2013). The distance elasticity ρ is estimated from 1970 HQ-destination branch-link data. The parameters κ and c_M are estimated by minimum distance using firm-network moments and the response of Japan Productivity Center participation to manager abundance.

5.3 Counterfactual Exercises

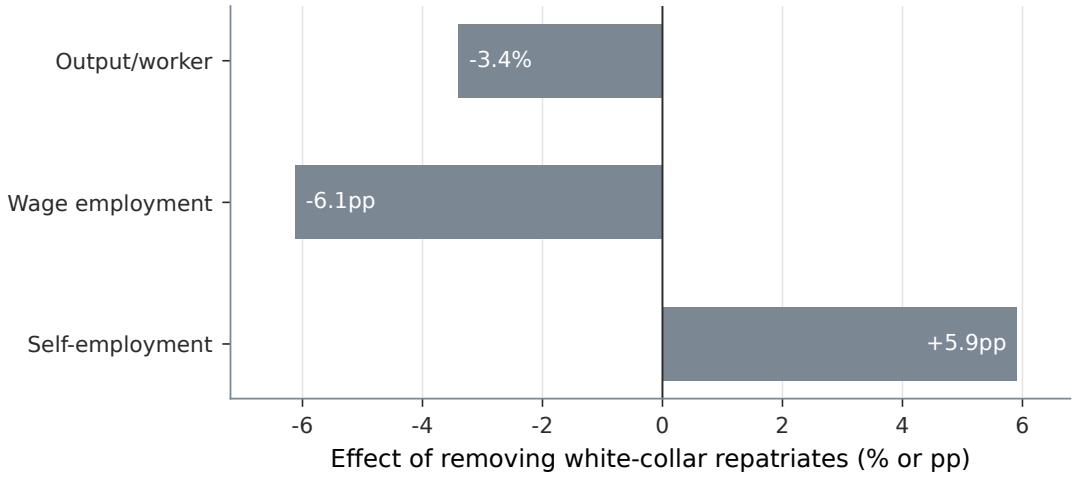
This subsection quantifies the contribution of white-collar repatriates through the manager-supply channel. I start from the estimated 1970 spatial general equilibrium and hold non-manager fundamentals fixed, including district population, land, agricultural productivity, demand shifters, and geography. I then remove the district-level white-collar repatriate component from observed 1970 manager counts, re-solve wages and occupational choices, and allow modern firms to adjust rival managerial services, management-practice adoption, entry, establishment size, and establishment networks. After clipping districts where the requested removal exceeds observed managers, this exercise removes about one quarter of observed 1970 manager employment.

The Role of Managers. The first counterfactual measures the aggregate effect of white-collar repatriates through manager supply. Removing the white-collar manager component lowers aggregate output per worker by about 3.4 percent and non-agricultural output per worker by about 4.1 percent. The wage-employment share falls by 6.1 percentage points, while the self-employed and family-worker share rises by 5.9 percentage points. On the firm side, establishments per baseline active firm fall by 17 percent and production workers per establishment fall by 6.6 percent. The counterfactual therefore captures the mechanism emphasized by the model: when managerial capacity becomes scarce, the cost of modern production rises, modern firms reduce production-labor demand, and workers move back toward traditional self-employment.

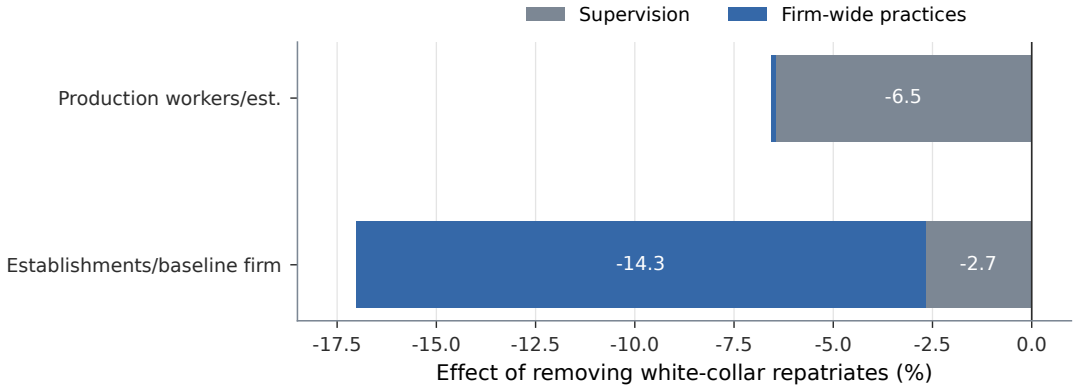
Panel (A) of Figure 7 reports the total effects on aggregate output and employment shares. Panel (B) decomposes the two firm margins where the manager channels map cleanly to outcomes. Removing managers lowers production workers per establishment by 6.6 percent, and almost all of this loss comes from rival managerial services: the rival contribution is 6.5 percentage points, while the non-rival contribution is only 0.1 percentage points. This is the Lucas margin. Managers are rival inputs that make each establishment larger by increasing supervision and coordination capacity. By contrast, establishments per baseline active firm fall by 17 percent, and the non-rival channel accounts for 14.3 percentage points of that loss, compared with 2.7 percentage points from rival services. This is the management-practice margin. Practices adopted at headquarters can be reused across establishments, so losing them sharply contracts the aggregate establishment network. The decomposition therefore separates the two roles of managers: rival services govern establishment size, while non-rival practices govern establishment expansion.

The Role of Multi-Establishment Networks. The second counterfactual asks whether multi-establishment networks amplify the effect of manager supply. I shut down non-HQ

Figure 7: The Two Roles of Managers



(A) Aggregate margins



(B) Firm-margin decomposition

Notes: This figure reports the effect of removing the white-collar repatriate component from observed 1970 manager counts. The counterfactual holds non-manager fundamentals fixed and re-solves the 1970 general equilibrium. Panel (A) reports total effects. Output per worker is reported as a percent change, while employment shares are reported in percentage points. Self-employment includes family workers. Panel (B) decomposes the two firm-margin effects into rival managerial-service and non-rival management-practice channels using the model channel decomposition. Production workers per establishment and establishments per baseline active firm are reported as percent changes. The latter divides aggregate establishment intensity by the baseline mass of active modern firms, so the denominator is fixed across the baseline and counterfactual.

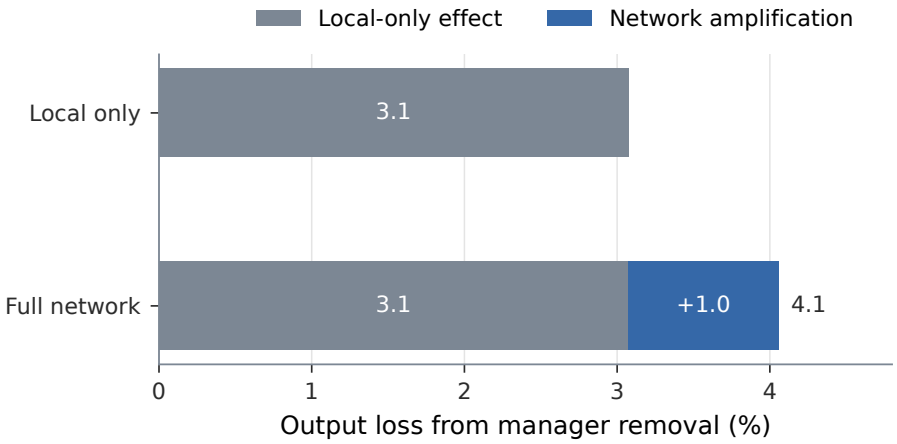
expansion by setting $\tau_{rs} = \infty$ for all $r \neq s$. In this local-only economy, modern firms may still hire managers, adopt management practices, and expand within the headquarters district, but they cannot open establishments in other districts. Relative to the baseline, shutting down non-HQ expansion lowers aggregate output per worker by 5.4 percent and non-agricultural output per worker by 6.7 percent. This level effect, shown in the right panel of Figure 8, indicates that cross-district establishment networks are quantitatively important in the observed 1970 economy.

To isolate the part of the manager effect transmitted through those networks, I compare the percent loss from manager removal with and without non-HQ expansion. Let $Y(m, n)$ denote an outcome when the white-collar manager component is either present ($m = 1$) or removed ($m = 0$), and when non-HQ expansion is either allowed ($n = 1$) or shut down ($n = 0$). I compute the percent decline from $Y(1, n)$ to $Y(0, n)$ under each network regime, and define network amplification as the difference between the full-network loss and the local-only loss. For non-agricultural output per worker, the full manager-removal effect is 4.1 percent. The local-only effect is 3.1 percent. The difference is 1.0 percentage point, implying that about one quarter of the non-agricultural output effect is transmitted through multi-establishment networks. The left panel of Figure 8 reports this decomposition graphically.

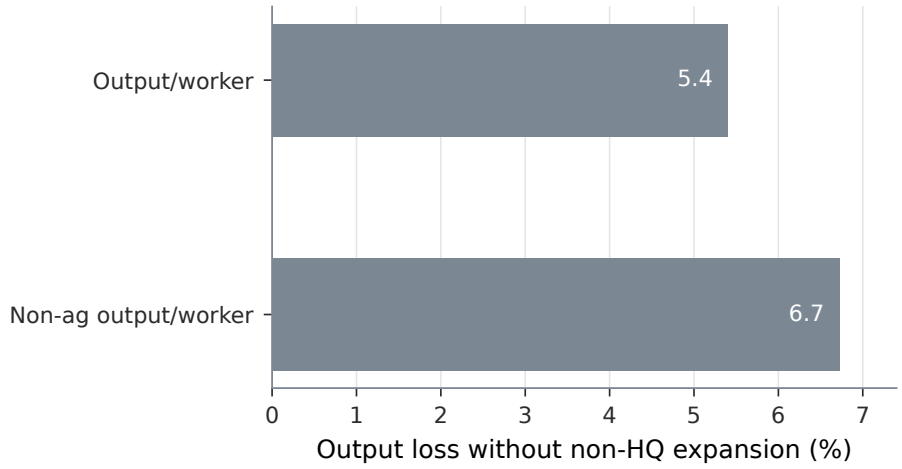
This decomposition shows that the gains from manager supply were not realized only through local firm expansion. A quantitatively important part came from firms headquartered in manager-abundant districts opening establishments elsewhere and transmitting organizational capacity across space. The result highlights a broader lesson for development: the aggregate return to managerial abundance depends partly on whether firms can convert managerial capacity into spatial expansion. In economies where local markets are fragmented by regulation, administrative barriers, or protection of local firms, this multi-establishment channel may be muted, limiting the growth effects of manager supply even when managers themselves become more abundant.[9]

[9]For evidence on subnational regulatory fragmentation, see OECD (2020), which documents overlapping central and regional regulations, large variation in local business licensing, and subnational regulations that conflict with national rules in decentralized Indonesia. For evidence on local protectionism, see Barwick et al. (2021), Fang et al. (2025), and Liu et al. (2022), who document discrimination against nonlocal firms in product markets, procurement and investment, and commercial disputes in China.

FIGURE 8: THE ROLE OF MULTI-ESTABLISHMENT NETWORKS



(A) MANAGER-EFFECT AMPLIFICATION



(B) NON-HQ EXPANSION SHUTDOWN

Notes: Panel (A) decomposes the percent loss in non-agricultural output per worker from removing the white-collar repatriate manager component into the local-only effect and the additional amplification from multi-establishment networks. The local-only effect shuts down non-HQ expansion in both the observed-manager and manager-removal economies. Panel (B) reports output losses from shutting down non-HQ expansion in the observed-manager 1970 equilibrium. Both panels report positive output losses in percent.

6 Conclusion

This paper studies the role of manager supply in firm growth and economic development by analyzing Japan's post-World War II repatriation, in which six million Japanese nationals returned from the former colonies. Using predetermined family registries and Allied logistics as instruments, I identify the differential effects of white-collar and production worker inflows on firm growth and economic development.

Three main empirical findings emerge. First, white-collar repatriates triggered structural transformation. Districts receiving more white-collar returnees experienced declines in agricultural employment, expansions in manufacturing and services, and an increase in output per worker. Moreover, white-collar exposure shifted local production from self-employed and family labor toward wage workers and outside managers, indicating a transition from traditional household production to scalable modern firms. Second, white-collar repatriates increased firm size on both the intensive and extensive margins. At the firm level, white-collar exposure not only raised the number of establishments per firm, but also increased the probability of operating outside the headquarters city and expanded the geographic span of the firm's establishment network. Third, white-collar repatriates increased firms' exposure to modern management practices, which allowed firms to grow. Neither group affected patenting, indicating that growth operated through organizational upgrading rather than innovation. White-collar repatriates provided the "visible hands" that enabled local firms to modernize and expand spatially (Chandler, 1977).

I develop a model that explains these patterns through occupational reallocation and firm growth. Individuals sort into production work, traditional self-employment, management, and modern entrepreneurship. Traditional self-employed producers operate small local varieties with limited scale, while modern firms hire managers and production workers and choose establishment intensity and market reach across districts. Managers have two roles. They provide rival services inside establishments, such as supervision and coordination, and they use headquarters time to adopt management practices that are non-rival within the firm. A larger manager supply lowers the cost of these margins, raises management practice adoption, increases establishment size, and expands firms' establishment networks across districts. As modern firms grow, they raise demand for production workers, pulling labor out of agriculture and traditional self-employment into wage work. Because the same headquarters management practices are reused across a larger establishment network, expansion raises the marginal product of managers. The model therefore links manager supply to structural transformation, spatial propagation, and growth, and implies both an

agglomeration force among headquarters managerial workers and weak equilibrium bias toward managers.

The counterfactual exercises show that these organizational margins matter quantitatively. Removing the white-collar repatriate shock lowers output per worker in 1970 by 3.4 percent and non-agricultural output per worker by 4.1 percent. I interpret this gap as the contribution of manager inflow to output per worker. Shutting down non-HQ establishment expansion shows that about one quarter of the non-agricultural output effect operates through firms' multi-establishment networks. A model without spatial firm organization would therefore understate the aggregate consequences of manager supply.

The historical setting may limit direct generalization to contemporary economies. That said, post-World War II Japan shared key features with today's low-income countries. The economy was predominantly agricultural, firms were organized as small family enterprises, and professional managers were scarce. In this sense, the findings offer insights for developing economies where traditional firm structures dominate and managerial constraints limit growth. The results suggest that policies expanding the supply of managerial human capital, through education, training programs, or skilled migration, could lower the costs of hiring outside managers and help economies transition from traditional to modern organizational forms, enabling productivity gains, economic growth, and spatial spillovers to other locations through firm expansion.

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Outline of the Appendix

A Data

This section details the construction of the primary datasets used in the analysis. The project relies on three main data sources: (1) novel microdata on repatriates digitized from archival survey records, (2) firm-level microdata digitized from business directories, and (3) district-level economic and demographic data from the Population Census and other government statistics. Table A1 summarizes these datasets.

Table A1: Summary of Data Sources

Dataset	Years	Sample/Coverage	Source
Repatriation and Firm Microdata			
Repatriate Survey	1964	460,000 households	Kanagawa Archives
Teikoku Directory	1938, 1970	All registered firms	TDB-CAREE
JPC Mission Database	1955–1975	Participating firms	Umezaki et al.
Census and Establishment Data			
Population Census	1920–1970	All districts	Statistics Bureau
Census of Commerce	1960	All establishments	MITI
Census of Manufactures	1960	Estab. with 4+ employees	MITI
Prefectural Yearbooks	1940	All districts	J-DAC
Other Data Sources			
Tax Statistics	1934	All tax districts	MOF
IIP Patent Database	1964–1970	All applications	IIP
War Damage	1945	All districts	ESB (1949)
Transportation	1920–1970	All stations/exits	MLIT
Universities	1920–1970	All universities	MEXT

Notes: JPC = Japan Productivity Center. The JPC Mission Database was compiled by Umezaki et al. (n.d.). J-DAC = Japan Digital Archives Center (Prefectural Statistical Online). MITI = Ministry of International Trade and Industry. MOF = Ministry of Finance. ESB = Economic Stabilization Board. IIP = Institute of Intellectual Property. MLIT = Ministry of Land, Infrastructure, Transport and Tourism. MEXT = Ministry of Education, Culture, Sports, Science and Technology. TDB-CAREE = Teikoku Databank Center for Advanced Empirical Research on Enterprise and Economy.

A.1 Repatriation Microdata

I construct a novel dataset of repatriates by digitizing the *Zaigai Shiyu Zaisan Jittai Chosa Hyo* (Survey on the Actual Status of Overseas Private Assets) stored at the Kanagawa Prefectural Archives. This survey was conducted in November 1964 by the National Federation of Repatriate Organizations (*Hikiagesha Dantai Zenkoku Rengo-kai*). Its primary purpose was to document the assets left behind by Japanese nationals in the former colonies to inform compensation policies. As described in Matsuzaki (2019), the original survey slips were stored in cardboard boxes at the Federation's office before being transferred to the archives, where they were eventually organized and digitized. The sample covers approximately 460,000 households. Unfortunately, the Kanagawa Prefectural Archives do not contain

records for Kagoshima and Yamanashi prefectures. I randomly chose and digitized 15% of total households.

Although the survey was conducted in 1964, it provides detailed information on each household's status as of August 15, 1945 (the end of World War II). Key variables include the name of the household head, their occupation in the colonies, their last address abroad, their family registry (*honseki*), and their post-repatriation settlement location in Japan.

A.2 Firm and Establishment Data

Firm-Level Data. To measure firm modernization and organizational structure, I use the *Teikoku Ginkou Kaisha Yoroku* (Teikoku Bank and Company Directory) for the years 1938 and 1970. The data for available prefectures (Osaka, Kyoto, Hyogo, Fukuoka, Aichi, Shizuoka, Nagano, and Gunma) were obtained from the Teikoku Databank Center for Advanced Empirical Research on Enterprise and Economy (TDB-CAREE) database at Hitotsubashi University (Teikoku Databank Center for Advanced Empirical Research on Enterprise and Economy, 2024). For prefectures not covered by the database, I digitized the corresponding directories to create a complete national dataset. I digitized randomly selected firms in each page of the *Teikoku Ginkou Kaisha Yoroku*. The directory was compiled by Teikoku Koshinsho (now Teikoku Databank). It covers joint-stock companies (*Kabushiki Kaisha*), limited partnerships (*Goshi Kaisha*), and unlimited partnerships (*Gomei Kaisha*). The directory lists firms meeting a minimum capital threshold, which varies by year (e.g., 50,000 yen in 1938 and generally 1 million yen in 1957). Thus, it covers the universe of medium and large enterprises but excludes smaller firms. Crucially, starting from the postwar editions, the directory includes the number of employees and annual sales, in addition to standard financial and organizational variables like capital, board members, and establishment year. I use this data to construct measures of firm scale (employees, capital) and scope (number of establishments).

Japan Productivity Center Overseas Study Missions. To measure firms' exposure to modern management practices, I use the unpublished *Japan Productivity Center Overseas Study Mission Database, 1955–1975,* compiled by Umezaki et al. (n.d.). The database identifies firms that participated in overseas missions organized by the Japan Productivity Center to study management, production, labor relations, marketing, and organization. I construct an indicator for participation by 1970 and the number of missions attended by 1970. These measures capture firms' exposure to management training rather than the adoption of specific practices.

Service and Manufacturing Establishments and Output (1960). For 1960, I use establishment counts and output from the *Shogyo Tokei Chosa* (Census of Commerce) (Ministry of

International Trade and Industry, 1961) and the *Kogyo Tokei Chosa* (Census of Manufactures) (Ministry of International Trade and Industry, 1960). The 1960 Census of Manufactures is the earliest edition providing municipality-level data, allowing for consistent district-level analysis.

A.3 District Economic Data

Population Census. I construct a panel of sectoral employment shares (agriculture, manufacturing, and services) and employment status (self-employed, family labor, wage workers, and managers) from the Population Census of Japan (*Kokusei Chosa*) for 1920–1970 (Statistics Bureau, 2024). Employment status variables are available only after World War II. The data are aggregated to 1960 district (*gun* or *shi*) boundaries using the procedure described in Section B.6.

Pre-World War II Output Data. I obtain prewar output data from the *Zeimu Tokei Sho* (Tax Statistics) for fiscal year 1934 (Ministry of Finance, 1934). I use the *Eigyo Shueki Zei* (Business Profits Tax), levied on net profits of commercial and industrial enterprises, as a proxy for local non-agricultural economic activity before the war. The data reports taxpayer counts and taxable profits at the city (*shi*) and county (*gun*) levels.

Patents. I obtain patent data from the Institute of Intellectual Property (IIP) Patent Database 2020 edition (*IIP Patent Database 2020-nen ban*) (Nakamura, 2016). This database covers approximately 12.7 million patent applications filed since 1964. I use the number of patent applications filed by residents of each district to measure local innovation output between 1964 and 1970.

A.4 Geography and Infrastructure

War Damage. To control for the destruction caused by WWII, I use data on buildings destroyed by air raids. The data are originally from Economic Stabilization Board (1949), which I obtain via Davis and Weinstein (2002).

Transportation Infrastructure. I construct a district-level panel of transportation infrastructure, specifically the number of railway stations and highway interchanges. The data are obtained from the National Land Numerical Information download service provided by the Ministry of Land, Infrastructure, Transport and Tourism (Ministry of Land, Infrastructure, Transport and Tourism, 2024).

Universities. Data on the location and establishment year of universities are collected from the *Zenkoku Daigaku Ichiran* (National List of Universities) (Ministry of Education, Culture,

Sports, Science and Technology, 2023). I use this to count the stock of universities in each district over time.

B Additional Empirical Results

B.1 Summary Statistics of Repatriate Share

Table A2: Summary Statistics of Repatriate Shares

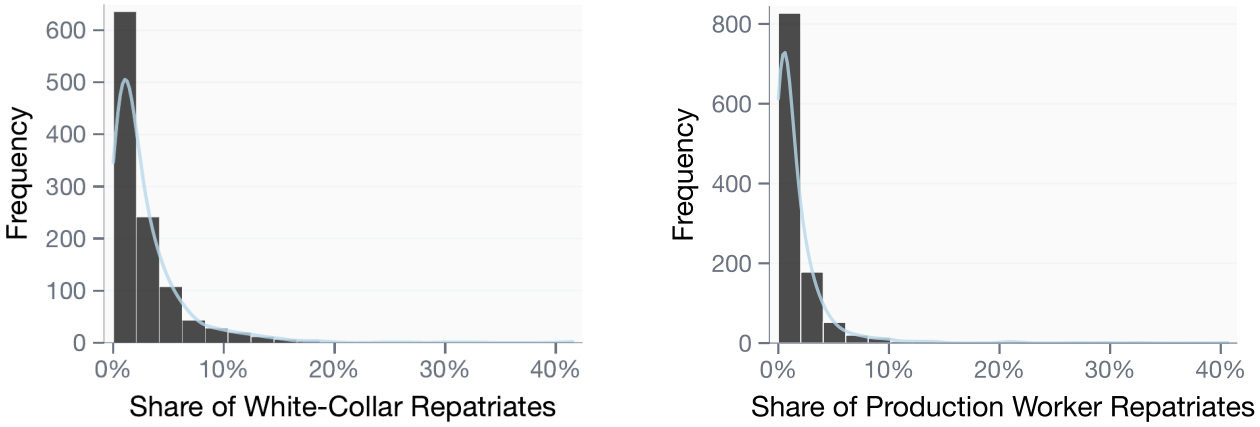
	Production-worker repatriate share	White-collar repatriate share
10th percentile	0.000	0.003
50th percentile	0.008	0.017
90th percentile	0.038	0.067
Mean	0.017	0.029
Standard deviation	0.030	0.038
N	1,107	

Notes: This table reports selected summary statistics for district-level production-worker and white-collar repatriate shares in 1950. Each share is the corresponding repatriate inflow divided by the district's 1940 labor force.

B.2 Repatriate Share Distribution

Figure A1 plots the distribution of white-collar and production worker repatriate inflows normalized by the 1940 district labor force. Both distributions show geographic heterogeneity. Although the majority of districts received inflows below 5%, the distributions are characterized by a pronounced right skew, with a long tail of districts absorbing significantly larger population shocks. This cross-sectional variation in exposure intensities for both skill groups serves as the primary source of identification.

Figure A1: Repatriate Share Distribution



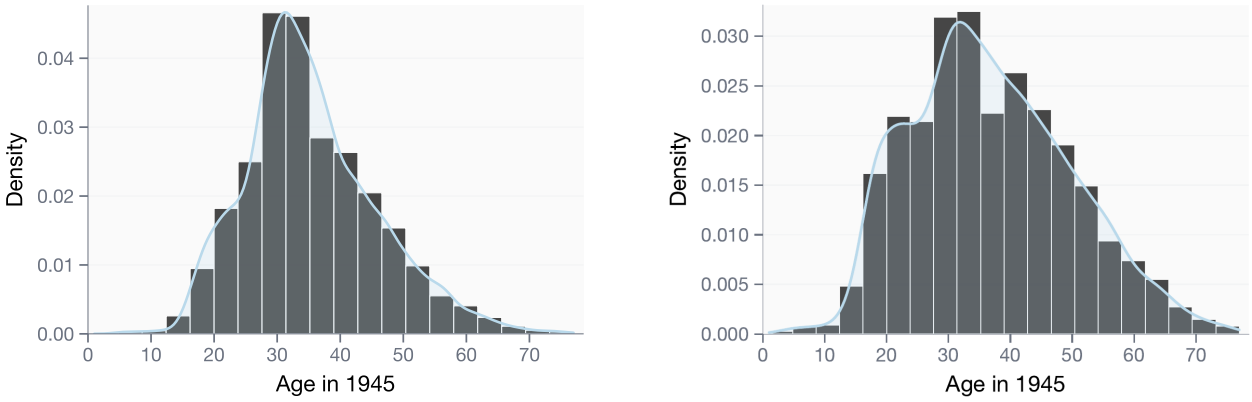
(A) White-Collar (B) Production Worker

Notes: This figure plots the distribution of white-collar (Panel A) and production worker (Panel B) repatriate shares in 1945. The histograms show the density of districts in each repatriate share bin, and the curves represent kernel density estimates.

B.3 Repatriate Age Distribution

Figure A2 presents the age distributions for white-collar and production worker repatriates. Both groups were predominantly working-age adults, with the distribution concentrated between ages 20 and 40. The similar age profiles rule out lifecycle differences as a driver of their divergent economic effects.

FIGURE A2: REPATRIATE AGE DISTRIBUTION



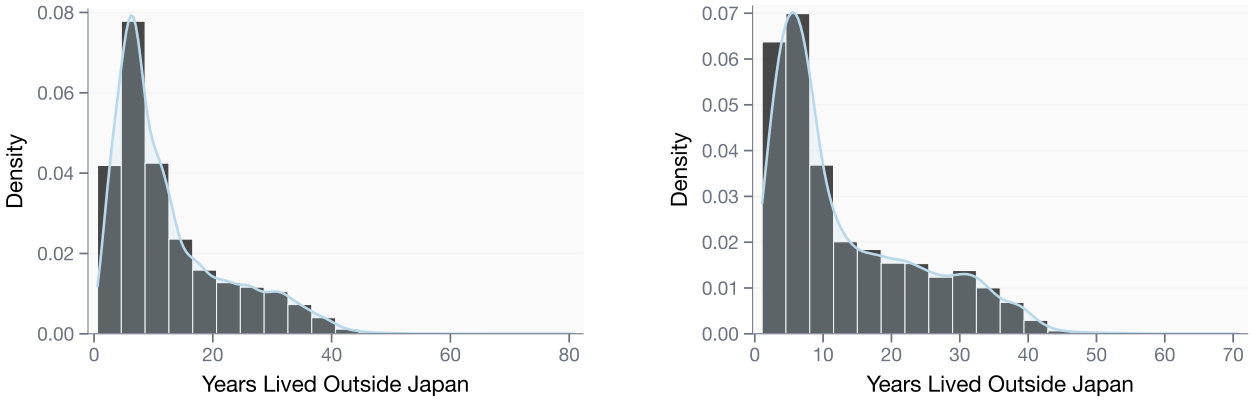
(A) WHITE-COLLAR (B) PRODUCTION WORKER

Notes: This figure plots the age distribution of white-collar (Panel A) and production worker (Panel B) repatriates in 1945. The histograms show the density of individuals in each age bin, and the curves represent kernel density estimates.

B.4 Repatriate Length of Stay Distribution

Figure A3 shows the distribution of the length of stay in the colonies for white-collar and production worker repatriates. Many repatriates, especially white-collar ones, lived abroad for several years, suggesting sustained exposure to colonial administrative and business operations.

Figure A3: Repatriate Length of Stay Distribution



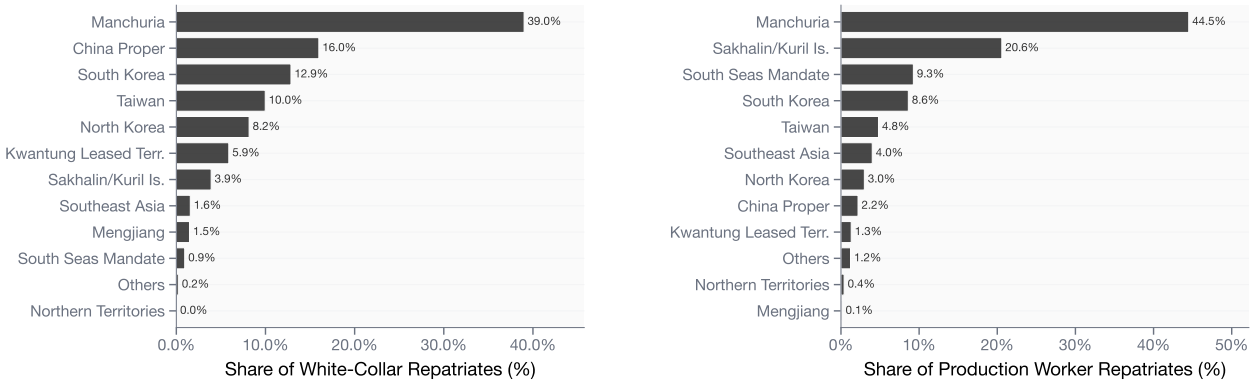
(A) White-Collar (B) Production Worker

Notes: This figure plots the distribution of the number of years spent in the colonies/occupied territories for white-collar (Panel A) and production worker (Panel B) repatriates. The histograms show the density of individuals by years of residence, and the curves represent kernel density estimates.

B.5 Distribution of Colonies

Figure A4 shows the distribution of white-collar and production worker repatriates by their region of origin. Manchuria was the single largest source for both groups, accounting for nearly 40% of all returnees. However, there are notable differences: white-collar repatriates were more likely to return from Manchuria and North China, reflecting the administrative and industrial nature of Japan's presence there, whereas production worker repatriates were more dispersed across other regions.

Figure A4: Colony Distribution



(A) White-Collar (B) Production Worker

Notes: This figure displays the breakdown of white-collar (Panel A) and production worker (Panel B) repatriates by their region of last residence. The horizontal bars represent the percentage of the group's population returning from each specific colony or occupied territory.

B.6 Geographic Crosswalks and Standardized Boundaries

To address the methodological challenges associated with changing administrative boundaries over time, I implement a spatial standardization procedure using 1960 district boundaries as the reference unit. Following Eckert et al. (2020), I construct geographic crosswalks by intersecting historical district boundaries with the 1960 reference map. This process generates a set of time-invariant spatial units, with area-based weights linking historical districts to their 1960 counterparts.

For historical year t, weights are calculated as:

$$w_{rs}^{(t)} = \frac{A_{rs}^{(t)}}{A_s^{(t)}} \quad \forall\, r \in \mathcal{R}_{1960},\, s \in \mathcal{R}_t,$$

where $w_{rs}^{(t)}$ is the weight linking 1960 district r to historical district s, $A_{rs}^{(t)}$ is their intersection area, $A_s^{(t)}$ is the total area of historical district s, $\mathcal{R}_{1960}$ is the set of reference districts, and $\mathcal{R}_t$ is the set of districts in year t.

For a historical variable X (e.g., population in 1940), its value in 1960 boundaries is:

$$X_{r,t}^{1960} = \sum_{s \in \mathcal{R}_t} w_{rs}^{(t)} X_{s,t}.$$

For example, consider a 1960 district r that overlaps with two 1940 districts: if 1940 District A has population 100 and 20% of its area overlaps with district r, and 1940 District B has population 10 and 100% of its area overlaps with district r, then the 1940 population assigned to 1960 district r is $X_{r,1940}^{1960} = (100 \times 0.2) + (10 \times 1.0) = 30$. This area-weighted reallocation assigns 30 people from 1940 to the 1960 boundaries of district r.

B.7 Repatriate Settlement Discrete Choice Results

The conditional logit model used to construct the instrument assumes that each repatriate i, routed to landing port $\ell(i)$ by colonial origin and Allied shipping logistics, chooses a final settlement district r to maximize utility. The utility specification includes two key shifters: (i) an indicator for whether the destination matches the repatriate's ancestral *honseki* registry, capturing historically-rooted ties to ancestral places, and (ii) log distance from the assigned landing port to the destination, encoding repatriation logistics rather than postwar economic prospects. Both shifters are predetermined and plausibly exogenous to postwar local economic conditions. Table A3 reports maximum likelihood estimates. The large positive coefficient on *honseki* indicates that repatriates were much more likely to settle in their ancestral home district, while the negative coefficient on log distance shows that

settlement probability declined with distance from the landing port. These estimates are used to compute predicted settlement probabilities, which are then aggregated to construct the instrumental variable for district-level repatriate shares.

$$U_{ir}^{g} = \underbrace{\beta_{h}^{g} \cdot \mathbf{1}\{r = h_i\}}_{\text{Family-registry tie}} + \underbrace{\beta_{d}^{g} \cdot \log d_{\ell(i)r}}_{\text{Landing-port access}} + \varepsilon_{ir}^{g} \tag{30}$$

with $\varepsilon_{ir}^{g} \sim$ i.i.d. Type-I extreme value. Conditional on the landing port, this delivers a conditional-logit probability for each destination district.

Table A3: Discrete Choice Model of Repatriate Settlement

	Final settlement choice
	(1)
Honseki tie	7.987***
	(0.011)
Log distance from landing port	-0.578***
	(0.006)

Notes: This table reports maximum-likelihood estimates of Equation (30) from the conditional logit model of repatriate settlement. The dependent variable is the final settlement choice. The reported covariates are an indicator for whether a destination contains the repatriate's *honseki* and log distance from the assigned landing port. Standard errors are clustered by individual.

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

B.8 Other Channels

To see the impact of repatriate settlement on the development of universities and transportation infrastructure, I estimate the following difference-in-differences regression:

$$Y_{rt} = \beta_0 + \beta_1 \text{White-Collar}_{r,1950} + \beta_2 \text{Production Worker}_{r,1950} + \lambda_t + \alpha_r + \mu_{p(r)} + \varepsilon_{rt} \tag{31}$$

where Y_{rt} is the number of universities per capita and the number of stations and highway exits per capita, $\text{White-Collar}_{r,1950}$ is the white-collar repatriate share, $\text{Production Worker}_{r,1950}$ is the production worker repatriate share, λ_t denotes the time fixed effect, α_r denotes the district fixed effect, and $\mu_{p(r)}$ denotes the prefecture fixed effect.

Next, I examine the impact of repatriate settlement on patenting. I estimate the following difference-in-differences regression:

TABLE A4: REPATRIATE INFLOWS, UNIVERSITIES, AND TRANSPORTATION (IV)

	Universities per capita	Stations and highway exits per capita
	(1)	(2)
Production-worker repatriate share	-0.00	-0.00*
	(0.00)	(0.00)
White-collar repatriate share	-0.00	-0.00***
	(0.00)	(0.00)
N	6,642	5,535
F-statistic	58.12	58.12

Notes: This table reports district-year 2SLS estimates of Equation (31). The dependent variables are universities per capita and the number of railway stations and highway exits per capita. Postwar interactions with white-collar and production-worker repatriate shares are instrumented with the corresponding predicted-share interactions. The specification includes district, year, and prefecture-by-year fixed effects. Standard errors are clustered by district and reported in parentheses. The F-statistic is the Kleibergen–Paap rk Wald weak-identification statistic.

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

$$P_{r,1970-1964} = \beta_0 + \beta_1 \text{White-Collar}_r + \beta_2 \text{Production Worker}_r + \boldsymbol{X}_r'\Gamma + \mu_{p(r)} + \varepsilon_r \tag{32}$$

where $P_{r,1970-1964}$ is the number of patents filed per capita between 1964 and 1970, White-Collar_r is the white-collar repatriate share, $\text{Production Worker}_r$ is the production worker repatriate share, $\boldsymbol{X}_r'\Gamma$ denotes the usual controls. $\mu_{p(r)}$ is the prefecture fixed effect.

B.9 Secondary Repatriates

As a robustness check, I include secondary worker repatriate share in the main specification.

Table A5: Repatriate Inflows and Patenting (IV)

	Patents per capita, 1964–1970	
	(1)	(2)
Production-worker repatriate share	-0.01	0.01
	(0.01)	(0.01)
White-collar repatriate share	-0.00	-0.00
	(0.00)	(0.00)
N	1,107	1,107
F-statistic	58.07	56.11
Prefecture fixed effects	✓	✓
Log density, 1940		✓
War destruction		✓

Notes: This table reports district-level 2SLS estimates of Equation (32). The dependent variable is patent applications per capita between 1964 and 1970. White-collar and production-worker repatriate shares are instrumented with their predicted settlement shares. Both columns include prefecture fixed effects; Column 2 additionally controls for log population density in 1940 and war damage. Standard errors are clustered by district and reported in parentheses. The F-statistic is the Kleibergen–Paap rk Wald weak-identification statistic. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

TABLE A6: REPATRIATES AND LOCAL STRUCTURAL TRANSFORMATION (IV)

Panel A: Log labor-force change	1960–1940			1940–1930	1930–1920
	(1)	(2)	(3)	(4)	(5)
Production-worker repatriate share	2.55**	2.23**	-0.18	0.06	-0.10
	(0.99)	(0.95)	(1.02)	(0.69)	(0.36)
White-collar repatriate share	4.11***	3.87***	2.10***	-2.20***	0.40**
	(0.72)	(0.69)	(0.75)	(0.84)	(0.19)
F-statistic	48.03	46.13	45.88	45.88	45.88
Panel B: Agriculture employment-share change					
	(1)	(2)	(3)	(4)	(5)
Production-worker repatriate share	0.12	0.11	0.13	-0.11	0.18**
	(0.37)	(0.37)	(0.37)	(0.14)	(0.08)
White-collar repatriate share	-0.81***	-0.81***	-0.81***	0.06	-0.03
	(0.27)	(0.27)	(0.26)	(0.12)	(0.08)
F-statistic	62.30	62.17	62.01	62.01	62.01
Panel C: Manufacturing employment-share change					
	(1)	(2)	(3)	(4)	(5)
Production-worker repatriate share	0.35	0.35	0.34	0.03	-0.04
	(0.27)	(0.27)	(0.26)	(0.07)	(0.06)
White-collar repatriate share	0.24	0.24	0.23	-0.01	0.02
	(0.18)	(0.18)	(0.17)	(0.05)	(0.05)
F-statistic	62.30	62.17	63.12	63.12	63.12
Panel D: Service employment-share change					
	(1)	(2)	(3)	(4)	(5)
Production-worker repatriate share	-0.46**	-0.46**	-0.47***	0.08	-0.15***
	(0.18)	(0.18)	(0.18)	(0.11)	(0.04)
White-collar repatriate share	0.57***	0.57***	0.57***	-0.04	0.00
	(0.14)	(0.14)	(0.14)	(0.08)	(0.03)
N	1,107	1,107	1,107	1,107	1,107
F-statistic	62.30	62.17	62.68	62.68	62.68
Prefecture fixed effects	✓	✓	✓	✓	✓
Log density, 1940	✓	✓	✓	✓	✓
War destruction		✓	✓	✓	✓
Baseline outcome			✓	✓	✓

Notes: This table reports 2SLS estimates of Equation (2) after adding the secondary-worker repatriate share to the controls. Panel A reports changes in log labor force. Panels B–D report changes in the agriculture, manufacturing, and service employment shares. Columns 1–3 use changes from 1940 to 1960. Columns 4–5 use pre-repatriation changes from 1930 to 1940 and 1920 to 1930. White-collar and production-worker repatriate shares are instrumented with their predicted settlement shares. Other controls are indicated at the bottom of the table. Standard errors are clustered by district and reported in parentheses. The F-statistic is the Kleibergen–Paap rk Wald weak-identification statistic.

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table A7: Repatriate Inflows, Establishment Scale, and Output per Worker (IV)

	Log number of establishments (1960–1950)	Log employees per establishment (1960–1950)	Log revenue per worker (1960–1940)
	(1)	(2)	(3)
Production-worker repatriate share	0.65	-1.22	-1.21
	(1.31)	(1.18)	(0.85)
White-collar repatriate share	2.57***	2.12**	1.68***
	(0.88)	(0.95)	(0.55)
N	1,100	1,090	1,102
F-statistic	63.18	56.00	65.03

Notes: This table reports 2SLS estimates of Equation (2) after adding the secondary-worker repatriate share to the controls. The dependent variables are changes in log establishments and log employees per establishment from 1950 to 1960. Column 3 instead reports the change in log revenue per worker from 1940 to 1960. White-collar and production-worker repatriate shares are instrumented with their predicted settlement shares. Other controls include prefecture fixed effects, log population density in 1940, war damage, and the baseline value of the corresponding outcome. Standard errors are clustered by district and reported in parentheses. The F-statistic is the Kleibergen–Paap rk Wald weak-identification statistic.

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table A8: Repatriate Inflows and Employment Organization (IV)

	Self-employed share (1970–1950)	Family-worker share (1970–1950)	Wage-worker share (1970–1950)	Manager share (1970–1950)
	(1)	(2)	(3)	(4)
Production-worker repatriate share	0.07	0.18*	-0.24	-0.01
	(0.07)	(0.11)	(0.15)	(0.02)
White-collar repatriate share	-0.28***	-0.11*	0.34***	0.02**
	(0.05)	(0.06)	(0.09)	(0.01)
N	1,107	1,107	1,107	1,107
F-statistic	63.59	61.84	62.42	61.79

Notes: This table reports 2SLS estimates of Equation (2) after adding the secondary-worker repatriate share to the controls. The dependent variables are changes from 1950 to 1970 in the shares of self-employed workers, family workers, wage workers, and managers, including public-sector managers. White-collar and production-worker repatriate shares are instrumented with their predicted settlement shares. Other controls include prefecture fixed effects, log population density in 1940, war damage, and the 1950 value of the corresponding outcome. Standard errors are clustered by district and reported in parentheses. The F-statistic is the Kleibergen–Paap rk Wald weak-identification statistic.

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table A9: Repatriate Inflows and Firms' Spatial Expansion (IV)

	Log number of establishments	Operates outside HQ city	Maximum HQ–establishment distance (km)
	(1)	(2)	(3)
Post × production-worker repatriate share	-4.63*	-4.75**	-1093.40**
	(2.62)	(1.97)	(481.61)
Post × white-collar repatriate share	4.49	5.20**	1254.15**
	(3.08)	(2.36)	(570.88)
N	78,455	78,455	78,455
F-statistic	35.67	35.67	35.67

Notes: This table reports repeated-cross-section 2SLS estimates of Equation (3) after adding the secondary-worker repatriate share to the controls. The dependent variables are log establishments per firm, an indicator for operating at least one establishment outside the headquarters city, and maximum headquarters-establishment distance in kilometers. The sample consists of firm cross sections from 1938, 1957, and 1970. The specification includes headquarters-district and year fixed effects. Postwar interactions with actual repatriate shares are instrumented with the corresponding predicted-share interactions. Standard errors are clustered by district and reported in parentheses. The F-statistic is the Kleibergen–Paap rk Wald weak-identification statistic.

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

C Theory

C.1 Proof of Proposition 1

I prove each statement in turn. Throughout, consider the partial equilibrium effect of a fall in the headquarters manager wage w_{Mr}, holding demand shifters fixed. General equilibrium wage responses are discussed below.

First, consider the firm's choice of headquarters management practices. For an interior choice of M_r, the management practice first order condition is

$$\chi \sum_{s=1}^{R} x(n_{rs}^*)\pi_{rs}^o(z, M_r) \log b(M_r) = w_{Mr} c(M_r), \tag{33}$$

where

$$\pi_{rs}^o(z, M_r) = K_s[zA(M_r)]^\chi, \qquad \chi = \frac{\delta}{1 - \delta(\alpha + \beta)}. \tag{34}$$

Define

$$\mathcal{F}(M_r, w_{Mr}) \equiv \chi \sum_{s=1}^{R} x(n_{rs}^*)\pi_{rs}^o(z, M_r) \log b(M_r) - w_{Mr} c(M_r). \tag{35}$$

The first order condition is $\mathcal{F}(M_r, w_{Mr}) = 0$. Under the second order condition for the management practice choice,

$$\mathcal{F}_{M_r}(M_r, w_{Mr}) < 0. \tag{36}$$

Moreover,

$$\mathcal{F}_{w_M}(M_r, w_{Mr}) = -c(M_r) < 0. \tag{37}$$

By the implicit function theorem,

$$\frac{\partial M_r^*}{\partial w_{Mr}} = -\frac{\mathcal{F}_{w_M}}{\mathcal{F}_{M_r}} < 0. \tag{38}$$

Therefore, a decline in the manager wage w_{Mr} raises the optimal level of management practice adoption:

$$w_{Mr} \downarrow \quad \Rightarrow \quad M_r^*(z) \uparrow . \tag{39}$$

Since $A'(M_r) > 0$, this also raises firm productivity:

$$M_r^*(z) \uparrow \quad \Rightarrow \quad A(M_r^*(z)) \uparrow . \tag{40}$$

Second, consider establishment size. For a given M_r, full-reach operating revenue in region s is

$$R_{rs} = \Xi_s \left[zA(M_r) S_{rs}^{\alpha} L_{rs}^{\beta} \right]^{\delta}. \tag{41}$$

The first order conditions for local managerial services and production labor are

$$w_{Ms} S_{rs}^{*} = \alpha\delta R_{rs}^{*}, \qquad w_{Ps} L_{rs}^{*} = \beta\delta R_{rs}^{*}. \tag{42}$$

Optimized revenue satisfies

$$R_{rs}^{*} = \left[\Xi_s (\alpha\delta)^{\alpha\delta} (\beta\delta)^{\beta\delta} w_{Ms}^{-\alpha\delta} w_{Ps}^{-\beta\delta} \right]^{\frac{1}{1-\nu}} [zA(M_r)]^{\chi}, \qquad \nu \equiv \delta(\alpha+\beta) < 1. \tag{43}$$

Thus, holding local input wages fixed,

$$A(M_r) \uparrow \quad \Rightarrow \quad R_{rs}^{*} \uparrow. \tag{44}$$

Using (42), higher optimized revenue raises both local production labor and local rival managerial services:

$$L_{rs}^{*}(z) \uparrow, \qquad S_{rs}^{*}(z) \uparrow. \tag{45}$$

In general equilibrium, this conclusion continues to hold whenever the productivity effect from higher $A(M_r)$ dominates any induced increase in local input wages.

Third, consider establishment intensity. Let

$$N_r^{*} \equiv \sum_{s=1}^{R} n_{rs}^{*}. \tag{46}$$

For an interior establishment intensity choice, the first order condition is

$$x'(n_{rs}^{*}) \pi_{rs}^{o}(z, M_r) = \tau_{rs} + \kappa N_r^{*}, \tag{47}$$

with $\tau_{rr} = 0$. Around the symmetric equilibrium, active destination markets are symmetric, so write $n_{rs}^{*} = n_r^{*}$, $\pi_{rs}^{o} = \pi_r^{o}$, and $N_r^{*} = J_r n_r^{*}$, where J_r is the number of active markets. Then (47) becomes

$$x'(n_r^{*}) \pi_r^{o} = \tau + \kappa J_r n_r^{*}. \tag{48}$$

Differentiating with respect to π_r^{o} gives

$$\left[-x''(n_r^{*}) \pi_r^{o} + \kappa J_r \right] \frac{\partial n_r^{*}}{\partial \pi_r^{o}} = x'(n_r^{*}). \tag{49}$$

Since $x'(n) > 0$, $x''(n) < 0$, $\pi_r^o > 0$, and $\kappa J_r \geq 0$,

$$\frac{\partial n_r^*}{\partial \pi_r^o} > 0. \tag{50}$$

Because

$$M_r^* \uparrow \quad \Rightarrow \quad A(M_r^*) \uparrow \quad \Rightarrow \quad \pi_{rs}^o(z, M_r^*) \uparrow, \tag{51}$$

establishment intensity rises:

$$n_{rs}^*(z) \uparrow . \tag{52}$$

Fourth, consider agricultural employment. Modern firm expansion raises non agricultural demand for production workers. If local production worker supply is not perfectly elastic, the outward shift in non agricultural labor demand raises the production worker wage:

$$L_{Ns}^d \uparrow \quad \Rightarrow \quad w_{Ps} \uparrow . \tag{53}$$

Agricultural labor demand is pinned down by

$$w_{Ps} = \alpha_A A_{As} L_{As}^{\alpha_A - 1} T_s^{1-\alpha_A}. \tag{54}$$

Solving for agricultural employment,

$$L_{As} = \left(\frac{\alpha_A A_{As} T_s^{1-\alpha_A}}{w_{Ps}} \right)^{\frac{1}{1-\alpha_A}}. \tag{55}$$

Since $\alpha_A \in (0, 1)$,

$$\frac{\partial \log L_{As}}{\partial \log w_{Ps}} = -\frac{1}{1-\alpha_A} < 0. \tag{56}$$

Therefore,

$$w_{Ps} \uparrow \quad \Rightarrow \quad L_{As} \downarrow . \tag{57}$$

Fifth, production-worker employment in modern firms rises. Modern-firm production employment in region s is

$$E_{Ps}^M = \sum_{r=1}^{R} \sum_{g \in \{B,W\}} H_{gr} \int_{\mathcal{E}_{gr}} x(n_{rs}^*(z)) L_{rs}^*(z) dG(z), \tag{58}$$

where $\mathcal{E}_{gr}$ denotes the set of type-g modern entrepreneurs headquartered in region r. From the previous steps, a manager supply shock raises L^*_{rs} and n^*_{rs}, subject to wage responses that do not dominate the productivity effect. Hence E^M_{Ps} rises. Manager headcount is

$$E_{Ms} = \sum_{g \in \{B,W\}} H_{gs} \int_{\mathcal{M}_{gs}} dG(z). \tag{59}$$

Managerial services S_{rs} and $C(M_r)$ are efficiency units rather than worker headcounts, so they cannot be added directly to E^M_{Ps}. Total modern wage employment rises whenever the increase in E^M_{Ps} exceeds any decline in E_{Ms}.

Finally, consider traditional self-employment. Under the occupational ordering illustrated in Figure 6, the cutoff between production work and self-employment is common across background types and satisfies

$$z_{1s} = \left(\frac{w_{Ps}}{\lambda_T \Xi_s} \right)^{1/\delta}. \tag{60}$$

The cutoff between self-employment and management is type specific:

$$z_{2gs} = \left(\frac{\lambda_T \Xi_s}{a_g w_{Ms}} \right)^{1/(1-\delta)}. \tag{61}$$

Type g chooses traditional self-employment for $z \in [z_{1s}, z_{2gs})$. Let $\omega_{gs} \equiv H_{gs}/H_s$ denote the population share of type g in region s. With Pareto skills and the normalization $\underline{z} = 1$, the aggregate traditional self-employment share is

$$s^T_s = \sum_{g \in \{B,W\}} \omega_{gs} \left[G(z_{2gs}) - G(z_{1s}) \right] = z_{1s}^{-\nu_z} - \sum_{g \in \{B,W\}} \omega_{gs} z_{2gs}^{-\nu_z}. \tag{62}$$

Holding background shares fixed and differentiating,

$$ds^T_s < 0 \quad \Longleftrightarrow \quad d \log z_{1s} > \sum_{g \in \{B,W\}} \omega_{gs} \left(\frac{z_{1s}}{z_{2gs}} \right)^{\nu_z} d \log z_{2gs}. \tag{63}$$

Using the cutoff definitions,

$$d \log z_{1s} = \frac{1}{\delta} \left(d \log w_{Ps} - d \log \Xi_s \right), \tag{64}$$

and, because a_g is predetermined and fixed,

$$d \log z_{2gs} = \frac{1}{1-\delta} \left(d \log \Xi_s - d \log w_{Ms} \right). \tag{65}$$

Therefore traditional self-employment falls if

$$\frac{1}{\delta}\left(d\log w_{Ps} - d\log \Xi_s\right) > \sum_{g\in\{B,W\}} \omega_{gs}\left(\frac{z_{1s}}{z_{2gs}}\right)^{\nu_z} \frac{1}{1-\delta}\left(d\log \Xi_s - d\log w_{Ms}\right). \tag{66}$$

This is the stated sufficient condition. It says that the increase in the production worker wage must be large enough relative to changes in local demand and manager wages. Moreover, $a_W > a_B$ implies $z_{2Ws} < z_{2Bs}$, so a composition shift toward type W directly reduces traditional self-employment at fixed wages and demand. Under (66), the set of individuals choosing traditional self-employment shrinks, so traditional self-employment falls.

C.2 Proof of Proposition 2

Fix a modern firm headquartered in region r with productivity z. For a given management practice choice M_r, optimized full-reach operating profit in region s is

$$\pi^o_{rs}(z, M_r) = K_s\left[zA(M_r)\right]^{\chi}, \tag{67}$$

where

$$\chi = \frac{\delta}{1-\delta(\alpha+\beta)}. \tag{68}$$

The firm value, after optimizing over local inputs but before optimizing over M_r, can be written as

$$\mathcal{V}_r(z, M_r, \{n_{rs}\}_{s=1}^R) = \sum_{s=1}^R x(n_{rs})\pi^o_{rs}(z, M_r) - \sum_{s\neq r}\tau_{rs}n_{rs} - \frac{\kappa}{2}\left(\sum_{s=1}^R n_{rs}\right)^2. \tag{69}$$

The direct effect of M_r on full-reach operating profit in market s is

$$\frac{\partial \pi^o_{rs}(z, M_r)}{\partial M_r} = \chi\pi^o_{rs}(z, M_r)\frac{A'(M_r)}{A(M_r)}. \tag{70}$$

Since

$$A(M_r) = A_0\exp\left(\int_0^{M_r}\log b(m)\,dm\right), \tag{71}$$

we have

$$\frac{A'(M_r)}{A(M_r)} = \log b(M_r). \tag{72}$$

Therefore,

$$\frac{\partial \pi^o_{rs}(z, M_r)}{\partial M_r} = \chi\pi^o_{rs}(z, M_r)\log b(M_r). \tag{73}$$

Let $\{n_{rs}^*\}_{s=1}^R$ denote the establishment intensity choices that solve the firm's establishment problem for a given M_r. By the envelope theorem, the marginal benefit of increasing M_r is the direct effect of M_r on optimized operating profits, holding the optimized establishment choices fixed:

$$MB_M = \sum_{s=1}^{R} x(n_{rs}^*) \frac{\partial \pi_{rs}^o(z, M_r)}{\partial M_r}. \tag{74}$$

Substituting the expression above gives

$$MB_M = \chi \sum_{s=1}^{R} x(n_{rs}^*) \pi_{rs}^o(z, M_r) \log b(M_r). \tag{75}$$

This proves the expression in the proposition.

Next, consider the effect of establishment scope on the marginal benefit of management practice adoption. Holding z, M_r, wages, and demand shifters fixed, the derivative of MB_M with respect to market reach in destination s is

$$\frac{\partial MB_M}{\partial x(n_{rs}^*)} = \chi \pi_{rs}^o(z, M_r) \log b(M_r). \tag{76}$$

Since $\chi > 0$, $\pi_{rs}^o(z, M_r) > 0$, and $b(M_r) > 1$, we have

$$\frac{\partial MB_M}{\partial x(n_{rs}^*)} > 0. \tag{77}$$

Equivalently, because $x'(n) > 0$,

$$\frac{\partial MB_M}{\partial n_{rs}^*} = \chi x'(n_{rs}^*) \pi_{rs}^o(z, M_r) \log b(M_r) > 0. \tag{78}$$

Thus, greater establishment intensity raises the marginal benefit of adopting an additional headquarters management practice.

Finally, adopting practices requires headquarters managerial services. Since

$$C(M_r) = \int_0^{M_r} c(m)\, dm, \tag{79}$$

the managerial efficiency units required for the marginal practice are

$$C'(M_r) = c(M_r). \tag{80}$$

Hence the marginal product of headquarters managerial services used for practice adoption is

$$MP_M^M = \frac{MB_M}{c(M_r)}. \tag{81}$$

Differentiating with respect to market reach in destination s,

$$\frac{\partial MP_M^M}{\partial x(n_{rs}^*)} = \frac{\chi \pi_{rs}^o(z, M_r) \log b(M_r)}{c(M_r)} > 0. \tag{82}$$

Therefore, a larger establishment network raises the marginal product of headquarters managerial services.

This establishes the complementarity between establishment scope and managers. A larger network raises the return to headquarters management practices; because those practices require managerial services, establishment expansion raises the value of managers. Conversely, an increase in manager supply lowers the cost of adopting practices, raises M_r^*, increases productivity $A(M_r^*)$, and makes establishment expansion more profitable. Establishment scope therefore acts as manager-complementary organizational change.