Managerial Experience, Firm Size, and Economic Development

Evidence from the Collapse of the Japanese Empire

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Abstract

I study how a larger supply of workers with managerial experience affects firm size and economic development, combining evidence from a natural experiment with a quantitative model. After World War II, three million Japanese civilians, many of them with managerial experience, were forced to return to Japan. I use repatriates' predetermined family-registry locations in Japanese districts to isolate exogenous variation in local inflows of workers with managerial experience. The inflow shifted employment from self-employment toward wage work and from agriculture toward 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 with occupational choice and multi-establishment firms to quantify the aggregate effects of managerial experience and the role of firms' geographic expansion. Managers supervise production within establishments and implement practices that raise productivity across the firm's establishment network. Removing the managerial experience of these repatriates lowers aggregate output per worker by about 3 percent. Firms' ability to expand geographically amplifies the output effect of managerial experience by about 25 percent.

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

Firms are small and local in developing economies. In these economies, much employment remains in agriculture and self-employment while firms typically employ few workers and operate a single, owner-managed establishment (Gollin, 2008; Bento and Restuccia, 2021; Gottlieb et al., 2025). Large firms differ from small firms along many dimensions, but one important difference is that they use managers more intensively (Akcigit et al., 2021). Because these firms account for a larger share of employment in richer economies, those economies also use managers more intensively overall. What explains these patterns? One explanation comes from the demand side. Firms expand in response to greater demand, improved market access, or technological progress and demand more managers to support that expansion (Chandler, 1977; You, 2021; Caliendo and Rossi-Hansberg, 2012; Caliendo et al., 2020). These patterns may also reflect the supply side: greater availability of managers may promote both firm growth and economic development.

This paper argues that a larger supply of workers with managerial experience increases firm size and promotes economic development. Managerial work requires practical skills in coordinating and supervising others, which workers may acquire through experience and on-the-job training (Beaudry and François, 2010; Grönqvist and Lindqvist, 2016). These coordination skills also help firms manage activities across establishments (Chandler, 1977). A larger local supply of workers with managerial experience may therefore enable firms to expand into other districts, affecting production and employment even where the supply of managers has not increased. I ask two questions. First, does an increase in the local supply of workers with managerial experience cause firms to grow and accelerate economic development? Second, does managerial experience enable firms to expand across districts, and how does this expansion contribute to economic development?

In this paper, I combine a natural experiment from Japan's post-WWII repatriation with a spatial general-equilibrium model and find that inflows of workers with managerial experience contribute to firm growth and economic development, partly through multi-establishment firms. Empirically, the local inflows increased establishment size and firms' geographic expansion while shifting employment from self-employment toward wage work and from agriculture toward manufacturing and services. The model implies that without the managerial experience brought by repatriates, aggregate output per worker would have been about 3 percent lower. Firms' ability to operate establishments outside their headquarters districts amplifies this output effect by about 25 percent.

Japan's forced post-WWII repatriation provides an ideal natural experiment to study the impacts of expanding the local pool of workers with managerial experience on firm size and economic development. Japan's defeat forcibly returned more than six million nationals—nearly 9 percent of the home population—from territories formerly under Japanese control.

Japanese imperial expansion led to the establishment of government agencies, railways, schools, and firms overseas. Many returnees acquired managerial and supervisory experience in these organizations, where Japanese workers were disproportionately employed in upper-tier positions while local workers were concentrated in lower-tier roles. Repatriates had more managerial experience than workers who remained in Japan. Yet the two groups had similar education levels and came from similar family occupational backgrounds.

Identifying this supply-side effect is difficult in most settings because of a potential demand-side mechanism: managers may sort toward places where firms are already growing and demanding more managers. Using newly digitized repatriation records, I measure each district's inflow of repatriates with managerial experience. I instrument the inflow using predetermined family-registry locations, which affected settlement through historical ties. To help distinguish managerial experience from broader human capital, I control for each district's median annual income overseas as a proxy for broader human capital.[1] 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.[2]

I find that inflows of repatriates with managerial experience increased firm size and contributed to structural transformation. Managerial inflows increased average establishment size, the number of establishments, and sales per worker. These districts also shifted away from agriculture and self-employment and toward manufacturing, services, and wage work. Inflows of production workers did not produce comparable changes on these margins. The empirical estimates therefore show that increasing manager supply helped move local economies from small-scale traditional production toward larger wage-paying firms and promote economic development.

Because managers help firms coordinate establishments, I empirically test whether inflows of repatriates with managerial experience allowed firms to expand beyond their headquarters districts. I find that inflows of repatriates with managerial experience made firms more spatially extensive. Firms headquartered in high-inflow districts operated more establishments and were more likely to operate outside their headquarters districts. These results provide a potential channel through which local manager-supply shocks can affect production and employment elsewhere: greater managerial capacity may help firms coordinate establishments across districts and reach demand beyond their headquarters markets.[3]

[1] Personnel records from Mitsui Bussan, one of Japan's largest trading companies before 1945 (Mitsui & Co., Ltd., n.d.), provide supporting evidence for this interpretation. University schooling is associated with higher monthly pay in overseas workplaces, conditional on recorded managerial titles and other personnel characteristics. This schooling–pay association supports using income as a proxy for education-related human capital.

[2] 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.

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

To examine a potential channel for spatial expansion, I ask whether inflows of repatriates with managerial experience increased participation in management training. 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 use firms' participation in the Japan Productivity Center's overseas study missions as a proxy for adopting modern management practices. This postwar program sent Japanese managers to the U.S. to study these practices. I find that inflows of repatriates with managerial experience 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 supervision, but also by expanding firms' stock of reusable organizational inputs.[4]

Next, I develop a spatial model to quantify aggregate effects of local inflows of workers with managerial experience. The model combines Lucas-style occupational choice with qualification for managers, endogenous establishment networks, and management-practice adoption. Individuals differ in skill and managerial experience and choose among production work, self-employment, management, and entrepreneurship, with management available only to qualified workers. Self-employed workers operate traditional owner-operated businesses, while entrepreneurs operate modern wage-paying firms. Modern firms use managerial services to supervise production at establishments and to operate headquarters practices that raise productivity throughout the firm. They can expand across districts by operating establishments outside their headquarters district.

The model shows how increasing the number of workers with managerial experience can expand firms and shift workers from self-employment into wage work. Managerial experience increases the probability that a worker is qualified to enter management, shifting manager supply outward and lowering the local managerial 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 spatially. As firms grow, they demand more production workers and draw workers out of self-employment. The model reproduces the key empirical findings: having more managers reduces self-employment, increases wage employment and firm size, and broadens establishment networks.

I use the estimated model to answer two questions that across-region contrasts alone cannot answer: how much repatriates with managerial experience mattered for the economy

[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.

as a whole, and how much multi-establishment firms contributed to aggregate economic development. First, I ask how the economy would have differed if repatriates had returned without their managerial experience and were therefore no more likely than natives to enter management, while keeping their number and locations fixed. Second, I repeat this counterfactual in an economy where firms cannot operate establishments outside their headquarters districts to see the role of multi-establishment networks in economic development. In the spatial economy, eliminating this managerial experience reduces aggregate output per worker by about 3 percent. This effect is about 25 percent smaller when firms cannot expand beyond their headquarters districts. A model without multi-establishment firms would therefore understate the aggregate consequences of manager supply.

Related Literature. First, this paper contributes to the literature on managers, firm size, and economic development by showing that a larger supply of workers with managerial experience increases firm size and promotes economic development. Classic theories make managers central to firm size, hierarchy, and coordination (Kaldor, 1934; Penrose, 1959; Chandler, 1977; Lucas, 1978). Recent work emphasizes delegation frictions and relative management costs (Akcigit et al., 2021; Hjort et al., 2026), as well as higher education and broader skill supply (Cox, 2025; Engbom et al., 2025; Gottlieb et al., 2025). I examine a distinct source of managerial scarcity: a limited pool of workers with experience relevant to management.

Second, I examine firms' geographic expansion as a margin linking firm growth to economic development. Research on firm size and development has emphasized employment per firm or establishment (Bento and Restuccia, 2021; Engbom et al., 2025). I extend this focus to firms' geographic reach, building on research on multi-establishment organization and the propagation of shocks within firms (Gumpert et al., 2022; Giroud et al., 2024; Kleinman, 2025). I contribute to this literature by showing how firms' geographic expansion amplifies the aggregate effects of managerial experience.

Third, this paper contributes to the literature on migration and development by examining the role of migrants' prior occupational experience. Existing research shows that migration can accelerate sectoral reallocation (Braun and Kvasnicka, 2014), expand local markets (Peters, 2022), transfer capital (Dinkelman et al., 2024), diffuse technology (Hornung, 2014), and stimulate innovation (Terry et al., 2026). I identify a managerial-experience channel by comparing inflows of repatriates with managerial experience and production-worker repatriates within the same forced migration episode. This comparison shows how migrants' prior occupational experience shapes economic development in receiving economies.

Lastly, I contribute to the literature on the role of human capital in economic development (Caselli, 2005; Schoellman, 2012; Manuelli and Seshadri, 2014; Aghion et al., 2025). At the micro level, a substantial literature studies the returns to work experience and learning on

the job (Rubinstein and Weiss, 2006; Deming, 2021, 2022). Research on managers further shows that management training and managerial quality improve worker allocation and organizational performance (Giorcelli, 2019; Muñoz and Otero, 2025; Minni, 2026). Yet the contribution of human capital acquired through work to economic development remains understudied, despite evidence of its potential aggregate importance (Lagakos et al., 2018; Jedwab et al., 2023). I address this gap by showing that managerial human capital, one form of work-related human capital, promotes economic development.

The remainder of the paper is organized as follows. Section 2 presents the empirical strategy and historical context of the repatriation. Section 3 presents the empirical analysis. Section 4 develops a general-equilibrium spatial model that connects the empirical findings to aggregate effects. Building on this model, Section 5 shows the aggregate effects of managerial experience and the role of multi-establishment firms in economic development. Section 6 concludes.

2 Empirical Strategy and Historical Context

This section presents the empirical strategy and historical context of the Japanese post-WWII repatriation. I first introduce the main specification and explain how family-registry instruments address the possibility that repatriates settled where firms were already growing and demanding more workers. I then document four features of Japan's postwar repatriation that support the empirical analysis. First, Allied policy generated a large and rapid return migration while strict asset limits restricted the capital returnees could bring. These features make repatriation primarily a labor supply shock. Second, predetermined family-registry locations shaped initial settlement and provide the basis for the instrument used in the empirical analysis. Third, Japanese organizations overseas had placed many civilians in administrative, managerial, and supervisory roles. Their forced return brought workers with experience relevant to management into Japan while repatriates and non-repatriates (Japanese who remained in Japan) had similar education levels and family occupational backgrounds. Finally, repatriation occurred while agriculture and self-employment remained prevalent, allowing the paper to examine whether inflows of workers with managerial experience accelerated the transition toward larger, wage-paying firms.

2.1 Empirical Strategy and Identification Challenge

This subsection presents the empirical specification and explains how I address endogenous settlement using family-registry instruments. Japan's postwar repatriation provides a large inflow of workers whose pre-return occupations and initial settlements can be observed. I

compare outcome changes before and after repatriation across districts receiving different inflows of repatriates with managerial experience, while accounting for production-worker inflows. I relate changes in district outcomes to local inflows (Dustmann et al., 2017; Peters, 2022) using the following specification:

$$\Delta Y_d = \beta_M M_d + \beta_P P_d + \boldsymbol{X}_d' \Gamma + \varepsilon_d. \tag{1}$$

A district d is a city or a rural county. Appendix B.1 explains these geographic units in detail. Data across years are harmonized to 1960 district boundaries. The dependent variable, ΔY_d, measures changes in establishment outcomes and employment structure from the baseline (the pre-shock period) to the relevant postwar year (the post-shock period).

The treatment variables measure managerial inflows, M_d, and production-worker inflows, P_d, relative to the district's 1940 labor force:

$$M_d = \frac{N_d^M}{L_{d,1940}}, \qquad P_d = \frac{N_d^P}{L_{d,1940}}. \tag{2}$$

Here, N_d^M and N_d^P are the numbers of repatriates with managerial experience and production-worker repatriates whose first postwar settlement was in district d. The occupational classification is described below. The denominator, $L_{d,1940}$, is the district's 1940 labor force. Using a 1940 denominator measures the size of each inflow relative to the local labor market before repatriation. First differences control for time-invariant district characteristics. $\boldsymbol{X}_d$ is a vector of controls. Section 3.2 defines these controls and explains their role in identification. The error term, ε_d, contains unobserved determinants of outcome changes before and after repatriation.

A central identification challenge in migration studies is endogenous settlement (Altonji and Card, 1991; Card, 2001). Repatriates may have chosen districts with better postwar economic prospects, including places where firms were already poised to expand. Unobserved growth prospects could therefore increase both repatriate inflows and subsequent growth, making M_d and P_d correlated with ε_d. Consequently, an association between inflows and outcome changes need not reflect an effect of repatriation.

I address this challenge by instrumenting both inflows using family-registry locations recorded as of August 15, 1945, before postwar settlement. These instruments assign repatriates to their predetermined registry locations rather than their chosen postwar destinations. Identification requires the instruments to predict actual inflows and, conditional on controls, to be unrelated to other unobserved determinants of outcome changes. The following subsections explain the historical context of the forced return and the family-registry locations underlying these instruments.

2.2 Policy-Driven Repatriation Created a Labor-Supply Shock

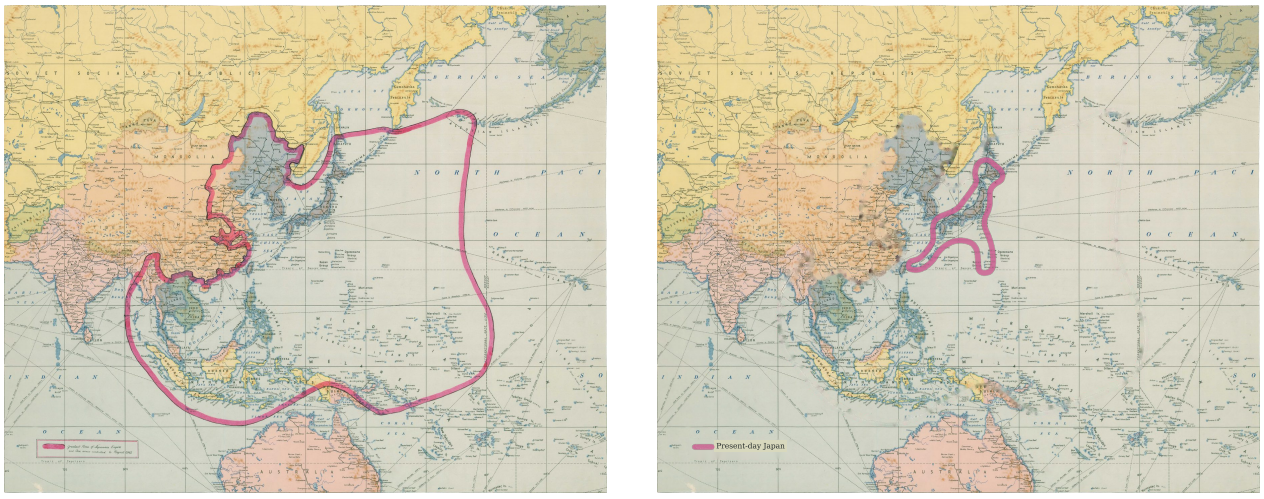
Postwar repatriation was large, rapid, policy-driven, and accompanied by little portable capital. These features make it useful for studying an increase in civilian labor supply that was not influenced by economic opportunities in Japan. The collapse of the Japanese empire generated a return migration large enough to shift the country's labor supply. By the end of World War II, roughly three million Japanese civilians lived outside Japan proper in territories under Japanese control while another three million military personnel were stationed overseas. Japan's defeat ended Japanese control over these 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 the population of Japan proper. Figure 1 illustrates the territorial collapse behind this population movement.

I study civilian returnees using household records from the 1964 *Survey of Overseas Private Assets*. The survey documented assets left in territories formerly under Japanese control (Matsuzaki, 2019). The records therefore primarily cover people who had established lives overseas and describe their circumstances before and after repatriation, including pre-repatriation occupations, income and assets, and initial 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 civilian return migration, not the broader demobilization of Japan's armed forces.

FIGURE 1: Territories Under Japanese Control in 1942 Compared with Modern Japan

A. Areas under Japanese control (August 1942)

B. Modern Japan



NOTES: The pink outline in Panel A indicates areas under Japanese control in August 1942. Panel B highlights present-day Japan. Source: "Map of Japanese Empire, August 1942," Docsteach (NARA), https://docsteach.org/document/map-of-japanese-empire-august-1942/.

Allied policy and transport capacity determined the timing and scale of repatriation. The

Japanese government initially favored settlement in place, but a conference led by the Allied occupation headquarters in January 1946 adopted a comprehensive repatriation plan and coordinated the use of 200 U.S. vessels. The additional shipping capacity helped complete most returns within a year rather than the three or four years initially anticipated (Japan Center for Asian Historical Records, 2025). Allied directives required the repatriation of Japanese nationals from Korea and organized the removal of civilians from China, Manchuria, Taiwan, Hainan, and northern Indochina (State–War–Navy Coordinating Committee, 1945; State–War–Navy Coordinating Subcommittee for the Far East, 1946). Table A1 summarizes the directives and administrative arrangements that governed return and reception.

Collapsing security reinforced the policy-driven return. Violence, especially in Soviet-occupied Manchuria, pushed civilians to leave (Nishizaki, 2016). Individual preferences varied, but the timing and scale of repatriation were driven by post-surrender policy and logistics rather than by local labor-market opportunities in Japan.

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, 1945c, 1946a,b). The repatriation process included Allied inspections of returnees' belongings upon arrival, which provided an administrative means to enforce restrictions on portable assets (Figure A2). 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.

2.3 Predetermined Family-Registry Locations Shaped Postwar Settlement

Family-registry locations could predict initial settlement through repatriates' connections to family and community in Japan. A family-registry location identifies a household's legal domicile, which can differ from its current residence. Many families retained an ancestral location in Japan as their family-registry location after moving abroad (Krogness, 2014). The rapid, forced return may have limited repatriates' ability to compare economic opportunities across destinations.[5] Existing family and community connections could therefore have played an important role in choosing an initial destination.

Family-registry locations predate postwar settlement, providing a predetermined basis for

[5]Bohnet et al. (2025) discuss a similar mechanism for repatriation to Portugal, where the unexpected end of the colonial war limited the scope for settlement decisions based on economic considerations.

addressing the endogenous sorting discussed in Section 2.1. The repatriate survey separately records each household's family-registry location as of August 15, 1945—the date Japan announced its surrender—and its first address after repatriation (Matsuzaki, 2019). These recorded locations predate the destination choices through which repatriates could sort toward districts with stronger postwar economic prospects.

The instruments use family-registry locations at surrender to predict the two occupational inflows into each district. Let H_d^M and H_d^P denote the numbers of repatriates with managerial experience and production-worker repatriates, respectively, whose family-registry locations at surrender were in district d. Using the same 1940 labor-force denominator as the realized inflows, I construct the instruments as

$$Z_d^M = \frac{H_d^M}{L_{d,1940}}, \qquad Z_d^P = \frac{H_d^P}{L_{d,1940}}. \tag{3}$$

I instrument M_d and P_d in equation (1) with Z_d^M and Z_d^P. Appendix A.3 describes the family-registration system and documents how the survey records family-registry locations at surrender separately from first postwar settlement addresses.

The family-registry instruments share the intuition of conventional immigration-network instruments: they use pre-existing geographic ties to predict migrants' destinations and address endogenous sorting toward locations with better economic opportunities (Altonji and Card, 1991; Card, 2001). However, the Japanese repatriation setting offers two advantages. First, aggregate repatriation was driven by the collapse of the Japanese empire and Allied policies, rather than economic opportunities in receiving districts. Conventional network instruments may remain endogenous when sustained economic improvements in destination economies attract immigration (Engler et al., 2023). The forced nature of repatriation substantially reduces this concern. Second, mass repatriation was concentrated in the immediate postwar period. When immigration flows are persistent, network instruments may conflate the effects of current immigration with ongoing adjustments to earlier inflows (Jaeger, Ruist and Stuhler, 2018). Because repatriation was a one-time migration shock, the family-registry instruments substantially mitigate this concern.

2.4 Repatriation Increased Potential Manager Supply

Repatriation expanded the pool of workers with experience relevant to management. Japanese firms and public institutions overseas offered Japanese workers opportunities for upward mobility into administrative, managerial, and supervisory roles. The repatriate records identify this occupational experience before return, and postwar occupations provide evidence that it predicted entry into management. The postwar employee survey shows similar education levels and parent's occupations for repatriates and non-repatriates, helping

distinguish managerial experience from these observed characteristics.

Overseas Organizational Experience. Japanese territorial expansion led to the establishment of firms, railways, and government institutions overseas, creating demand for personnel to coordinate operations and supervise workers. These organizations reproduced personnel hierarchies in which Japanese employees were concentrated in upper-tier positions. At the Korean Government Railways, for example, Japanese employees held 98% of senior-official positions but only 5% of low-ranked positions (Lim, 2024). Administrative and supervisory assignments, together with internal training, provided opportunities to acquire organizational experience through employment (Iwauchi and Sasaki, 1987; Nishizaki, 2022).

These positions offered opportunities to gain experience in personnel management and coordination across organizational units. For example, managers at the South Manchuria Railway, one of Japan's largest firms at the time, assigned employees to tasks and coordinated with other departments—familiar managerial responsibilities today (South Manchuria Railway, Railway Department, 1923; Nishizaki, 2022). Appendix A.4 documents these responsibilities in greater detail and compares them with managerial duties in postwar Japanese firms.

Mitsui Bussan, a Japanese trading company, illustrates how overseas employment could offer Japanese workers opportunities for upward mobility through entry into management. Employees in the same education category were more likely to hold managerial titles overseas than in Japan. The comparison uses a digitized 1943 personnel register from Mitsui Bussan, the trading company within the Mitsui business conglomerate.[6] The records report workplace assignments, education categories, hiring year, registered origin, occupational titles, and monthly pay. Among 2,118 personnel entries, recorded managerial titles were 3.5 percentage points more common in overseas workplaces than in Japan, conditional on recorded education category (Table A11). This finding is consistent with overseas employment offering opportunities for upward mobility through entry into management.

Occupational Classification and Validation. Most repatriate household heads had overseas occupations related to management. I find that 62.7% of repatriate household heads had overseas occupations related to management. Production and lower-tier manual workers, agricultural workers, and manual-service workers account for 22.3%. The remaining 15.0% have titles that cannot be classified consistently and are excluded from these two categories. Appendix A.5 reports the occupational mapping and its historical sources. The workforce in Japan proper had a different occupational composition, with a smaller share of workers in occupations related to management. Workers in occupations related to management

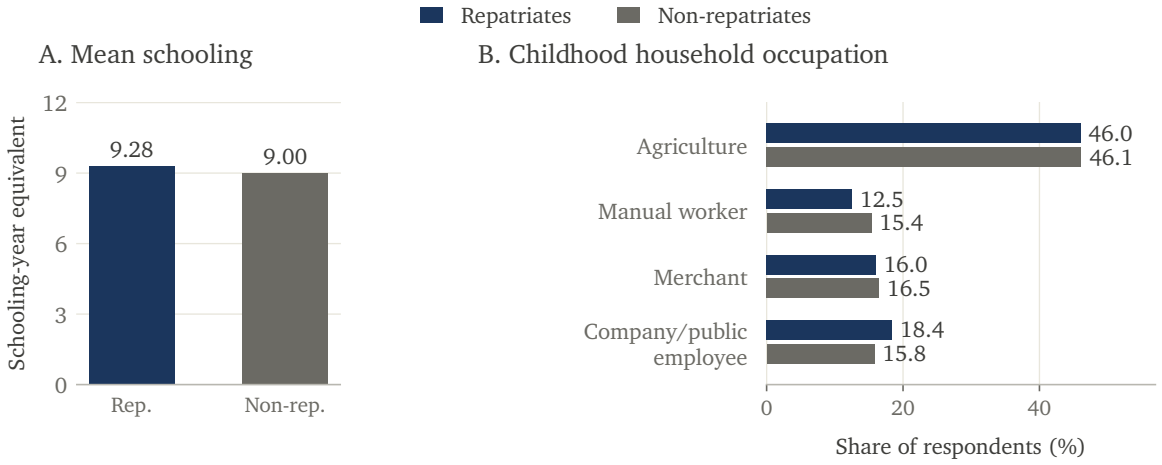
[6]The Mitsui business conglomerate was dismantled after World War II, and Mitsui Bussan itself was dissolved in 1947 (Mitsui Public Relations Committee, 2013).

accounted for 13.5% of employed men aged 15 and older in the 1940 Population Census, compared with 62.7% of repatriate household heads (Statistics Bureau, 2024).

Repatriates classified as having managerial experience were more likely than other groups to hold managerial or organizational positions after return, supporting the classification as a measure of potential manager supply. Among repatriates aged 20–69 in 1964, 34.2% of those with managerial experience before repatriation held managerial or organizational positions, compared with 9.3% of those from production-worker backgrounds and 9.5% of those from high-skilled nonmanagerial backgrounds, such as lawyers and professors (Table A6).

Using the postwar employee survey, I find that repatriates and non-repatriates had similar education levels and household backgrounds despite the large difference in occupations related to management (Institute of Social Science, The University of Tokyo, 2018). The average schooling years were 9.3 years for repatriates and 9.0 years for non-repatriates. The share who came from farming families was 46.0% among repatriates and 46.1% among non-repatriates. Figure 2 shows the mean schooling and household-background comparisons; Appendix Figure A13 reports the schooling distribution. Appendix B.8 documents the survey and sample construction; Appendix C.1 reports differences in education and family background between the two groups after controlling for age, sex, and childhood location.

FIGURE 2: Education and Household Background of Repatriates and Non-Repatriates



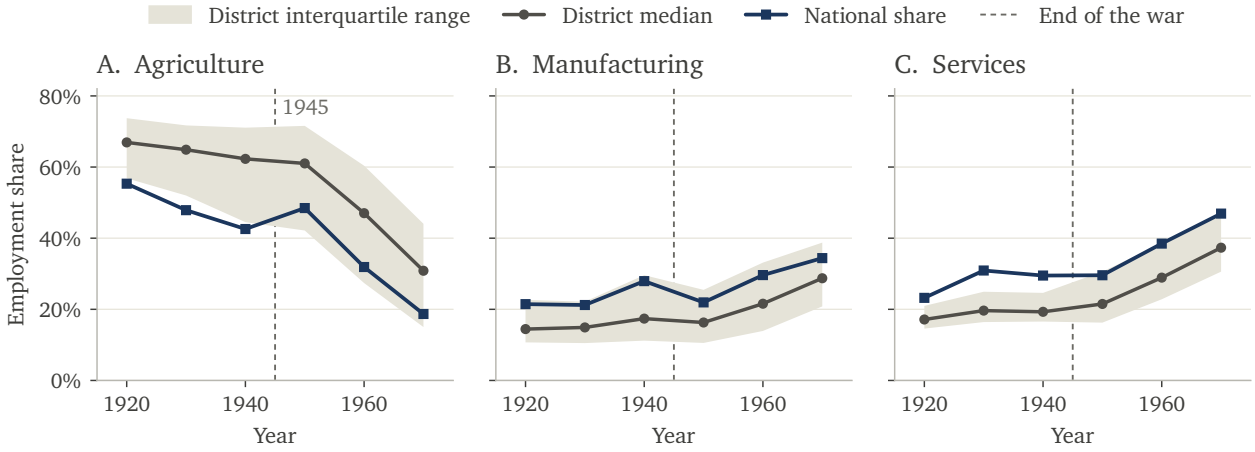
NOTES: The 1951 Keihin employee survey in Yokohama and Kawasaki. Panel A reports mean schooling-years. Panel B reports childhood household occupations at elementary-school completion; categories may overlap. Appendices B.8 and C.1 report sample construction and controlled comparisons. Source: Institute of Social Science, The University of Tokyo (2018).

2.5 Postwar Japan's 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.

Repatriation occurred while Japan's structural transformation remained incomplete. As shown in Figure 3, agriculture still accounted for approximately 48% of employment in 1950. Over the next two decades, its share fell to 19% as services expanded and manufacturing continued to grow.

FIGURE 3: Sectoral Employment Shares in Japan, 1920–1970



NOTES: Employment shares of agriculture, manufacturing, and services in Japan, 1920–1970. Blue lines show national shares; dark gray lines and shaded bands show the median and interquartile range of district-level shares. The dashed vertical line marks 1945, the end of the war and the start of repatriation.

Economic development during this period also changed how production was organized, from self-employment toward wage employment. Nationally, self-employed and family workers accounted for 60.6% of employment in 1950 and 35.8% in 1970, while the employee share rose from 39.3% to 64.2% (National Institute of Population and Social Security Research, 2024). The district data used in this paper display the same transition. In the average district, the combined self-employed and family-worker share fell from 65.2% to 44.2%. The wage-worker share rose from 34.7% to 55.7%, and the manager share increased from 1.5% to 2.8% (Table 1). 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 1: Employment Shares in 1950 and 1970

	1950		1970	
Category	Mean (%)	S.D. (pp)	Mean (%)	S.D. (pp)
Employment Status				
Self-employed	27.2	(5.1)	21.9	(6.7)
Family workers	38.0	(13.4)	22.3	(9.8)
Wage workers	34.7	(17.1)	55.7	(16.0)
Occupation				
Managers	1.5	(1.2)	2.8	(1.7)

NOTES: This table reports means (percent) and standard deviations (percentage points) of employment shares across districts in 1950 and 1970. Districts are cities or rural counties harmonized to 1960 boundaries. Employment-status shares partition employed workers into self-employed, family workers, and wage workers; the manager share is the fraction employed in managerial occupations. Source: Population Census of Japan.

3 Empirical Results

Managerial scarcity may keep firms small and local, limiting the wage jobs they can offer. Experienced managers can help firms organize larger workforces and coordinate establishments across cities, allowing firms to serve markets beyond their headquarters districts. A limited local supply of workers qualified for management may therefore constrain firm growth. I examine whether inflows of repatriates with managerial experience relaxed these constraints. Specifically, using Japan's postwar repatriation, I test whether these inflows increased the number and size of service-sector establishments,[7] shifted employment from agriculture and self-employment toward wage work, and enabled firms to operate outside their headquarters cities. Section 3.1 motivates the empirical questions and discusses the data. Section 3.2 assesses the validity of the family-registry instruments. Section 3.3 presents the effects of managerial inflows on firm growth and economic development.

3.1 Empirical Questions and Data

This subsection motivates the empirical questions and introduces the data and measures used to test them. I bring together several historical datasets, including newly digitized repatriate microdata, to study how the supply of workers with managerial experience affects firm size and economic development. I combine these microdata with district measures of service-sector establishment size and counts, together with employment structure to examine firm growth and employment reallocation. I then use firm directories to measure spatial expansion and records of the Japan Productivity Center's overseas study missions to examine firms' acquisition of management knowledge as a potential channel for that expansion.

[7] I focus on service-sector establishments because of data availability.

I conduct district-level empirical analyses using districts as the unit of observation. Districts are cities (*shi*) or rural counties (*gun*); towns and villages within each rural county form a single observation. I harmonize all district data to 1960 boundaries. The data cover 1,113 districts across urban and rural Japan, excluding Kagoshima and Yamanashi prefectures, for which repatriate microdata are unavailable. Prefectures are Japan's first-level administrative divisions. Appendix B.1 describes these units, and Appendix B.2 documents the boundary harmonization.

I measure repatriate inflows using newly digitized household records from the 1964 *Survey of Overseas Private Assets*, preserved at the Kanagawa Prefectural Archives. The records identify households' overseas occupations, family-registry locations, and initial postwar settlement destinations. These fields allow me to distinguish inflows of repatriates with managerial experience from production-worker inflows and construct the family-registry instruments described in Section 2. Appendix Figures A8 and A9 show the geographic distribution of these inflows and their corresponding family-registry exposure.

To assess the effects on firm size, I first examine whether managerial inflows increased the number and average size of service-sector establishments. Managers supervise workers within establishments, so greater managerial capacity may allow establishments to operate larger workforces (Lucas, 1978). Managers also coordinate operations across locations, enabling firms to operate additional establishments (Chandler, 1977). Managers may also improve the organization of production within firms, raising labor productivity. I therefore examine whether managerial inflows increased sales per worker, a proxy for labor productivity. To test these questions, I combine district repatriate inflows with 1936 tax records and the 1960 Census of Commerce (Ministry of Finance, 1936; Ministry of International Trade and Industry, 1961). From this census, I use establishment counts, worker totals, and annual sales to construct district establishment counts, average workers per establishment, and sales per worker for the service sector. The baseline measures combine establishment counts and sales from the 1936 tax records with sectoral employment from the 1940 Population Census (Statistics Bureau, 2024). Using these measures, I test whether managerial inflows increased the size of service-sector establishments.

I next ask whether managerial inflows shifted employment from self-employment toward wage work and from agriculture toward nonagricultural sectors. Self-employment is the main form of work in low-income economies; as countries become richer, employment shifts toward wage work (Gollin, 2008; Gindling and Newhouse, 2014).[8] Large firms employ managers intensively, so the high relative cost of management in poorer countries can constrain their growth (Hjort et al., 2026). Greater managerial capacity may therefore enable firms to grow and create wage jobs, drawing workers out of self-employment. Growth in manufacturing and

[8]The self-employment share can also be used as an inverse proxy for average firm size (Kerr and Forster, 2026).

service firms may also draw labor out of agriculture. I use the Population Census to measure changes in district self-employment and wage-employment shares, as well as employment shares in agriculture, manufacturing, and services (Statistics Bureau, 2024). These outcomes directly test whether and how a larger supply of workers with managerial experience affects economic development through shifts toward nonagricultural sectors and wage work.

I then ask whether managerial inflows enabled firms to expand beyond their headquarters districts. Research on firm size and economic development has emphasized employment per firm or establishment, leaving geographic expansion through multi-establishment networks less explored. These networks may allow a local increase in managerial capacity to support production and employment elsewhere, extending its development effects beyond the receiving district. Operating establishments across locations requires managerial coordination (Chandler, 1977). Gumpert et al. (2022) show that more geographically dispersed firms have more managerial layers, consistent with greater coordination requirements across locations. The 1938 and 1970 editions of the *Teikoku Bank and Company Directory* record firms' headquarters and establishment locations (Teikoku Databank Center for Advanced Empirical Research on Enterprise and Economy, 2024). I use these repeated cross sections to measure whether a firm operates outside its headquarters area. Hence, I test whether maanger supply affects firms' spatial organizations.

I lastly ask whether managerial inflows encouraged firms to invest in management knowledge that could help them coordinate establishments across locations and spatially expand. Experienced managers may help firms put newly acquired management knowledge into practice. Bender et al. (2018) document a positive association between managerial human capital and the quality of firms' management practices. In an experiment with Indian textile firms, Bloom et al. (2013) show that better management practices raise productivity and lead firms to open additional plants. A larger supply of workers with managerial experience may therefore support firms' spatial expansion through better management practices.

I use participation in the Japan Productivity Center's overseas study missions as a proxy for the adoption of modern management practices. Established in 1955 to promote productivity improvement, the Center sent Japanese managers to visit U.S. firms and study production management, marketing, and business organization (Japan Productivity Center, n.d.). For a similar program in postwar Italy, Giorcelli (2019) reports that more than 90 percent of firms receiving managerial training adopted American management practices within three years. These practices were still in use fifteen years later, and participating firms experienced lasting gains in employment and productivity. This evidence from Italy motivates the proxy interpretation for Japan. The mission database records participating firms and the missions they attended, allowing me to measure attendance between 1955 and 1965 (Umezaki et al.,

n.d.).

Appendix B documents the sources, sample construction, and geographic harmonization in more detail. I next discuss instrument validity before presenting the estimates for establishment growth, employment reallocation, and firms' spatial expansion.

3.2 Instrument Validity

This subsection assesses the validity of the family-registry instruments, discussing relevance, threats to identification, controls, balance tests, and trends before repatriation. To assess instrument validity, I return to the district-level specification in equation (1):

$$\Delta Y_d = \beta_M M_d + \beta_P P_d + \boldsymbol{X}_d' \Gamma + \varepsilon_d.$$

Here, d indexes districts and ΔY_d is the change from baseline to follow-up in a district outcome. The inflows M_d and P_d measure repatriates with managerial experience and production-worker repatriates, respectively, relative to the district's 1940 labor force. The coefficients β_M and β_P measure their effects, conditional on the other inflow and the controls. $\boldsymbol{X}_d$ is a vector of controls, and ε_d captures other determinants of outcome changes. I instrument each inflow with its corresponding family-registry exposure, assigning the same occupational group by its registry location on August 15, 1945 and using the same 1940 labor-force denominator.

I include production-worker inflows, P_d, to help distinguish the managerial channel from population growth and characteristics shared by repatriates. Both occupational groups added residents and could increase local consumption demand, allowing firms to grow and changing employment structure. Repatriates may also share traits associated with having moved abroad, such as willingness to take risks or entrepreneurial initiative, that could affect firm growth independently of managerial experience. Including production-worker inflows alongside managerial inflows provides a comparison for these shared channels, helping distinguish them from the role of managerial experience.

The family-registry instruments address returnees' sorting toward districts where firms were already poised to grow. A causal interpretation requires the two instruments to predict the two realized inflows and, conditional on controls, to affect outcomes only through those inflows and to be unrelated to other unobserved determinants of outcome changes. Predetermined registry locations avoid constructing the instruments from returnees' chosen postwar destinations, thereby addressing endogenous sorting toward districts with better growth prospects. Their distribution may nevertheless reflect local conditions and overseas connections that also predict subsequent growth. A forced return does not by itself make district exposure exogenous (Bohnet et al., 2025). The following discussion explains how the district controls and supporting tests address these concerns.

Instrument Relevance. Family-registry exposure strongly predicts both realized inflows. In the establishment-count specification, the conditional first-stage F-statistics are 280.3 for the managerial inflow and 138.6 for the production-worker inflow; the Kleibergen–Paap statistic for the joint system is 37.0. Appendix C.3 reports the joint first-stage regressions and the conditional and unconditional relevance graphs. These relationships establish relevance; the remaining discussion concerns whether registry exposure is correlated with the error term in equation (1).

Controls. The family-registry instruments may reflect baseline conditions that predict subsequent growth even without repatriation. First differencing removes time-invariant district effects, but it does not remove differences in growth associated with those initial conditions. I control for log 1940 population density as a proxy for initial urbanization and economic concentration. These conditions may be associated with both family-registry exposure and subsequent economic change. I measure log population density as the natural logarithm of 1940 population divided by district area in square kilometers, both measured on 1960 boundaries. Following Peters (2022), I also control for each outcome's baseline level. For example, when examining changes in agricultural employment, I control for the district's agricultural employment share in 1940. Districts with different initial establishment sizes or employment structures may have experienced different subsequent changes, and these starting conditions may also be correlated with registry exposure. I also include the 1930 share of residents born outside Japan proper to account for overseas ties in 1930 that could predict both registry exposure and postwar growth. Prefecture fixed effects absorb outcome changes common to districts within the same prefecture, so identification uses differences in exposure within prefectures.

Wartime destruction could confound the estimates through differences in postwar recovery. Davis and Weinstein (2002) show that Japanese cities experiencing larger wartime population losses subsequently recovered rapidly, with most returning to their relative position in the city-size distribution within approximately 15 years. This recovery suggests that destruction could shape postwar growth trajectories. If wartime destruction was correlated with family-registry exposure, the estimated effects could partly reflect reconstruction dynamics. I therefore control for the recorded number of buildings destroyed by wartime air raids, allocated to 1960 district boundaries and divided by the district's 1950 population.

Repatriates with managerial experience may also have brought other forms of human capital that contributed to postwar firm growth. To assess whether these differences account for the estimated effects, I include median annual income overseas as a proxy for broader human capital. I assign repatriate household heads to districts using their first postwar addresses and calculate the median of their recorded annual incomes overseas. Mitsui personnel records support using income as a proxy for broader human capital. Among

1,249 personnel entries in overseas workplaces, university schooling is associated with 37% higher monthly pay conditional on recorded managerial titles and other personnel characteristics (Table A12). This within-firm association indicates that income contains schooling-related information beyond recorded managerial titles. Appendix C.2 documents the sample, controls, and interpretation. I compare estimates with and without the income proxy to assess whether observed differences in returnees' broader human capital account for the results. Conditional on these controls, I assume that both family-registry instruments are uncorrelated with other determinants of postwar outcome changes. As a robustness check, I show in the appendix how the estimates change as these controls are added sequentially. The estimated effects of managerial inflows change little across these specifications (Appendix Tables A17–A19).

Balance Tests and Trends Before Repatriation. I next examine whether family-registry exposure is associated with districts' baseline economic conditions or growth trends, conditional on controls. In the balance tests, I regress districts' 1940 sectoral employment shares and baseline output proxy on both family-registry exposures, controlling for log 1940 population density, the 1930 overseas-born share, and prefecture fixed effects. The managerial-experience exposure coefficients are statistically insignificant for agriculture, services, and the output proxy, while the manufacturing-share estimate is significant at the 10-percent level (Table A14). I then test for trends before repatriation by estimating the IV specification with changes in agricultural, manufacturing, and service employment shares during 1920–1930 and 1930–1940 as outcomes. All six coefficients on managerial inflows are statistically insignificant (Table A15). Together, these tests provide supporting evidence that the estimated postwar effects of managerial inflows do not simply reflect pre-existing economic differences or trends.

3.3 Main Results

This subsection presents the effects of managerial inflows on firm growth and economic development. I begin with growth of service-sector establishments and employment reallocation, then turn to firm-level evidence on spatial expansion and management training.

Repatriates with Managerial Experience Expanded Service Establishments. A larger local supply of workers with managerial experience may ease managerial scarcity. Firms may then find it easier to hire managers to supervise larger workforces, operate additional establishments, and improve the organization of production, which leads to an increase in average firm size. I examine these possibilities using average establishment size, establishment counts, and sales per worker in the service sector. For these outcomes, ΔY_d in equation (1)

is the difference between the 1960 log outcome and its corresponding 1936 outcome. I estimate the equation by 2SLS with the controls discussed in Section 3.2 and cluster standard errors by district. The coefficient β_M measures the effect of managerial inflows conditional on production-worker inflows and these controls. Because inflow shares enter as fractions, a one-percentage-point larger inflow changes a log outcome by $0.01\beta_M$ log points, or approximately β_M percent. The coefficient β_P has the analogous interpretation for production-worker inflows.

Table 2: Repatriate Inflows and Service Establishment Growth (IV)

Service-sector establishment outcomes	Log establishments change, 1936–1960	Log employees per establishment change, 1936–1960	Log sales per worker change, 1936–1960
	(1)	(2)	(3)
Managerial inflow share	1.88	0.69	1.19
	(0.51)	(0.19)	(0.29)
Production-worker inflow share	-0.63	-0.23	0.22
	(0.93)	(0.37)	(0.53)
Observations	1,113	1,113	1,113
Kleibergen–Paap rk Wald statistic	37.03	35.85	35.91

Notes: District-level 2SLS for 1,113 districts. Outcomes are changes from 1936 to 1960 in log establishments, log employees per establishment, and log sales per worker in the service sector. Each regression includes both managerial and production-worker inflow shares. Each share is the number of repatriates in that group assigned by first postwar address, divided by the district's 1940 labor force. Instruments assign the same groups by family-registry location on August 15, 1945, with the same denominator. Shares enter as fractions: 0.01 times a coefficient is the log-point effect of a one-percentage-point inflow increase. Controls include the corresponding baseline outcome, log 1940 population density, the 1930 overseas-born share, wartime buildings destroyed divided by 1950 population, median annual income overseas in thousands of yen, and prefecture fixed effects. District-clustered standard errors are in parentheses.

Managerial inflows increased the number of service-sector establishments (Table 2, column 1). Moving from the 25th to the 75th percentile of the inflow share—an increase of 5.7 percentage points—is associated with 11.3 percent more establishments. This effect amounts to 4 percent of the baseline cross-district gap between the 90th and 10th percentiles. Repatriates with managerial experience could help existing firms open additional establishments. District counts do not distinguish new firms from additional establishments of existing firms; the firm-directory analysis below tests whether firms also operate beyond their headquarters areas.

Managerial inflows also increased average establishment size (column 2). The same inflow comparison is associated with 4.0 percent more employees per establishment, equivalent to 3 percent of the corresponding baseline 90–10 gap. Managers can take on supervisory

responsibilities and coordinate a larger workforce, allowing owners to delegate tasks and expand their effective span of control. This pattern is consistent with managerial scarcity limiting establishment size.

Managerial inflows raised sales per worker alongside establishment growth (column 3). The same inflow comparison is associated with 7.0 percent higher sales per worker, equivalent to 5 percent of the corresponding baseline 90–10 gap. Experienced managers may improve work organization or facilitate adoption of more productive organizational techniques, which increases labor productivity.

Repatriates with Managerial Experience Reshaped Employment Structure. Firm expansion may draw workers from self-employment and family work into wage work and from agriculture into nonagricultural sectors. I examine these shifts using equation (1), with changes in sectoral employment shares from 1940 to 1960 and changes in self-employment, wage-worker, and family-worker shares from 1940 to 1970 as outcomes.[9]

Inflows of repatriates with managerial experience shifted employment out of agriculture and into nonagricultural sectors. The estimates in Panel A of Table 3 imply that an interquartile increase in the inflow share of repatriates with managerial experience reduced the agricultural employment share by 2.7 percentage points, equivalent to 5 percent of its 1940 cross-district gap between the 90th and 10th percentiles. The manufacturing employment share increased by 0.5 percentage points, equivalent to 2 percent of its 1940 cross-district 90–10 gap. The service employment share increased by 2.1 percentage points, equivalent to 9 percent of its 1940 cross-district 90–10 gap. The service response is therefore the largest relative to its 1940 dispersion, while the manufacturing response is comparatively small. The production-worker estimates do not reject zero for agriculture or manufacturing and are negative for services.

Inflows of repatriates with managerial experience also shifted employment from self-employment and family work toward wage-paying firms. Panel B implies that an interquartile increase in the inflow share of repatriates with managerial experience reduced self-employment by 0.7 percentage points and family work by 1.2 percentage points, while increasing wage employment by 2.0 percentage points. The changes indicate meaningful employment reallocation. Production-worker inflows increased self-employment, while their estimated effects on wage employment and family work are imprecise.

Together, the two panels support the role of managers in structural transformation mentioned in the beginning. The same manager-supply shock that expanded service-sector establishments also shifted employment out of agriculture and self-employment and into services and wage-paying firms. The results are consistent with a story that as firms grow as

[9]District-level employment-status data are unavailable for 1960.

TABLE 3: Repatriate Inflows and Employment Structure (IV)

A. Changes in sectoral employment shares, 1940–1960	Agriculture employment share	Manufacturing employment share	Service employment share
	(1)	(2)	(3)
Managerial inflow share	-0.47	0.09	0.36
	(0.09)	(0.06)	(0.06)
Production-worker inflow share	0.01	0.22	-0.24
	(0.17)	(0.14)	(0.09)
Observations	1,113	1,113	1,113
Kleibergen–Paap rk Wald statistic	35.99	36.04	36.12
B. Changes in employment-status shares, 1940–1970	Self-employed share	Wage-worker share	Family-worker share
	(1)	(2)	(3)
Managerial inflow share	-0.13	0.34	-0.21
	(0.03)	(0.07)	(0.05)
Production-worker inflow share	0.16	-0.24	0.07
	(0.06)	(0.15)	(0.11)
Observations	1,113	1,113	1,113
Kleibergen–Paap rk Wald statistic	36.05	36.24	36.36

NOTES: District-level 2SLS. Outcomes are changes in sectoral employment shares in 1940–1960 (Panel A) and self-employment, wage-work, and family-work shares in 1940–1970 (Panel B). Each regression includes both managerial and production-worker inflow shares. Each share is the number of repatriates in that group assigned by first postwar address, divided by the district's 1940 labor force. Instruments assign the same groups by family-registry location on August 15, 1945, with the same denominator. All shares enter as fractions; coefficients give percentage-point outcome changes per percentage-point inflow increase. Controls include the outcome's 1940 level, log 1940 population density, the 1930 overseas-born share, wartime buildings destroyed divided by 1950 population, median annual income overseas in thousands of yen, and prefecture fixed effects. Panel B covers all employment statuses. District-clustered standard errors are in parentheses.

a response to more workers with managerial experience, they hire workers from agriculture and self-employment which reduces agriculture employment share and self-employment share. These estimates establish a local structural transformation response, although they do not by themselves show that the measured establishment growth caused the worker reallocation. I next examine whether firms also expanded beyond the districts receiving managers.

Establishment Networks. Managers' role in coordinating operations across locations motivates the next question: did managerial inflows enable firms to operate beyond their headquarters districts? I pool firm records from the 1938 and 1970 editions of the *Teikoku Bank and Company Directory* to compare changes in average firm organization across headquarters districts. The records are not linked across years, so the estimates measure changes

between two firm cross sections rather than growth within continuing firms. Let f index a firm record in directory year t, let $d(f,t)$ denote its headquarters district, and let Post_t equal one in 1970. Using firm-level observations from the 1938 and 1970 directory cross sections, I estimate the following difference-in-differences specification:

$$\begin{aligned} Y_{ft} = {} & \beta_P^F \left(P_{d(f,t)} \times \text{Post}_t\right) + \beta_M^F \left(M_{d(f,t)} \times \text{Post}_t\right) + \delta_{d(f,t)} + \phi_{p(d(f,t)),t} \\ & + \left(\boldsymbol{X}_{d(f,t)}^F \times \text{Post}_t\right)' \Pi + \varepsilon_{ft}, \end{aligned} \tag{4}$$

where Y_{ft} is an indicator equal to one if firm f has an establishment outside its headquarters district. Because Post_t is zero in 1938 and one in 1970, the inflow and control interactions enter only for the 1970 records; the fixed effects enter in both years. Headquarters-district fixed effects $\delta_{d(f,t)}$ absorb permanent differences across locations, and prefecture-by-year fixed effects $\phi_{p(d(f,t)),t}$ absorb shocks common to firms within a prefecture and year. The vector $\boldsymbol{X}_{d(f,t)}^F$ contains the same covariates as the district analysis: log 1940 population density, the 1930 overseas-born share, wartime buildings destroyed divided by 1950 population, median annual income overseas, and the baseline outcome, measured here as the headquarters district's 1938 share of firms operating outside their headquarters areas.

The coefficient β_M^F measures the differential postwar change in the probability of outside-HQ operation for firms headquartered in districts with larger managerial inflows, holding the production-worker inflow fixed. Because inflow shares enter as fractions, it gives the percentage-point probability change associated with a one-percentage-point increase in managerial inflows. As in the district analysis, realized settlement may respond to anticipated firm growth. I therefore instrument the two postwar actual-inflow interactions with the corresponding postwar interactions with family-registry exposure shares. Table 4 adds controls sequentially while retaining the same 129,807 firm records in all four columns. Column 1 includes the 1938 outside-HQ share, log 1940 population density, and fixed effects. Columns 2–4 add the overseas-born share, wartime destruction, and repatriate income overseas, respectively.

The estimated effect of managerial inflows on outside-HQ operation is positive across all four specifications (Table 4). The coefficient rises from 0.128 in Column 1 to 0.157 with the full controls in Column 4. The full-control estimate rejects zero at the 5-percent level and implies that an interquartile increase in managerial inflows—5.7 percentage points—raised the probability of outside-HQ operation by approximately 0.9 percentage points. The production-worker estimates are imprecise in every column.

The increase in outside-HQ operation is consistent with greater managerial capacity allowing firms to coordinate more geographically dispersed production. Together with the establishment-size results, this pattern supports a role for managers in both supervising

TABLE 4: Repatriate Inflows and Firms' Spatial Expansion (IV)

Outcome: firm operates outside its headquarters area, 1938 and 1970	(1)	(2)	(3)	(4)
Post × managerial inflow share	0.13	0.15	0.16	0.16
	(0.08)	(0.08)	(0.08)	(0.08)
Post × production-worker inflow share	0.01	-0.04	-0.28	-0.28
	(0.33)	(0.34)	(0.36)	(0.36)
Observations	129,807	129,807	129,807	129,807
Kleibergen–Paap rk Wald statistic	46.11	46.11	48.13	48.03
HQ-district fixed effects	✓	✓	✓	✓
Prefecture-by-year fixed effects	✓	✓	✓	✓
Log population density, 1940	✓	✓	✓	✓
Outside-HQ share, 1938	✓	✓	✓	✓
Overseas-born share, 1930		✓	✓	✓
War destruction			✓	✓
Median repatriate income				✓

NOTES: Firm-level 2SLS using repeated directory cross sections in 1938 and 1970. The outcome is an indicator for operation outside the headquarters area. All columns use the same 129,807 records. Production-worker and managerial inflows are assigned by first postwar address to the headquarters district and divided by its 1940 labor force. Each regression includes both inflow shares interacted with Post which is equal to one if year is 1970, instrumented by corresponding Post interactions with August 15, 1945 family-registry exposure shares. Inflow and instrument shares enter as fractions. coefficients give percentage-point probability changes per percentage-point inflow increase. Every column includes headquarters-district and prefecture-by-year fixed effects and Post interactions with log 1940 population density and the headquarters district's 1938 outside-HQ share. Column 2 adds Post interacted with the 1930 overseas-born share; Column 3 adds Post interacted with wartime buildings destroyed divided by 1950 population. Column 4 adds Post interacted with median annual income overseas in thousands of yen. Headquarters-district-clustered standard errors are in parentheses.

workers within establishments and coordinating operations across locations. Firm networks provide a potential channel through which a local manager-supply shock can affect production and employment elsewhere.[10] The estimates do not identify effects in particular destination districts or establish where individual managers worked; the spatial model is needed to quantify that propagation.

Exposure to Management Training. Experienced managers may help firms apply management knowledge to coordinate establishments across locations. I therefore examine whether managerial inflows increased participation in Japan Productivity Center overseas study missions, a measure of firms' efforts to acquire that knowledge. The mission database identifies participating firms and the missions they attended. I use attendance as a proxy for adopting modern management practices, motivated by the evidence from the related Italian program discussed in Section 3.1 (Giorcelli, 2019). The Japanese records observe participation, so actual practice adoption remains inferred.

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

Because mission attendance has no pre-repatriation counterpart, I estimate a postwar firm-level 2SLS specification. Each observation is a firm record, and the regression sample contains 112,084 records. The outcome is the number of missions recorded for that firm between 1955 and 1965. Inflows of repatriates with managerial experience and of production-worker repatriates in the headquarters district enter jointly and are instrumented with their corresponding family-registry exposure shares. The coefficient on inflows of repatriates with managerial experience measures their effect on mission attendance, holding the production-worker inflow fixed. The specification includes prefecture fixed effects, log 1940 population density, wartime building destruction, median annual income overseas, and the 1930 overseas-born share.

Table 5: Repatriate Inflows and Exposure to Management Training (IV)

	JPC mission count 1955–1965
	(1)
Managerial inflow share	0.18
	(0.11)
Production-worker inflow share	-0.49
	(0.24)
Observations	112,084
Kleibergen–Paap rk Wald statistic	25.09

Notes: Firm-level 2SLS. The outcome counts Japan Productivity Center overseas study missions attended in 1955–1965. Each regression includes both managerial and production-worker inflow shares. Each share is the number of repatriates in that group assigned by first postwar address, divided by the district's 1940 labor force. Instruments assign the same groups by family-registry location on August 15, 1945, with the same denominator. District refers to firm headquarters. Shares enter as fractions; 0.01 times a coefficient gives the mission-count effect of a one-percentage-point inflow increase. Controls are prefecture fixed effects, log 1940 population density, wartime building destruction divided by 1950 district population, median annual income overseas by first postwar address, and the 1930 overseas-born share. Headquarters-district-clustered standard errors are in parentheses.

The positive coefficient on managerial inflows provides suggestive evidence of greater mission participation by firms headquartered in more exposed districts. The coefficient is 0.18 with a standard error of 0.11, while the production-worker estimate is −0.49 with a standard error of 0.24 (Table 5). The estimate for managerial inflows rejects zero only at the 10-percent level and is less precise than the establishment-scale and employment estimates. Interpreting attendance as a proxy for practice adoption, this response is consistent with firms acquiring management knowledge that could help them coordinate larger establishment networks. The data do not directly establish practice adoption or identify whether training caused the observed spatial expansion.

Taken together, the firm-level estimates show that the manager-supply shock changed firms' geographic organization, accompanied by suggestive evidence of greater investment

in management training. Expanded establishment networks provide a potential channel through which a local shock can affect other districts. Because the empirical estimates neither locate all of these destination effects nor capture the resulting equilibrium adjustments, they cannot recover the nationwide effect.

Taking Stock. This section establishes three empirical findings. Inflows of repatriates with managerial experience expanded service-sector establishments, shifted employment toward nonagricultural wage work, and extended firms' establishment networks beyond exposed headquarters districts. Mission attendance provides weaker supporting evidence that the same shock increased firms' efforts to acquire organizational knowledge. The balance and pretrend exercises provide little evidence that these findings are driven by observable pre-existing differences associated with family-registry exposure.

4 Theory

In this section, I develop a spatial model that serves two purposes. First, the model characterizes how a larger pool of workers with managerial experience affects firm size, occupational allocation, and firms' establishment networks. Second, it provides the framework used in Section 5 to quantify the aggregate effects of managerial experience and the role of multi-establishment networks in economic development.

The economy is static and consists of multiple districts and two sectors: agriculture and nonagriculture. Agricultural goods are freely traded across districts. In each district, a homogeneous nonagricultural good is produced either by traditional self-employed individuals using their own labor or by modern firms combining entrepreneurial skill with hired production workers and managers. The nonagricultural good is nontradable across districts. A firm must therefore operate an establishment in a district in order to produce and sell there. This local-production requirement gives firms a reason to operate establishments across districts. I make this assumption to isolate the role of multi-establishment in economic development.

Managers help firms organize production within establishments and across districts. Within each establishment, managerial services and production labor are complementary inputs. Managers employed at headquarters additionally implement organizational practices that raise productivity throughout the firm's establishment network, following Kleinman (2025). Because these practices can be used across establishments, greater headquarters managerial capacity raises the return to operating in additional districts. A local increase in the supply of workers with managerial experience can therefore affect not only firms headquartered in that district, but also production and employment in other districts through

spatial expansion.

Skill and managerial qualification shape individuals' occupational choices. Each district contains an exogenous mass of individuals. Building on the occupational-choice framework of Lucas (1978), individuals choose among production work, traditional self-employment, hired management, and modern entrepreneurship. Skill raises productivity in management and entrepreneurship. Production workers supply identical units of labor and can work in agriculture or modern nonagricultural establishments at the same district wage. Hired management additionally requires qualification: prior preparation to perform managerial work. This requirement draws on Beaudry and François (2010), who model managerial skills acquired on the job.

4.1 Skill, Managerial Qualification, and Preferences

In this subsection, I specify district populations and the distribution of individual skill, describe how managerial qualification differs between natives and repatriates, and introduce household preferences.

Endowments and Skill. Individuals differ in skill, but natives and repatriates share the same skill distribution in every district. District $d \in \{1, \ldots, D\}$ contains a continuum of individuals in two groups: natives (N) and repatriates with managerial experience (R). Let H_{gd} denote the fixed mass of group-g residents, $g \in \{N, R\}$, with $H_d = H_{Nd} + H_{Rd}$. Individuals differ in skill z, which follows the same Pareto distribution in every district and population group (natives and repatriates):

$$G(z) = 1 - \left(\frac{z_0}{z}\right)^{\nu}, \qquad z \geq z_0 > 0, \qquad \nu > 1.$$

Here z_0 is the minimum skill and ν governs the thickness of the upper tail. Skill raises productivity in modern entrepreneurship. A qualified individual who chooses management supplies z efficiency units of managerial services. Production workers supply one unit of labor regardless of skill.

Managerial Qualification. Only qualified individuals can work as managers. The model takes qualification as given and does not capture how workers become qualified through subsequent employment or training. It therefore does not describe how managerial experience would evolve over time without repatriation. Among individuals in group g with skill z, a share $q_g(z)$ is qualified for management, with $0 < q_N(z) \leq q_R(z) \leq 1$. I assume that prior managerial experience makes repatriates at least as likely to be qualified as natives with the same skill. Qualification can vary with skill. To isolate the qualification channel, I assume that prior experience does not change managerial productivity conditional on skill.

Preferences. Individuals consume agricultural goods and the local nonagricultural good, with Cobb–Douglas preferences

$$u(c^A, c^N) = (c^A)^{1-\phi}(c^N)^{\phi}, \qquad 0 < \phi < 1.$$

Normalize the agricultural price to one and let p_d denote the nonagricultural price in district d. Individuals spend a share ϕ of income on nonagriculture and the remainder on agriculture.

4.2 Production and Firm Organization

This subsection describes production in both sectors and how modern firms use managers within establishments and at headquarters.

Agriculture. Agricultural producers combine production workers with fixed district land to produce the freely traded good:

$$Y_d^A = Z_d^A (L_d^A)^{\alpha_A} T_d^{1-\alpha_A}, \qquad 0 < \alpha_A < 1,$$

where $Z_d^A > 0$ is district-specific agricultural productivity, L_d^A is agricultural employment, and $T_d > 0$ is the district's land endowment. Agricultural producers and modern nonagricultural establishments hire from the same pool of production workers within each district, paying the common competitive wage w_d^P. Land rents $\mathcal{R}_d^A$ accrue to immobile landowners, who consume in the district where their land is located.

Modern Establishments. A modern firm is owned by an entrepreneur with skill z and headquartered in the owner's district d. The firm operates a headquarters establishment and can open one additional establishment in each other district. Each establishment produces the local homogeneous nonagricultural good. The entrepreneur hires production workers and managers in each destination for local production, and managers at headquarters to implement practices that raise productivity across establishments. Output at an establishment in district r, operated by a firm headquartered in district d, is

$$y_{dr} = zA(M_d) m_{dr}^{\alpha} L_{dr}^{\beta}, \qquad \alpha, \beta > 0, \qquad \alpha + \beta < 1.$$

Here, L_{dr} is the number of production workers and m_{dr} is managerial input at the establishment in destination r. Managerial services are measured in efficiency units and cost w_r^M per unit in destination r. Firm-wide productivity is increasing in both owner skill z and headquarters managerial input M_d ($A'(M_d) > 0$).

Local managers raise production workers' productivity through tasks such as coordination

and supervision. Because managerial services and production labor are complementary, additional managerial input allows the firm to employ more production workers profitably at given wages and output prices.

Nonrival Headquarters Practices. Headquarters managers implement nonrival organizational practices that raise productivity throughout the firm, following Kleinman (2025).[11] These practices include accounting systems, personnel rules, inventory routines, and branch-reporting systems. Operating them requires M_d efficiency units of managerial services at headquarters, with productivity contribution $A(M_d)$. I assume that A is continuous, increasing, and concave, with $A(M) > 0$ for $M > 0$. Additional headquarters services therefore raise productivity with diminishing marginal gains.

Establishment Locations. Firms can serve other districts by paying a fixed operating cost in each destination. Each establishment outside headquarters requires $f_{dr} > 0$ units of the agricultural numéraire, whose price is normalized to one. This recurring cost covers premises, communication, and administration and increases with distance from headquarters. The headquarters establishment has no fixed operating cost, so $f_{dd} = 0$.

Modern Firm's Problem. The firm jointly chooses local inputs, headquarters managerial services, and establishment locations to maximize profit. Conditional on headquarters input M_d, variable profit in destination r is

$$\pi^o_{dr}(z, M_d) \equiv \max_{m_{dr}, L_{dr} \geq 0} \left\{ p_r z A(M_d) m_{dr}^{\alpha} L_{dr}^{\beta} - w_r^M m_{dr} - w_r^P L_{dr} \right\}. \tag{5}$$

For a destination outside headquarters, the firm operates if variable profit exceeds the fixed operating cost. Let $b_{dr}(z) \in \{0, 1\}$ indicate operation in district r, with $b_{dd}(z) = 1$. Because headquarters input affects every destination's profit, location decisions are independent only conditional on M. The firm chooses headquarters input to maximize

$$\Pi^E_d(z) = \max_{M \geq 0} \left\{ \pi^o_{dd}(z, M) + \sum_{r \neq d} \max\{\pi^o_{dr}(z, M) - f_{dr}, 0\} - w_d^M M \right\}. \tag{6}$$

The first term is variable profit at the headquarters establishment. Each term in the sum is the net return from operating in another district, and the final term pays headquarters

[11] In Kleinman (2025), headquarters production is modeled using high-skilled labor. Empirically, however, Kleinman (2025) shows that the relationship between nonrival task content and headquarters intensity remains strong after controlling for occupation-level college intensity, suggesting that the organizational component of headquarters activity is not fully captured by education-related human capital. Motivated by this distinction, I model prior managerial experience as a separate determinant of workers' ability to provide this organizational input.

managers once for the whole firm. For given wages and output prices, better headquarters practices raise operating profits and can make additional destinations profitable.

Headquarters managerial input and geographic expansion are complementary.[12] At given wages and output prices, more headquarters input raises the return to opening an establishment in each destination. Serving an additional destination, in turn, raises the return to headquarters input because its productivity benefit applies there as well.

Traditional Production. Traditional self-employed producers use only their own labor. This category also approximates family businesses and small owner-managed firms that do not separate ownership, management, and production.[13]

A self-employed producer in district d produces one unit of the local homogeneous nonagricultural good:

$$y_d^T = 1.$$

Self-employed producers sell only in their home district and do not use headquarters practices. Their income is therefore

$$V_d^T = p_d.$$

Unlike modern entrepreneurs, self-employed producers cannot increase output by hiring workers or opening additional establishments.

4.3 Occupational Choice

Occupational choice determines which qualified individuals work as managers. Let $V_d^o(z)$ denote the income of an individual with skill z in district d from occupation $o \in \{P, T, M, E\}$, where P denotes production work, T traditional self-employment, M hired management, and E modern entrepreneurship. The four occupational incomes are

$$\begin{aligned} V_d^P(z) &= w_d^P, & V_d^T(z) &= p_d, \\ V_d^M(z) &= w_d^M z, & V_d^E(z) &= \Pi_d^E(z). \end{aligned}$$

Production workers supply one unit of labor and can work in agriculture or modern nonagricultural establishments at the same district wage w_d^P. A qualified manager of skill z supplies z efficiency units of managerial services and earns $w_d^M z$. A modern entrepreneur earns the maximized profit $\Pi_d^E(z)$ from the firm's employment, headquarters, and establishment-location choices.

Following Engbom et al. (2025), I assume that workers in each district are indifferent

[12] See Appendix Proposition 2.

[13] Bassi et al. (2023) document limited specialization in small manufacturing firms in Uganda and show that these firms operate like collections of self-employed workers.

between production work and traditional self-employment, implying

$$w_d^P = p_d. \tag{7}$$

At a given nonagricultural price, additional production workers can be drawn from traditional self-employment without raising the wage, as long as traditional self-employment remains positive.

At given district wages and firm profits, natives and repatriates with the same skill face the same occupational incomes. They differ only in their probability of being qualified for management. Let $Q = 1$ for a qualified individual and $Q = 0$ otherwise. Let $V_d^Q(z)$ denote the highest occupational income available to an individual with skill z and qualification status Q. A qualified individual can choose among all four occupations:

$$V_d^1(z) = \max\left\{V_d^P(z), V_d^T(z), V_d^M(z), V_d^E(z)\right\}. \tag{8}$$

An unqualified individual cannot choose management and therefore chooses among production work, traditional self-employment, and modern entrepreneurship:

$$V_d^0(z) = \max\left\{V_d^P(z), V_d^T(z), V_d^E(z)\right\}. \tag{9}$$

In an equilibrium with positive traditional self-employment, let z_d^{PM} denote the skill at which management reaches the common production-work and traditional-self-employment payoff, let z_d^{PE} denote the skill at which modern entrepreneurship reaches that payoff, and let z_d^{ME} denote the skill at which management and modern entrepreneurship provide the same income. These cutoffs satisfy

$$w_d^M z_d^{PM} = p_d, \qquad \Pi_d^E(z_d^{PE}) = p_d, \qquad w_d^M z_d^{ME} = \Pi_d^E(z_d^{ME}).$$

Lemma 1 (Occupational-payoff ordering)**.** *Suppose production work and traditional self-employment are both chosen, and*

$$w_d^M z_0 < p_d, \qquad \Pi_d^E(z_d^{PM}) < p_d.$$

Then the occupational cutoffs satisfy

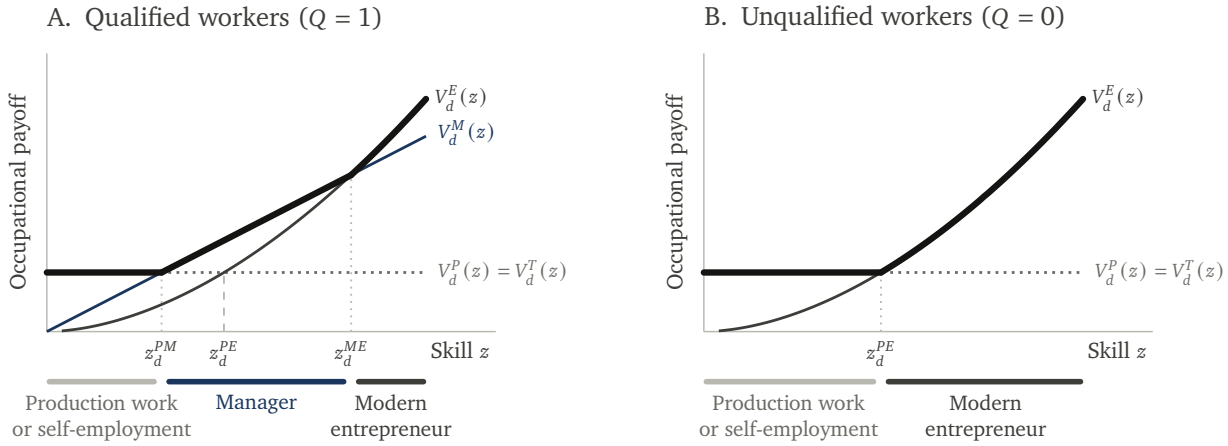
$$z_0 < z_d^{PM} < z_d^{PE} < z_d^{ME} < \infty.$$

Qualified individuals choose production work or traditional self-employment for $z < z_d^{PM}$, management for $z_d^{PM} < z < z_d^{ME}$, and modern entrepreneurship for $z > z_d^{ME}$. Unqualified

individuals choose production work or traditional self-employment for $z < z_d^{PE}$ *and modern entrepreneurship for* $z > z_d^{PE}$.

The proof is in Appendix D.3. The first condition ensures that management is not attractive at the minimum skill. The second ensures that entrepreneurship has not yet become attractive when management first reaches the common production–traditional payoff. Since entrepreneurial income eventually grows faster than managerial earnings, entrepreneurship ultimately becomes the highest-paying occupation. Figure 4 illustrates this ordering.

FIGURE 4: Occupational Choice by Skill and Managerial Qualification



NOTES: Panel A shows occupational choice for qualified workers, who can choose management. They choose production work or traditional self-employment below z_d^{PM}, management between z_d^{PM} and z_d^{ME}, and modern entrepreneurship above z_d^{ME}. Panel B shows occupational choice for unqualified workers, who cannot choose management. They choose production work or traditional self-employment below z_d^{PE} and modern entrepreneurship above z_d^{PE}. Production work and traditional self-employment provide the common payoff $V_d^P(z) = V_d^T(z) = p_d$. Managerial earnings are $V_d^M(z) = w_d^M z$, and modern entrepreneurial income is $V_d^E(z) = \Pi_d^E(z)$. The two panels use the same skill scale and illustrate the ordering $z_d^{PM} < z_d^{PE} < z_d^{ME}$.

4.4 Spatial Equilibrium

District nonagricultural prices, wages, and occupational allocations jointly satisfy local labor and nonagricultural goods-market clearing, while the agricultural market clears nationally. With positive traditional self-employment in each district, the production wage equals the local output price, $w_d^P = p_d$.

Labor-Market Clearing. Individuals' occupational choices determine the supply of production labor and managerial services in each district. Let $\sigma_{gd}^o(z)$ denote the share of individuals with skill z in group g and district d who choose occupation $o \in \{P, T, M, E\}$. These shares combine qualified and unqualified individuals' optimal choices with weights $q_g(z)$ and

$1 - q_g(z)$. Labor-market clearing allocates workers indifferent between production work and self-employment.

Production-worker supply in district r equals demand from agriculture and modern establishments:

$$\sum_{g\in\{N,R\}} H_{gr} \int \sigma_{gr}^{P}(z)\, dG(z) = L_r^A + \sum_{d=1}^{D} \sum_{g\in\{N,R\}} H_{gd} \int \sigma_{gd}^{E}(z) b_{dr}(z) L_{dr}(z)\, dG(z). \tag{10}$$

Managerial supply in efficiency units equals demand from establishments and headquarters in district r:

$$\begin{aligned} \sum_{g\in\{N,R\}} H_{gr} \int z\, \sigma_{gr}^{M}(z)\, dG(z) = &\sum_{d=1}^{D} \sum_{g\in\{N,R\}} H_{gd} \int \sigma_{gd}^{E}(z) b_{dr}(z) m_{dr}(z)\, dG(z) \\ &+ \sum_{g\in\{N,R\}} H_{gr} \int \sigma_{gr}^{E}(z) M_r(z)\, dG(z). \end{aligned} \tag{11}$$

Income and Goods-Market Clearing. District income sums residents' occupational earnings, including profits from all establishments owned by local entrepreneurs, and local land rents:

$$I_r = \sum_{g\in\{N,R\}} H_{gr} \int \sum_{o\in\{P,T,M,E\}} \sigma_{gr}^{o}(z) V_r^{o}(z)\, dG(z) + \mathcal{R}_r^A. \tag{12}$$

Residents spend ϕI_r on the local nonagricultural good. Local output equals their consumption:

$$\begin{aligned} \frac{\phi I_r}{p_r} = &\sum_{g\in\{N,R\}} H_{gr} \int \sigma_{gr}^{T}(z)\, dG(z) \\ &+ \sum_{d=1}^{D} \sum_{g\in\{N,R\}} H_{gd} \int \sigma_{gd}^{E}(z) b_{dr}(z) y_{dr}(z)\, dG(z). \end{aligned} \tag{13}$$

The first term is traditional output. The second is modern output, including production by firms headquartered elsewhere.

Total agricultural output equals household consumption plus the agricultural goods used to operate establishments:

$$\begin{aligned} \sum_{r=1}^{D} Y_r^A = &(1-\phi) \sum_{r=1}^{D} I_r \\ &+ \sum_{d=1}^{D} \sum_{g\in\{N,R\}} H_{gd} \int \sigma_{gd}^{E}(z) \left[\sum_{r\neq d} b_{dr}(z) f_{dr} \right] dG(z). \end{aligned} \tag{14}$$

Equilibrium. Given the number of districts D, populations $\{H_{gd}\}$, land endowments $\{T_d\}$, agricultural productivities $\{Z_d^A\}$, skill distribution G, qualification functions $\{q_g\}$, expenditure share ϕ, technologies $(A, \alpha, \beta, \alpha_A)$, and establishment costs $\{f_{dr}\}$, an equilibrium consists of district nonagricultural prices and wages $\{p_d, w_d^P, w_d^M\}$, occupational shares $\{\sigma_{gd}^o(z)\}$, agricultural employment $\{L_d^A\}$, and firm choices $\{M_d(z), b_{dr}(z), m_{dr}(z), L_{dr}(z)\}$. Firm choices solve equations (5) and (6). Occupational shares aggregate the maximizing choices in equations (8) and (9). In an equilibrium with positive traditional self-employment in every district, production wages satisfy equation (7). Labor markets clear according to equations (10) and (11), and income and nonagricultural goods-market clearing satisfy equations (12) and (13). Agricultural producers maximize profits at the district production wage, and the national agricultural market clears according to equation (14). The agricultural price is normalized to one.

4.5 Impacts of More Workers with Managerial Experience

A larger share of workers with managerial experience can increase firm size and shift employment toward wage work. I study this mechanism in a single-district benchmark without agriculture, where residents consume only the nonagricultural good and each modern firm operates one establishment. I normalize the nonagricultural price to one and hold population and the skill distribution fixed.

This exercise varies managerial qualification while holding the skill distribution and technology fixed. Engbom et al. (2025) instead study how an increase in skill supply allows firms to reorganize production and grow by hiring white-collar workers.[14]

For this benchmark, assume $q_R(z) = 1$, with continuously differentiable native qualification satisfying $0 < q_N(z) < 1$ and $q_N'(z) \geq 0$. Headquarters productivity is $A(M) = A_0 M^\eta$. Consider an equilibrium with positive traditional self-employment and the interior occupational ordering $z_0 < z^{PM} < z^{PE} < z^{ME}$.

Proposition 1 (Managerial experience and average firm size)**.** *Under these assumptions, an increase in the share of workers with managerial experience increases average employment per firm, raises total wage-employment shares, and lowers the traditional self-employment share.*

The proof is in Appendix D.4.

More managerial experience expands the pool of qualified managers and lowers the managerial wage. Lower managerial costs make modern firms more profitable and increase their demand for production workers. With traditional self-employment still available, firms can attract these workers without raising the production wage at the fixed output price. Panels A and B of Figure 5 illustrate these changes in occupational payoffs.

[14] For a broader review of firm size and economic development, see Eslava (2026).

This expansion shifts employment from self-employment toward wage work. Accounting for entrepreneurial entry and exit, both production-worker and managerial employment rise, while traditional self-employment falls. Panels C and D show the corresponding increases in managerial and production-worker employment.

These changes increase average firm size. Each self-employed producer and each modern entrepreneur owns one firm. As more people become employees, fewer remain firm owners, so the total number of firms falls. With population fixed, employment per firm—including owners—therefore rises.

5 Model Estimation and Counterfactual Results

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 spatial model and compare its benchmark equilibrium with a counterfactual that removes the effect of managerial experience on qualification while holding the location and number of repatriates fixed. Repeating the experiment in an economy without establishments outside headquarters districts measures the role of multi-establishment networks in economic development.

5.1 Quantitative Implementation

To take the model to the data, I specify functional forms for traditional production, establishment costs, and managerial qualification. I also introduce differences in occupational preferences, allowing individuals with the same skill and managerial qualification to choose different occupations.

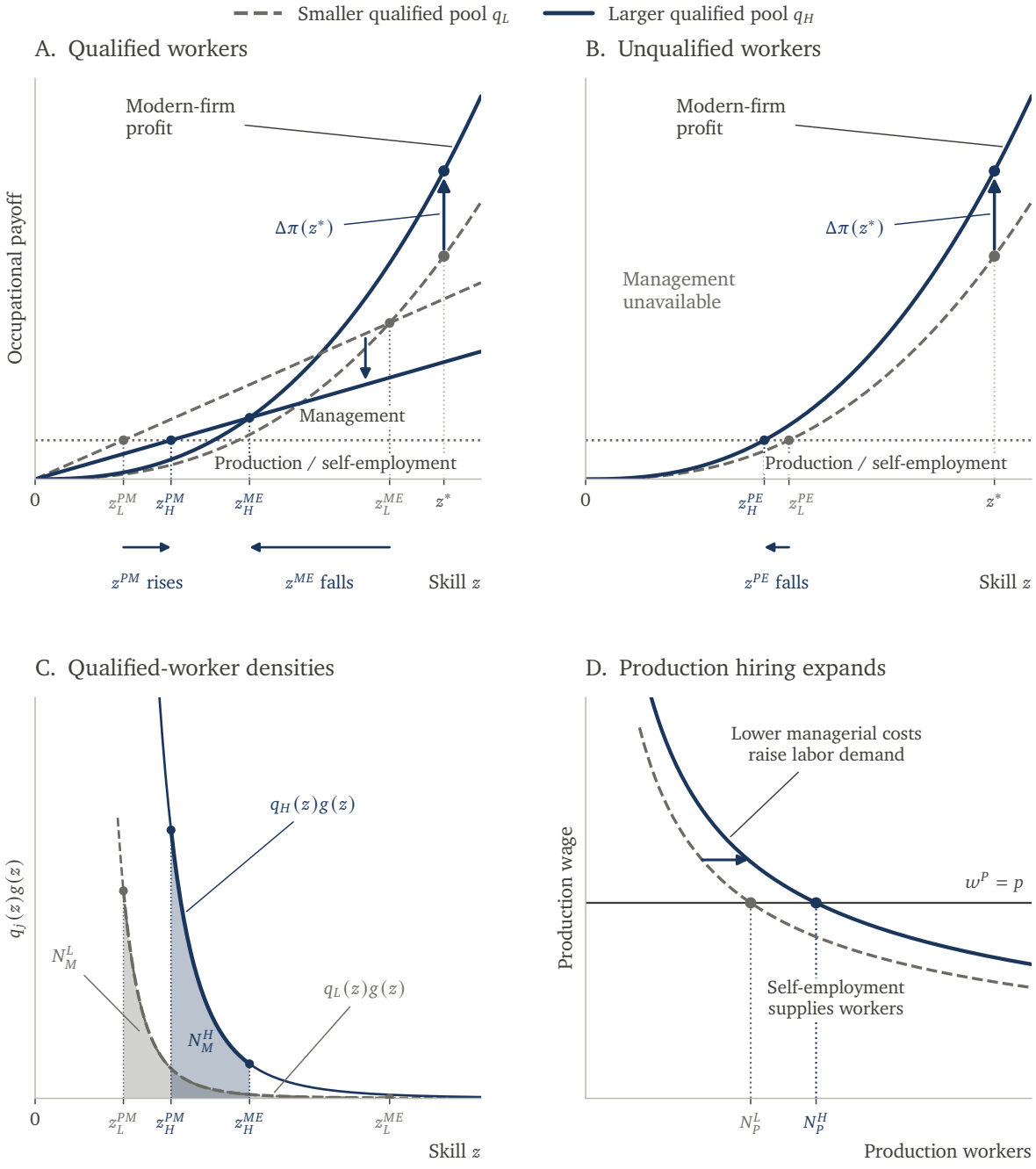
Traditional Self-employment and Expansion Cost. I allow skill to raise productivity in traditional self-employment. An individual with skill z produces $y_d^T(z) = z^\zeta$, where $0 \le \zeta < 1$, and earns $V_d^T(z) = p_d z^\zeta$. I estimate ζ jointly with the other parameters using the traditional-employment share.

I parameterize destination operating costs as

$$f_{dr} = \begin{cases} 0, & d = r, \\ f_X \left(\dfrac{\text{dist}_{dr}}{100 \text{ km}} \right)^\rho, & d \neq r, \end{cases} \qquad f_X > 0, \qquad \rho > 0. \tag{15}$$

Here f_X is the recurring agricultural-resource cost of an establishment 100 kilometers from headquarters, and ρ is its distance elasticity.

FIGURE 5: Qualification, Occupational Sorting, and Firm Hiring



NOTES: Illustrative equilibria for Proposition 1. Dashed gray denotes a smaller qualified pool (q_L); solid blue denotes a larger pool (q_H). Panels A and B show occupational payoffs; arrows below the horizontal axes show how the cutoffs move. At z^*, a continuing firm's profit gain raises its hiring by $\Delta L = b\Delta\pi$, where $b = \beta/[1-(\eta+\alpha+\beta)]$. Panel C shades manager headcounts under $q_j(z)g(z)$ between z_j^{PM} and z_j^{ME} on a common linear scale, where $g(z)$ is the skill density. The larger qualified pool more than offsets the narrower management interval. Panel D plots production labor demand conditional on each equilibrium's managerial wage and entrepreneur set. Intersections with $w^P = p = 1$ give $N_P^j = bX_j$, where X_j is aggregate modern entrepreneurial profit.

Smooth Occupational Choice. Following Engbom et al. (2025), I allow individuals with the same skill and qualification to differ in their preferences over occupations. Let $o \in \{P, T, M, E\}$ index production work, traditional self-employment, hired management, and modern entrepreneurship, respectively. Utility in occupation o is $\log V_d^o(z) + \varepsilon_{od}/\xi$, where the shocks are independent standard Type-I extreme-value draws and $\xi = 8$. Production workers earn w_d^P, traditional producers earn $p_d z^\zeta$, qualified managers earn $w_d^M z$, and modern entrepreneurs earn $\Pi_d^E(z)$. Let O_Q denote the occupations available to an individual with qualification Q, with management available only when $Q = 1$. Conditional choice probabilities are

$$p_{od}^Q(z) = \frac{[V_d^o(z)]^\xi}{\sum_{j \in O_Q} [V_d^j(z)]^\xi}, \qquad o \in O_Q. \tag{16}$$

The parameter ξ governs sensitivity to income differences; an occupation with zero income receives zero probability.

Managerial Qualification. I allow natives' probability of being qualified for management to increase with skill:

$$q_N(z) = \frac{1}{1 + \exp[-(a_N + b_N \log z)]}, \qquad b_N \geq 0, \qquad q_R(z) = 1. \tag{17}$$

The parameter a_N governs the level of native qualification, and b_N governs its relationship with skill. In the benchmark, $q_R(z) = 1$ for all z: every repatriate with managerial experience is qualified for management. Qualification makes management available, but occupational earnings and preferences determine who becomes a manager.

5.2 Parameterization and Estimation

I divide the parameters into three groups according to the information used to determine them. The first group is fixed before estimation. The second group is measured directly or recovered from equilibrium conditions using 1970 data. The third group governs occupational allocation, modern production, and firm networks. I estimate these nine parameters jointly by minimum distance, combining ten moments with three IV estimates from the empirical analysis in Section 3.

Fixed Parameters. I fix the occupational-choice inverse dispersion at $\xi = 8$, motivated by long-run mobility estimates in Dix-Carneiro (2014) and Ashournia (2018). I fix the productivity parameter at $\eta = 0.10$, following the output–management elasticity calibration in Bloom et al. (2016, Table 1).

Directly Measured Parameters and Recovered Fundamentals. In the model, households spend the fraction ϕ of income on nonagricultural goods. I therefore set ϕ to one minus the 1970 household expenditure share on food, beverages, and tobacco: $\phi = 0.69$.[15] The agricultural labor-demand condition implies $w_d^P L_d^A / Y_d^A = \alpha_A$: the labor exponent equals labor's share of value added. I therefore set α_A to agricultural labor cost divided by agricultural value added in the Japan Industrial Productivity (JIP) Database, giving $\alpha_A = 0.43$ (Fukao et al., 2007; Research Institute of Economy, Trade and Industry, 2015).

I recover agricultural productivity Z_d^A by matching each district's agricultural employment at its observed manufacturing wage. Agricultural producers hire labor until its marginal product equals the production wage, $w_d^P = \alpha_A Z_d^A (T_d / L_d^A)^{1-\alpha_A}$. Let $w_d^{P,\text{data}}$ denote the 1970 manufacturing wage, used to measure the common production wage, and let $L_d^{A,\text{data}}$ denote 1970 agricultural employment. Solving the labor-demand condition for productivity gives

$$Z_d^A = \frac{w_d^{P,\text{data}}}{\alpha_A} \left(\frac{L_d^{A,\text{data}}}{T_d} \right)^{1-\alpha_A}. \tag{18}$$

I normalize minimum skill to $z_0 = 1$. Table 6 summarizes the fixed parameters, directly measured quantities, and recovered fundamentals used in the benchmark economy.

Table 6: Fixed and Directly Recovered Parameters

Parameter	Interpretation	Value	Source or method
ξ	Occupational-choice inverse dispersion	8.00	Dix-Carneiro (2014); Ashournia (2018)
η	Productivity parameter	0.10	Bloom et al. (2016, Table 1)
ϕ	Nonagriculture expenditure share	0.69	One minus food, beverage, and tobacco expenditure share
α_A	Agricultural labor share	0.43	JIP labor cost/value added
T_d	District land area (km^2)	District-specific	Administrative polygon areas
Z_d^A	District agricultural productivity	District-specific	equation (18)

Notes: District population masses, bilateral distances, and land area enter as observed inputs. Agricultural productivity is recovered from the agricultural labor-demand condition using 1970 manufacturing wages, agricultural employment, and land area, as shown in equation (18). Land area measures administrative territory, not cultivated acreage.

Jointly Estimated Parameters. I jointly estimate the rest of nine parameters by minimum distance, targeting ten moments, including the IV estimates from Section 3. The jointly estimated parameters govern the skill distribution, production, managerial qualification, and the costs of geographic expansion. I parameterize production using $\gamma \equiv \alpha + \beta$ and $s_M \equiv \alpha/\gamma$,

[15] The expenditure totals come from the Cabinet Office's *National Accounts for 1998*, supporting Table 13, for calendar year 1970 at current prices.

so $\alpha = \gamma s_M$ and $\beta = \gamma(1 - s_M)$. The jointly estimated parameter vector is

$$\Theta \equiv \{\nu, \gamma, s_M, \zeta, f_X, \rho, a_N, b_N, A_0\}. \tag{19}$$

Compensation and employment moments discipline production and occupational choice. Manager compensation relative to modern-firm labor compensation and the corporate labor share primarily inform s_M and γ. Traditional self-employment and the managerial-inflow coefficients for self-employment and log employees per establishment help discipline ζ and A_0. The employment-tail exponent informs ν. The manager headcount share and the university-to-high-school managerial-employment-rate ratio primarily inform the native qualification parameters a_N and b_N. Firm-network moments discipline expansion costs. The managerial-inflow coefficient for outside-headquarters operation primarily informs f_X, while the distance gradient of distinct firm–market presences informs ρ.

Regression Targets. The regression targets discipline the model's response to managerial inflows, complementing the static moments that describe employment, compensation, and firm organization. I target the full-control managerial-inflow coefficients for outside-headquarters operation, self-employment, and log employees per establishment in Tables 2 to 4. These coefficients are 0.16, −0.13, and 0.69, respectively. Together, they restrict how an increase in the supply of workers with managerial experience changes firms' spatial organization, occupational allocation, and establishment scale.

Minimum-Distance Criterion. I estimate the model by simulated method of moments, minimizing the weighted distance between model moments $\mu_k(\Theta)$ and the ten empirical targets μ_k^{data}:

$$\begin{aligned} \widehat{\Theta} &= \arg\min_{\Theta} J(\Theta), \qquad J(\Theta) = \sum_{k=1}^{10} d_k(\Theta)^2, \\ d_k(\Theta) &= \frac{\mu_k(\Theta) - \mu_k^{\text{data}}}{|\mu_k^{\text{data}}|}. \end{aligned} \tag{20}$$

I search the parameter space using Sobol sequences and TuRBO-based Bayesian optimization, combined with local refinement using DFO-LS (Sobol', 1967; Eriksson et al., 2019; Cartis et al., 2019).

Untargeted Validation. Targeted fit assesses whether the model can reproduce the moments used to estimate it; untargeted moments provide a separate test of its implications. I evaluate the model using agriculture's employment share, active-firm density, average selected-firm employment, and the selected-firm employment distribution. The firm-level comparisons use the mapped positive-employment Teikoku sample and its sampling weights.

Table 7: Jointly Estimated Parameters and Targeted Moments

A. Estimated parameters

Parameter	Interpretation	Estimate
ν	Skill and entrepreneur-productivity tail	8.63
γ	Total variable-input curvature	0.70
s_M	Managerial share of variable inputs	0.20
ζ	Skill elasticity of traditional output	0.48
f_X	Remote operating cost at 100 km	16.39
ρ	Distance elasticity of expansion cost	0.89
a_N	Native managerial-qualification intercept	−4.03
b_N	Skill slope of native managerial qualification	6.87
A_0	Headquarters productivity scale	1.71

B. Targeted moments and model fit

Targeted moment	Data	Model
Teikoku employment-tail exponent	1.11	0.89
Corporate labor compensation share	0.82	0.81
Manager / modern labor compensation	0.23	0.22
Traditional nonagricultural self-employment	0.17	0.17
Distance gradient of distinct firm–district presences	1.32	1.91
Three-rank managers / modern wage workers	0.11	0.12
University/high-school managerial-employment-rate ratio	3.31	3.29
Managerial-inflow regression coefficients		
Outside-headquarters operation	0.15	0.05
Self-employment	−0.12	−0.05
Log employees per establishment	0.68	0.78

Notes: The SMM criterion in Section 5.2 sums squared deviations from ten point targets: seven static and network moments and three managerial-inflow regression coefficients. All nine parameters are jointly estimated from the moments in Panel B.

Table 8: Untargeted Model Validation

Validation moment	Data	Model
Agriculture employment share	0.187	0.218
Active modern firms per worker	0.0167	0.0480
Selected-firm mean employment	133.215	200.868
Selected-firm share with fewer than 50 employees	0.594	0.841
Selected-firm share with 50–99 employees	0.186	0.055
Selected-firm share with 100–299 employees	0.156	0.053
Selected-firm share with 300 or more employees	0.064	0.051

Notes: These moments receive no weight in estimation. Selected-firm moments use inverse-probability weights for mapped Teikoku firms with positive employment; the model comparison selects firms by employment to match their weighted population mass. Employment bins are fewer than 50, 50–99, 100–299, and at least 300 employees.

Without targeting these moments, the model comes close to agriculture's employment share and the share of large firms. Agriculture accounts for 21.8 percent of employment in the model, compared with 18.7 percent in the data. Among selected firms, 5.1 percent have at least 300 employees, compared with 6.4 percent in the data.

5.3 Counterfactual Exercises

The counterfactual exercises quantify how repatriates' managerial experience contributes to economic development and how firms' expansion across districts shapes this contribution. In the main experiment, I remove repatriates' managerial qualification advantage while keeping their number and location fixed. At each skill level z, I lower their qualification probability from $q_R(z) = 1$ to the estimated native probability $\widehat{q}_N(z)$, leaving natives' qualification unchanged. All other parameters, the skill distribution, land, agricultural productivity, and geography remain fixed. I then solve for new equilibrium wages, occupational choices, and firm decisions. Comparing this economy with the benchmark measures the contribution of repatriates' managerial qualification without changing the population in any district.

Table 9: Removing Repatriates' Managerial Qualification Advantage

Outcome	Counterfactual change
Output per worker	−2.8%
Traditional employment share	+3.2 pp
Firm size (including self-employed)	−11.6%

Notes: Changes relative to the full-spatial benchmark after reducing repatriates' managerial qualification probability at each skill level to the native probability, holding district populations and all other parameters fixed. Output and firm-size changes are percentages; the traditional-employment-share change is in percentage points.

In the estimated model, repatriates' managerial experience supports larger firms and higher output while reducing traditional self-employment. Table 9 shows that removing repatriates' managerial qualification advantage lowers output and shifts employment toward traditional self-employment. Aggregate output per worker falls by 2.8 percent. The traditional employment share rises by 3.2 percentage points. Average firm size, including owners and traditional self-employed workers, falls by 11.9 percent. These results highlight the contribution of human capital acquired through work to economic development, as emphasized by Jedwab et al. (2023). The counterfactual shows how one specific form of this human capital—managerial experience—can raise aggregate output by supporting larger firms and shifting employment away from traditional self-employment.

The Role of Multi-Establishment Networks. I assess the role of multi-establishment networks by comparing the baseline and manager-removal economies under two spatial regimes,

using the same estimated parameters. The full-spatial regime allows firms to choose whether to operate one establishment in each destination. The HQ-only regime imposes $b_{dr} = 0$ for $d \neq r$, while retaining one headquarters establishment per modern firm. Hence, firms can operate only in their headquarters district. I solve a separate baseline and qualification counterfactual in each regime. Aggregate output per worker falls by 2.8 percent in the full-spatial economy and 2.1 percent in the HQ-only economy. The output loss is therefore about 25 percent larger when firms can operate outside their headquarters districts.

This comparison shows that managerial qualification has a larger aggregate output effect when firms can operate outside their headquarters districts. The amplification reflects both adjustments to establishment networks and the different occupational and production structures that networks support in the benchmark. 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 regulation, administrative barriers, or protection of local firms fragment markets across districts, this multi-establishment channel may be muted, limiting the growth effects of manager supply even when managers themselves become more abundant.[16]

6 Conclusion

This paper provides evidence that a larger supply of workers with managerial experience contributes to firm growth and structural transformation. Using Japan's postwar repatriation as a natural experiment, I find that inflows of repatriates with managerial experience increased average establishment size and sales per worker. The same inflows shifted employment from self-employment toward wage work and from agriculture toward manufacturing and services. Firms headquartered in more exposed districts operated more establishments and were more likely to operate outside their headquarters cities. They also participated more in overseas management-training programs. Repatriates with managerial experience provided the "visible hands" that helped local firms modernize and expand spatially (Chandler, 1977).

The spatial model connects managerial experience to firm organization, occupational choices, and aggregate output. I assume that prior experience expands the pool of workers qualified for management. Managers contribute to production within establishments and implement headquarters practices that raise productivity throughout the firm. In the counterfactual, removing repatriates' qualification advantage while holding population and

[16]For evidence on subnational regulatory fragmentation, see OECD (2020), which documents overlapping central and subnational 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.

settlement fixed lowers aggregate nonagricultural output per worker and shifts employment toward traditional self-employment. Comparing this experiment with one in which firms can operate only in their headquarters district evaluates how access to other markets changes the aggregate effect. The output loss is about 25 percent larger when firms can operate outside their headquarters districts, showing how geographic expansion amplifies the aggregate output effect of managerial experience.

The historical setting may limit direct generalization to contemporary economies. Nevertheless, postwar Japan shared important features with many developing economies: substantial agricultural employment, widespread self-employment, and small, family-run businesses. The findings therefore offer insights into economies where managerial scarcity constrains firm growth. Policies that expand the pool of workers prepared for management—through relevant education, practical training, or migration of workers with managerial experience—could help firms hire managers and expand. Such expansion could support the transition toward wage employment and extend production across locations, allowing the benefits of greater managerial availability to reach beyond individual districts. An important question for future research is which policies can effectively expand the supply of workers prepared for management and promote economic development.

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Outline of the Appendix

A Historical Documentation

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- A.2 Repatriation Processing and Asset Restrictions
- A.3 Information Recorded in the Repatriate Survey
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D Theory

- D.1 Establishment Production and Labor Demand
- D.2 Headquarters Practices and Geographic Expansion
- D.3 Occupational Sorting and Qualification
- D.4 Managerial Qualification and Average Firm Size
- D.5 Quantitative Firm Choices and Equilibrium Accounting

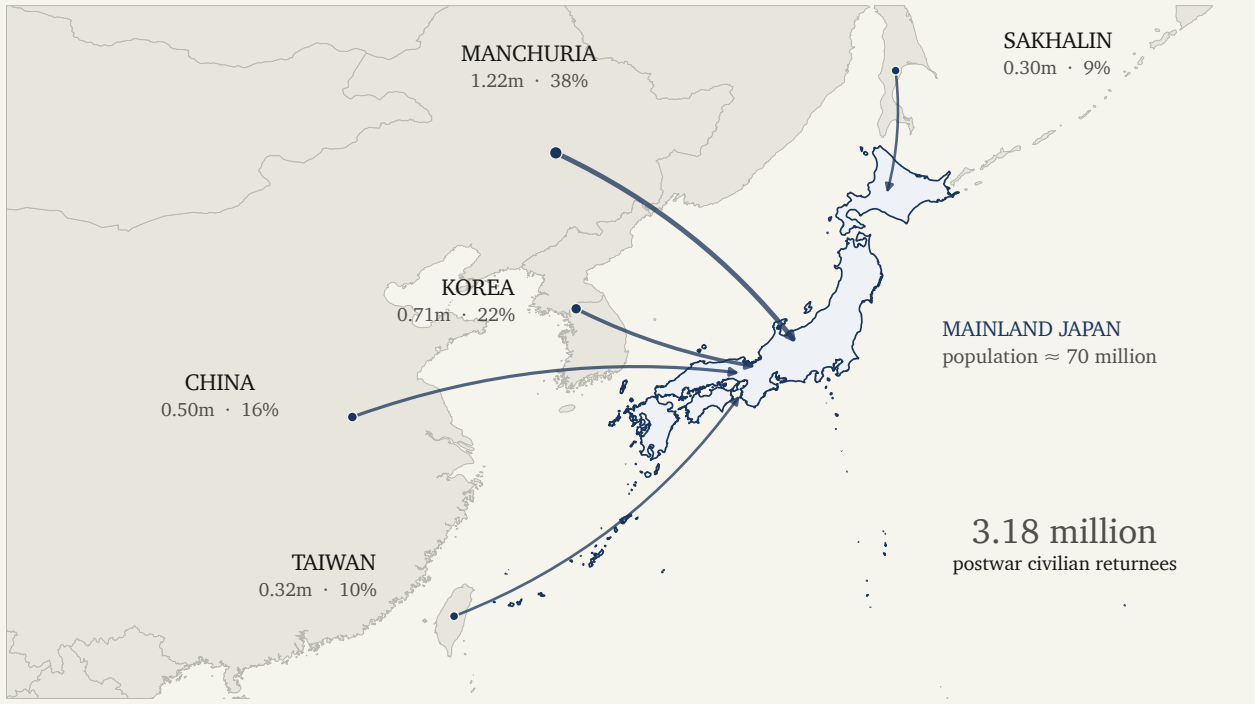
A Historical Documentation

This section documents the historical basis for the paper's measures of repatriate settlement and managerial experience. I first describe returnees' origins, reception procedures, and restrictions on the assets they could bring to Japan. I then distinguish family-registry locations at surrender from first postwar addresses, which measure registry exposure and realized settlement, respectively. Finally, I explain why overseas occupational titles indicate experience relevant to management and compare the classification with returnees' postwar occupations.

A.1 Origins of Civilian Repatriation

Civilian repatriation drew returnees from across Japan's former overseas empire and wartime-occupied territories. Figure A1 shows the geographic reach and relative size of these flows, providing context for the overseas employment discussed below.

FIGURE A1: Major Origins of Postwar Japanese Civilian Repatriates



NOTES: Arrows point from each origin toward Japan proper, with line widths proportional to the origin's share of civilian returnees. Labels report rounded counts and shares of the 3.18 million civilian returnees. Modern coastlines and borders are shown only as geographic reference. Manchuria is represented by an origin point rather than a modern administrative boundary. Source: author's construction from official totals reported by Ministry of Health and Welfare Relief Bureau (1977).

A.2 Repatriation Processing and Asset Restrictions

Restrictions on asset transfers help distinguish the labor inflow from the wealth returnees could bring to Japan. Allied authorities organized arrivals at reception centers and restricted incoming cash and property. Table A1 summarizes these rules and the procedures for processing returnees.

Table A1: Selected Repatriation Directives and Administrative Arrangements

Date	Document or decision	Provision relevant to the paper
September 27, 1945	SCAPIN-67	Limited civilians returning to Japan to ¥1,000 per person. Excess yen, other currencies, securities, financial instruments, jewelry, and most other property were to be taken up.
October 15 and November 17, 1945	SCAPIN-142 and SCAPIN-293	Directed the Japanese government to operate reception centers at designated ports and coordinate customs, transportation, physical inspection, quarantine, demobilization, and onward travel.
January 1946	Comprehensive repatriation plan	A GHQ-led conference adopted an integrated plan for repatriation and transport. The mobilization of 200 U.S. vessels accelerated the return.
February 8, 1946	SCAPIN-721	Specified the treatment of yen currency, exchange certificates, and Japanese government bonds brought into Japan and required records at ports of debarkation.

Notes: SCAPIN-67 governed the funds and property that Japanese civilians could bring into Japan. SCAPIN-142 and SCAPIN-293 directed the operation of reception centers for incoming Japanese and outgoing non-Japanese repatriates. SCAPIN-721 specified the treatment of currency and financial instruments brought into Japan. The table reports selected provisions relevant to the paper. Sources: Supreme Commander for the Allied Powers (1945a,b,c, 1946a) and Japan Center for Asian Historical Records (2025).

Evidence of baggage inspection complements the written rules governing returnees' belongings. Figure A2 documents one inspection at Kajiki in November 1945. The photograph illustrates the reception process. The directives in Table A1 establish the general rules governing cash and financial assets.

A.3 Information Recorded in the Repatriate Survey

The 1964 *Survey of Overseas Private Assets* documented private assets left overseas to inform compensation policies (Matsuzaki, 2019). It asked respondents to reconstruct their circumstances at surrender and immediately after repatriation. Its fields therefore refer to dates before the survey: occupation describes overseas employment, family-registry locations are recorded as of August 15, 1945, and settlement is the first address after repatriation.

A family-registry location was a household's legal domicile, not necessarily its current residence, and could be transferred (Krogness, 2014). My empirical design requires only that its recorded 1945 August 15 location predate postwar settlement. Figure A4 reproduces

FIGURE A2: Baggage Inspection During Repatriation, 1945



NOTES: Allied personnel inspect the belongings of a Japanese woman returning from Davao with her child at Kajiki, Japan, on November 20, 1945. The photograph documents baggage inspection during repatriation. Source: Showakan Digital Archive, photograph 90081862; original held by the U.S. National Archives (Showakan Digital Archive, 1945).

a redacted form and shows that these fields are recorded separately, allowing the analysis to distinguish predetermined family-registry exposure from realized settlement. Section B.3 describes the survey's coverage, digitization, and limitations.

The family-registration system records births, marriages, deaths, and family relationships in a household register. Its registered location identifies where the register is legally maintained. Household members could live elsewhere in Japan or abroad while retaining their registered domicile, and many families retained ancestral locations after moving (Krogness, 2014). For example, most Japanese settlers in Karafuto retained registrations in their home prefectures (Ivings, 2014).

Households may retain an earlier family-registry location because changing residence creates little reason to update it. In a 2016 Ministry of Justice survey, reported reasons included seeing no need to change the registered location, finding the procedure cumbersome, and maintaining ties to a family home or hometown (Hitachi, Ltd., 2016, p. 31, Figure 27). Table A2 reports the distribution of responses.

TABLE A2: Reasons for Keeping Family-Registry Location Separate from Residence, 2016

Reported reason	Share (%)
Never considered changing it	22.0
No need to move it to the current address	18.5
Changing it is cumbersome	15.9
Want to register at the family home	14.3
Follow family practice	11.8
Want to register at the birthplace or hometown	8.4
Attachment to a particular place	2.6
Prefer to keep registry and residential locations different	1.7
Other	4.8

NOTES: Shares among 4,875 respondents whose family-registry location differed from their current residence. The online survey was conducted in May 2016. Response categories are translated and abbreviated. These responses describe contemporary reasons for retaining a registered domicile and do not establish settlement behavior in 1945. Source: Hitachi, Ltd. (2016, p. 31, Figure 27), report prepared for the Ministry of Justice.

Figure A3 summarizes when each measure is recorded and how it enters the empirical design.

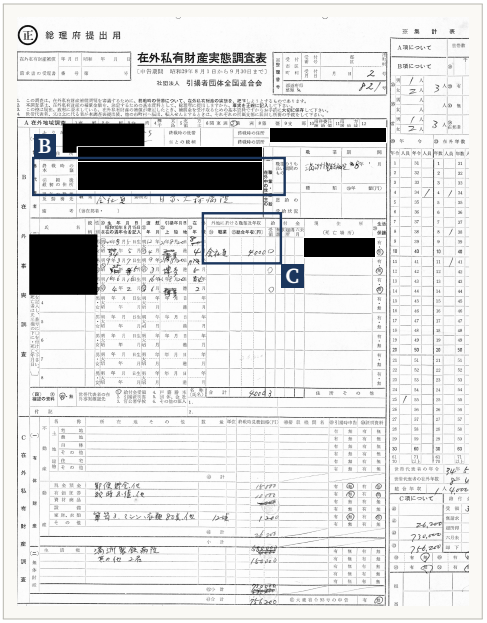
FIGURE A3: Timing of the Repatriation Measures and Outcomes



NOTES: Arrows show chronological order. The empirical analysis uses exposure based on family-registry locations to instrument realized inflows of repatriates with managerial experience and of production-worker repatriates and estimates their effects on subsequent district and firm outcomes.

FIGURE A4: Fields Used to Measure Family-Registry Exposure, Settlement, and Occupation

A. Redacted survey form



B. Family registry and first postwar address



The upper field records the family-registry location at surrender; the lower field records the first address after repatriation.

C. Overseas occupation and annual income



The handwritten entry records the occupation as "*shain*" and annual income as ¥4,000.

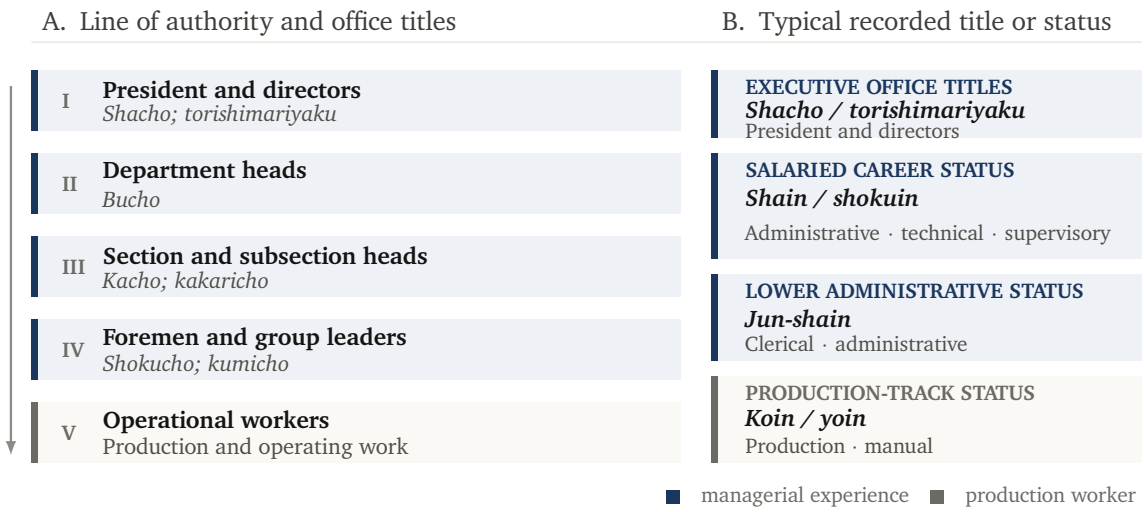
NOTES: Panel A reproduces one form from the 1964 *Survey of Overseas Private Assets*; boxes mark the fields enlarged in Panels B and C. Panel B enlarges the fields labeled "family registry at the end of the war" and "first address after repatriation." Panel C enlarges the fields for occupation and annual income overseas. Names and address entries are redacted, and the signature block is omitted. Source: author's digitization of records held by the Kanagawa Prefectural Archives; see Matsuzaki (2019).

A.4 Overseas Organizations and Managerial Experience

The establishment of Japanese firms and public institutions overseas created demand for administrative and supervisory staff. Firms, railways, and government institutions required personnel to coordinate operations, administer employment, and supervise workers. The Korean Government Railways adopted the Japanese government-employee system for its upper and middle ranks, while the South Manchuria Railway reproduced a hierarchy separating administrative and technical staff from lower-tier workers (Lim, 2024; Nishizaki, 2022).

These organizations combined a chain of authority with distinct personnel career tracks. As illustrated in Figure A5, office titles identified positions within the chain of command, while status titles identified employees' career tracks. *Shain* and *shokuin* belonged to salaried administrative, technical, and supervisory tracks, whereas *koin* and *yoin* belonged to production tracks (Levine, 1955; Suzuki, 1985; Ujihara, 1959; Aso, 1983). Ujihara (1968) describes *shain* as employees directing the enterprise, staff supporting them, or candidates being prepared for future managerial positions. These titles therefore indicate experience relevant to management.

FIGURE A5: Typical Organization and Job-Status Titles in Large Japanese Firms Before 1945



NOTES: Panel A summarizes the typical hierarchy and its office titles. Panel B shows personnel-status categories recorded in company and repatriate records. Office titles indicate authority; status titles indicate career track. Ink blue denotes titles used to identify repatriates with managerial experience in the empirical analysis; warm gray denotes production-worker titles. Sources: Levine (1955); Suzuki (1985); Ujihara (1959, 1968); Aso (1983).

Japanese employees disproportionately occupied the upper tiers of these overseas organizations (Table A3). The South Manchuria Railway records place Japanese employees in the career-track *shokuin* category, while the lower-tier *yoin* category consisted entirely of non-Japanese workers. At the Korean Government Railways, Japanese employees held 98% of senior-official positions but only 5% of low-ranked positions (Nishizaki, 2022; Lim, 2024).

Personnel policies helped produce this division: the Korean Government Railways favored Japanese employees in promotion, pay, and access to training (Lim, 2024). Nationality-based differences in access to these positions shaped who acquired administrative and supervisory experience.

Table A3: Japanese Concentration in Upper-Tier Overseas Railway Employment, 1944

A. South Manchuria Railway in Japanese-controlled Manchuria

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

B. Korean Government Railways in colonial Korea

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

Notes: Panel A reports employee counts at the South Manchuria Railway; Panel B reports within-rank nationality shares at the Korean Government Railways. The two organizations used different job classifications. The table documents nationality sorting across upper- and lower-tier positions rather than a comparison of identical titles. Sources: Nishizaki (2022) and Lim (2024, Table 1, pp. 613–614).

Internal training complemented the experience employees acquired through their work. Large Japanese firms developed technicians, skilled workers, and foremen through on-the-job training, company schools, and courses for incumbent employees (Iwauchi and Sasaki, 1987). Overseas organizations adopted similar arrangements. The South Manchuria Railway provided both on-the-job and formal training, while the Korean Government Railways combined its personnel hierarchy with internal technical education (Nishizaki, 2022; Lim, 2024). Together with administrative and supervisory assignments, these arrangements provided opportunities to develop relevant capabilities through employment rather than formal education alone.

Public-sector employment also provided administrative and supervisory experience. A 1921 ordinance assigned the principal of the Government-General of Korea's normal school, a teacher-training institution, responsibility for managing the school and supervising its staff; designated instructors directed its attached school and practical teaching (Government of Japan, 1921). In Taiwan, the Police and Prison Officer Training Institute provided academic and practical training for several ranks (Japan Center for Asian Historical Records, n.d.), and Japanese officers directed Indigenous and Han police auxiliaries (Kitamura, 2004, pp. 113–114). These examples establish relevant responsibilities and training in particular public-sector positions, although they do not imply that every teacher or police officer supervised employees.

A contemporary assessment emphasized both the scale of this experienced workforce and the potential disruption from its departure. In June 1946, the U.S. State-War-Navy Coordinating Committee estimated that approximately 168,000 Japanese had held key positions as managers, supervisors, and foremen in China, Taiwan, and Manchuria at surrender. These workers had at least two years of specialized training. The report stated that Japanese personnel occupied most top technical and administrative positions in Manchuria and nearly all higher administrative positions in Taiwan. It warned that Taiwan's economy could be severely disrupted if these personnel departed immediately (State–War–Navy Coordinating Subcommittee for the Far East, 1946, pp. 898–900).

South Manchuria Railway regulations assigned managers responsibility for personnel decisions and coordination across organizational units. The company's 1923 workshop regulations authorized managers to assign employees to duties and decide pay increases and promotions for specified employee categories, within approved staffing and budgets. They also required managers to consult other departments involved in the decision, report important decisions to the Railway Department, and submit reports on completed work and specified transactions (South Manchuria Railway, Railway Department, 1923, Workshop Regulations, Arts. 3–8, pp. 73–75). These responsibilities provided opportunities to gain experience in organizing employees and coordinating operations.

Similar responsibilities appear in descriptions of managerial work in postwar Japanese manufacturing. In a contemporary account, Yahata Steel executive Ikeda (1965, Sec. 2.4, pp. 1539–1540) describes frontline managers at the Tobata plant as allocating workers, evaluating subordinates, recommending pay increases and promotions, and coordinating production with other sections. Table A4 compares selected duties with those specified in the South Manchuria Railway regulations. The overlap supports the plausibility that experience acquired in overseas organizations could be useful in postwar firms.

TABLE A4: Managerial Responsibilities at the South Manchuria Railway and Postwar Yahata Steel

Function	South Manchuria Railway, 1923 Workshop managers in Manchuria	Yahata Steel, 1965 account Frontline managers at Tobata, Japan
Personnel allocation	Assign qualifying employees to duties.	Allocate personnel to tasks and reassign workers within the work unit.
Pay and promotion	Decide pay increases and advancement in grade for qualifying employees.	Assess subordinates for allowances, bonuses, pay increases, and promotion. Submit recommendations to a superior.
Leave administration	Approve requests under specified employee-service provisions, including leave.	Permit absence and leave and handle attendance-related matters.
Coordination across units	Consult other departments involved in the decision and seek approval for important or exceptional decisions.	Contact related sections when schedules change and coordinate production adjustments.
Reporting	Submit completion reports and monthly reports on specified orders and transactions.	Prepare handover records and report production disruptions to superiors.

NOTES: English paraphrases of selected prescribed responsibilities for managers. The South Manchuria Railway column draws on the Workshop Regulations in South Manchuria Railway, Railway Department (1923, pp. 73–75), covering the Shahekou and Liaoyang workshops. The Yahata column draws on Ikeda (1965, Sec. 2.4, pp. 1539–1540), a company executive's published account. The roles differ in seniority and authority: workshop managers could approve specified personnel decisions, whereas Yahata frontline managers recommended pay and promotion decisions. Coordination and reporting also concern different operational settings. The documents establish responsibilities for selected positions, not task frequencies, representative coverage of repatriates, or individual skill transfer.

A.5 Occupational Classification and Postwar Occupations

The classification in Table A5 uses the organizational experience associated with recorded overseas occupations. Administrative, technical, supervisory, and public organizational roles identify workers with experience relevant to entering management; production and manual occupations define the comparison group. These categories describe prior experience rather than verified supervisory responsibility for every worker. Ordinary teachers and police remain in the baseline classification, while Table A16 reports the narrower classification that includes them only when a supervisory rank is recorded.

To compare this 62.7% share with the workforce in Japan proper, I construct the closest feasible domestic counterpart using the 1940 Population Census (Statistics Bureau, 2024). The repatriate records report household heads' occupations, so I use employed men age 15 and older as the domestic benchmark. Managers and clerical workers, technicians, public officials, and teachers together accounted for 13.5% of this workforce, compared with 62.7% of repatriate household heads.[17] The census uses broad occupational categories, whereas the repatriate survey records specific job titles, so the comparison is not exact. Even so, it shows that returnees were far more concentrated in administrative, technical, public-service,

[17]Managers and clerical workers accounted for 8.4% and technicians for 2.3%; adding public officials and teachers raises the broad benchmark to 13.5%.

Table A5: Classifying Repatriates by Overseas Occupation

Repatriates with managerial experience (62.7%)		Production-worker repatriates (22.3%)	
Occupation	**Description**	**Occupation**	**Description**
Career-track staff	Salaried career-track administrative, technical, and supervisory staff	Production workers	Blue-collar production workers
Lower-tier clerical staff	Lower-tier clerical and administrative employees	Lower-tier manual workers	Bottom-tier manual workers
Bureaucrats, police, teachers	Public administration, policing, and education	Agriculture, manual services	Farm labor and low-skilled manual services

Notes: Shares refer to sampled repatriate household heads. Other titles account for 15.0% and cannot be classified consistently. Managerial experience denotes prior work in administrative, technical, supervisory, or public organizational roles relevant to entering management. Original Japanese titles are *shain/shokuin* (career-track staff), *jun-shain* (lower-tier clerical staff), *koin* (production workers), and *yoin* (lower-tier manual workers). The occupational mappings draw on Ujihara (1959, 1968); Aso (1983); Yamashita (2006); Kitamura (2004); Government of Japan (1921); Japan Center for Asian Historical Records (n.d.).

and teaching career tracks than workers in Japan proper.

Table A6 relates these overseas occupational backgrounds to postwar occupations. Among economically active repatriates aged 20–69 in 1964, the managerial-experience group was more likely to hold a managerial or organizational position than either the production-worker group or workers from high-skilled nonmanagerial backgrounds. This comparison validates the classification's predictive content; it is not an estimate of the causal effect of overseas occupation.

Table A6: Overseas Occupational Background and Managerial or Organizational Positions in 1964

Overseas occupational background	Postwar managerial/organizational share
Managerial experience	34.2%
Production work	9.3%
High-skilled nonmanagerial work	9.5%

Notes: The sample consists of economically active repatriates aged 20–69 in the 1964 *Survey of Overseas Private Assets*. The outcome is the share holding managerial or organizational positions in 1964 within each overseas-occupation group. High-skilled nonmanagerial backgrounds include lawyers and professors. The overseas managerial-experience and production-worker groups use the baseline classification in Table A5. Source: author's digitization of records held by the Kanagawa Prefectural Archives.

B Data

This appendix documents the sources and sample restrictions behind the empirical analysis. Repatriate survey records measure inflows and family-registry exposure, while firm directories and district statistics measure economic outcomes. Employee and personnel records provide supporting evidence on managerial experience, schooling, and pay. I first explain the common district boundaries, then describe how each source is used to construct the analysis samples. Table A7 summarizes the sources; Appendix C presents the supporting regressions and robustness checks.

Table A7: Summary of Data Sources

Dataset	Years	Sample/Coverage	Source
Repatriation and Firm Microdata			
Survey of Overseas Private Assets	1964	69,165 households (15% sample)	Kanagawa Prefectural Archives
Teikoku Directory	1938, 1970	Directory-listed firms in covered prefectures	TDB-CAREE and author digitization
JPC Mission Database	1955–1975	Participating firms	Umezaki et al.
Employee and Personnel Data			
Keihin Employee Survey	1951	Industrial employees in Yokohama and Kawasaki	SSJDA
Mitsui Personnel Register	1943	Personnel entries in Japan and overseas	Mitsui Bunko Digital Archives
Census and Establishment Data			
Population Census	1920–1970	All districts	Statistics Bureau
Census of Commerce	1960	Service-sector establishments	MITI
Other Data Sources			
Tax Statistics	1936	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	1930–1980	All universities	MEXT

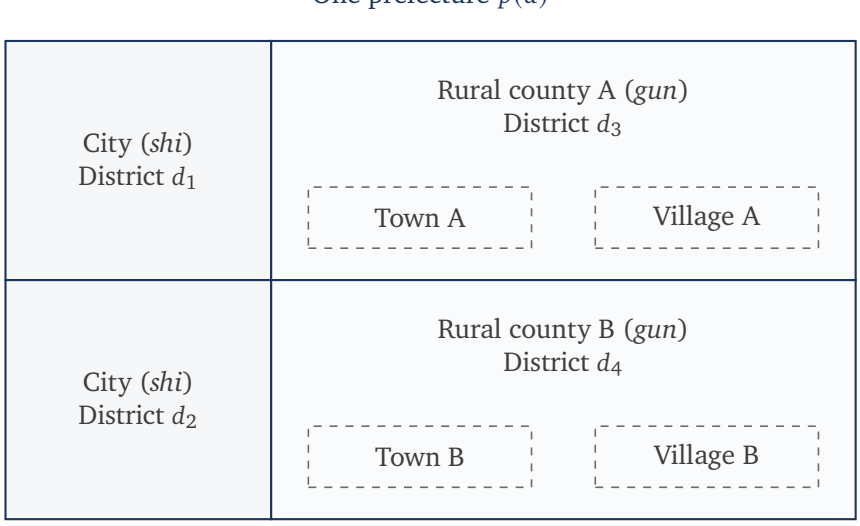
Notes: JPC = Japan Productivity Center. The JPC Mission Database was compiled by Umezaki et al. (n.d.). SSJDA = Social Science Japan Data Archive, Institute of Social Science, The University of Tokyo. The Keihin employee survey is described by Institute of Social Science, The University of Tokyo (2018); the Mitsui records were obtained from the Mitsui Bunko Digital Archives and transcribed by the author. 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.

B.1 Unit of Analysis: Districts

The district provides a common geographic unit for combining repatriate records with local economic outcomes. A district d is a city (*shi*), a rural county (*gun*), or a special ward of Tokyo. Each city and special ward forms a separate district, while each rural county groups its constituent towns and villages into a single district. Prefectures are Japan's first-level administrative divisions and contain these local units. Figure A6 illustrates one prefecture $p(d)$ containing two city districts and two rural-county districts. The towns and villages within a county are not separate observations in the district-level regressions.

The sample contains 1,113 districts on common 1960 boundaries: 533 cities, 557 rural counties, and Tokyo's 23 special wards. Their median populations in 1960 were approximately 49,600, 51,000, and 351,100, respectively, calculated from the harmonized Population Census data. The sample covers urban and rural areas across Japan but excludes Kagoshima and Yamanashi, where repatriate survey records are unavailable. Okinawa is also outside the sample because it was under U.S. military administration until 1972. Appendix Figures A8 and A9 show this coverage.

FIGURE A6: Cities and Rural Counties as Districts



NOTES: The illustrative prefecture contains four districts. Solid lines separate districts; dashed boxes identify towns and villages within each rural county. The drawing does not represent actual administrative boundaries.

B.2 Geographic Crosswalks and Standardized Boundaries

I assign historical observations to common 1960 district boundaries so that changes in administrative borders do not change the geographic units being compared. Following Eckert et al. (2020), I intersect historical district boundaries with the 1960 reference map. The

resulting geographic crosswalks allocate each historical district's totals across 1960 districts in proportion to their overlapping areas.

Each crosswalk weight is the fraction of a historical district's area that lies within a particular 1960 district. For historical year t, the weight is:

$$w_{dr}^{(t)} = \frac{A_{dr}^{(t)}}{A_{r}^{(t)}} \quad \forall\, d \in \mathcal{D}_{1960},\, r \in \mathcal{D}_t,$$

Here, $w_{dr}^{(t)}$ links 1960 district d to historical district r. The areas $A_{dr}^{(t)}$ and $A_{r}^{(t)}$ denote their intersection and the total area of historical district r, respectively. The sets $\mathcal{D}_{1960}$ and $\mathcal{D}_t$ contain the reference districts and the districts in historical year t.

I reconstruct each historical total on 1960 boundaries by summing these weighted contributions. For a historical variable X, such as population in 1940, the reconstructed value is:

$$X_{d,t}^{1960} = \sum_{r \in \mathcal{D}_t} w_{dr}^{(t)} X_{r,t}.$$

The allocation can combine parts of several historical districts into one reference district. For example, suppose 1960 district d overlaps with two 1940 districts. District A has population 100, and 20% of its area overlaps with d; District B has population 10, and all of its area overlaps with d. The assigned 1940 population is $X_{d,1940}^{1960} = (100 \times 0.2) + (10 \times 1.0) = 30$.

B.3 Repatriation Microdata

The repatriate microdata come from a random sample of archived household records in the 1964 *Survey of Overseas Private Assets* (*Zaigai Shiyu Zaisan Jittai Chosa Hyo*). The National Federation of Repatriate Organizations (*Hikiagesha Dantai Zenkoku Rengo-kai*) conducted the survey in November 1964 to document assets left in territories formerly under Japanese control and inform compensation policies. The survey slips were transferred from the Federation's office to the Kanagawa Prefectural Archives, as described in Matsuzaki (2019). The archive holds approximately 460,000 household records, with no records for Kagoshima or Yamanashi. I randomly sampled and digitized 69,165 households, approximately 15% of the available records.

The survey's occupation and address fields allow me to construct separate measures of overseas experience, registry exposure, and postwar settlement. It records the household head's name, pre-repatriation occupation, last address abroad, family-registry location on August 15, 1945, and first address in Japan after repatriation. Thus, the registry address refers to surrender, while the settlement address refers to the subsequent return to Japan. I classify occupations using the rules in Appendix A.5, assign each group separately by these

two addresses, and divide the district counts by the 1940 labor force. The first postwar address defines realized inflows; the registry address defines the corresponding instruments.

B.4 Repatriate Characteristics and Geographic Distribution

The following statistics describe how much repatriate inflows varied across districts and how the two occupational groups differed before returning to Japan. I first report inflow shares and compare realized settlement with family-registry exposure. I then describe age, years abroad, and last overseas residence. These descriptive comparisons help characterize the inflows used in the regressions.

Summary Statistics of Repatriate Shares. Realized inflow shares measure each occupational group's arrivals relative to the receiving district's 1940 labor force. Table A8 summarizes these shares across the 1,113 districts in the baseline local-outcome sample, using the 1940 labor force as the common denominator.

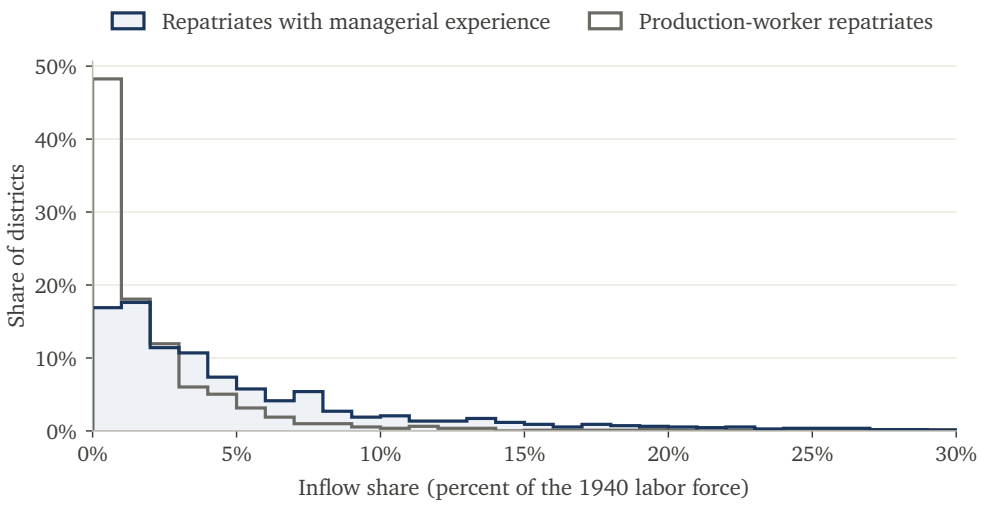
Table A8: Summary Statistics of Repatriate Shares

	Production-worker repatriate share	Inflow share: repatriates with managerial experience
10th percentile	0.000	0.006
25th percentile	0.003	0.014
50th percentile	0.011	0.034
75th percentile	0.026	0.072
90th percentile	0.053	0.138
Mean	0.023	0.058
Standard deviation	0.042	0.075
Observations	1,113	

Notes: This table reports selected summary statistics for the inflow shares of production-worker repatriates and of repatriates with managerial experience in the baseline local-outcome estimation sample. Each share is the corresponding realized repatriate inflow divided by the district's 1940 labor force.

Repatriate Share Distribution. Most districts received inflows below 5% of their 1940 labor force, but a smaller group received much larger inflows. Figure A7 shows this right-skewed distribution for both occupational groups. The figure describes variation in realized settlement; the IV regressions use the component predicted by family-registry exposure.

FIGURE A7: Repatriate Share Distribution



NOTES: Distribution of the realized inflow shares used in the regressions and summarized in Table A8, across the 1,113 districts in the estimation sample. Each outline shows the share of districts in 1-percentage-point bins. The horizontal axis is truncated at 30 percent; 17 districts for repatriates with managerial experience and 5 for production-worker repatriates lie above it.

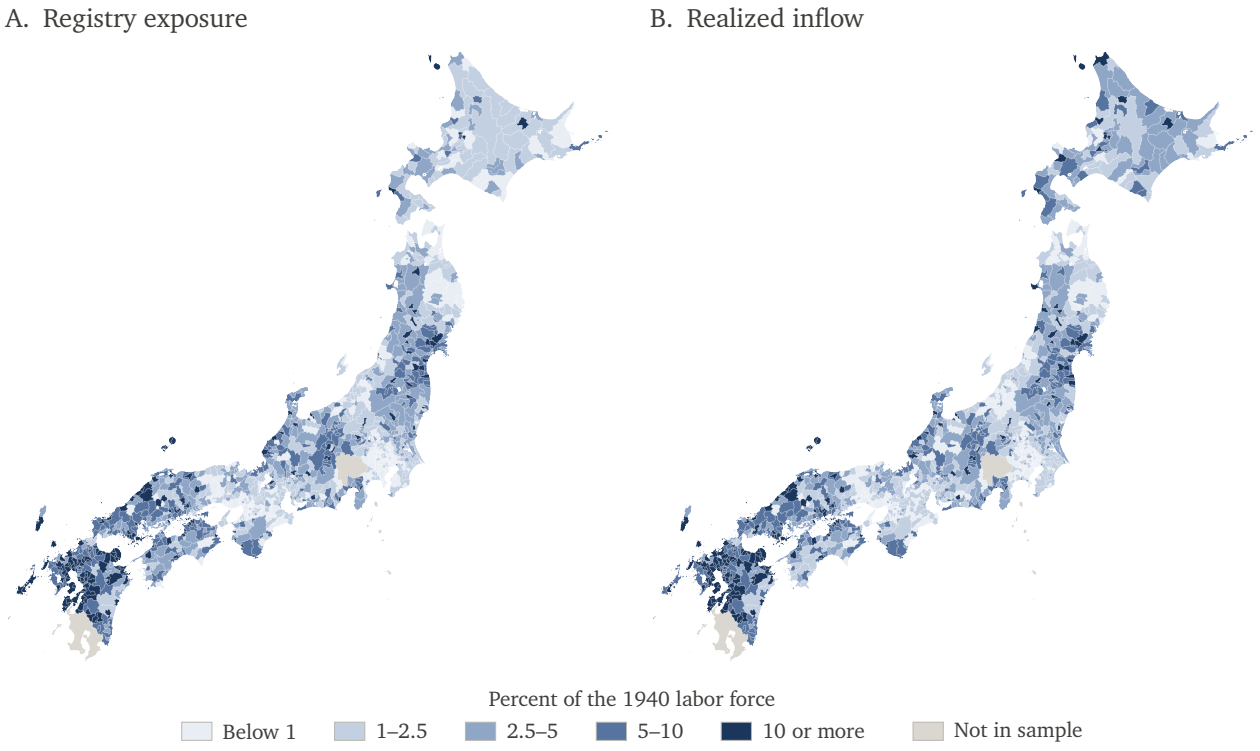
Geographic Distribution of Repatriate Shares. Registry exposure closely tracks realized settlement for repatriates with managerial experience. Figures A8 and A9 map both measures for the two occupational groups. For the managerial group, their correlation across districts is 0.96. Both measures are highest in Kyushu, Shikoku, and western Honshu and lowest in the prefectures around Tokyo and Osaka, where 1940 labor forces are large.

Production-worker settlement differs more from registry exposure, largely because of Hokkaido. The correlation is 0.71 across all districts and 0.96 when Hokkaido is excluded. Hokkaido received 16% of the realized production-worker inflow in the estimation sample but accounted for 5% of registry exposure. The IV specification uses registry exposure to predict settlement rather than treating all realized inflow variation as exogenous.

Settlement in Hokkaido by repatriates registered in Karafuto accounts for much of this mismatch. Karafuto, the southern part of Sakhalin immediately north of Hokkaido, supplied many returnees who settled in Hokkaido (Kimura, 2024). Among production-worker repatriates whose first postwar address was in Hokkaido, 61% had their family registry in Karafuto, compared with 34% of repatriates with managerial experience. These returnees contribute to Hokkaido's realized inflow, while their Karafuto registrations contribute no exposure to domestic districts. Their greater prevalence among production workers helps explain why registry exposure tracks production-worker settlement less closely.[18]

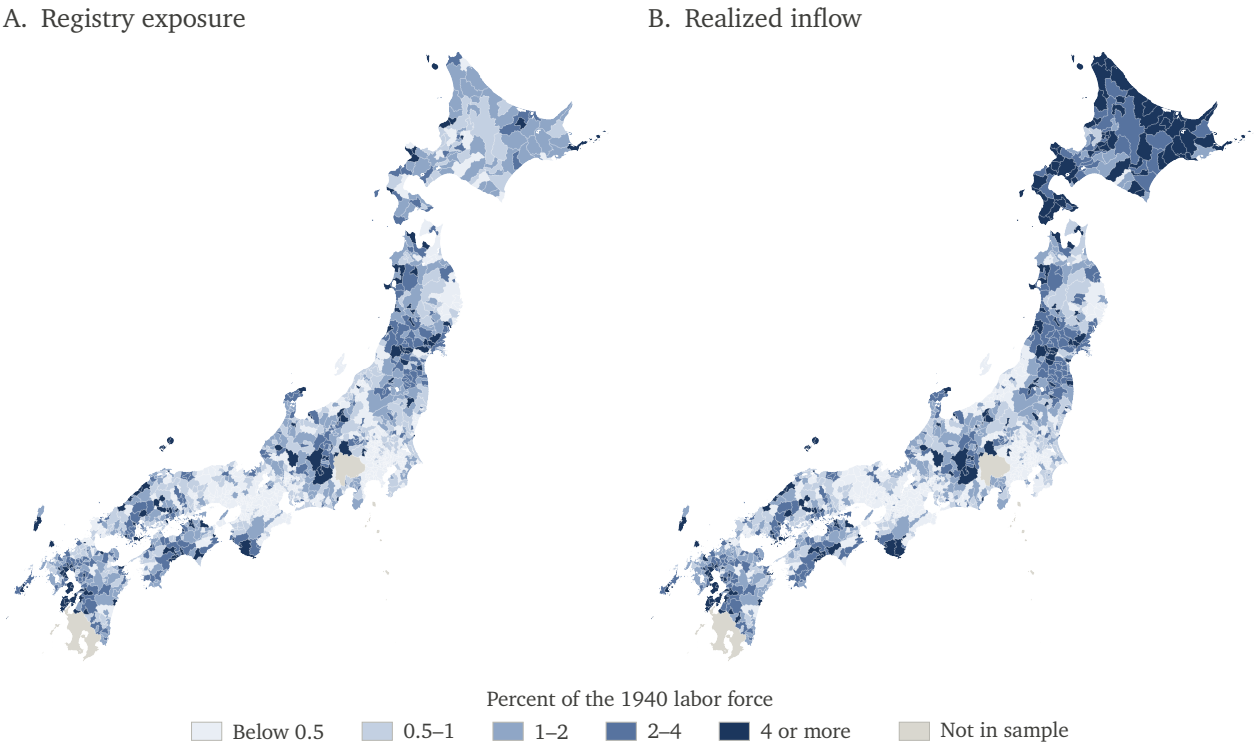
[18]Excluding records with Karafuto family registries from realized inflows raises the production-worker correlation with registry exposure from 0.71 to 0.93; the managerial correlation rises from 0.96 to 0.97. This descriptive comparison retains the same 1,113 districts and 1940 labor-force denominators.

FIGURE A8: Registry Exposure and Realized Inflow of Repatriates with Managerial Experience



NOTES: Districts are cities or rural counties harmonized to 1960 boundaries. Panel A assigns repatriates with managerial experience to their family-registry district on August 15, 1945; Panel B assigns them to their first postwar address. Values are the instrument and inflow shares used in the regressions, expressed in percent of the district's 1940 labor force; Table A8 summarizes the realized inflow shares. Both panels use the same shading classes. Gray districts are outside the 1,113-district estimation sample: Yamanashi and Kagoshima prefectures, for which the archive holds no survey records, and the Izu Islands. Okinawa is not shown; it is outside the sample since it was under U.S. military administration until 1972.

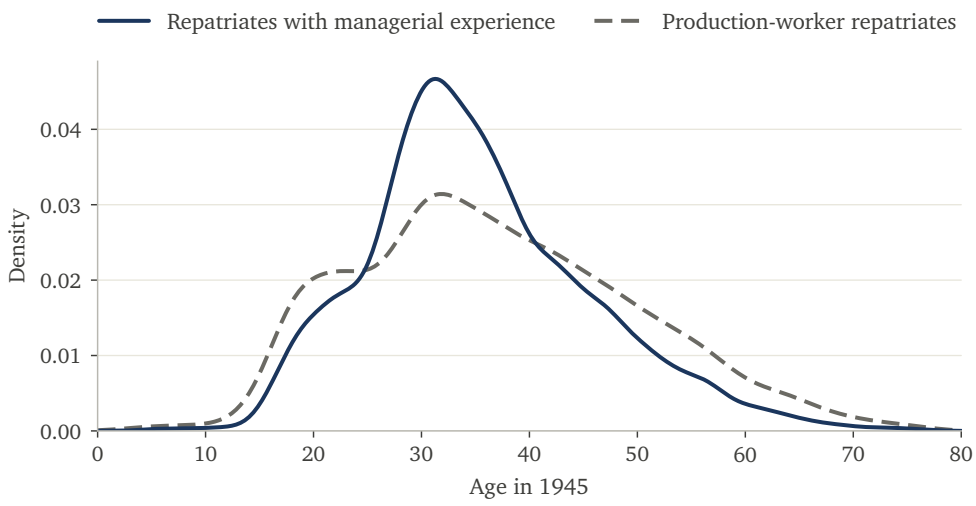
FIGURE A9: Registry Exposure and Realized Inflow of Production-Worker Repatriates



NOTES: Panel A assigns production-worker repatriates to their family-registry district on August 15, 1945; Panel B assigns them to their first postwar address. Values and gray districts are defined as in Figure A8. The cutoffs are lower than in Figure A8 because production-worker shares are smaller, so the same shade denotes different values in the two figures. Okinawa is not shown; it is outside the sample since it was under U.S. military administration until 1972.

Repatriate Age Distribution. Both occupational groups consisted predominantly of working-age adults. Figure A10 plots their ages in 1945, with both distributions concentrated between 20 and 40. The broadly similar profiles describe the groups' age composition but do not establish that age plays no role in their differing economic effects.

FIGURE A10: Repatriate Age Distribution



NOTES: Kernel density estimates of age in 1945 for repatriates with managerial experience and production-worker repatriates.

Repatriate Length of Stay Distribution. Years lived abroad indicate the duration of potential exposure to overseas workplaces. Figure A11 shows that many repatriates, especially those with managerial experience, had lived abroad for several years. This duration is consistent with sustained exposure to overseas administrative and business organizations, although residence alone does not identify the work performed.

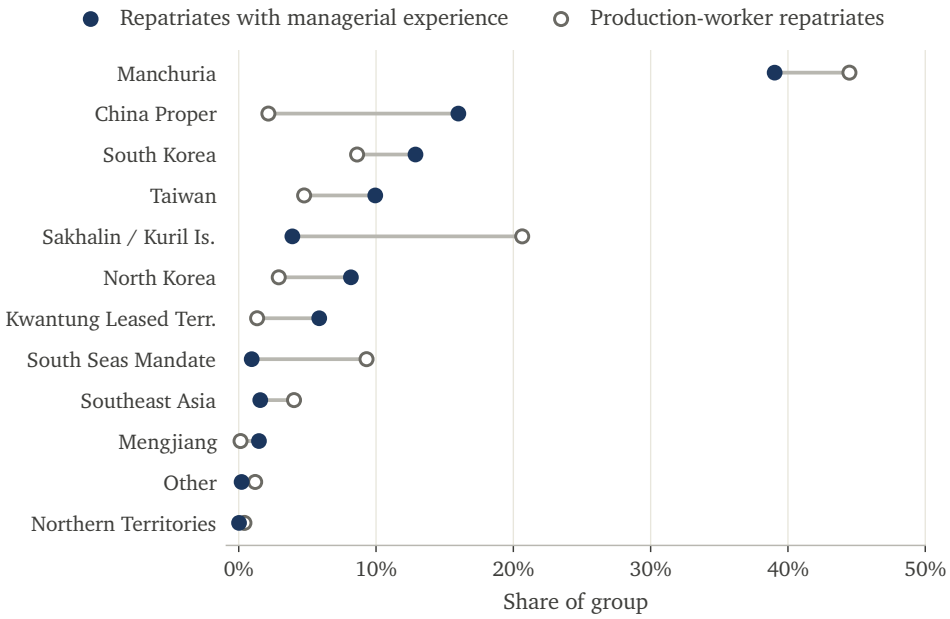
FIGURE A11: Repatriate Length of Stay Distribution



NOTES: Kernel density estimates, reflected at zero, of years lived abroad before repatriation for repatriates with managerial experience and production-worker repatriates. The horizontal axis is truncated at 50 years; 23 and 14 individuals, respectively, lie beyond it.

Pre-Repatriation Regions of Residence. Manchuria was the largest source of both occupational groups, while other overseas origins differed substantially. Figure A12 groups repatriates by their last overseas residence: Manchuria accounts for 39% of those with managerial experience and 44% of production-worker repatriates. The managerial group had larger shares from China Proper (16% versus 2%), Korea (21% versus 12%), Taiwan (10% versus 5%), and the Kwantung Leased Territory (6% versus 1%). Production-worker repatriates had larger shares from Sakhalin and the Kuril Islands (21% versus 4%) and the South Seas Mandate (9% versus 1%).

FIGURE A12: Repatriates by Pre-Repatriation Region of Residence



NOTES: Share of each group whose last overseas residence was in the indicated region: filled markers for repatriates with managerial experience and open markers for production-worker repatriates. Rows are ordered by the two groups' combined count.

B.5 Firm and Establishment Data

Firm directories measure the geographic scope of individual firms, while establishment statistics measure the number and scale of local production units. The directory analysis uses firm records from 1938 and 1970. The establishment analysis aggregates outcomes to the common district boundaries, so its observations and coverage differ from those of the firm regressions.

Firm-Level Data. I combine two sources of entries from the *Teikoku Ginkou Kaisha Yoroku* (Teikoku Bank and Company Directory) to measure operation outside firms' headquarters

areas. The TDB-CAREE database at Hitotsubashi University contains the directory-listed firms in Osaka, Kyoto, Hyogo, Fukuoka, Aichi, Shizuoka, Nagano, and Gunma (Teikoku Databank Center for Advanced Empirical Research on Enterprise and Economy, 2024). I supplement these records with my digitization of directory entries for the remaining prefectures.

The spatial-expansion regressions use 129,807 records: 30,134 in 1938 and 99,673 in 1970, across 830 headquarters districts. Of these districts, 806 are observed in both years. I assign repatriate inflows to the district containing each firm's headquarters. The records are repeated cross sections rather than linked firms, so they measure changes in outside-headquarters operation among listed firms rather than expansion by the same continuing firms. Table 4 reports estimates using this sample.

Directory coverage limits these comparisons to firms meeting the publisher's eligibility rules. Teikoku Koshinsho, now Teikoku Databank, compiled the directory for joint-stock companies (*Kabushiki Kaisha*), limited partnerships (*Goshi Kaisha*), and unlimited partnerships (*Gomei Kaisha*). The minimum-capital threshold varied across editions and was 50,000 yen in 1938. The sample therefore covers incorporated medium and large firms above the directory threshold.

Japan Productivity Center Overseas Study Missions. JPC records measure firms' participation in overseas study missions, providing a proxy for exposure to management training. I use the unpublished *Japan Productivity Center Overseas Study Mission Database, 1955–1975*, compiled by Umezaki et al. (n.d.). It records participation in missions on management, production, labor relations, marketing, and organization. Attendance motivates the practice-adoption proxy discussed in Section 3.1, but the records do not directly observe adoption.

The main JPC sample contains 112,084 firm records in 1,030 headquarters districts with the required inflows, instruments, and controls. I use the firm file labeled 1955–1965, assign exposure by headquarters district, and code missing participation counts as zero. The tabulated outcome counts linked participant records: several participants from one firm on one mission can contribute multiple records, and linked records can extend beyond the file's stated window. It therefore differs from a count of distinct missions attended within 1955–1965. Table 5 reports the estimates for this measure.

Service Establishments and Output (1960). The 1960 *Shogyo Tokei Chosa* (Census of Commerce) supplies the postwar service-establishment measures (Ministry of International Trade and Industry, 1961). I use establishment counts, employment, and sales to measure the number of establishments, employees per establishment, and sales per worker at the district level. Table 2 compares these measures with their baseline counterparts or proxies in the 1,113-district sample.

B.6 District Economic Data

District statistics measure changes in employment composition and local economic activity. Population Census data provide employment outcomes, 1936 tax records provide proxies for initial economic conditions, and patent applications measure recorded innovation. I combine these sources with the district inflows using the common geographic boundaries described above.

Population Census. The Population Census measures both movement across sectors and changes in employment status. I construct a panel of agriculture, manufacturing, and service employment shares from the Population Census of Japan (*Kokusei Chosa*) for 1920–1970 (Statistics Bureau, 2024). I also use the shares of self-employed, family, and wage workers in 1940 and 1970 and recorded managerial occupations. I harmonize the data to 1960 district boundaries using the crosswalks in Section B.2.

1936 Tax Records. 1936 tax records provide proxies for local nonagricultural activity before the repatriation shock. I use the *Zeimu Tokei Sho* (Tax Statistics) for fiscal year 1936 (Ministry of Finance, 1936). Its *Eigyo Shueki Zei* (Business Profits Tax) was levied on the net profits of commercial and industrial enterprises. The records report sector headcounts and taxable profits at the city (*shi*) and county (*gun*) levels. These tax measures proxy for economic activity in 1936; they are not direct observations of sales comparable to the 1960 census.

Patents. Patent applications provide a measure of recorded local inventive activity. I use the Institute of Intellectual Property (IIP) Patent Database 2020 edition (*IIP Patent Database 2020-nen ban*), which covers approximately 12.7 million applications filed since 1964 (Nakamura, 2016). I count applications filed by district residents in 1964–1970 and express them per 10,000 members of the district's 1960 labor force. Table A24 uses this outcome in the same 1,113-district sample across its four specifications.

B.7 Geography and Infrastructure

War-damage records control for wartime destruction, while transportation and university counts measure other potential channels of local growth. Appendix C.11 reports the facility-count tests.

War Damage. The war-damage control measures air-raid destruction relative to district population. I use buildings destroyed from Economic Stabilization Board (1949), obtained via Davis and Weinstein (2002), and divide the count by 1950 population.

Transportation Infrastructure. Transportation records measure the availability of railway stations and highway interchanges in each district. I obtain them from the National Land Numerical Information download service of the Ministry of Land, Infrastructure, Transport and Tourism (Ministry of Land, Infrastructure, Transport and Tourism, 2024). The regressions use 1,106 districts at ten-year intervals in 1930–1970, with counts per 10,000 contemporaneous residents.

Universities. University records measure the geographic availability of higher-education institutions. I use the *Zenkoku Daigaku Ichiran* (National List of Universities) to count universities in each district by establishment year (Ministry of Education, Culture, Sports, Science and Technology, 2023). The regressions use 1,106 districts at ten-year intervals in 1930–1980, with counts per 10,000 contemporaneous residents (Table A23).

B.8 Keihin Employee Survey, 1951

The Keihin survey allows comparisons of repatriates' schooling, parental occupations, and recorded managerial experience with those of other industrial employees. The *Survey on Keihin Manufacturing Industrial District (Employee Survey), 1951* records repatriation status, schooling categories, employment histories, and childhood household occupations. Conducted in September 1951 at 86 factories in Yokohama and Kawasaki, it received 14,594 responses; the restored data contain 14,327 records (Institute of Social Science, The University of Tokyo, 2018). Its coverage is industrial employees in these locations rather than a representative sample of Japan's population.[19]

I use a common complete-case sample so that adding background controls does not change which respondents are compared. The sample contains 7,510 employees: 1,275 repatriates and 6,235 non-repatriates, observed in 63 sampling workplaces. Each has explicit repatriation status, observed age and sex, a valid schooling category, and a documented civilian job beginning before 1945. Each also has all five childhood household-occupation responses and a valid childhood prefecture or overseas location. I impose no additional adult-age, male-only, or verified-graduation restriction.

The parental-occupation comparisons use childhood household occupations as the available measure of family background. These responses refer to the household at elementary-school completion, may overlap, and do not identify a particular parent's occupation. Appendix C.1 reports the schooling, parental-occupation, and managerial-experience regressions using this common sample.

[19]The data for this secondary analysis, "Survey on Keihin Manufacturing Industrial District (Employee Survey), 1951, (Institute of Social Science, The University of Tokyo)" was provided by the Social Science Japan Data Archive, Center for Social Research and Data Archives, Institute of Social Science, The University of Tokyo.

B.9 Mitsui Personnel Records

Mitsui personnel records provide within-firm evidence on overseas managerial positions and the association between schooling and pay. I digitized the 1943 Mitsui Bussan personnel register from the Mitsui Bunko Digital Archives. It records workplace, schooling, hiring year, occupational titles, and monthly pay. These personnel entries describe employees within one firm rather than a representative sample of overseas workers.

The managerial-position and pay comparisons require different samples from the register. The comparison of all overseas workplaces with Japan uses 2,118 entries with known placement, one of the four recorded schooling categories, a hiring year, and recorded location of origin. I exclude unknown or mixed Japan/overseas workplaces. The pay comparison uses 1,249 overseas entries with positive pay and the required schooling, hiring-year, and location of origin information. Appendix C.2 defines the workplace comparisons and reports both sets of estimates. The entries are not linked career histories, so the managerial comparison describes title prevalence rather than promotions caused by overseas assignment.

C Additional Empirical Results

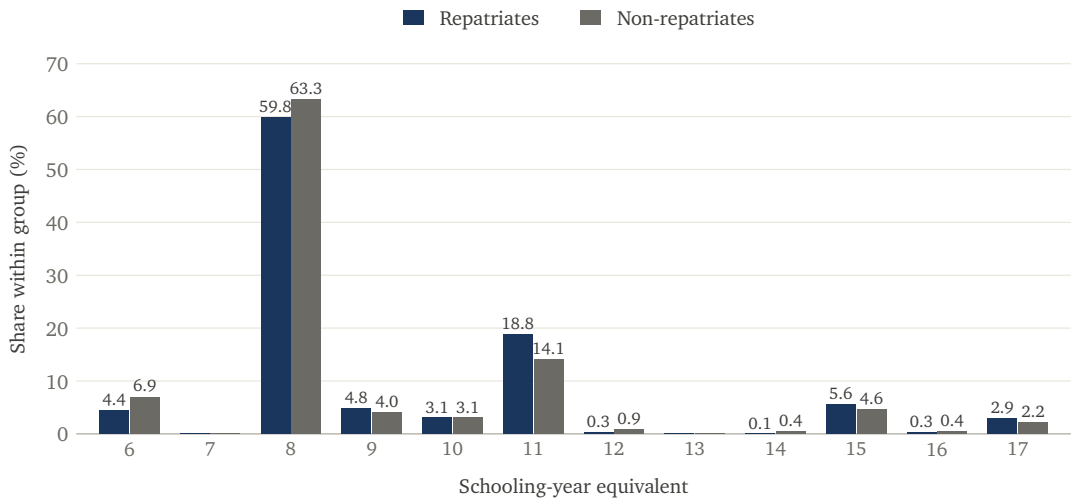
This section presents supporting evidence on managerial experience, tests of the identification strategy, and robustness checks for the main estimates. I first use the Keihin survey and Mitsui personnel records to examine managerial experience, schooling, household background, and income. I then report first-stage estimates, balance tests, and trends before repatriation, followed by sensitivity to occupational classification, additional controls, and alternative measures of repatriate inflows. Finally, I examine other channels.

C.1 Repatriate Background and Managerial Experience in the Keihin Survey

I use the Keihin employee survey to assess whether there was selection into moving out of Japan on observables such as education and whether repatriates' recorded managerial experience differs after accounting for schooling and parental occupations. These comparisons help interpret inflows of workers with managerial experience by examining the educational and parental backgrounds that accompany them. Appendix B.8 describes the survey and construction of the 7,510-person sample used throughout this subsection.

Schooling is concentrated in the same category for repatriates and non-repatriates. Figure A13 shows that approximately 60 percent of repatriates and 63 percent of non-repatriates fall in the category corresponding to eight years of schooling. Repatriates are somewhat more concentrated in the eleven-year category, which accounts for 19 percent of repatriates and 14 percent of non-repatriates.

FIGURE A13: Schooling Distribution of Repatriates and Non-Repatriates



NOTES: Share within each group in the 1951 Keihin employee survey, using the same sample as Figure 2. Schooling-years are years assigned to recorded school categories. Source: Institute of Social Science, The University of Tokyo (2018).

I first compare schooling and parental occupations to describe the observed background differences that may accompany repatriates' managerial experience. I estimate equation (A1) by OLS separately for schooling and each parental occupation category. Table A9 reports the results. Each regression includes repatriate status, age and sex indicators, and fixed effects for childhood prefecture or overseas location. All regressions use the same 7,510 respondents, with standard errors clustered by the 63 sampling workplaces.

The coefficient β_k measures the repatriate–non-repatriate difference for outcome k. Here, Y_{ik} denotes outcome k for employee i, and R_i indicates repatriate status. The controls $\boldsymbol{D}_i$ and $\lambda_{\ell(i),k}$ represent age and sex indicators and childhood-location fixed effects, respectively. Panel A reports β_k in years assigned to recorded school categories. Panel B reports $100\beta_k$ in percentage points for parental occupations.

$$Y_{ik} = \alpha_k + \beta_k R_i + \boldsymbol{D}_i'\Gamma_k + \lambda_{\ell(i),k} + \varepsilon_{ik}. \tag{A1}$$

Table A9: Repatriate Differences in Education and Childhood Household Background

	Fully controlled
A. Education (years)	
Education-level equivalent (years)	0.05
	(0.11)
B. Childhood household occupation (percentage points)	
Agriculture	-1.46
	(1.78)
Manual worker	0.38
	(1.18)
Merchant	-0.76
	(1.07)
Company or public employee	1.05
	(2.24)
Age and sex indicators	✓
Childhood-location indicators	✓
Observations	7,510
Repatriates	1,275
Sampling-workplace clusters	63

Notes: OLS estimates of equation (A1), controlling for age, sex, and childhood-location indicators. Standard errors clustered by 63 sampling workplaces are in parentheses, with finite-sample correction and $t(62)$ inference. All regressions are unweighted and use the same 7,510 respondents: 1,275 repatriates and 6,235 non-repatriates. Childhood location includes domestic prefectures and a separate overseas category. Source: Institute of Social Science, The University of Tokyo (2018).

Conditional differences in schooling and parental occupations are small in this sample. After accounting for age, sex, and childhood location, the schooling difference in Table A9 is 0.05 years, and the parental occupation differences range from −1.46 to 1.05 percentage points. These estimates provide little evidence that repatriates in this sample were more

educated or differed substantially in recorded parental occupations. They do not establish that the groups have equivalent backgrounds or rule out differences in unobserved skills.

I then examine whether a difference in recorded managerial experience remains after accounting for schooling and parental occupations. I estimate equation (A2) by OLS. Table A10 reports results for three control sets. Each column is a linear probability model using the same 7,510 respondents. All columns include separate age, sex, and reported school-category indicators; column 2 adds the five parental occupation indicators, and column 3 also adds childhood-prefecture indicators and an overseas category. Standard errors are clustered by the 63 sampling workplaces, with finite-sample correction and t-based intervals using 62 degrees of freedom.

The coefficient β_c measures the adjusted difference in recorded managerial experience in each specification. Here, G_i indicates any formal managerial occupation in a documented civilian job beginning before 1945, and R_i indicates repatriate status. For column c, $\boldsymbol{X}_{ic}$ contains the controls described above. I report $100\beta_c$ in percentage points.

$$G_i = \alpha_c + \beta_c R_i + \boldsymbol{X}_{ic}'\Gamma_c + \varepsilon_{ic}, \qquad c \in \{1, 2, 3\}. \tag{A2}$$

Table A10: Repatriation Status and Recorded Managerial Experience in the Keihin Survey

	(1)	(2)	(3)
Repatriate status (pp)	0.57	0.57	0.64
	(0.31)	(0.32)	(0.35)
Age, sex, and school category	✓	✓	✓
Childhood household occupations		✓	✓
Childhood location			✓
Observations	7,510	7,510	7,510
Sampling-workplace clusters	63	63	63

Notes: OLS estimates of the linear probability model in equation (A2) for the same 7,510 complete cases as Table A9: 1,275 repatriates and 6,235 non-repatriates. The outcome is any formal managerial occupation in a civilian job beginning before 1945. Coefficients and standard errors are in percentage points. All columns include separate age, sex, and reported school-category indicators; column 2 adds five overlapping childhood household-occupation marks, and column 3 also adds childhood-location indicators. The regressions are unweighted. Standard errors clustered by 63 sampling workplaces are in parentheses, with finite-sample correction; two-sided tests use the t distribution with 62 degrees of freedom. Schooling is reported in 1951, and historical job codes do not establish the timing or location of promotion. Source: Institute of Social Science, The University of Tokyo (2018).

The estimated managerial-experience difference remains positive when parental occupations and childhood location are added as controls. In Table A10, the estimate rises from 0.57 percentage points with age, sex, and schooling controls to 0.64 points with the full control set. These results offer suggestive evidence that workers were more likely to be managers when they worked overseas after controlling for education.

C.2 Managerial Positions and Schooling–Pay Differences within Mitsui

The Mitsui personnel records help interpret both overseas managerial experience and the income control used in the regressions. I first ask whether managerial titles were more common overseas among employees with similar observed schooling and personnel characteristics. I then examine whether income contains information about schooling beyond recorded managerial titles to see if income information contains information about broader human capital beyond recorded managerial titles. Appendix B.9 describes the Mitsui personnel register.

Managerial Positions. I compare overseas workplaces with Japan within Mitsui to assess whether managerial titles were more common overseas after accounting for schooling and personnel characteristics to see if overseas assignment acted as an upward mobility opportunity. The comparison uses 2,118 personnel entries with schooling in the four main recorded categories, a hiring year, and recorded location of origin. Unknown or mixed Japan/overseas workplaces are excluded. The outcome identifies managerial titles. I estimate equation (A3) by OLS to measure the overseas–Japan difference in managerial-title prevalence and report the results in Table A11. Each specification is a linear probability model controlling for exact hiring year, and recorded location of origin.

The two schooling specifications check whether the overseas association depends on grouping graduates of different institutions together. Panel A controls for the type of schooling, grouping graduates of different universities together in the university category. Panel B controls for the specific school recorded for each employee, distinguishing individual institutions within each schooling category. Both panels use the same personnel entries and other controls within each workplace comparison.

The coefficient β_{gs} measures the overseas–Japan difference for workplace comparison g and schooling specification s. Here, M_i indicates a recorded managerial title and O_{ig} equals one in the specified overseas group and zero in Japan. The vector $\boldsymbol{X}_i$ contains hiring-year and registered-origin. The education fixed effect $\mu_{e_s(i),gs}$ uses schooling categories in Panel A and recorded schools in Panel B. I report $100\beta_{gs}$ in percentage points.

$$M_i = \alpha_{gs} + \beta_{gs} O_{ig} + \boldsymbol{X}_i' \Gamma_{gs} + \mu_{e_s(i),gs} + \varepsilon_{igs}. \tag{A3}$$

TABLE A11: Overseas Workplaces and Recorded Managerial Positions within Mitsui

Workplace comparison	Difference (pp)	Observations
A. Schooling-category controls		
All overseas workplaces	3.53	2,118
	(1.12)	
Core territories plus Manchuria	2.24	1,245
	(1.66)	
Broader colonial/occupied workplaces	3.32	2,091
	(1.12)	
B. Recorded-school fixed effects		
All overseas workplaces	4.79	2,118
	(1.40)	
Core territories plus Manchuria	5.23	1,245
	(2.36)	
Broader colonial/occupied workplaces	4.64	2,091
	(1.40)	
Hiring-year, origin, and job-function controls	✓	

NOTES: OLS estimates of the linear probability model in equation (A3) for managerial titles. Each row compares the indicated workplaces with Japan. Panel A controls for the four recorded schooling categories; Panel B replaces them with fixed effects for recorded school labels. Both panels control for exact hiring year and recorded location of origin and use the same entries within each workplace comparison. HC1 robust standard errors are in parentheses. Coefficients and standard errors are in percentage points. The core territories are Taiwan, Korea, Karafuto, and Kwantung; Manchuria is included separately. The broader colonial/occupied grouping extends geographic coverage to China and Southeast Asia and excludes Thailand; it is distinct from all overseas workplaces. Workplace groups follow the recorded geographic labels. Samples require known placement, one of the four schooling categories, a hiring year, and a recorded location of origin. Source: author's transcription of the 1943 Mitsui Bussan personnel register obtained from the Mitsui Bunko Digital Archives.

Managerial titles are more common in overseas workplaces when broad schooling categories are held fixed. In Panel A of Table A11, the all-overseas difference is 3.53 percentage points. The broader colonial/occupied comparison gives a difference of 3.32 points. The core-territory-plus-Manchuria difference is 2.24 points, with an interval from −1.02 to 5.50 that includes zero.

Controlling for the specific school recorded for each employee also leaves a positive overseas association. In Panel B, the all-overseas difference is 4.79 percentage points while the broader colonial/occupied and core-territory-plus-Manchuria differences are 4.64 and 5.23 points, respectively. All three intervals exclude zero in this specification, although the core-territory result is sensitive to the choice of schooling controls.

The results therefore support an association between overseas employment and managerial positions beyond observed schooling and personnel characteristics. They do not identify promotions caused by overseas assignment: prior rank and promotion histories are unavailable. These results suggest that overseas assignment acted as an upward mobility opportunity for employees with similar observed schooling and personnel characteristics.

Schooling and Pay. Next, I examine whether income contains information about schooling beyond recorded managerial titles to see if income information contains information about broader human capital beyond recorded managerial titles. This association informs the use of median annual income overseas as an imperfect proxy for broader human capital in the district regressions. I estimate equation (A4) by OLS. Table A12 reports the results.

The pay comparison focuses on overseas personnel with observed earnings and schooling. The sample includes 1,249 entries with positive pay, a hiring year, and a recorded location of origin. The four recorded schooling categories are university (316), commercial school (591), higher commercial school (260), and higher technical/specialist school (82).

The regression compares university schooling with the pooled other three schooling categories while accounting for recorded managerial titles and other personnel characteristics. The dependent variable is log monthly pay. Controls are a managerial-title indicator, hiring-year categories, recorded location of origin, and workplace region.

The coefficient β measures the conditional log-pay difference between university and other schooling categories. Here, w_i denotes monthly pay and U_i indicates recorded university schooling. The vector $\boldsymbol{Q}_i$ contains the managerial-title indicator, hiring-year categories, recorded origin, and workplace-region indicators. I report $100[\exp(\beta) - 1]$ as the percentage difference in conditional geometric mean pay.

$$\log w_i = \alpha + \beta U_i + \mathbf{Q}_i'\Gamma + \varepsilon_i. \tag{A4}$$

TABLE A12: Recorded University Schooling and Pay within Mitsui's Overseas Workplaces

	Log monthly pay, 1943
Recorded university schooling	0.31
	(0.01)
Managerial-title indicator	✓
Hiring-year, origin, and workplace-region controls	✓
Observations	1,249
Conditional geometric-pay difference	36.9%

NOTES: OLS estimates of equation (A4) for the 1,249 personnel entries described above. The dependent variable is log monthly pay. Recorded university schooling is compared with the pooled commercial, higher commercial, and higher technical/specialist categories. Controls are the recorded managerial-title indicator, hiring-year categories, registered origin, and workplace region. HC1 robust standard errors are in parentheses. The percentage difference is $100[\exp(\beta) - 1]$ and refers to conditional geometric mean pay. Source: author's transcription of the 1943 Mitsui Bussan personnel register obtained from the Mitsui Bunko Digital Archives.

University schooling is associated with higher pay even after accounting for recorded managerial titles. The log-pay coefficient of 0.314 in Table A12 corresponds to a 37% conditional pay difference.

The schooling–pay association supports using income as a proxy for broader human capital. It does not identify a causal return to schooling, and the sample covers selected personnel entries within one firm's overseas workplaces. Income can also reflect managerial experience and labor-market conditions. The estimate does not directly validate district median income or establish that the income control removes all skill differences.

C.3 Joint First Stage

The first-stage regressions test whether family-registry exposure provides the variation needed to identify the effects of managerial and production-worker repatriate inflows. Because both inflows enter the main IV specification, the two registry exposures must provide distinct variation that predicts them. I assess this requirement in the 1,113-district establishment-count sample using the regressions in equation (A5) and the results in Table A13, followed by conditional and unconditional plots.

To match the establishment-count specification, I regress each realized inflow on both registry exposures and the full set of controls. For district d, M_d and P_d are the realized managerial and production-worker inflows, and Z_d^M and Z_d^P are their corresponding family-registry exposures. Each measure divides the relevant repatriate count by the district's 1940 labor force. The control vector $\boldsymbol{X}_d$ contains the baseline establishment-count proxy, log 1940 population density, the 1930 overseas-born share, wartime destruction, and median annual

income overseas. Each equation also includes prefecture fixed effects, $\mu^{g}_{p(d)}$, for $g \in \{M, P\}$.

$$
\begin{aligned}
M_d &= \pi_{MM} Z^M_d + \pi_{MP} Z^P_d + \boldsymbol{X}'_d \Gamma_M + \mu^M_{p(d)} + u^M_d, \\
P_d &= \pi_{PM} Z^M_d + \pi_{PP} Z^P_d + \boldsymbol{X}'_d \Gamma_P + \mu^P_{p(d)} + u^P_d.
\end{aligned}
\tag{A5}
$$

Table A13: Registry Exposure and Realized Repatriate Inflows

	Managerial inflow share	Production-worker inflow share
	(1)	(2)
Managerial-experience registry exposure	0.96	-0.05
	(0.07)	(0.03)
Production-worker registry exposure	-0.03	1.40
	(0.07)	(0.16)
Mean realized inflow	0.058	0.023
Partial R^2	0.875	0.529
Sanderson–Windmeijer conditional F-statistic	280.34	138.60
Kleibergen–Paap rk Wald statistic	37.03	
Observations	1,113	1,113

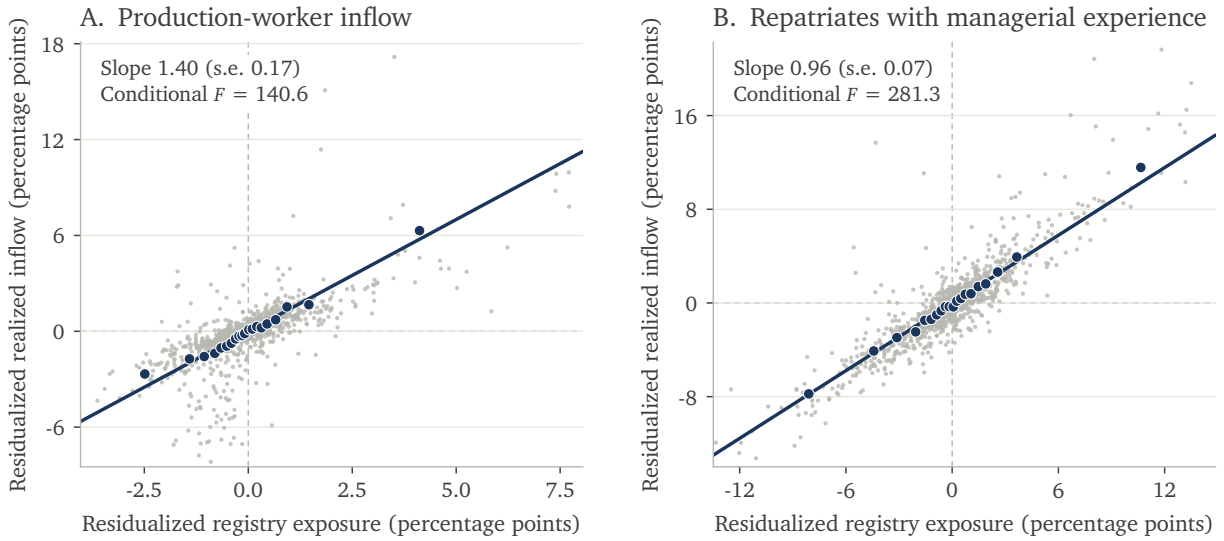
Notes: This table reports district-level first-stage regressions for 1,113 districts. The dependent variable in Column 1 is the number of repatriates classified as having managerial experience and whose first postwar address was in the district, divided by the district's 1940 labor force. Column 2 uses the analogous share of repatriates with overseas production or manual occupations. Production-worker registry exposure and registry exposure to repatriates with managerial experience assign the corresponding groups by their family-registry district on August 15, 1945 and divide by that district's 1940 labor force; each regression includes both exposure shares. All inflow and exposure shares enter as fractions. Every column includes the establishment-count proxy, log 1940 population density, the 1930 overseas-born share, wartime buildings destroyed divided by 1950 population, median annual income overseas in thousands of yen, and prefecture fixed effects. Standard errors clustered by district are in parentheses. Mean realized inflow is the dependent-variable mean, and partial R^2 is the excluded instruments' partial R^2.

Registry exposure strongly predicts the corresponding inflow after conditioning on the other exposure and the full controls. In Table A13, one percentage point more managerial registry exposure predicts 0.96 percentage points more managerial inflow; the corresponding estimate for production workers is 1.40. The Sanderson–Windmeijer conditional F-statistics are 280.3 for managerial inflows and 138.6 for production-worker inflows. The Kleibergen–Paap statistic for the joint system is 37.0. These results support the relevance of the instruments for estimating the effects of both inflows.

The conditional plots illustrate how registry exposure predicts settlement beyond the other group's exposure and key baseline district characteristics. In Figure A14, Panel A relates production-worker registry exposure to the realized production-worker inflow, while Panel B does the same for repatriates with managerial experience. I remove from both axes the variation explained by the other group's registry exposure, the baseline establishment-count proxy, log 1940 population density, the 1930 overseas-born share, and prefecture fixed effects. Each axis therefore measures the part of exposure or inflow left unexplained by these

characteristics. The upward-sloping fitted lines show that districts with greater remaining exposure received larger corresponding inflows. These plots omit wartime destruction and income; Table A13 reports the regressions with both controls included.

FIGURE A14: Family-Registry Exposure Predicts Repatriate Settlement



NOTES: Each point is a district. Panel A relates the realized production-worker inflow to production-worker family-registry exposure; Panel B does the same for repatriates with managerial experience. In each panel, both axes are residualized with respect to the other group's family-registry exposure, the baseline establishment-count proxy, log 1940 population density, the 1930 overseas-born share, and prefecture fixed effects. Axes are in percentage points. Small dots are districts, large dots are means within 20 equal-sized bins of exposure, and lines are OLS fits using all districts.

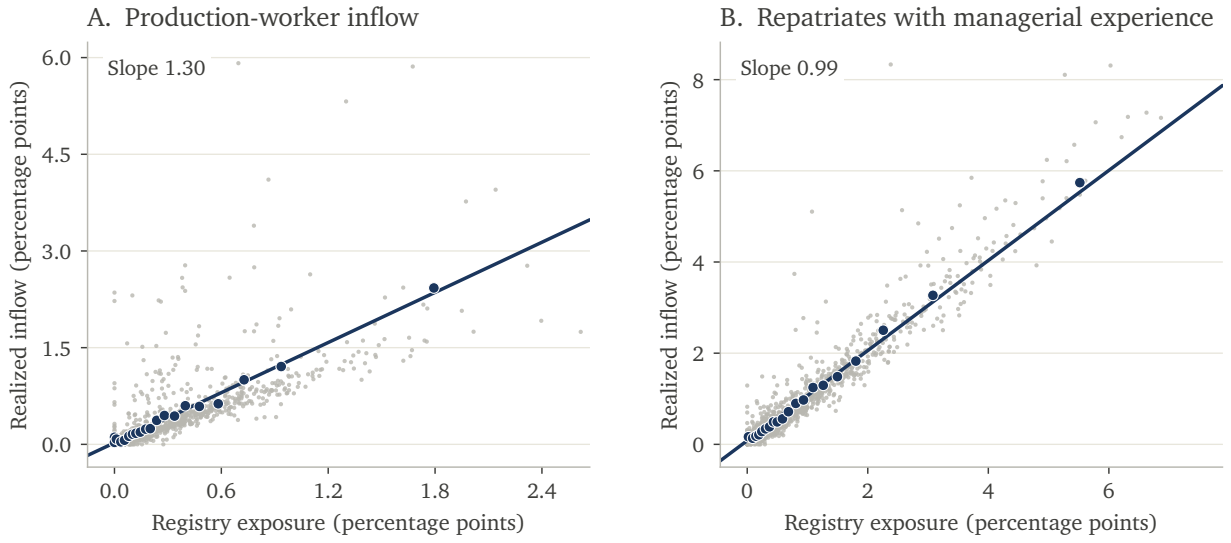
The unconditional plots provide a descriptive comparison with the conditional relationships. In Figure A15, districts with greater registry exposure received larger realized inflows from the corresponding group. These plots show the relationships before accounting for the other group's exposure, district controls, or prefecture fixed effects.

Strong first stages support instrument relevance but do not establish that registry exposure is unrelated to other determinants of district growth. The following subsections examine balance and trends before repatriation to assess this separate concern.

C.4 Balance of Registry Exposure

The balance tests assess whether managerial registry exposure is associated with baseline economic conditions that could independently predict postwar growth. Predetermined registry locations may still reflect local economic structure and overseas connections. Such patterns would threaten identification if the controls did not account for their effects on subsequent growth. Table A14 examines this concern using 1940 sectoral employment shares and an output proxy.

FIGURE A15: Registry Exposure and Realized Repatriate Inflows: Unconditional Relationships



NOTES: Each point is a district. Panel A relates production-worker registry exposure to the realized production-worker inflow; Panel B relates registry exposure to repatriates with managerial experience to the realized inflow of repatriates with managerial experience. Registry exposure assigns each group by its family-registry district on August 15, 1945, while realized inflow assigns each group by its first postwar address. Axes report percentage points. Small dots are districts, large dots are means within 20 equal-sized bins of registry exposure, and lines are unconditional linear fits using all districts. The relationships do not condition on the other group's exposure, baseline controls, or prefecture fixed effects.

To test for these differences, I estimate equation (A6) separately for four baseline outcomes in the same 1,113 districts. The dependent variable $Y_{d,k}^{\text{pre}}$ is the district's 1940 agriculture, manufacturing, or service employment share, or log sales per worker, the baseline output proxy. Both registry exposures, Z_d^M and Z_d^P, enter jointly. The control vector $\boldsymbol{C}_d$ contains log 1940 population density and the 1930 overseas-born share, while $\mu_{p(d),k}$ denotes prefecture fixed effects. The outcome being tested is omitted from the controls because it is the dependent variable. The coefficient $\theta_{M,k}$ measures the conditional association between managerial registry exposure and each baseline outcome.

The balance tests detect a weak association with manufacturing employment in 1940 but no statistically significant associations with the other three outcomes. In Table A14, one percentage point more managerial registry exposure is associated with a 0.11-percentage-point lower manufacturing employment share. This estimate is significant at the 10-percent level but not at the 5-percent level. The agriculture, service, and output-proxy estimates are not statistically distinguishable from zero.

These tests provide evidence on instrument validity by examining observed baseline conditions. They do not rule out differences in unobserved determinants of postwar growth or establish the exclusion restriction. The following subsection checks whether registry exposure predicts sectoral trends before repatriation.

$$Y_{d,k}^{\text{pre}} = \theta_{M,k} Z_d^M + \theta_{P,k} Z_d^P + \boldsymbol{C}_d' \Lambda_k + \mu_{p(d),k} + \varepsilon_{d,k}. \tag{A6}$$

TABLE A14: Registry Exposure and Baseline Economic Conditions

	Agriculture share, 1940 (1)	Manufacturing share, 1940 (2)	Service share, 1940 (3)	Log output proxy 1936/1940 (4)
Managerial-experience registry exposure	0.07	-0.11	0.04	-0.01
	(0.08)	(0.06)	(0.05)	(0.41)
Observations	1,113	1,113	1,113	1,113
Production exposure	✓	✓	✓	✓
Prefecture fixed effects	✓	✓	✓	✓
Log density, 1940	✓	✓	✓	✓
Overseas-born share, 1930	✓	✓	✓	✓

NOTES: This table reports district-level balance regressions. Columns 1–3 use the district's 1940 agriculture, manufacturing, and service employment shares as dependent variables. Column 4 uses the log 1936 output proxy. Family-registry exposure to repatriates with managerial experience is the number of repatriates classified as having managerial experience under the baseline occupational mapping and whose family registry on August 15, 1945 was in the district, divided by the district's 1940 labor force. Production-worker family-registry exposure is defined analogously for repatriates with overseas production or manual occupations, and both exposure shares enter each regression. Exposure and employment shares enter as fractions; no display conversion is applied. Every column includes log 1940 population density, the 1930 overseas-born share, and prefecture fixed effects. The baseline outcome being tested is not included as a control because it is the dependent variable. Standard errors clustered by district are in parentheses.

C.5 Pre-Repatriation Sectoral Trends

The trend tests for 1920–1940 assess whether the variation used to identify the effects of managerial inflows also predicts sectoral changes that occurred before repatriation. Pre-existing development paths could explain part of the postwar relationship even if districts had similar 1940 employment shares. I therefore apply the IV specification to earlier changes in agriculture, manufacturing, and service employment shares.

To test for these prior trends, I estimate equation (A7) by 2SLS separately for each sector and decade. The dependent variable is $\Delta Y_d^{\text{pre}} = Y_{d,t} - Y_{d,t-10}$, where $Y_{d,t}$ is the sector's employment share. In Table A15, Column 1 covers 1930–1940 ($t = 1940$), and Column 2 covers 1920–1930 ($t = 1930$); Panels A–C report agriculture, manufacturing, and services. These six regressions use the same 1,113 districts. Both realized postwar inflows, M_d and P_d, enter jointly and are instrumented with their corresponding registry exposures, Z_d^M and Z_d^P. Because the outcomes predate repatriation, nonzero coefficients would point to pre-existing differences associated with the instruments.

The trend tests compare changes before repatriation conditional on observed district characteristics. The control vector $\boldsymbol{X}_d$ contains the sector's 1940 employment share, log 1940 population density, and the 1930 overseas-born share; $\mu_{p(d)}$ denotes prefecture fixed effects. Some controls are measured at or after the end of the tested decade, so these tests do not

assess whether districts had similar trends before repatriation without conditioning on those characteristics.

$$\Delta Y_d^{\text{pre}} = \beta_M M_d + \beta_P P_d + \boldsymbol{X}_d' \Gamma + \mu_{p(d)} + \varepsilon_d. \tag{A7}$$

Table A15: Repatriate Exposure and Sectoral Trends Before Repatriation (IV)

	Change, 1930–1940 (1)	Change, 1920–1930 (2)
A. Agriculture employment-share change		
Managerial inflow share	0.02	-0.02
	(0.05)	(0.02)
Production-worker inflow share	-0.07	0.14
	(0.10)	(0.05)
Kleibergen–Paap rk Wald statistic	36.09	36.09
B. Manufacturing employment-share change		
Managerial inflow share	-0.01	-0.003
	(0.03)	(0.016)
Production-worker inflow share	-0.03	-0.03
	(0.06)	(0.04)
Kleibergen–Paap rk Wald statistic	36.14	36.14
C. Service employment-share change		
Managerial inflow share	-0.004	0.01
	(0.034)	(0.01)
Production-worker inflow share	0.10	-0.11
	(0.08)	(0.03)
Kleibergen–Paap rk Wald statistic	36.22	36.22
Observations	1,113	1,113
Prefecture fixed effects	✓	✓
Log density, 1940	✓	✓
Baseline outcome	✓	✓
Overseas-born share, 1930	✓	✓

Notes: This table reports district-level 2SLS estimates using employment-share changes that predate repatriation. Panels A–C use changes in the agriculture, manufacturing, and service employment shares; Column 1 covers 1930–1940 and Column 2 covers 1920–1930. The production-worker inflow share is the number of repatriates with overseas production or manual occupations whose first postwar address was in the district, divided by the district's 1940 labor force. The inflow share of repatriates with managerial experience is defined analogously for repatriates classified as having managerial experience under the baseline occupational mapping. Each regression includes both inflow shares, instrumented with the corresponding family-registry exposure shares, which assign each group by its family-registry district on August 15, 1945 and use the same denominator. Inflow, instrument, and outcome shares enter as fractions; each coefficient is the percentage-point change in the outcome associated with a one-percentage-point larger inflow share. Every column includes the sector's 1940 employment share, log 1940 population density, the 1930 overseas-born share, and prefecture fixed effects. Standard errors clustered by district are in parentheses.

None of the six managerial-inflow coefficients in Table A15 is statistically distinguishable from zero. The production-worker coefficients indicate a positive association with the change in agriculture's employment share and a negative association with the change in services' share during 1920–1930. Both are significant at the 1-percent level. The tests therefore do

not show an absence of associations before repatriation for both inflows.

These results reduce concern that the estimated postwar effects of managerial inflows merely continue earlier sectoral reallocation. They do not establish the exclusion restriction or rule out baseline differences that the tests lack precision to detect.

C.6 Sensitivity to Ordinary Teacher and Police Titles

This comparison tests whether the main results depend on counting ordinary teachers and police among repatriates with managerial experience. These titles indicate work within organizations but do not by themselves establish supervisory responsibility. I therefore compare the baseline classification, which includes these titles, with a narrower definition that retains teachers and police only when an explicit supervisory rank is recorded.

To isolate this classification choice, I re-estimate the main 2SLS specifications using the same observations, full controls, fixed effects, and clustering for each outcome. Table A16 reports the narrower definition in Column 1 and the baseline definition in Column 2 for the outcomes in Tables 2–5. Each definition of the managerial inflow is instrumented with its corresponding family-registry exposure. The production-worker inflow enters jointly, and both its definition and its instrument are unchanged. All inflows and instruments retain the district's 1940 labor force as their denominator.

TABLE A16: Sensitivity to Excluding Ordinary Teachers and Police

	Excludes ordinary teachers and police	Includes ordinary teachers and police	Observations
A. Service establishment scale			
Log establishments change, 1936–1960	2.07	1.88	1,113
	(0.58)	(0.51)	
Log employees per establishment change, 1936–1960	0.78	0.69	1,113
	(0.21)	(0.19)	
Log sales per worker change, 1936–1960	1.34	1.19	1,113
	(0.33)	(0.29)	
B. Employment structure			
Agricultural employment-share change, 1940–1960	-0.55	-0.47	1,113
	(0.10)	(0.09)	
Self-employed-share change, 1940–1970	-0.15	-0.13	1,113
	(0.03)	(0.03)	
Wage-worker-share change, 1940–1970	0.42	0.34	1,113
	(0.08)	(0.07)	
C. Firm organization			
Outside-headquarters-area indicator	0.19	0.16	129,807
	(0.10)	(0.08)	
JPC mission count	0.20	0.18	112,084
	(0.12)	(0.11)	

NOTES: The table reports coefficients on managerial inflows from 2SLS regressions with full controls. Outcomes and periods follow Tables 2–5. Panel A covers service-sector establishments. Baseline establishment and output proxies come from 1936 tax records; the employment totals used to construct baseline size and output per worker are from 1940. The first column excludes ordinary teachers and police unless an explicit supervisory rank is recorded; the second column includes these ordinary titles. Both retain administrative, technical, supervisory, owner, organizational, and nonmanual railway occupations. Each regression also includes the production-worker inflow share, whose definition is unchanged. Each managerial inflow is instrumented with its own corresponding family-registry exposure; the production-worker inflow uses the same instrument in both columns. All inflows and instruments use the district's 1940 labor force as denominator. District regressions include the corresponding baseline outcome, log 1940 population density, the 1930 overseas-born share, wartime buildings destroyed divided by 1950 population, median annual income overseas in thousands of yen, and prefecture fixed effects. The outside-HQ regressions use the same 129,807 sample as Table 4, with headquarters-district and prefecture-by-year fixed effects and Post interactions with the full controls, including the district's 1938 outside-HQ share. JPC regressions use the full controls in Table 5. Samples are identical across definitions for each outcome. Shares enter as fractions; district log outcomes, the outside-HQ indicator, and mission counts retain their stated units. Standard errors clustered by district or headquarters district are in parentheses. The Kleibergen–Paap rk Wald statistics range from 27.4 to 51.4 for the narrower definition and from 25.1 to 48.0 for the broader definition.

Excluding ordinary teachers and police preserves the signs and significance levels of every reported result. In Panels A and B, the coefficients remain positive for establishment counts, employees per establishment, sales per worker, and wage employment, and negative for agriculture and self-employment. All six are significant at the 1-percent level under both

definitions. In Panel C, the outside-headquarters coefficient is 0.193 under the narrower definition and 0.157 under the baseline definition, both significant at 5%. The JPC mission-count coefficient is 0.205 and 0.182, respectively, and remains less precisely estimated, with significance at the 10-percent level under both definitions.

The comparison supports robustness to this classification choice but does not establish supervisory responsibility for every worker in the remaining category. It also does not identify the separate effects of teachers and police.

C.7 Establishment Growth and Employment Status Across Control Sets

I add controls sequentially to assess whether the estimated effects of managerial inflows are sensitive to overseas ties in 1930, wartime recovery, or returnees' broader human capital. These factors could affect postwar growth and be correlated with family-registry exposure. Tables A17 and A18 show how the establishment-growth and employment-status estimates change as the corresponding controls enter.

To make the columns comparable, I hold each outcome's 1,113-district sample, inflow definitions, instruments, fixed effects, and clustering fixed. All columns estimate the main 2SLS specification with managerial and production-worker inflows entering jointly. Column 1 includes the corresponding baseline outcome, log 1940 population density, and prefecture fixed effects. Column 2 adds the 1930 overseas-born share to account for overseas ties in 1930, and Column 3 adds wartime destruction to account for differences in recovery. Column 4 adds median annual income overseas as a proxy for broader human capital and reproduces the main estimates.

TABLE A17: Service Establishment Growth Across Control Sets (IV)

A. Log establishment-count change, 1936–1960	(1)	(2)	(3)	(4)
Managerial inflow share	1.94	1.92	1.88	1.88
	(0.51)	(0.51)	(0.51)	(0.51)
Production-worker inflow share	-0.55	-0.53	-0.63	-0.63
	(0.94)	(0.94)	(0.93)	(0.93)
Kleibergen–Paap rk Wald statistic	37.05	37.05	37.10	37.03
B. Log employees per establishment change, 1936–1960	(1)	(2)	(3)	(4)
Managerial inflow share	0.68	0.69	0.69	0.69
	(0.18)	(0.19)	(0.19)	(0.19)
Production-worker inflow share	-0.24	-0.21	-0.22	-0.23
	(0.36)	(0.37)	(0.37)	(0.37)
Kleibergen–Paap rk Wald statistic	35.90	35.94	35.91	35.85
C. Log sales per worker change, 1936–1960	(1)	(2)	(3)	(4)
Managerial inflow share	1.17	1.18	1.19	1.19
	(0.28)	(0.29)	(0.29)	(0.29)
Production-worker inflow share	0.22	0.27	0.22	0.22
	(0.52)	(0.53)	(0.53)	(0.53)
Kleibergen–Paap rk Wald statistic	35.97	36.01	35.98	35.91
Observations	1,113	1,113	1,113	1,113
Prefecture fixed effects	✓	✓	✓	✓
Log density, 1940	✓	✓	✓	✓
Baseline outcome or proxy	✓	✓	✓	✓
Overseas-born share, 1930		✓	✓	✓
War destruction			✓	✓
Median repatriate income				✓

NOTES: District-level 2SLS for service-sector establishment outcomes, using the samples and outcomes in Table 2. Outcomes are changes from baseline to 1960 in log establishments, log employees per establishment, and log sales per worker. Baseline establishment and output proxies come from 1936 tax records; the employment totals used to construct baseline size and output per worker are from 1940. Each regression includes both managerial and production-worker inflow shares, instrumented with their corresponding registry exposures, using the 1940 labor force as denominator. Shares enter as fractions; 0.01 times a coefficient gives the log-point effect of a one-percentage-point inflow increase. Column 1 includes the corresponding baseline outcome proxy, log 1940 population density, and prefecture fixed effects. Column 2 adds the 1930 overseas-born share; Column 3 adds wartime buildings destroyed divided by 1950 population; Column 4 adds median annual income overseas in thousands of yen and reproduces the main estimates. Samples are fixed across columns. District-clustered standard errors are in parentheses.

The estimates for service-sector establishments change little across the control sets (Table A17). From Columns 1 to 4, the coefficients change from 1.937 to 1.881 for establishment counts, 0.683 to 0.689 for employees per establishment, and 1.173 to 1.189 for sales per

worker. All three remain positive and significant at the 1-percent level in every column. Production-worker coefficients remain statistically insignificant.

TABLE A18: Employment Status Across Control Sets (IV)

A. Self-employed share change, 1940–1970				
	(1)	(2)	(3)	(4)
Managerial inflow share	-0.13	-0.13	-0.13	-0.13
	(0.03)	(0.03)	(0.03)	(0.03)
Production-worker inflow share	0.17	0.17	0.16	0.16
	(0.06)	(0.06)	(0.06)	(0.06)
Kleibergen–Paap rk Wald statistic	36.12	36.15	36.12	36.05
B. Wage-worker share change, 1940–1970				
	(1)	(2)	(3)	(4)
Managerial inflow share	0.35	0.35	0.34	0.34
	(0.07)	(0.07)	(0.07)	(0.07)
Production-worker inflow share	-0.25	-0.24	-0.24	-0.24
	(0.15)	(0.15)	(0.15)	(0.15)
Kleibergen–Paap rk Wald statistic	36.24	36.34	36.31	36.24
Observations	1,113	1,113	1,113	1,113
Prefecture fixed effects	✓	✓	✓	✓
Log density, 1940	✓	✓	✓	✓
Baseline outcome or proxy	✓	✓	✓	✓
Overseas-born share, 1930		✓	✓	✓
War destruction			✓	✓
Median repatriate income				✓

NOTES: District-level 2SLS for the same 1,113 districts and employment-status outcomes as Panel B of Table 3. Outcomes are changes in self-employment and wage-worker shares from 1940 to 1970. Each regression includes both managerial and production-worker inflow shares, instrumented with their corresponding family-registry exposure shares. Inflows and instruments use the district's 1940 labor force as denominator. Inflow, instrument, and employment shares enter as fractions; coefficients give percentage-point outcome changes per percentage-point inflow increase. The four control sets follow Table A17, with the corresponding 1940 employment-status share included in every column. Each outcome's sample is held fixed across columns. District-clustered standard errors are in parentheses.

The estimated shift from self-employment toward wage work is also stable across the control sets. In Table A18, the managerial coefficient on the self-employed share changes from −0.127 to −0.125 between Columns 1 and 4, while the wage-worker coefficient changes from 0.346 to 0.345. Both remain significant at the 1-percent level in every column. Production-worker inflows remain positively associated with self-employment at the 1-percent level, while their wage-worker coefficients are not statistically distinguishable from zero.

The stability of the managerial coefficients across both tables reduces concern that the estimates are driven by these measured differences. It does not establish that the instruments are unrelated to unobserved determinants of postwar growth.

C.8 Sectoral Reallocation Across Control Sets

I add controls sequentially to assess whether the estimated sectoral reallocation is sensitive to overseas ties in 1930, wartime recovery, or returnees' broader human capital. These factors could be correlated with registry exposure and with changes in local employment structure. Table A19 shows how the estimates for agriculture, manufacturing, and services change as the corresponding controls enter.

To isolate sensitivity to the controls, I estimate equation (A8) by 2SLS for each sector and column using the same 1,113 districts. Here, $Y_{d,t}$ is the sector's employment share in year t, and c indexes the control set. Panels A–C of Table A19 report changes from 1940 to 1960 in agriculture, manufacturing, and services. Managerial and production-worker inflows enter jointly and are instrumented with their corresponding registry exposures. Their definitions and district-level clustering are fixed across columns.

The four columns separate sensitivity to overseas ties, wartime recovery, and broader human capital. In Column 1, $\boldsymbol{X}_{d,c}$ contains the sector's 1940 employment share and log 1940 population density; prefecture fixed effects, $\mu_{p(d),c}$, enter every column. Column 2 adds the 1930 overseas-born share, and Column 3 adds wartime destruction. Column 4 adds median annual income overseas as a proxy for broader human capital and reproduces the main estimates.

The shift out of agriculture and toward services changes little across the control sets. Between Columns 1 and 4, the managerial coefficient for agriculture moves from −0.468 to −0.466, while the service coefficient remains 0.363. Both are significant at the 1-percent level in every column. The manufacturing coefficient changes from 0.095 to 0.094 and remains significant at 10%, but not at 5%, throughout. Production-worker inflows retain a negative service-share coefficient, significant at 5%, while their agriculture and manufacturing coefficients remain statistically insignificant.

The clearest evidence is therefore for reallocation from agriculture toward services, with less precise evidence for manufacturing. Stability across the included controls supports this pattern but does not rule out confounding by unobserved district characteristics.

C.9 Mission Attendance Across Control Sets

I add controls sequentially to assess whether the estimated effect of managerial inflows on JPC mission attendance is sensitive to overseas ties in 1930, wartime recovery, or returnees' broader human capital. These district characteristics could predict both registry exposure and firms' participation in overseas study missions. Table A20 compares the estimates as the corresponding controls enter.

To keep the comparison focused on the controls, I use the same postwar firm-level 2SLS

$$Y_{d,1960} - Y_{d,1940} = \beta_{M,c} M_d + \beta_{P,c} P_d + \boldsymbol{X}'_{d,c} \Gamma_c + \mu_{p(d),c} + \varepsilon_{d,c}. \tag{A8}$$

TABLE A19: Sectoral Reallocation Across Control Sets (IV)

A. Agricultural employment share change, 1940–1960	(1)	(2)	(3)	(4)
Managerial inflow share	-0.47	-0.47	-0.47	-0.47
	(0.09)	(0.09)	(0.09)	(0.09)
Production-worker inflow share	0.02	0.02	0.01	0.01
	(0.17)	(0.17)	(0.17)	(0.17)
Kleibergen–Paap rk Wald statistic	36.05	36.09	36.05	35.99
B. Manufacturing employment share change, 1940–1960	(1)	(2)	(3)	(4)
Managerial inflow share	0.10	0.09	0.09	0.09
	(0.06)	(0.06)	(0.06)	(0.06)
Production-worker inflow share	0.21	0.22	0.22	0.22
	(0.14)	(0.14)	(0.14)	(0.14)
Kleibergen–Paap rk Wald statistic	36.11	36.14	36.10	36.04
C. Service employment share change, 1940–1960	(1)	(2)	(3)	(4)
Managerial inflow share	0.36	0.36	0.36	0.36
	(0.06)	(0.06)	(0.06)	(0.06)
Production-worker inflow share	-0.24	-0.24	-0.23	-0.24
	(0.09)	(0.09)	(0.09)	(0.09)
Kleibergen–Paap rk Wald statistic	36.15	36.22	36.18	36.12
Observations	1,113	1,113	1,113	1,113
Prefecture fixed effects	✓	✓	✓	✓
Log density, 1940	✓	✓	✓	✓
Baseline outcome or proxy	✓	✓	✓	✓
Overseas-born share, 1930		✓	✓	✓
War destruction			✓	✓
Median repatriate income				✓

NOTES: District-level 2SLS. Outcomes in Panels A–C are the 1940–1960 changes in agriculture, manufacturing, and service employment shares. Each regression includes both actual inflows, M_d and P_d, instrumented with Z_d^M and Z_d^P. Actual inflows assign managerial-experience and production-worker repatriates by first postwar address; instruments assign them by family-registry locations on August 15, 1945. Both use the district's 1940 labor force as denominator. All shares enter as fractions; coefficients measure percentage-point outcome changes per percentage-point inflow increase. Every column includes the sector's 1940 employment share, log 1940 population density, and prefecture fixed effects. Column 2 adds the 1930 overseas-born share; Column 3 adds wartime buildings destroyed divided by 1950 population; Column 4 adds median annual income overseas in thousands of yen and reproduces the main estimates. Samples are fixed across columns. District-clustered standard errors are in parentheses.

specification as Table 5. Every column retains the same 112,084 firm records and the number of missions recorded for each firm in 1955–1965 as the outcome. Managerial and production-worker inflows enter jointly and are instrumented with their corresponding family-registry exposures in the headquarters district. Inflow definitions, instruments, prefecture fixed effects, and headquarters-district clustering are fixed across columns.

Each column retains the earlier controls as another potential source of confounding is added. Column 1 controls for log 1940 population density and prefecture fixed effects. Column 2 adds the 1930 overseas-born share, and Column 3 adds wartime destruction. Column 4 adds median annual income overseas as a proxy for broader human capital and reproduces the main estimate.

Table A20: JPC Mission Attendance Across Control Sets (IV)

A. JPC mission count, 1955–1965	(1)	(2)	(3)	(4)
Managerial inflow share	0.14	0.18	0.18	0.18
	(0.10)	(0.11)	(0.11)	(0.11)
Production-worker inflow share	-0.40	-0.48	-0.48	-0.49
	(0.24)	(0.24)	(0.24)	(0.24)
Kleibergen–Paap rk Wald statistic	24.56	24.59	25.10	25.09
Observations	112,084	112,084	112,084	112,084
Prefecture fixed effects	✓	✓	✓	✓
Log density, 1940	✓	✓	✓	✓
Overseas-born share, 1930		✓	✓	✓
War destruction			✓	✓
Median repatriate income				✓

Notes: Firm-level 2SLS for the same 112,084 firm records and 1955–1965 mission-count outcome as Table 5. Each regression includes both managerial and production-worker inflow shares, instrumented with their corresponding family-registry exposure shares, using the headquarters district's 1940 labor force as denominator. Every column includes log 1940 population density and prefecture fixed effects. Column 2 adds the 1930 overseas-born share; Column 3 adds wartime buildings destroyed divided by 1950 population; Column 4 adds median annual income overseas in thousands of yen. Samples are fixed across columns. Headquarters-district-clustered standard errors are in parentheses.

Accounting for overseas ties in 1930 produces most of the change in the managerial estimate. The coefficient rises from 0.139 (standard error 0.102) in Column 1 to 0.182 (0.107) in Column 2 and remains 0.182 in Columns 3 and 4. The Column 1 estimate is not statistically significant, while Columns 2–4 reject zero at 10%, but not at 5%. The production-worker coefficient moves from −0.397 to −0.481 when the overseas-born share enters and is −0.485 with the full controls; it is significant at 5% in Columns 2–4.

The comparison provides suggestive evidence of greater mission attendance once overseas ties in 1930 are accounted for, with little further change from destruction or income controls.

The outcome records participation in management training and does not directly establish adoption of the practices studied.

C.10 Total Repatriate Inflow

I combine managerial and production-worker inflows to examine what a single measure of their combined size reveals about economic change. This provides a benchmark for the main regressions, which allow the two occupational groups to have different effects. The combined measure covers these two baseline groups and imposes the same coefficient on each, so it cannot identify a separate managerial contribution.

For the district regressions, I define $T_d = M_d + P_d$ and instrument it with $Z_d^T = Z_d^M + Z_d^P$, the sum of the corresponding family-registry exposure shares. Both shares use the district's 1940 labor force as denominator. I estimate equation (A9) by 2SLS using each outcome's main 1,113-district sample and full control set. The controls include the baseline outcome or proxy, log 1940 population density, the 1930 overseas-born share, wartime destruction, and median annual income overseas. Every regression includes prefecture fixed effects and district-clustered standard errors.

The combined inflow predicts growth of service-sector establishments and reallocation toward nonagricultural wage work. In Table A21, a one-percentage-point increase raises establishment counts by approximately 1.22%, employees per establishment by 0.45%, and sales per worker by 0.93%. It reduces the agriculture employment share by 0.34 percentage points and increases manufacturing and service shares by 0.13 and 0.21 points, respectively. The self-employment share falls by 0.05 points, while the wage-worker share rises by 0.19 points. All eight district estimates are statistically significant at the 5-percent level.

The firm regressions examine whether the combined inflow also predicts spatial expansion or JPC mission attendance. Panel A of Table A22 uses the same 129,807 records and full controls as Column 4 of Table 4. Panel B uses the same 112,084 firm records and 1955–1965 mission-count outcome as Table 5. Total inflow and its summed registry instrument are assigned to the headquarters district; the table note reports the controls and fixed effects for each specification.

The firm-level estimates provide weaker evidence than the district results. In Table A22, the outside-headquarters-city coefficient is 0.086 (standard error 0.051), significant at 10% but not at 5%. A one-percentage-point increase in combined inflow implies a 0.086-percentage-point increase in the probability of outside-HQ operation. The mission-count coefficient is 0.023 (0.048) and is not statistically significant.

$$\Delta Y_d = \beta_T T_d + \boldsymbol{X}_d'\Gamma + \mu_{p(d)} + \varepsilon_d, \qquad T_d = M_d + P_d. \tag{A9}$$

TABLE A21: Total Repatriate Inflow, Establishment Growth, and Employment Structure (IV)

Outcome	Total inflow	Observations	Kleibergen–Paap rk Wald statistic
A. Service establishment growth			
Log establishments change, 1936–1960	1.22	1,113	281.97
	(0.37)		
Log employees per establishment change, 1936–1960	0.45	1,113	289.00
	(0.10)		
Log sales per worker change, 1936–1960	0.93	1,113	288.76
	(0.16)		
B. Employment structure			
Agriculture employment-share change, 1940–1960	-0.34	1,113	271.46
	(0.06)		
Manufacturing employment-share change, 1940–1960	0.13	1,113	268.63
	(0.04)		
Service employment-share change, 1940–1960	0.21	1,113	283.14
	(0.03)		
Self-employed-share change, 1940–1970	-0.05	1,113	261.00
	(0.02)		
Wage-worker-share change, 1940–1970	0.19	1,113	263.73
	(0.04)		

NOTES: District-level 2SLS estimates of equation (A9). Total inflow sums the baseline managerial-experience and production-worker groups, assigned by first postwar address and divided by the district's 1940 labor force. The instrument sums their corresponding August 15, 1945 family-registry exposure shares with the same denominator. Outcomes and samples follow Tables 2 and 3. The establishment outcomes are changes from baseline to 1960 in log establishments, log employees per establishment, and log sales per worker in the service sector. Baseline establishment and output proxies come from 1936 tax records; the employment totals used to construct baseline size and output per worker are from 1940. Every row includes the outcome's baseline level or proxy, log 1940 population density, wartime buildings destroyed divided by 1950 population, median annual income overseas in thousands of yen, the 1930 overseas-born share, and prefecture fixed effects. The inflow and instrument enter as fractions. For log outcomes, 0.01 times a coefficient gives the log-point effect of a one-percentage-point inflow increase; for employment shares, the coefficient gives the percentage-point effect. District-clustered standard errors are in parentheses.

TABLE A22: Total Repatriate Inflow, Spatial Expansion, and Management Training (IV)

Outcome	Total inflow	Observations	Kleibergen–Paap rk Wald statistic
A. Spatial expansion, 1938–1970			
Outside-headquarters-city indicator	0.09	129,807	543.03
	(0.05)		
B. Management training, 1955–1965			
JPC mission count	0.02	112,084	344.81
	(0.05)		

NOTES: Firm-level 2SLS using the same samples and full controls as Column 4 of Table 4 for spatial expansion and Table 5 for mission attendance. Total inflow and its instrument sum the baseline managerial and production-worker inflow shares defined in Table A21, assigned to the headquarters district. Panel A uses 129,807 from repeated directory cross sections in 1938 and 1970, without firm links; source-specific coding is described in Appendix B.5. Post, equal to one in 1970, interacts with total inflow and its summed registry instrument. Controls are headquarters-district and prefecture-by-year fixed effects and Post interactions with log 1940 population density, the district's 1938 outside-HQ share, the 1930 overseas-born share, wartime destruction, and median annual income overseas. Panel B uses 112,084 firm records and counts JPC missions in the 1955–1965 source. It includes prefecture fixed effects, log 1940 population density, wartime destruction, median annual income overseas, and the 1930 overseas-born share. Destruction is recorded buildings destroyed divided by 1950 population; income enters in thousands of yen. Shares enter as fractions: a one-percentage-point inflow increase changes mission count by 0.01 times the coefficient, and the outside-city probability by the coefficient in percentage points. Headquarters-district-clustered standard errors are in parentheses.

C.11 Other Channels

I examine universities, transportation facilities, and patenting to assess whether managerial inflows also changed other potential sources of local growth. An expansion of higher education, transport infrastructure, or recorded innovation could contribute to the firm growth and employment reallocation documented in the main results. These tests use the baseline occupational groups and their corresponding family-registry instruments.

The university and transportation regressions measure whether facilities became more abundant relative to the local population. I estimate equation (A10) by 2SLS using 1,106 districts observed at ten-year intervals: 1930–1980 for universities and 1930–1970 for transportation. Table A23 reports the results.

$$Y_{dt} = \beta_M \left(M_d \times \text{Post}_t\right) + \beta_P \left(P_d \times \text{Post}_t\right) + \alpha_d + \lambda_t + \mu_{p(d),t} + \eta \left(\text{Post}_t \times B_d\right) + \varepsilon_{dt}, \tag{A10}$$

Both inflows enter jointly, so the managerial coefficient holds production-worker inflows fixed. In equation (A10), M_d and P_d are the baseline inflow shares defined in equation (2), Post_t equals one from 1950 onward, and B_d is the 1930 overseas-born share. The outcome Y_{dt} counts universities or railway stations and highway exits per 10,000 contemporaneous residents. The controls are district, year, and prefecture-by-year fixed effects and Post interacted with B_d. I instrument both inflow interactions with the corresponding family-

registry exposure shares, Z_d^M and Z_d^P, interacted with Post. Standard errors are clustered by district.

Table A23: Repatriate Inflows, Universities, and Transportation (IV)

	Universities per 10,000 residents 1930–1980	Stations and highway exits per 10,000 residents 1930–1970
	(1)	(2)
Managerial inflow share	-0.01	-7.12
	(0.04)	(2.37)
Production-worker inflow share	0.02	-5.07
	(0.06)	(5.61)
Observations	6,636	5,530
Kleibergen–Paap rk Wald statistic	36.67	36.66

Notes: District-year 2SLS estimates of equation (A10), using 1,106 districts observed every ten years in 1930–1980 for universities and 1930–1970 for transportation. Outcomes are the numbers of universities and of railway stations and highway exits per 10,000 residents, using contemporaneous population. Both inflows use the baseline occupational classification and the 1940 labor-force denominator. Actual inflows are assigned by first postwar address. Each regression includes both inflow shares interacted with Post, equal to one from 1950 onward, instrumented by the corresponding August 15, 1945 family-registry exposure shares interacted with Post. Inflow shares enter as fractions, so one-percentage-point effects equal 0.01 times the coefficients. The specification includes district, year, and prefecture-by-year fixed effects and the interaction of Post with the 1930 overseas-born share. Standard errors clustered by district are in parentheses.

The institutional estimates do not show an increase in facilities per resident. In Table A23, the university coefficient is −0.007 (standard error 0.036) and is not statistically significant. The transportation coefficient is −7.116 (2.371), significant at 1%, implying 0.071 fewer stations and highway exits per 10,000 residents for a one-percentage-point inflow increase. Because contemporaneous population is the denominator, this negative estimate does not establish a decline in the absolute number of facilities. Facility counts also do not directly measure education quality or transport capacity.

The patenting regressions test whether managerial arrivals increased recorded inventive activity, measured by 1964–1970 patent applications per 10,000 members of the 1960 labor force. I estimate equation (A11) by 2SLS; Table A24 reports the results.

$$P_{d,1970-1964} = \beta_M M_d + \beta_P P_d + \boldsymbol{X}_d'\Gamma + \mu_{p(d)} + \varepsilon_d, \tag{A11}$$

The four-column sequence tests whether overseas ties in 1930, wartime destruction, or broader repatriate human capital account for the patenting estimate. All columns retain the same 1,113 districts, prefecture fixed effects $\mu_{p(d)}$, and log 1940 population density. Columns 2–4 sequentially add the 1930 overseas-born share, war destruction, and median

annual income overseas through x_d.

TABLE A24: Repatriate Inflows and Patenting (IV)

	Patents, 1964–1970 per 10,000 in the 1960 labor force			
	(1)	(2)	(3)	(4)
Managerial inflow share	-3.22	2.98	1.76	1.61
	(12.98)	(50.58)	(51.36)	(51.46)
Production-worker inflow share	85.60	127.99	137.07	123.04
	(67.32)	(111.35)	(117.03)	(120.41)
Observations	1,113	1,113	1,113	1,113
Kleibergen–Paap rk Wald statistic	36.16	36.19	36.16	36.09
Prefecture fixed effects	✓	✓	✓	✓
Log density, 1940	✓	✓	✓	✓
Overseas-born share, 1930		✓	✓	✓
War destruction			✓	✓
Median repatriate income				✓

NOTES: District-level 2SLS estimates of equation (A11) for the same 1,113 districts in all columns. The outcome is 1964–1970 patent applications per 10,000 members of the 1960 labor force. Each regression includes both managerial and production-worker inflow shares, assigned by first postwar address and normalized by the 1940 labor force. Their instruments are the corresponding August 15, 1945 family-registry exposures with the same definitions and denominator. All columns include prefecture fixed effects and log 1940 population density. Columns 2–4 sequentially add the 1930 overseas-born share, war destruction, and median annual income overseas in thousands of yen. Destruction is buildings destroyed divided by 1950 population. Inflows enter as fractions; one-percentage-point effects equal 0.01 times the coefficients. District-clustered standard errors are in parentheses.

None of the four managerial coefficients in Table A24 is statistically significant. In Column 4, a one-percentage-point inflow increase implies 0.016 additional applications per 10,000 members of the 1960 labor force (95% confidence interval: [−0.994, 1.026]). This wide interval does not establish an absence of innovation effects.

D Theory

This appendix provides the derivations and proofs for the model in Sections 4 and 5. I derive establishment labor demand and occupational choices and prove the results on geographic expansion, average firm size, and wage employment. I then state the quantitative equilibrium conditions and define firm employment and establishment counts.

D.1 Establishment Production and Labor Demand

This subsection derives establishment labor demand, optimal headquarters managerial input, and firm profits. For the local input problem, fix a modern firm (d, z), an active destination r, and firm-wide productivity $\bar{A} = A(M)$. The establishment sells the local homogeneous good at price p_r, so its revenue is $\mathcal{R}_{dr} = p_r z \bar{A} m_{dr}^{\alpha} L_{dr}^{\beta}$. Let $\gamma \equiv \alpha + \beta < 1$.

Complementarity and Optimal Inputs. Conditional on managerial input $m > 0$, optimal production employment is

$$L^D(m; z, \bar{A}, p_r, w_r^P) = \left[\frac{\beta p_r z \bar{A}}{w_r^P}\right]^{\frac{1}{1-\beta}} m^{\gamma_M}, \qquad \gamma_M \equiv \frac{\alpha}{1-\beta} \in (0, 1). \tag{A12}$$

Managerial input therefore raises demand for production labor. Optimal inputs satisfy

$$\alpha \frac{\mathcal{R}_{dr}}{m_{dr}} = w_r^M, \qquad \beta \frac{\mathcal{R}_{dr}}{L_{dr}} = w_r^P. \tag{A13}$$

Substituting these conditions into the revenue function gives

$$\mathcal{R}_{dr} = \left[p_r z \bar{A} \left(\frac{\alpha}{w_r^M}\right)^{\alpha} \left(\frac{\beta}{w_r^P}\right)^{\beta}\right]^{\frac{1}{1-\gamma}}. \tag{A14}$$

Variable profit is $\pi_{dr}^o = (1-\gamma)\mathcal{R}_{dr}$. Holding $(z, \bar{A}, p_r, w_r^P)$ fixed, the managerial-wage elasticities of input demand are

$$\begin{aligned} \frac{\partial \log m_{dr}}{\partial \log w_r^M} &= -\frac{1-\beta}{1-\gamma} < 0, \\ \frac{\partial \log L_{dr}}{\partial \log w_r^M} &= -\frac{\alpha}{1-\gamma} < 0. \end{aligned} \tag{A15}$$

Cheaper managerial services increase both inputs at an operating establishment. These conditional responses do not determine average employment per establishment in equilibrium, where entry, locations, wages, output prices, and managers' skill composition can change.

Optimal Headquarters Input and Firm Profits. Choosing headquarters input determines how firm revenue and labor demand scale with entrepreneurial skill. Assume $A(M) = A_0 M^{\eta}$, with $A_0, \eta > 0$ and $\gamma + \eta < 1$. Hold wages and output prices positive and finite, and fix an establishment network $S \subseteq \{1, \ldots, D\}$ containing headquarters d. Let $\mathcal{R}_d(z, M; S) = \sum_{r \in S} \mathcal{R}_{dr}$ denote total firm revenue conditional on M and $F_{dS} = \sum_{r \in S \setminus \{d\}} f_{dr}$ its fixed operating costs. Define

$$B_{dS} \equiv \sum_{r \in S} \left[p_r A_0 \left(\frac{\alpha}{w_r^M} \right)^{\alpha} \left(\frac{\beta}{w_r^p} \right)^{\beta} \right]^{\frac{1}{1-\gamma}}.$$

This is independent of skill. Summing optimized establishment revenues in equation (A14) gives

$$\mathcal{R}_d(z, M; S) = B_{dS} z^{\frac{1}{1-\gamma}} M^{\frac{\eta}{1-\gamma}}.$$

After choosing local inputs, the firm therefore solves

$$\max_{M \geq 0} \left\{ (1-\gamma) B_{dS} z^{\frac{1}{1-\gamma}} M^{\frac{\eta}{1-\gamma}} - w_d^M M - F_{dS} \right\}.$$

Headquarters input raises revenue at every establishment, so its first-order condition depends on total firm revenue. Denote optimal headquarters input by $M_d(z; S)$ and the resulting revenue by $\mathcal{R}_d(z; S)$. The condition is

$$\frac{\eta \mathcal{R}_d(z; S)}{M_d(z; S)} = w_d^M, \qquad M_d(z; S) = \frac{\eta \mathcal{R}_d(z; S)}{w_d^M}.$$

Substituting this choice into total revenue and raising both sides to $1 - \gamma$ yields

$$\mathcal{R}_d(z; S)^{1-\gamma} = B_{dS}^{1-\gamma} z \left(\frac{\eta \mathcal{R}_d(z; S)}{w_d^M} \right)^{\eta},$$

$$\mathcal{R}_d(z; S)^{1-\gamma-\eta} = B_{dS}^{1-\gamma} \left(\frac{\eta}{w_d^M} \right)^{\eta} z.$$

Optimized revenue is therefore

$$\mathcal{R}_d(z; S) = \left[B_{dS}^{1-\gamma} \left(\frac{\eta}{w_d^M} \right)^{\eta} \right]^{\frac{1}{1-\gamma-\eta}} z^{\frac{1}{1-\gamma-\eta}}.$$

Its elasticity with respect to entrepreneurial skill is

$$\varepsilon_E \equiv \frac{1}{1-\gamma-\eta}. \tag{A16}$$

Optimized firm profits subtract local labor costs, headquarters costs, and fixed operating costs from revenue. The first-order conditions imply that local labor costs equal $\gamma\mathcal{R}_d(z;S)$ and headquarters costs equal $\eta\mathcal{R}_d(z;S)$. Thus,

$$\Pi_d(z;S) = (1-\gamma-\eta)\mathcal{R}_d(z;S) - F_{dS} = K_{dS}z^{\varepsilon_E} - F_{dS},$$

where $K_{dS} > 0$ is independent of skill. The firm chooses its establishment network to obtain

$$\Pi_d^E(z) = \max_{S:\, d\in S\subseteq\{1,\ldots,D\}} \{K_{dS}z^{\varepsilon_E} - F_{dS}\}.$$

For a fixed network, the local input conditions and the headquarters condition imply that all labor inputs also scale with z^{ε_E}. This scaling applies to revenue and surplus before fixed operating costs.

Finite Firm Choices and Aggregate Outcomes. The skill-scaling result identifies a sufficient restriction for finite aggregate factor demands. The condition $\gamma+\eta<1$ ensures finite optimal inputs at positive finite wages and output prices. Since factor demands for a fixed network scale with z^{ε_E}, the Pareto restriction $\nu > \varepsilon_E$ makes the relevant skill moment finite. There are finitely many possible networks, so allowing firms to choose their locations preserves this bound. These restrictions apply to the quantitative model with $\eta = 0.10$ and estimated $A_0 > 0$.

D.2 Headquarters Practices and Geographic Expansion

A lower managerial wage in the headquarters district reduces the cost of both headquarters services and managerial input at the local establishment. The following result holds production wages, output prices, managerial wages in other districts, and establishment costs fixed.

Proposition 2 (Managerial wages and geographic expansion)**.** *Fix a firm's skill, production wages, output prices, establishment costs, and managerial wages outside its headquarters district d. Let $M_d(w_d^M)$ and $N_d(w_d^M)$ denote its optimal headquarters input and establishment count. If $0 < \widetilde{w}_d^M < w_d^M$, then*

$$M_d(\widetilde{w}_d^M) \geq M_d(w_d^M), \qquad N_d(\widetilde{w}_d^M) \geq N_d(w_d^M). \tag{A17}$$

Proof. Fix a modern firm headquartered in district d with productivity z, and define $\gamma \equiv \alpha+\beta$. The solution to the local input problem in equation (5) implies

$$\pi_{dr}^o(z,M_d) = \bar{\pi}_{dr}^o(z)A(M_d)^{\varepsilon_A}, \qquad \varepsilon_A \equiv \frac{1}{1-\gamma} > 0, \tag{A18}$$

where $\bar{\pi}^o_{dr}(z) > 0$ depends on local wages and output prices but not on M_d. At the headquarters establishment, $\bar{\pi}^o_{dd}(z) = C_d(z)(w^M_d)^{-\alpha\varepsilon_A}$, where $C_d(z) > 0$ is independent of w^M_d. For $M_d > 0$,

$$\frac{\partial \pi^o_{dr}(z, M_d)}{\partial M_d} = \varepsilon_A \frac{A'(M_d)}{A(M_d)} \pi^o_{dr}(z, M_d) \geq 0. \tag{A19}$$

Holding the other wages, output prices, and establishment costs fixed, profits before paying for headquarters services are

$$B_d(M; w^M_d) \equiv C_d(z)(w^M_d)^{-\alpha\varepsilon_A} A(M)^{\varepsilon_A} + \sum_{r \neq d} \max\{\pi^o_{dr}(z, M) - f_{dr}, 0\}.$$

The first term is variable profit at the headquarters establishment, where $f_{dd} = 0$. Profits in other destinations depend on w^M_d only through the choice of M.

Let $M = M_d(w^M_d)$ and $\widetilde{M} = M_d(\widetilde{w}^M_d)$. Global optimality gives

$$\begin{aligned} B_d(M; w^M_d) - w^M_d M &\geq B_d(\widetilde{M}; w^M_d) - w^M_d \widetilde{M}, \\ B_d(\widetilde{M}; \widetilde{w}^M_d) - \widetilde{w}^M_d \widetilde{M} &\geq B_d(M; \widetilde{w}^M_d) - \widetilde{w}^M_d M. \end{aligned}$$

Adding the inequalities yields

$$\begin{aligned} C_d(z) \left[(\widetilde{w}^M_d)^{-\alpha\varepsilon_A} - (w^M_d)^{-\alpha\varepsilon_A} \right] \left[A(\widetilde{M})^{\varepsilon_A} - A(M)^{\varepsilon_A} \right] \\ + (w^M_d - \widetilde{w}^M_d)(\widetilde{M} - M) \geq 0. \end{aligned}$$

The coefficient on the first difference is positive, and A is increasing. If $\widetilde{M} < M$, the first term is nonpositive and the second is strictly negative, contradicting the inequality. Hence $\widetilde{M} \geq M$. Since wages and output prices in other districts are unchanged, operating profit weakly rises in every remote destination. The entry rule implied by equation (6), with equality assigned to nonentry, gives $b_{dr}(z, \widetilde{M}) \geq b_{dr}(z, M)$ for every $r \neq d$. The headquarters establishment is present under both choices. Summing the location indicators proves the weak increase in establishment count. □

D.3 Occupational Sorting and Qualification

This subsection proves Lemma 1.

Proof of Lemma 1. Fix positive district wages and output prices and finite optimized firm profits. Conditional on headquarters input and an establishment network, optimizing local inputs gives income of the form $Cz^{1/(1-\alpha-\beta)} - F$, where $C \geq 0$ and $F \geq 0$ do not depend on skill; this follows from equation (A14). Maximizing over headquarters input and networks preserves convexity and monotonicity, so $\Pi^E_d(z)$ is convex and nondecreasing, and strictly

increasing wherever profits are positive. A fixed positive headquarters input with only the headquarters establishment gives a feasible payoff that eventually exceeds the linear managerial income because $1/(1-\alpha-\beta) > 1$.

The first condition of the lemma implies $z_d^{PM} = p_d/w_d^M > z_0$. The second, $\Pi_d^E(z_d^{PM}) < p_d$, implies a unique $z_d^{PE} > z_d^{PM}$ at which entrepreneurial income reaches p_d. At z_d^{PE}, management pays $w_d^M z_d^{PE} > p_d = \Pi_d^E(z_d^{PE})$. The difference $\Pi_d^E(z) - w_d^M z$ is convex, negative at both z_d^{PM} and z_d^{PE}, and eventually positive. It therefore has a unique zero $z_d^{ME} > z_d^{PE}$ and is negative on (z_d^{PM}, z_d^{ME}). Hence $z_0 < z_d^{PM} < z_d^{PE} < z_d^{ME} < \infty$.

Below z_d^{PM}, neither management nor entrepreneurship exceeds the common production-work and self-employment payoff. Between z_d^{PM} and z_d^{ME}, management pays more than either alternative; above z_d^{ME}, entrepreneurship pays the most. Workers without managerial qualification choose between the common payoff and entrepreneurship, switching at z_d^{PE}. □

Occupational Shares. The shares used in Section 4.4 aggregate occupational choices within each population group.

Let $\mathcal{O}_1 = \{P, T, M, E\}$ and $\mathcal{O}_0 = \{P, T, E\}$ be the available occupations when $Q = 1$ and $Q = 0$, respectively. Let $V_d^Q(z)$ denote the highest available occupational income, as defined in equations (8) and (9). For $o \in \mathcal{O}_Q$, define

$$\mathcal{Z}_{od}^Q \equiv \left\{ z : V_d^o(z) = V_d^Q(z) \right\}. \tag{A20}$$

For each qualification status Q, let $a_{od}^Q(z)$ denote the fraction choosing occupation o. These nonnegative fractions sum to one over available occupations and are zero when $z \notin \mathcal{Z}_{od}^Q$. When the maximizing occupation is unique, its fraction is one. When production work and self-employment tie, their fractions accommodate production-labor demand. Fractions at any other payoff ties have no aggregate effect if those ties have zero mass under G.

The group-g share choosing occupation $o \in \{P, T, E\}$ is

$$\sigma_{gd}^o(z) \equiv q_g(z) a_{od}^1(z) + [1 - q_g(z)] a_{od}^0(z). \tag{A21}$$

For management, only qualified individuals can enter, so

$$\sigma_{gd}^M(z) \equiv q_g(z) a_{Md}^1(z). \tag{A22}$$

D.4 Managerial Qualification and Average Firm Size

This subsection proves Proposition 1. Consider the single-district benchmark without agriculture, with population one, no operating cost, and the nonagricultural price normalized to $p = 1$. Residents consume only the nonagricultural good. Production work and tradi-

tional self-employment then pay $V^P = V^T = 1$, and positive traditional self-employment pins the production wage at $w^P = 1$. Skills follow $G(z) = 1 - z^{-\nu}$ for $z \geq 1$, which normalizes $z_0 = 1$. Repatriates with managerial experience are qualified, $q_R(z) = 1$, and make up a share $s_R \in (0, 1)$ of the population, so the qualified share at skill z is

$$q(z, s_R) = s_R + (1 - s_R) q_N(z),$$

where q_N is continuously differentiable, $0 < q_N(z) < 1$, and $q_N'(z) \geq 0$. The result is local to an equilibrium with occupational cutoffs $1 < z^{PM} < z^{PE} < z^{ME}$.

Firm profits and occupational choice. With $A(M) = A_0 M^\eta$ and $\eta + \alpha + \beta < 1$, a modern entrepreneur of skill z chooses headquarters management M, establishment management m, and production labor L to maximize $z A_0 M^\eta m^\alpha L^\beta - w^M(M + m) - L$. The first-order conditions imply

$$\pi(z, w^M) = K (w^M)^{-a} z^\varepsilon, \qquad L(z) = b\, \pi(z, w^M), \qquad w^M [M(z) + m(z)] = a\, \pi(z, w^M),$$

where $\psi = 1 - (\eta + \alpha + \beta)$, $(a, b, \varepsilon) = (\eta + \alpha, \beta, 1)/\psi$, and $K = \psi \left[A_0 \eta^\eta \alpha^\alpha \beta^\beta\right]^{1/\psi} > 0$. Here ε equals ε_E in equation (A16), and $\nu > \varepsilon > 1$. Managerial inputs are measured in efficiency units, whereas L is production-worker headcount. The cutoffs solve $w^M z^{PM} = 1$, $\pi(z^{PE}, w^M) = 1$, and $\pi(z^{ME}, w^M) = w^M z^{ME}$, so

$$z^{PM} = \frac{1}{w^M}, \qquad z^{PE} = \left(\frac{(w^M)^a}{K}\right)^{1/\varepsilon}, \qquad z^{ME} = \left(\frac{(w^M)^{a+1}}{K}\right)^{1/(\varepsilon - 1)}.$$

Qualified individuals manage on (z^{PM}, z^{ME}) and become modern entrepreneurs above z^{ME}; unqualified individuals become modern entrepreneurs above z^{PE}. Below their entry cutoffs, individuals are indifferent between production work and traditional self-employment. Figure 5 illustrates these cutoffs and the link between profits and production hiring.

Aggregates. Write $q = q(z, s_R)$ and $\pi = \pi(z, w^M)$. Aggregate modern entrepreneurial profit, managerial payroll, and manager headcount are

$$X = \int_{z^{PE}}^{z^{ME}} (1 - q)\pi \, dG + \int_{z^{ME}}^{\infty} \pi \, dG, \qquad Y = \int_{z^{PM}}^{z^{ME}} w^M z q \, dG, \qquad N_M = \int_{z^{PM}}^{z^{ME}} q \, dG.$$

Summing firms' first-order conditions gives production employment and managerial-market clearing:

$$N_P = bX, \qquad Y = aX. \tag{A23}$$

Let $\ell \equiv \log w^M$. Partial derivatives hold the other element of (s_R, ℓ) fixed, while primes denote equilibrium derivatives with respect to s_R.

Two objects shorten the proofs. The first is the managerial premium

$$\Omega(z) \equiv w^M z - \max\{1, \pi(z, w^M)\},$$

which is continuous, positive on (z^{PM}, z^{ME}), and zero at z^{PM} and z^{ME}. Its log-wage derivative is $\partial_\ell \Omega = w^M z + a\pi\, \mathbf{1}\{z > z^{PE}\} > 0$. The second is $X_0 \equiv \int_{z^{PE}}^{\infty} \pi\, dG = \nu\left(z^{PE}\right)^{-\nu}/(\nu - \varepsilon)$, the profit that would accrue if every worker above z^{PE} were an entrepreneur, so that $X = X_0 - \int_{z^{PE}}^{z^{ME}} q\pi\, dG$. On (z^{PM}, z^{ME}), $z\Omega'(z) = w^M z - \varepsilon\pi\, \mathbf{1}\{z > z^{PE}\}$ because $z\pi_z = \varepsilon\pi$. Integrating $z\Omega' q$ by parts against $dG = \nu z^{-\nu-1} dz$, with no boundary terms because $\Omega(z^{PM}) = \Omega(z^{ME}) = 0$, therefore gives

$$Y + \varepsilon X = \varepsilon X_0 + \int_{z^{PM}}^{z^{ME}} \Omega(z)\left[\nu q(z, s_R) - z q_z(z, s_R)\right] dG(z), \tag{A24}$$

where $q_z = (1 - s_R) q'_N \geq 0$. Because managerial pay is linear in skill and profit has skill elasticity ε, $Y + \varepsilon X$ is the aggregate return to a proportional increase in all skills.

Lemma 2 (Production-worker employment)**.** *A marginal increase in managerial qualification lowers the managerial wage and increases aggregate production-worker employment and managerial payroll: $\ell' < 0$, $N'_P > 0$, and $Y' > 0$.*

Proof. At a fixed managerial wage, greater qualification raises Y and lowers X, because some workers who would otherwise become modern entrepreneurs become managers. At fixed qualification, a higher managerial wage raises Y and lowers X. Differentiating $Y = aX$ therefore gives

$$\ell' = -\frac{\partial_{s_R}(Y - aX)}{\partial_\ell (Y - aX)} < 0.$$

It remains to show that the cheaper managers expand modern production by more than the entrepreneurial activity lost to management. In equation (A24), neither X_0 nor Ω depends on s_R, and $\partial_{s_R}[\nu q - z q_z] = \nu(1 - q_N) + z q'_N$, so

$$\partial_{s_R}(Y + \varepsilon X) = \int_{z^{PM}}^{z^{ME}} \Omega\left[\nu(1 - q_N) + z q'_N\right] dG > 0.$$

For the wage response, X_0 is proportional to $(w^M)^{-a\nu/\varepsilon}$, so $\partial_\ell(\varepsilon X_0) = -a\nu X_0$, and moving the cutoffs has no first-order effect because Ω vanishes at z^{PM} and z^{ME}. Using $\int_{z^{PM}}^{z^{ME}} \partial_\ell \Omega\, q\, dG = Y + a(X_0 - X)$,

$$\partial_\ell(Y + \varepsilon X) = \nu(Y - aX) - \int_{z^{PM}}^{z^{ME}} \partial_\ell \Omega\; z q_z\, dG,$$

which is nonpositive at an equilibrium, where $Y = aX$. Along the equilibrium, $Y + \varepsilon X = (a + \varepsilon)X$,

so

$$(a+\varepsilon)X' = \partial_{s_R}(Y+\varepsilon X) + \partial_\ell(Y+\varepsilon X)\,\ell' > 0.$$

Hence $X' > 0$, and equation (A23) gives $N_P' = bX' > 0$ and $Y' = aX' > 0$. □

Lemma 3 (Manager headcount)**.** *A marginal increase in managerial qualification increases the number of employed managers:* $N_M' > 0$.

Proof. Let $\bar{r} = \int_{z^{PM}}^{z^{ME}} w^M z\, dG / [G(z^{ME}) - G(z^{PM})]$ denote mean potential managerial pay on the management interval at the initial equilibrium, so that $1 < \bar{r} < w^M z^{ME}$, and hold $\bar{r}$ fixed. It suffices to show $Y' - \bar{r}N_M' < 0$, since then $N_M' > Y'/\bar{r} > 0$ by Lemma 2.

At a fixed wage, the newly qualified workers are concentrated at low skills, where pay is below $\bar{r}$. Because $w^M z - \bar{r}$ is increasing and integrates to zero over (z^{PM}, z^{ME}) while $1 - q_N$ is nonincreasing, Chebyshev's inequality gives

$$\partial_{s_R}(Y - \bar{r}N_M) = \int_{z^{PM}}^{z^{ME}} (w^M z - \bar{r})(1 - q_N)\, dG \le 0.$$

A lower wage reduces pay for all managers and moves both cutoffs, with $\partial_\ell z^{PM} = -z^{PM}$ and $\partial_\ell z^{ME} = z^{ME}(a+1)/(\varepsilon - 1)$. Differentiating,

$$\partial_\ell(Y - \bar{r}N_M) = Y - \nu(\bar{r}-1)q(z^{PM})\left(z^{PM}\right)^{-\nu} + \frac{\nu(a+1)}{\varepsilon - 1}(w^M z^{ME} - \bar{r})\, q(z^{ME})\left(z^{ME}\right)^{-\nu}.$$

The last term is positive. For the first two, $q(z) \ge q(z^{PM})$ on (z^{PM}, z^{ME}) and the Pareto moment $\int_{z^{PM}}^{z^{ME}} w^M z\, dG = \frac{\nu}{\nu-1}\left(\left(z^{PM}\right)^{-\nu} - w^M z^{ME}\left(z^{ME}\right)^{-\nu}\right)$ give

$$\begin{aligned} Y - \nu(\bar{r}-1)q(z^{PM})\left(z^{PM}\right)^{-\nu} &\ge q(z^{PM})\left[\bar{r}\left(\left(z^{PM}\right)^{-\nu} - \left(z^{ME}\right)^{-\nu}\right) - \nu(\bar{r}-1)\left(z^{PM}\right)^{-\nu}\right] \\ &= \nu q(z^{PM})(w^M z^{ME} - \bar{r})\left(z^{ME}\right)^{-\nu} > 0. \end{aligned}$$

Hence $\partial_\ell(Y - \bar{r}N_M) > 0$, and with $\ell' < 0$,

$$Y' - \bar{r}N_M' = \partial_{s_R}(Y - \bar{r}N_M) + \partial_\ell(Y - \bar{r}N_M)\,\ell' < 0.$$

□

Proof of Proposition 1. Average firm size and wage employment. Each traditional or modern entrepreneur owns one firm. With population one, the number of firms is $F = N_T + N_E = 1 - N_P - N_M$, so Lemmas 2 and 3 give $F' = -(N_P' + N_M') < 0$. Average persons per firm, including owners and counting traditional businesses as firms, is $\bar{n} = 1/F$, so $\bar{n}' = (N_P' + N_M')/F^2 > 0$. The production-worker share N_P, the wage-employment share $N_P + N_M$, and average hired employees per firm, $\bar{n} - 1$, also increase.

Traditional self-employment. Since $N_T = 1 - N_P - (N_M + N_E)$ and $N_P' > 0$, it suffices to show $(N_M + N_E)' > 0$. Managers and modern entrepreneurs together consist of the qualified workers on (z^{PM}, z^{PE}) and all workers above z^{PE}, so $N_M + N_E = \int_{z^{PM}}^{z^{PE}} q\, dG + \left(z^{PE}\right)^{-\nu}$. On (z^{PM}, z^{ME}), $w^M z - \pi\, \mathbf{1}\{z > z^{PE}\} = \Omega + \mathbf{1}\{z < z^{PE}\}$, so $Y + X = X_0 + \int_{z^{PM}}^{z^{PE}} q\, dG + \int_{z^{PM}}^{z^{ME}} q\, \Omega\, dG$. Multiplying by ν, using $\nu\left(z^{PE}\right)^{-\nu} = (\nu - \varepsilon)X_0$, and subtracting equation (A24) gives

$$\nu(N_M + N_E) = (\nu - 1)Y + (\nu - \varepsilon)X - \int_{z^{PM}}^{z^{ME}} \Omega\, z q_z\, dG.$$

The integral weakly falls: the premium $\Omega \geq 0$ narrows at every skill because $\partial_\ell \Omega > 0$ and $\ell' < 0$, $z q_z = (1 - s_R) z q_N' \geq 0$ weakly falls with s_R, and the moving cutoffs contribute nothing because $\Omega(z^{PM}) = \Omega(z^{ME}) = 0$. With $\nu > \varepsilon > 1$ and Lemma 2,

$$\nu(N_M + N_E)' \geq (\nu - 1)Y' + (\nu - \varepsilon)X' > 0.$$

Hence $N_T' = -N_P' - (N_M + N_E)' < 0$. □

D.5 Quantitative Firm Choices and Equilibrium Accounting

This subsection states firm choices and equilibrium conditions for the quantitative model in Section 5.1, with smooth occupational choice.

Headquarters Practices and Firm Choices. Headquarters managerial input raises productivity according to

$$A(M) = A_0 M^\eta, \qquad M \geq 0, \quad A_0 > 0. \tag{A25}$$

Each modern firm operates its headquarters establishment and chooses whether to open one establishment in each other destination. Operating costs f_{dr} are paid in the agricultural numéraire, with $f_{dd} = 0$. Maximized profit is

$$\Pi_d^E(z) = \max_{M \geq 0,\ \mathbf{b}_d \in \{0,1\}^D,\ b_{dd} = 1} \left\{ \sum_{r=1}^{D} b_{dr} \left[\pi_{dr}^o(z, M) - f_{dr} \right] - w_d^M M \right\}. \tag{A26}$$

Here $\pi_{dr}^o(z, M) = (1 - \alpha - \beta)\mathcal{R}_{dr}(z, M)$ uses the optimized revenue in equation (A14), with $\bar{A} = A(M)$. For a given M, a remote establishment operates when $\pi_{dr}^o(z, M) > f_{dr}$; equality is assigned to nonentry.

Smooth Occupational Shares. In the quantitative model, occupational incomes are

$$\begin{aligned} V_d^P(z) &= w_d^P, & V_d^T(z) &= p_d z^{\zeta}, \\ V_d^M(z) &= w_d^M z, & V_d^E(z) &= \Pi_d^E(z). \end{aligned} \tag{A27}$$

Conditional on qualification $Q \in \{0,1\}$, utility in occupation $o \in \mathcal{O}_Q$ is $\log V_d^o(z) + \varepsilon_{od}/\xi$, with independent standard Type-I extreme-value shocks across occupations and individuals. An occupation with zero income has utility minus infinity. These preferences imply the conditional probabilities in equation (16). Group-specific choice probabilities are

$$\begin{aligned} p_{Mgd}(z) &= q_g(z) p_{Md}^1(z), \\ p_{ogd}(z) &= q_g(z) p_{od}^1(z) + [1 - q_g(z)] p_{od}^0(z), \qquad o \in \{P, T, E\}. \end{aligned} \tag{A28}$$

Qualification follows equation (17), so native eligibility varies with skill. As ξ increases, each qualification group concentrates on occupations with the highest quantitative income. Background affects these probabilities only through $q_g(z)$.

District Labor Supply and Demand. Using these smooth probabilities, production-worker headcount, manager headcount, and managerial efficiency supply in district r are

$$\begin{aligned} \mathcal{H}_r^P &\equiv \sum_{g \in \{N,R\}} H_{gr} \int p_{Pgr}(z)\, dG(z), \\ \mathcal{H}_r^M &\equiv \sum_{g \in \{N,R\}} H_{gr} \int p_{Mgr}(z)\, dG(z), \\ \mathcal{S}_r^M &\equiv \sum_{g \in \{N,R\}} H_{gr} \int z\, p_{Mgr}(z)\, dG(z). \end{aligned} \tag{A29}$$

Production workers can work in agriculture or modern establishments at the same wage. Agricultural labor demand and land rents satisfy

$$L_r^A = \left[\frac{\alpha_A Z_r^A T_r^{1-\alpha_A}}{w_r^P} \right]^{\frac{1}{1-\alpha_A}}, \qquad \mathcal{R}_r^A = (1 - \alpha_A) Y_r^A, \tag{A30}$$

where $Y_r^A = Z_r^A (L_r^A)^{\alpha_A} T_r^{1-\alpha_A}$. Total factor demands are

$$\begin{aligned}
\mathcal{D}_r^P &= L_r^A + \sum_{d=1}^{D} \sum_{g\in\{N,R\}} H_{gd} \int p_{Egd}(z) b_{dr}(z) L_{dr}(z)\, dG(z), \\
\mathcal{D}_r^M &= \sum_{d=1}^{D} \sum_{g\in\{N,R\}} H_{gd} \int p_{Egd}(z) b_{dr}(z) m_{dr}(z)\, dG(z) \\
&\quad + \sum_{g\in\{N,R\}} H_{gr} \int p_{Egr}(z) M_r(z)\, dG(z).
\end{aligned} \tag{A31}$$

Labor-market clearing requires $\mathcal{H}_r^P = \mathcal{D}_r^P$ and $\mathcal{S}_r^M = \mathcal{D}_r^M$. Headquarters demand is counted where the firm is owned, and establishment demand is counted where production occurs.

Income and Nonagricultural Demand. District spending is financed by occupational earnings and local land rents. Traditional producers earn $p_r z^\zeta$, while modern entrepreneurs receive profits from their entire establishment network. Define their aggregate incomes as

$$\begin{aligned}
\mathcal{R}_r^T &\equiv \sum_{g\in\{N,R\}} H_{gr} \int p_{Tgr}(z) p_r z^\zeta\, dG(z), \\
\mathcal{P}_r^E &\equiv \sum_{g\in\{N,R\}} H_{gr} \int p_{Egr}(z) \Pi_r^E(z)\, dG(z).
\end{aligned} \tag{A32}$$

Total income available for spending in district r is

$$I_r = w_r^P \mathcal{H}_r^P + w_r^M \mathcal{S}_r^M + \mathcal{R}_r^T + \mathcal{P}_r^E + \mathcal{R}_r^A. \tag{A33}$$

Profits accrue to entrepreneurs in their headquarters district, and wages accrue where labor is supplied. Landowners spend their rents on the same consumption basket in the district generating those rents.

Traditional and modern producers supply the same local homogeneous good. District nonagricultural output is therefore

$$\begin{aligned}
Q_r^N &= \sum_{g\in\{N,R\}} H_{gr} \int p_{Tgr}(z) z^\zeta\, dG(z) \\
&\quad + \sum_{d=1}^{D} \sum_{g\in\{N,R\}} H_{gd} \int p_{Egd}(z) b_{dr}(z) y_{dr}(z)\, dG(z).
\end{aligned} \tag{A34}$$

Since establishment operating costs use the agricultural good, all nonagricultural output is

available for local consumption. Goods-market clearing requires

$$p_r Q_r^N = \phi I_r. \tag{A35}$$

Together with labor-market clearing, this condition determines the district output price and wages.

Agricultural Resource Clearing. Agriculture supplies household consumption and establishment operating costs. With f_{dr} from equation (15) and $f_{dd} = 0$, aggregate operating costs in units of the agricultural numéraire are

$$\mathcal{K}^n \equiv \sum_{d=1}^{D} \sum_{g \in \{N,R\}} H_{gd} \int p_{Egd}(z) \left[\sum_{r=1}^{D} b_{dr}(z) f_{dr} \right] dG(z). \tag{A36}$$

The national agricultural resource constraint is

$$\sum_{r=1}^{D} Y_r^A = \sum_{r=1}^{D} (1 - \phi) I_r + \mathcal{K}^n. \tag{A37}$$

Equilibrium. A quantitative equilibrium consists of district prices and wages $\{p_r, w_r^P, w_r^M\}$, occupational probabilities, agricultural employment, and firms' input and location choices. Occupational probabilities satisfy equations (16) and (A28); modern firms solve equation (A26); agricultural employment satisfies equation (A30); and labor and goods markets clear as above. These conditions use the fixed populations, skill distribution, qualification functions, land, technologies, and operating costs in Section 5.