Establishment Dynamics in Post-War Japan: Missing Entry and Shrinking Size*

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Abstract

We study the long-run evolution of establishment dynamism in post-war Japan and document three previously unreported trends. First, establishment entry rates declined persistently from the late 1950s to the late 1990s, while exit rates remained low and stagnant, producing a pronounced aging of Japanese business units. Second, average establishment size fell sharply during the 1960s and 1970s—most notably in manufacturing and construction—before partially recovering for younger establishments in subsequent decades. Third, the average lifecycle growth of cohorts shifted markedly downward in the same period, further dampening market dynamism. Using a standard firm dynamics model calibrated to Japan's historical data, we test a range of potential drivers. We find that changes in labor supply growth account for much of the long-term decline in entry rates, albeit via a largely direct mechanism with minimal compositional feedback. Moreover, a moderate reduction in fixed operation costs or in the dispersion of ex-ante productivity helps generate the observed declines in both entrant and incumbent sizes. In contrast, altering entry costs, exit values, or labor market distortions fails to yield realistic predictions in an economy with limited ex-post heterogeneity. Our findings suggest that long-running declines in labor supply growth, falling fixed costs, and narrowing entrant productivity dispersion together offer the most plausible explanation for Japan's enduring transition toward lower market dynamism.

Keywords: Firm Dynamics, Entry and Exit, Firm size, Lifecycle Growth, Postwar Japan

JEL Codes: L25, L16, N15, J11

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1 Introduction

Economists have long recognized the importance of market dynamism in fostering economic growth and competition. Recent decades, however, have seen a notable decline in business dynamism across several developed economies, notably the United States, where entry and exit rates have fallen, business units have aged, and the share of high-growth firms has waned (Hathaway and Litan, 2014a,b; Decker, Haltiwanger, Jarmin, and Miranda, 2014, 2016b; Pugsley and Şahin, 2019).[1] Despite growing interest in this phenomenon, systematic examinations of the long-run evolution of market dynamics outside the U.S. remain scarce. Moreover, prominent explanations in the literature—such as demographic shifts (Karahan, Pugsley, and Şahin, 2019; Hopenhayn, Neira, and Singhania, 2020; Peters and Walsh, 2019), market distortions (Restuccia and Rogerson, 2008; Hsieh and Klenow, 2009, 2014), and ex-ante heterogeneity (Sedláček and Sterk, 2017; Sterk, Sedláček, and Pugsley, 2021)—have yet to be thoroughly tested for external validity. In this paper, we help fill this gap by investigating the post-war evolution of establishment dynamics in Japan, a country marked by notably low business dynamism and a prevalence of small and medium-sized firms.[2]

To this end, we employ newly digitized data from the Establishment Census of Japan, which consistently covers the universe of private establishments from the 1950s through the 2000s. Focusing on employer establishments (given the limited economic impact of nonemployers), we document three central facts about Japan's long-term market dynamics (Section 2). First, the annual entry rate declined persistently, from at least over 8% in the late 1950s (or 7.5% in 1969 with more precise data) to about 4% in the late 1990s, when the slowdown attenuated. This drop pervaded all sectors, suggesting a secular phenomenon. While Japanese official reports (e.g., Small and Medium Enterprise Agency, 2011, 2017) have noted a declining entry rate since the 1980s, our analysis demonstrates that it can be traced as far back as the late 1950s, persisting for nearly half a century. Exit rates also fell sharply prior to 1970, then remained at a very low level (roughly 2%) until the late 1990s. Together, these trends dampened market dynamism and led to a pronounced aging of the establishment population: by 2006, one third of total employment was in establishments operating for more than 27 years.

Second, the average size of Japanese establishments declined steeply during the 1960s and 1970s, dropping from more than 24 employees to about 16. This decline was primarily driven by within-sector changes, most pronounced in manufacturing and construction but comparatively moderate in wholesale & retail and services. It also cut across all age groups. While the average size of younger establishments eventually recovered since the 1980s, especially in wholesale & retail and services, older establishments continued to shrink. Third, by linking repeated cross-sectional data, we observe a parallel downward shift in lifecycle growth for cohorts born in the 1960s and 1970s. These cohorts entered with smaller

[1] Additional evidence of declining business dynamism in the U.S. includes reduced inter-firm labor reallocation (Decker, Haltiwanger, Jarmin, and Miranda, 2016a), lower responsiveness to productivity shocks (Decker, Haltiwanger, Jarmin, and Miranda, 2018), and an increasing share of large firms (Autor, Dorn, Katz, Patterson, and Van Reenen, 2020). Akcigit and Ates (2019a) provides a thorough review. Outside the U.S., Ignaszak (2020) documents a falling startup rate and growing average establishment size in Germany.

[2] For instance, Mukoyama (2009) documents evidence that Japan's entry and exit rates and average establishment size are substantially lower than those in the U.S. We show an extended comparison in Section 2.2.

sizes and maintained lower sizes at older ages than their predecessors, particularly in manufacturing and construction. By contrast, cohorts in retail and services experienced only mild declines and returned quickly to typical lifecycle growth paths. To our knowledge, these patterns in establishment size and lifecycle growth have not been previously documented in either official reports or academic studies.

We argue that these empirical findings carry significant implications for the literatures on Japan's post-war development and on firm dynamics more broadly. First, our evidence indicates that Japan's weakened market dynamism is not confined to the so-called "lost decade" of the 1990s (e.g., Nishimura, Nakajima, and Kiyota, 2005) but stems from a durable decline in entry rates dating back to the late 1950s. This suggests the presence of systematic, persistent forces shaping Japan's business environment. Second, the drop in average establishment size offers a salient counterexample to the commonly found positive correlation between establishment size and a country's level of economic development (Bento and Restuccia, 2017; Poschke, 2018).[3] This discrepancy either underscores the importance of a country-specific developmental trajectory or raises the possibility of reverse causality.[4] Third, the downward shift in cohort lifecycle growth underscores the importance of initial conditions in shaping long-term firm trajectories in a historically contingent and industry-specific manner, complementing evidence of time- or cycle-specific cohort effects in other settings (Sedláček and Sterk, 2017; Sterk et al., 2021).

In the second part of this paper, we employ a standard firm dynamics model to explore mechanisms that could plausibly account for Japan's observed establishment trends. In Section 3, we set up and calibrate the canonical framework of Hopenhayn and Rogerson (1993) and Hopenhayn et al. (2020) to our data. The resulting benchmark economy features limited ex-post heterogeneity—manifested in low exit rates, a flat age-exit profile, and modest lifecycle growth. These distinctive market features in Japan prove pivotal for understanding how different economic forces (represented by model's structural parameters) translate into changes in market dynamics and establishment size distributions, as shown in Section 4.

Our first simulation exercise (Section 4.1) focuses on the long-run decline in labor supply growth. We find that slower labor supply growth can account for a significant portion of Japan's persistent entry-rate decline. The mechanism is straightforward: holding incumbent firms' labor demand fixed, a slower-growing labor force narrows the pool of available workers for new establishments, thereby constraining their formation. In our model, the entry margin is perfectly elastic, acting as a flexible wedge of labor demand to clear the labor market. Consequently, changes in labor supply growth translate directly into entry rates. Unlike the U.S. context documented in (Karahan et al., 2019) and (Hopenhayn et al., 2020), indirect feedback effects from compositional changes are nearly absent in the Japanese context due to

[3] This relationship has been attributed to productivity improvements stemming from technological or managerial advances in developed economies (Gollin, 2008; Poschke, 2018; Akcigit and Ates, 2019b) and to distortions such as firing costs, tax burdens, or size-dependent policies in developing economies that inhibit firm expansion (Hsieh and Klenow, 2014; Bento and Restuccia, 2017).

[4] While atypical, our results are not alone in the literature. Braguinsky, Branstetter, and Regateiro (2011) find that firm size distributions in Portugal shifted left for several decades, diverging from trends in other developed countries. They attribute this shift to heightened labor protections favoring smaller firms, generating also increased self-employment, which is absent in Japan. More recently, Neira and Singhania (2020) report a decline in the average size of both young and older U.S. firms since 2000, and Cao, Hyatt, Mukoyama, and Sager (2022) document falling establishment sizes in the U.S. throughout the early 1990s and 2000s.

minimal ex-post heterogeneity of establishments, reflected in modest differences in exit rates and labor demand across age groups.[5] As a result, the direct effect dominates, inducing a near one-for-one link between labor supply and entry rates and rapid convergence to new steady states, with an elasticity of merely 1.1 between steady states. Given that about 2 percentage points of Japan's decline in labor supply can be attributed to exogenous demographic factors, this mechanism can thus explain at least 2.2 percentage points of the observed drop in entry rates.

Subsequent analyses (Section 4.2) investigate alternative structural drivers, including shifts in entry costs, exit values, fixed operation costs, and the ex-ante productivity distribution. We find that large increases in entry cost or cuts to exit value, while capable of reducing entry rates by similar magnitudes, lead to implausibly negative lifecycle growth due to the proliferation of low-productivity incumbents after exit selection weakens. As incumbents and entrants initially share fairly close productivity distributions, allowing weaker selection easily shifts incumbents' productivity leftward relative to entrants, generating counterfactual outcomes. By contrast, a moderate reduction in fixed operation costs aligns more plausibly with historical patterns by lowering overall and entrant sizes in a more balanced way. Furthermore, diminishing the dispersion of ex-ante productivity at entry pushes down average establishment size across all ages, consistent with the parallel declines in lifecycle growth observed in the data. This is intuitive given that ex-ante heterogeneity largely drives firm size differences when ex-post variation is limited. Our final joint analysis of all structral parameters (Section 4.3) confirms that a combination of declining labor supply growth rate, reduced fixed costs, and narrower ex-ante productivity dispersion best replicates Japan's long-run patterns of declining entry rates and shrinking establishment sizes, whereas other changes generate trends conflicted with the data.[6] Specifically, these three factors jointly account for a 2.9 percentage point drop in entry rates, a 4.3-worker decline in average size, and a 2.4-worker decline in entrant size—capturing most of the changes documented in Japanese post-war data.

Lastly, in Section 5, we discuss some important empirical dimensions that our baseline model does not capture, including the macroeconomic impact on exit rates, potential labor market distortions, and deeper drivers of ex-ante heterogeneity. We discuss how these factors might (or might not) provide further insight into Japan's post-war establishment dynamics. Section 6 concludes the paper. An online appendix offers provides additional empirical facts and model results.[7]

[5]In the U.S. context, initial changes in entry margins trigger major compositional shifts in the age and size distribution, which in turn generate significant feedback effects and transitional dynamics. This results a large divergence between labor supply growth rates and entry rates occured. In Japan, these compositional effects play only a minor role.

[6]While labor market distortions such as size-correlated labor costs or labor adjustment costs have not been included in this joint test, in Online Appendix Section B.3, we extend the model and analysis to show that under fairly low and smooth lifecycle growth, they have minimal intended effects and thus offer little help in explaining the observed declines in average size and lifecycle growth in post-war Japan.

[7]The appendix, along with all data and replication code, is publicly available at `https://github.com/Alalalalaki/Jp-Est-Dyn`.

2 Empirical Facts

In this section, we first introduce our main dataset and discuss relevant data issues. We then provide a static comparison of key moments of market dynamism between Japan and the United States. Next, we present three sets of main empirical findings that characterize the long-run establishment dynamism in postwar Japan: the trends in entry and exit rates, the evolution of average establishment employment size, and lifecycle growth across different cohorts. In the final part of this section, we summarize our findings and discuss their implications, particularly in relation to existing empirical evidence and theoretical accounts in the broad literature on market dynamics, misallocation, and firm growth.

2.1 Data

The primary data source for exploring establishment dynamics in Japan is the "Establishment Census of Japan" (hereafter ECJ), administered and published by the Statistics Bureau of Japan. The ECJ was conducted every three years from 1951 through 1981 and every five years from 1981 until 2006. It remains the only national census in Japan that has comprehensively and consistently covered the universe of all private establishments in the Japanese non-primary sectors throughout nearly the entire post-war period.[8] The comprehensive coverage and long duration of the ECJ enable an examination of both overall trends and sector-specific variations in establishment dynamics throughout the post-war period. Additionally, the long span and consistency of the census statistics allow us to track lifecycle trajectories for certain establishment cohorts, conditional on their survival, through repeated appearances in the cross-sectional data. This makes it possible to study the evolution of lifecycle growth patterns across different cohorts.

The main statistics employed in our analysis are the number of establishments and the number of workers employed, aggregated by categories such as industry sector, organizational type, employment status, establishment size, and year of establishment, including their interactions. Classification by establishment opening year is particularly crucial, as it provides establishment age information and enables the calculation of annual entry and exit rates, average employment size by age, and the average lifetime growth trajectory of different cohorts. Specifically, we utilize data from establishments at age one to calculate annual entry and exit rates as well as employment size at entry time, and link age-specific statistics across chronological cross-sectional censuses to portray the average lifecycle employment growth conditional on survival for a certain cohort. Subsequent subsections will detail the methodologies employed in these calculations, discuss particular issues encountered, and present our main empirical findings. Before proceeding, we address several general issues regarding the ECJ data

[8]The ECJ was partially reformed and renamed the "Establishment and Enterprise Census of Japan" (EECJ) in 1996, with additional survey items on business activities included. Statistical continuity, except for the new items, was largely maintained between ECJ and EECJ, allowing for consistent historical analysis. Thus, both ECJ and EECJ are referred to as ECJ hereafter. Post-2006, the ECJ was abolished and replaced by the "Economic Census" (EC), which, due to significant changes in scope and methodology, does not provide comparable statistics with ECJ and EECJ. Consequently, our analysis is confined to the period ending in 2006.

Statistics data from the 1981 to 2006 censuses are accessible via the Japanese government's official statistics portal: www.e-stat.go.jp. Pre-1980s data, not electronically available, were manually collected from archived statistical volumes of the ECJ.

and the accuracy and representativeness of the features of post-war Japan's business dynamism and establishment demographics that we present.

Age Reporting and "Pseudo" Entries/Exits. The ECJ collects the self-reported opening year, defined as the year an establishment began its current economic activities at its current location under its current ownership. Consequently, changes in location, ownership, or line of business reset an establishment's reported opening year and treat it as a new entry in subsequent waves, while the original unit is recorded as an exit.[9] This approach can inflate measures of annual entry and exit rates if these changes are not interpreted as true market entries or exits. It may also affect measured entry sizes, as some new establishments could inherit employees from a restructured predecessor. We assume that any such bias remains relatively stable over time, so that the main trends—our primary interest—are not distorted.[10]

Interpolation and Long-Run Focus. Because the census was triennial through 1981 and quinquennial thereafter, and because some opening-year categories vary across surveys, we must use linear interpolation for certain age groups in some years to link cross-sectional snapshots over time and construct time-series patterns for specific cohorts. Consequently, our estimates smooth out poetntial age discontinuities and short-term fluctuations, emphasizing long-run secular trends in establishment dynamics that are the focus of our analysis.

Employer vs. Nonemployer Establishments. The ECJ data distinguish between legally incorporated establishments and individual proprietorship ones, which in practice can be regarded as employer establishments (those with at least one paid employee) and nonemployer units (often self-employed or family-run), respectively. Our analysis focuses mainly on employer establishments for several reasons. First, while nonemployers were numerically significant in early post-war decades, they declined sharply in employment share in the economy. Second, employer and nonemployer establishments follow distinct patterns in terms of entry, exit, and lifecycle growth. Existing studies note that nonemployer businesses tend to be subsistence-oriented, while employer establishments are more likely to seek business growth and expansion (see, e.g., Schoar, 2010; Decker et al., 2014). Indeed, nonemployer establishments in Japan generally employ only two or three workers (including the owner), with very little size dispersion, whereas employer establishments exhibit larger average sizes and greater dispersion. (Appendix A.1 provides more details.) Restricting attention to employers thus aligns our empirical analysis with

[9]According to the census: "The establishment date refers to when the business commenced operations at its current location, under its current management, and in its current line of business. If a business was relocated, or if it was resumed after destruction (e.g., war damage), the establishment date is considered the time of relocation or resumption. In cases where a business was inherited by an individual owner, or a sole proprietorship was converted into a family-owned corporation, management is deemed unchanged. However, if the business name remained while ownership or activities changed, the establishment date is considered the time of that change."

[10]The potential bias depends on how frequently these transitions occur and how strictly respondents adhere to the census definition. Given the overall low levels of annual entry and exit rates observed in our data, we expect the impact to be limited. And if anything, such overestimation strengthens our findings. Another potential problem is that self-reported opening year may also introduce rounding or other measurement errors in establishment age.

the standard firm dynamics literature and facilitates comparison with other countries' employer-only datasets.[11]

2.2 Cross-sectional Facts

Before examining long-run trends, which constitute the primary focus of this paper, we first characterize the cross-sectional features of Japanese establishment dynamics as observed in 2006, our final sample year, providing a snapshot of market structure and establishment demographics following decades of evolution. Additionally, we compare Japanese statistics with U.S. data from the Business Dynamics Statistics (BDS) of the U.S. Census Bureau, highlighting distinctive characteristics of Japanese establishment dynamics. This comparative analysis complements the findings in Mukoyama (2009), differing in our focus on employer establishments in non-primary sectors and our additional examination of statistics across age groups.

Table 1: Establishment Dynamism and Size: Japan vs. United States (2006)

	Japan	U.S.
Entry Rate (annual, %)	4.01	12.51
Exit Rate (annual, %)	4.48	10.07
- Age 1	5.00	21.54
- Age 2-6/2-5	5.17	14.84
- Age 27+/26+	3.53	5.85
Average Size (employees)	15.36	17.43
- Age 1	13.83	10.83
- Age 2-6/2-5	15.31	13.91
- Age 22+/21+	17.6	28.18

Notes: This table compares market dynamics statistics between Japan (Establishment Census) and the United States (BDS) in 2006. All statistics are based on employer establishments in non-primary sectors. Due to differences in age categorization between datasets, we select the most comparable age groups for comparison. Entry rates for both countries and U.S. exit rates are calculated using establishment counts from the year preceding the census. In contrast, Japanese exit rates represent annual averages of exits between 2001 (the previous census year) and 2006. While this averaging may slightly underestimate Japanese exit rates, the impact is minimal given Japan's flat age-exit profile.

Three key features emerge from Table 1. First, Japan exhibits notably lower annual entry and exit rates—approximately 4 percent—compared to the United States, where both rates exceed 10 percent. Second, Japan's exit-rate profile is substantially flat, ranging from 5 percent for age-1 establishments to 3.5 percent for those over age-27. In contrast, the U.S. shows a steep decline from 21.5 percent for age-1 establishments to 5.9 percent for those over age-26. Third, although average establishment sizes are comparable between the two countries, their age-size profiles differ significantly. In Japan, average size increases marginally from 13.8 workers for age-1 establishments to 17.6 workers for those over age-22. Conversely, U.S. establishments over age 21 employ nearly three times as many workers as age-

[11] For instance, the widely used U.S. Business Dynamics Statistics (BDS) and Longitudinal Business Database (LBD) sample only establishments with at least one paid employee.

1 establishments. These patterns highlight the distinctive features of establishment lifecycle selection and growth in the Japanese market, which we explore more in the subsequent subsections.

2.3 Long-run Time-series Facts

2.3.1 Entry, Exit, and Aging

We begin by illustrating the long-term patterns in establishment entry and exit rates. Annual establishment entry rates are calculated as the ratio of age-one establishments in a given census year to the total number of establishments from the preceding year.[12] The red line in Figure 1a shows the calculated annual entry rate for employer establishments from 1969 to 2006. Prior to 1969, age information was not routinely surveyed, except in the 1957 census, which provided statistics for the broader age category of 0-3, encompassing both employer and nonemployer establishments within the "all establishments" category. We thus calculate the annual entry rate using age 0-3 data for both the 1957 and 1969 censuses (blue dotted line) and using age-one data post-1969 (blue solid line) for the "all establishments" category. Since the entry rate trends for all establishments post-1969 closely follow those of employer establishments, and the entry rate derived from age 0-3 data does not differ significantly from that using age-one data in 1969, we consider the changes in entry rates between 1957 and 1969 for all establishments from age 0-3 data as an effective proxy for the entry rate changes in employer establishments during the early post-war period.

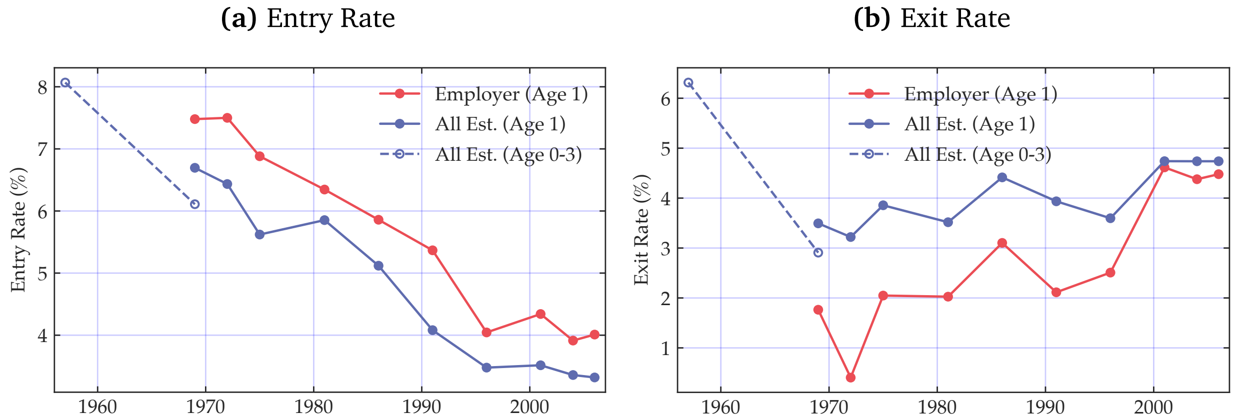
Figure 1a clearly shows that the entry rate for Japanese employer establishments has steadily declined from about 7.5 percent in the late 1960s to approximately 4 percent by the 2000s.[13] Moreover, the substantial decline (2 percentage points) in entry rates between the 1957 and 1969 censuses for all establishments suggests that the long-term decline in employer establishments' entry rates likely began around the late 1950s, if not earlier.[14] Notably, the long-term decline in entry rates appears to have slowed or plateaued since the late 1990s, well into Japan's "lost decades." Additionally, this long-term decline trend, along with its onset in the late 1950s and plateau since the 1990s, is corroborated by

[12] While the data include statistics for age-zero establishments, we use age-one establishments in the numerator to avoid inconsistencies arising from varying observation periods of age-zero establishments across different census years. These variations, due to changes in the census date, range from 5.5 to 9 months, subjecting them to different time spans and seasonal economic conditions. Notably, for the same reason, age-one cohorts experience varying market exposure spans across census years, potentially affecting the consistency of calculated entry rates as longer age-zero periods could imply more unobserved exits. To verify robustness, we adjusted the count of age-one establishments according to the span of age-zero in each census year and found similar results. This is because the exit rates are very low for even newly established firms in Japan, especially during those periods with changes in the observation periods. Consequently, extended exposure of new establishments did not result in significantly increased unobserved exits. The denominator for entry rate calculations, i.e., the total number of establishments a year before the census, is linearly interpolated from data of the two neighboring census years.

[13] We note that the entry and exit rates presented here slightly differ from those reported in official Japanese White Books (e.g. Small and Medium Enterprise Agency, 2011) using the same data source but different calculation methods. In official reports, the annual entry rate is calculated by averaging the total number of newly recorded establishments in a census year and dividing it by the total number of establishments at the previous census. This approach results in a failure to account for firms entering and exiting within the inter-census interval (3 or 5 years) and in using a lagged denominator. In practice, we find the general trends of entry and exit rates in White books largely consistent with ours.

[14] The nearly parallel trends between all establishments and employer establishments indicate that the decline from the initially high entry rates in the early post-war era is not due to a slowdown in the transformation from nonemployer to employer establishments.

Figure 1: Establishment Annual Entry and Exit Rate

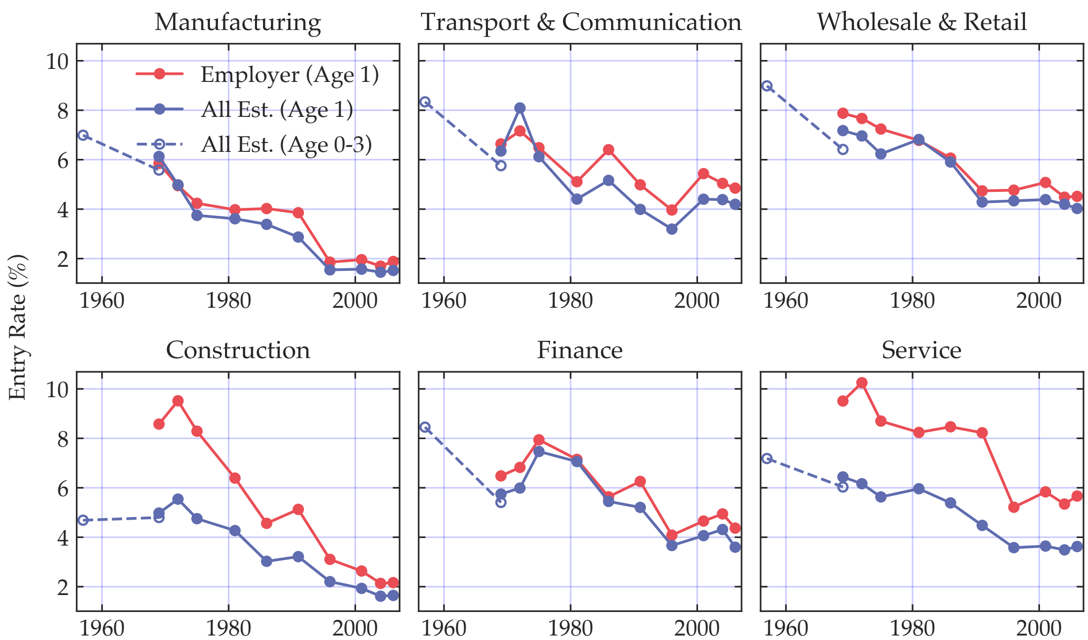


Notes: The red lines represent employer establishments, while the blue lines represent all private establishments, including both employer and nonemployer types. Entry rates depicted by solid lines are calculated by dividing the number of age-one establishments in a given census year by the total number of establishments from the previous year, linearly interpolated from the two neighboring census years. Entry rates shown by the dotted line between 1957 and 1969 use the average number of age 0-3 establishments, resulting in underestimated entry rates compared to those using the age-one group (as seen in the 1969 census data, where both estimates are plotted for comparison). The underestimation arises because the age 0-3 group includes only establishments that have survived for over three years after entry. Exit rates are calculated based on the entry rates and the yearly average net growth of establishment numbers between census years.

firm entry rates calculated from different official Japanese statistics (see Online Appendix Figure A2). Finally, Figure 2 demonstrates that although initial entry rates in 1957 or 1969 vary across sectors, a consistent long-term declining trend is observed across all sectors. This indicates that declining entry rates are a general characteristic of the post-war Japanese economy.

In Figure 1b, we calculate the corresponding annual exit rates by subtracting our calculated annual entry rates from the year-average net growth rate of establishment numbers between neighboring census years. For employer establishments, the exit rate hit a deep trough of less than 1 percent in the early 1970s, then remained largely stagnant at a low level between 2 and 3 percent until the late 1990s, when it rose to over 4 percent. Assuming that trends for all establishments mirror those for employer establishments even in the early post-war period, the figure indicates that the employer establishments' exit rate likely declined sharply between 1957 and 1969, as the all-establishments' exit rate, calculated using age 0-3 data, halved during the same period. Three points are particularly noteworthy. First, except for the very early post-war period for which we have less clear evidence, the annual exit rate for employer establishments in Japan remained strikingly low, ranging between 1-3 percent for nearly three decades from the late 1960s to the late 1990s. This rate is significantly lower compared to many other countries studied in the literature, whether developed or developing. Second, the evolution of exit rates in our data does not follow the trends in entry rates, except for the proximate and interpolated decline in the early post-war period. Theoretically, there can be mechanical links between entry and exit rates if the exit hazard decreases sharply with age and if young firms constitute a large share of the economy. This brings us to our third point: as shown in Online Appendix Figure A3, even for the youngest employer establishments, such as the age-one group, the annual exit rate in the subsequent three or five years remained below 5 percent throughout all observation periods, with only moderate declines in exit rates by age during many census years. In other words, the business survival rates for Japanese employer establishments were exceptionally high, and a business entering the market after the late 1960s could expect to survive in the market for two to three decades.

Figure 2: Entry Rate by Industry



Notes: For details on the calculation of these entry rates, see Figure 1. The six industries presented here were selected based on their relatively large shares of establishments and overall employment, although their specific rankings and importance vary over time. Note also that coverage in the Retail & Wholesale, Services, and Transport & Communication sectors differs in 2006 compared to earlier years, which may affect cross-period comparisons.

A natural consequence of declining entry and low exit rates is the decreasing share of young business units and the aging of the establishment population in post-war Japan, as shown in Figure 3. From 1972 to 2001, the proportion of age 1-5 establishments among total employer establishments decreased significantly from around 30 percent to below 20 percent. Similarly, the employment share of these young establishments declined by about 5 percent over the same period. This trend extends to middle-aged groups, such as those aged 6-11 and 12-21. Conversely, the share of employments in establishments older than 27 years increased markedly. By 2001, over 25 percent of establishments had been operating for more than 27 years, and nearly 35 percent of all employees in Japan worked in these long-lived establishments. This demographic shift could impact various aspects of the Japanese economy, especially if older establishments differ significantly from younger ones in employment and growth characteristics. In the following subsections, we explore the average size and growth trajectories of these aging establishments alongside their younger counterparts.

Figure 3: Number and Employment Share of Employer Establishments by Age

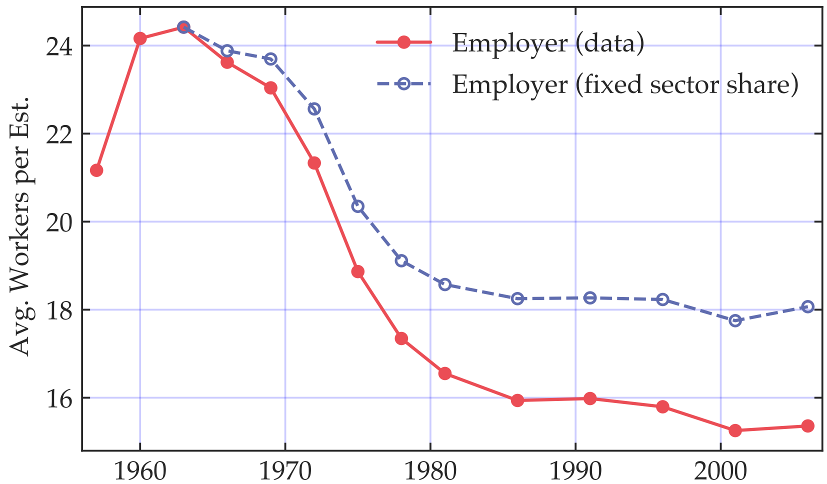
Notes: The "number share" refers to the proportion of total employer establishments accounted for by a given age group, while the "employment share" refers to the proportion of total employment. Some age-group data are missing in certain years.

2.3.2 Average Establishment Size

Next, we examine the trend in the average size of employer establishments, measured by the number of employed workers per establishment. Figure 4 reveals a noteworthy trend in post-war Japan: after rising in the late 1950s, the average employment size of employer establishments declined sharply from over 24 workers in the 1960s to fewer than 16 workers in the 1980s, where it remained thereafter. This decline is particularly surprising given that it occurred during the 1960s and 1970s, a period marked by remarkable economic growth and industrial catch-up in Japan. A potential explanation for this trend is the structural transformation of the Japanese economy from the manufacturing sector to the service sector. This sectoral shift led to a compositional change in the economy, contributing to the overall decline in average establishment size, as manufacturing establishments typically employ more workers than those in services. To control for this composition effect, Figure 4 also presents a counterfactual trend of average establishment size, assuming that the shares of two-digit industries remain fixed at their 1963 levels—the year when average employment size peaked. This counterfactual scenario isolates changes within each industry, weighted by their initial shares. This analysis reveals that changes in sector composition explain only 11 percentage points of the total 37 percent decline in average establishment size between 1963 and 2001. Declines within individual industries account for the remaining 26 percentage points, or roughly 70 percent, of this total reduction.[15]

[15] Strictly speaking, there is an additional covariance term in our decomposition that accounts for the interaction between within-sector changes and between-sector changes. However, this covariance term contributes less than one percentage point to the overall effect and is thus considered negligible for our analysis.

Figure 4: Average Establishment Size



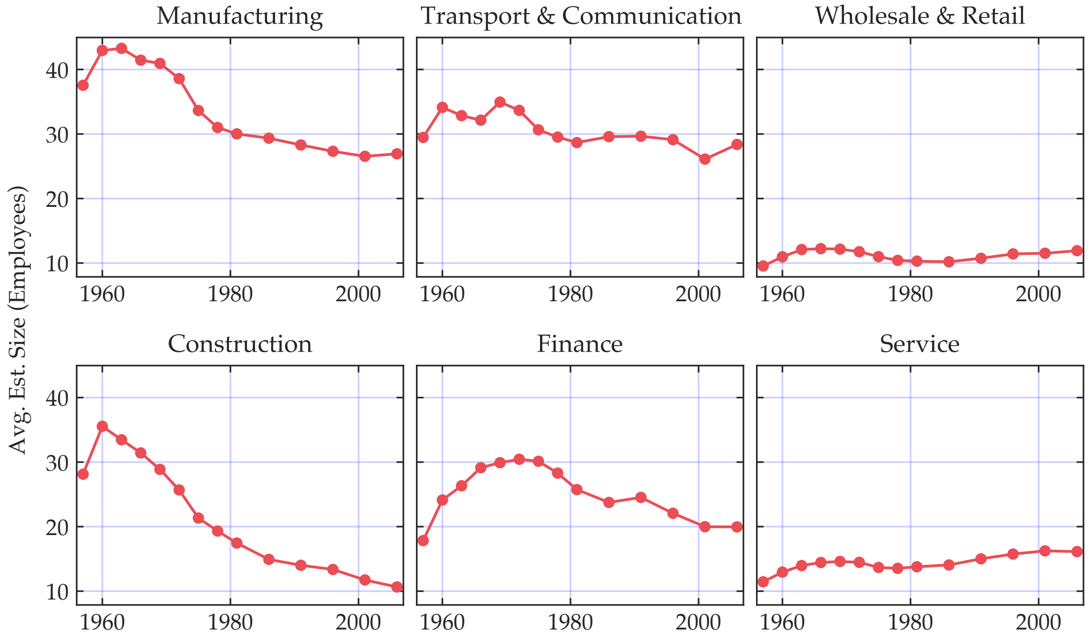
Notes: Establishment size is measured by the average number of employees per establishment. The dashed line represents a counterfactual scenario where the shares of two-digit industries are held constant at their 1963 levels, while allowing the average number of workers in each industry to evolve according to the data. This approach isolates within-sector changes in average establishment size from between-sector compositional changes that can be resulted from structural transformation.

We further analyze variations across different groups to understand the evolution of average establishment size. First, we examine industry-level variations at the two-digit level, as shown in Figure 5. Unlike the uniform decline in entry rates, the decline in establishment size varies significantly across industries in both extent and timing. Specifically, the Manufacturing and Construction industries experienced the earliest and most substantial reductions in average establishment size, beginning in the early 1960s and continuing into the 2000s. In contrast, the Wholesale & Retail and Services industries saw only moderate declines during the 1970s, followed by a gradual increase over the next two decades. This pattern suggests that industry-specific factors play a crucial role in the observed decline in establishment size in post-war Japan.

Further insights come from analyzing the evolution of average establishment size across different age groups in repeated cross-sectional data. Figure 6 shows that prior to 1980, most age groups experienced a decline in average establishment size. Post-1980, trends diverged between younger and older groups. Specifically, the age 0-5 group began increasing their average establishment size from the 1981 census onward, and the age 6-11 group followed in the 1986 census, indicating a recovery in the establishment size of newer generations. Nevertheless, their levels in the 2000s remained below those seen in the 1960s.[16] On the other hand, older groups, such as those aged 12-21, 17-26, and over 27, continued

[16]Online Appendix Figure A4 provides a disaggregated view of the same trends across major industries. This detailed analysis reveals a correlation between the extent of decline in young establishments during the 1970s and the magnitude of recovery in newer cohorts post-1980. Specifically, the Manufacturing and Construction sectors, which experienced the most significant reductions in the 1970s, showed only moderate or negligible rebounds after 1980. In contrast, the Wholesale & Retail and Services sectors, which faced less severe declines in the 1970s, demonstrated a sharp reversal of this trend in the subsequent decades.

Figure 5: Average Establishment Size By Industry



Notes: For details on industry selection, see Figure 2.

to see declines in their average employment size. By the early 2000s, establishments older than 12-21 years exhibited an average employment size that was close to or even lower than that of the 0-5 year age group in the cross-sectional data. This persistent decline in older groups, alongside their increased share in the economy as previously discussed, has offset the size recovery in newer establishments, resulting in stagnant overall establishment size in Japan.[17] Theoretically, changes in the size of any non-entrant group across repeated cross-sectional data can be attributed to two factors: variations in size at market entry and changes in growth rates during their lifespan. Therefore, the observed decline in size among older groups could stem from both a reduction in their initial sizes, as indicated by the age 0-5 data, and a decrease in growth rates over time.

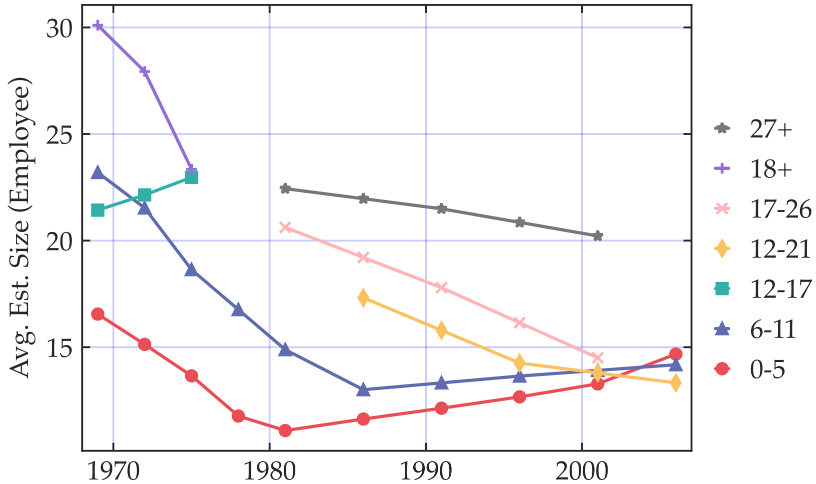
2.3.3 Establishment Lifecycle Growth

To further investigate the evolution of establishment lifecycle growth, we construct the average lifecycle trajectory for entrant cohorts (defined as the year of age-one) using interpolation.[18] Figure 7 displays

[17]Figure A4 shows that this divergence in average size growth between younger and older establishment groups is consistent across all major industries.

[18]Interpolation is necessary due to inconsistencies in age categorization across censuses. The exact intervals defining age categories are not uniform in different census years, and some categories do not link perfectly across censuses. For example, one census might categorize ages as 1, 2, 3, 4, 5, 6, 7-11, 12-16, etc. In a subsequent five-year census, the categories may remain unchanged, allowing us to trace the age 1 cohort to the age 6 category. However, further tracking is impeded by missing corresponding age categories in later censuses. To address this, we aggregate statistics from adjacent age categories (e.g., age 7-11 and age 12-16) to estimate missing data points. This approach enables us to generate consistent cohort-specific

Figure 6: Average Establishment Size by Age



Notes: The age groups selected are determined by data availability across different census years. Due to inconsistencies in age cohort tracking, not all designed age groups are available for the entire period. Therefore, we have selected the closest matching age groups in different periods to illustrate the trends.

the lifecycle growth of consecutive birth cohorts, with earlier cohorts presenting longer accessible trajectories. In 1969, a typical establishment entering the market employed an average of 15 workers at age one and grew to 18 workers by age twenty, conditional on survival.[19] Subsequent cohorts experienced a decline in entry size, reaching a nadir with the 1981 cohort at about 10 workers before rebounding to 12 workers in subsequent years. This pattern mirrors changes in the size of the age 0-5 category in cross-sectional data.[20] Interestingly, changes in the initial size of establishments have lasting impacts on their lifecycle growth. Cohorts that start with smaller sizes tend to experience downward shifts in their growth trajectories, resulting in lower average sizes in mature years. This pattern is more pronounced when examining different sectors separately. Figure 8 reveals that industries such as Manufacturing, Construction, and Finance, which witnessed substantial declines in average establishment size, exhibit pronounced downward shifts in lifecycle growth. In contrast, the Wholesale & Retail and Services industries show relatively mild declines, with cohorts quickly realigning with typical lifecycle growth trajectories observed in other cohorts.[21] Therefore, the downward shift in lifecycle growth for

lifecycle trajectories through linear interpolation.

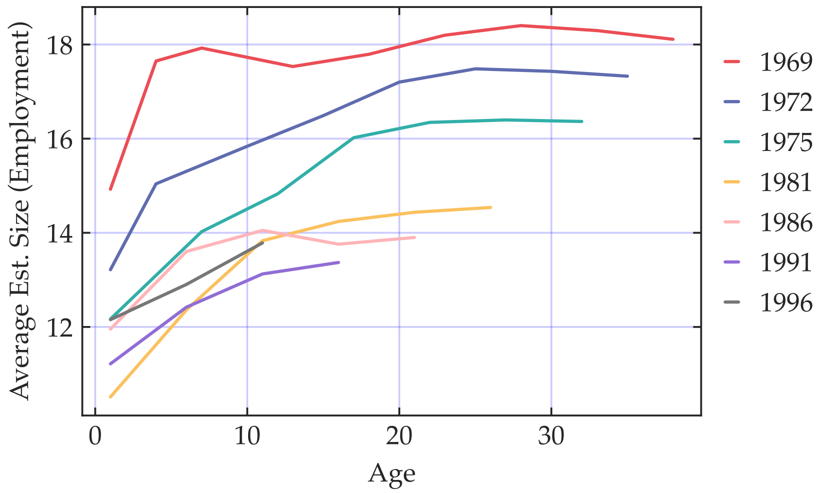
[19]Notably, even the cohort with the highest lifecycle employment growth in our dataset exhibited only a 30% growth over its lifespan, which is relatively low compared to cross-country comparisons. For instance, Hsieh and Klenow (2014) report that establishments in the U.S. on average expand eightfold after 30 years. Only countries at the lower end of the spectrum, such as India and Spain, exhibit growth rates comparable to those of Japanese establishments in our data. The absence of microdata limits our ability to distinguish between average cohort growth driven by selection effects and true growth of surviving establishments. Consequently, the notably low average growth rate of Japanese establishments may result from both subdued selection effects and inherently slow growth rates of establishments.

[20]Although data for entrant sizes before 1969 are unavailable due to the lack of age information, Online Appendix Figure A7 extrapolates statistics for cohorts born before 1969 from their data at later ages. This analysis suggests that a turning point in entry sizes likely occurred in the early 1960s.

[21]Although complete lifecycle trajectories for cohorts born before 1969 are unobservable due to data limitations, Figure A6 tracks these cohorts in their later stages. These later-life trajectories suggest that the downward shift in lifecycle growth began

new entrants across several specific sectors during the 1960s and 1970s is the primary factor behind the observed decline in average establishment size during these decades and the subsequent stagnation.

Figure 7: Average Lifecycle Growth by Birth Cohort



Notes: Each line corresponds to a birth cohort, labeled by the year in which the cohort reached age 1. Each data point shows the cohort's average size, observed in subsequent censuses and conditional on survival. When direct size data for a given cohort are unavailable in a particular census, we use linear interpolation from broader age categories in that census. Later cohorts necessarily have shorter observable spans.

We further identify two notable features concerning the evolution of establishments' lifecycle employment growth in our data. First, in addition to the significant decline in entry size during the 1960s and 1970s, there is a noticeable reduction in early lifecycle growth for newly entered establishments over the observation periods. This trend is particularly evident for cohorts that entered after 1981, as shown in Figures 7 and 8, which exhibit more flattened employment growth in their first ten years compared to earlier cohorts. Second, Online Appendix Figure A6 reveals that in the 1970s, the general upward trend in lifecycle employment growth was interrupted for establishments older than 10 or 20 years, which experienced decreasing average sizes with age, conditional on survival.[22] Taken together, these observations indicate that alongside the decline in cohort entry size during the 1960s and 1970s and the subsequent downward shifts in lifecycle growth for these cohorts, the disrupted lifecycle growth during the same period and the flattened early lifecycle growth post-1980s also contribute to the overall decline and stagnation of establishment sizes in Japan.

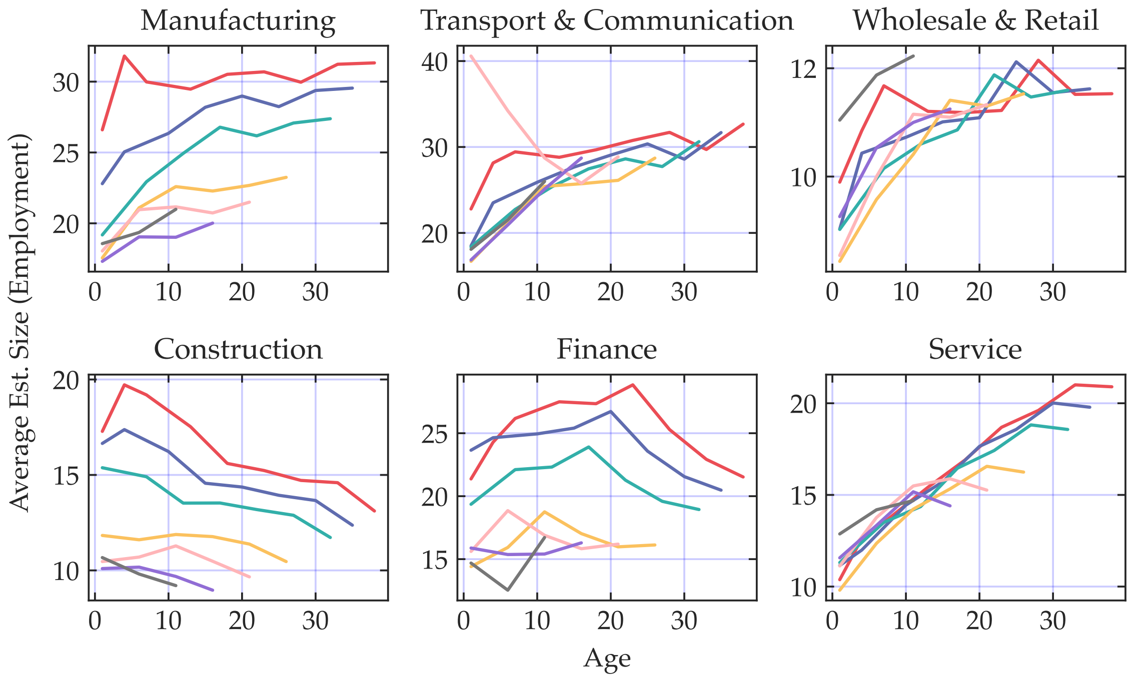
2.4 Summary and Discussion

We summarize three main empirical findings from the establishment statistics of Japan.

in the early 1960s, aligning with the decline in average establishment size observed in the economy during this period.

[22]This negative influence on lifecycle growth during the 1970s could have also affected younger groups. If so, the early lifecycle growth observed for the birth cohorts between 1969 and 1981 in Figure 7 might have been steeper had these adverse conditions not been present. Additionally, if these early shocks have a lasting impact on mature size levels, it could result in a more severe decline in lifecycle growth rates during the 1970s than the nearly parallel shifts observed in our data.

Figure 8: Average Lifecycle Growth by Birth Cohort and Industry



Notes: See the notes in Figure 7.

Fact 1. The establishment entry rate in Japan has persistently declined since the late 1950s. Combined with a stagnated low exit rate, this trend has led to an aging business population in recent decades.

Fact 2. The average employment size of Japanese establishments decreased by 35 percent during the 1960s and 1970s, with the earliest and most pronounced declines observed in the Manufacturing and Construction industries. While young establishments experienced a rebound in size thereafter, older establishments continued to decline.

Fact 3. The reduction and stagnation of average employment size are largely due to a downward shift in the lifecycle growth of establishments: newly entered cohorts exhibited both lower initial sizes and reduced sizes in their mature years. Additionally, the overall lifecycle growth rate has declined in more recent decades.

To our knowledge, these stylized features regarding the evolution of market dynamics in Japan have largely not been documented in existing literature, despite their potential importance in understanding the post-war Japanese economy. Moreover, these findings provide a unique case that enriches the broader literature on firm and establishment dynamics and lifecycle growth across both developed and developing countries. They suggest that the dominant factors influencing firm dynamics in a country can be rooted in both long-term, fundamental economic trends and historical contingencies. Below we discuss the implications of these empirical findings for the related literature on firm dynamics and lifecycle growth.

Firstly, it is well-documented that market dynamics in Japan are characterized by relatively low rates of both entry and exit (e.g., Mukoyama, 2009), with many studies attributing Japan's prolonged economic slowdown since the 1990s to this lack of business dynamism, which hinders the necessary process of creative destruction (e.g., Nishimura et al., 2005; Caballero, Hoshi, and Kashyap, 2008). However, our data reveal that this dampened business dynamism is not unique to Japan's "lost decade" but is a continuation of a long-term decline that began as early as the late 1950s. This suggests the presence of fundamental drivers within the Japanese post-war economy that are pervasive across different sectors and persistent over time. If true, addressing these underlying issues may be as critical as, or more so than, focusing on temporary market or institutional frictions that hinder market dynamism during economic slowdowns, such as the well-documented phenomenon of zombie lending in Japan (Caballero et al., 2008). Interestingly, we observe that the long-term decline in establishment entry rates began to decelerate in the late 1990s, coinciding with a spike in exit rates. Thus, our data suggest that the "lost decade" in Japan was not merely a period of economic stagnation but also marked a recovery in market dynamism.

Secondly, recent literature suggests a positive relationship between development and average establishment size. For instance, Bento and Restuccia (2017) document a positive correlation between manufacturing establishment size and various measures of development, while Poschke (2018) note that both the mean and dispersion of firm size are larger in developed countries and have increased over time in the U.S. The major explanations include enhanced entrepreneurial capability or better utilization of external management, which increases the span of control (e.g., Poschke, 2018; Akcigit and Ates, 2019b), and the presence of severe distortions in developing countries that hinder firms' input use and outputs, thereby limiting lifecycle growth (e.g., Hsieh and Klenow, 2014; Bento and Restuccia, 2017). However, our findings in Japan indicate that the typical positive relationship observed between establishment size and development does not necessarily hold within a country that has experienced substantial economic growth and catch-up, contrasting with the long-run experience of the U.S. Specifically, in Japan, forces during the 1960s and 1970s, particularly within the Manufacturing and Construction industries, led to a decline in the average employment size of both newly entered and well-established establishments. A similar case is observed in Portugal between 1980 and 2010, where the establishment size distribution shifted left amid significant economic fluctuations and reforms (Braguinsky et al., 2011). This discrepancy suggests either the importance of country-specific development trajectories or the potential presence of reverse causality in the relationship.[23]

[23] Moreover, recent evidence indicates that the traditional pattern of increasing establishment or firm size over time has begun to break down even in the U.S. during recent decades. Hopenhayn et al. (2020) and Neira and Singhania (2020) document that while average firm size in the U.S. has continued to increase since the 1980s, this growth primarily reflects shifts in the firm-age distribution toward older firms, as average firm size conditional on age has generally declined since the 1990s. Similarly, Cao et al. (2022) find that average establishment size within firms has decreased since 1990 and suggest that the continued growth in average firm size stems from increases in the average number of establishments per firm. Although we lack firm-level statistics before 1980, we have establishment statistics categorized as single-establishment, head-establishment, and branch-establishment in the Establishment Census from 1981 onward. As shown in Online Appendix Figure A8, the post-1980s period saw declining average sizes for both single-establishments and branch-establishments, while head-establishments

Lastly, Sedláček and Sterk (2017) document a cohort effect in U.S. firm dynamics, noting that the average firm's lifecycle growth depends on the business cycle conditions at the time of entry. Similarly, Sterk et al. (2021) suggest significant ex-ante heterogeneity in firms' growth potential and a decline in high-growth startups in the U.S. since the 1980s. In parallel, our analysis of Japanese data reveals a pronounced and enduring cohort effect over time. Specifically, within the Manufacturing and Construction industries, consecutive entry cohorts have exhibited consistently downward-shifted lifecycle growth for approximately two decades during Japan's mid-post-war economic expansion. Furthermore, this persistent shift in lifecycle growth during the 1960s and 1970s had a prolonged impact on the Japanese economy, as poorly performing cohorts faded out the market very slowly due to Japan's sluggish market dynamism. As a result, from the 1980s to the 2000s, the Japanese economy was characterized not only by an increasing prevalence of aging establishments due to low entry and exit rates but also by a substantial presence of establishments with limited growth potential.

3 Model

In this section, we set up our baseline establishment dynamics model and calibrate it using the Japanese establishment data presented earlier. The model follows the canonical framework of Hopenhayn (1992) and Hopenhayn and Rogerson (1993), extended to incorporate exogenous labor supply growth as in Hopenhayn et al. (2020). We briefly outline this parsimonious workhorse model below for completeness and to emphasize key mechanisms. For convenience, we use the terms "establishment" and "firm" interchangeably, though our focus remains on establishments throughout. Given the difficulty in identifying a steady-state period within our data, we calibrate the model's stationary equilibrium to match average data moments across periods, roughly targeting the conditions of early post-war Japan. In Section 4, we use this calibrated model to assess whether changes in model's strucutral parameters, which represent different economic forces, can account for the observed evolution of establishment dynamics.

3.1 Firm Dynamics Model

Firm. Firms in the economy produce a homogeneous good using labor as the sole input, with both the product and input markets assumed to be competitive. Each firm has the same production function, $f(s_t, n_t)$, where s_t is an idiosyncratic productivity that evolves over time, n_t is the labor input at time t, and f is strictly increasing in both (s, n) and strictly concave in n. This concavity induces diminishing returns to labor, providing the necessary curvature to pin down firm size.[24] Idiosyncratic productivity s_t follows a Markov process with conditional distribution $F(s_{t+1} \mid s_t)$, which is non-decreasing and independent across firms. In addition to labor costs, firms incur a fixed operation cost c_f (paid in labor units), capturing overhead labor needs. This cost is essential for generating endogenous entry and exit

experienced size increases. Moreover, paralleling U.S. trends, the average number of establishments per firm has increased during this period, despite a simultaneous decline in the share of multi-establishment firms.

[24] This setting—homogeneous good, perfect competition, and decreasing returns to labor—is isomorphic to one with differentiated goods, monopolistic competition, and a linear production function where the demand for each good imposes the curvature needed to determine firm size.

decisions.[25] Each firm's per-period profit is:

$$\pi_t(s_t, n_t, w_t) = f(s_t, n_t) - w_t n_t - w_t c_f, \tag{1}$$

where w_t is the market wage, and the homogeneous good's price is normalized to 1.[26]

The timing is as follows. At the start of period t, an incumbent observes its current productivity s_t and chooses its labor input n_t for production. At the end of the period, it decides whether to exit the market (with exit value V^x normalized to zero). Potential entrants may enter at the beginning of each period by paying an entry cost c_e (in product units), drawing an initial productivity s_t from distribution G_t, and then operating like incumbents. Thus, firms are ex-ante homogeneous but ex-post heterogeneous.

An incumbent firm's value at period t is:

$$V(s_t, \mathbf{w}_t) = \max_{n_t} \pi_t(s_t, n_t, w_t) + \beta \max_{X \in \{0,1\}} \{\mathbb{E}V(s_{t+1}, \mathbf{w}_{t+1} \mid s_t), 0\}, \tag{2}$$

where $\mathbf{w}_t$ is the sequence of current and future wages $\{w_i\}_{i \geq t}$, and X indicates exit ($X = 1$) or continuation ($X = 0$). Because the labor choice n_t affects only current profit, it is a static choice and depends solely on current period state variables (s_t, w_t); denote the optimal choice by $n(s_t, w_t)$. Since V is strictly increasing in s_t, there is an exit threshold $\bar{s}_t$ satisfying

$$\bar{s}_t = \inf\{s \mid \mathbb{E}V(s_{t+1}, \mathbf{w}_{t+1} \mid s_t) \geqslant V^x = 0\}.$$

Potential entrants share the ex-ante value function:

$$V^e(\mathbf{w}_t) = \int V(s, \mathbf{w}_t)\, dG_t(s) - c_e. \tag{3}$$

Household. We assume a representative household that supplies labor L_t inelastically. This assumption is justified if labor supply is largely determined by demographic factors or is otherwise unresponsive to economic conditions, rendering it exogenous to establishment dynamics. Japan's historically low unemployment rate further supports this approach, as structural unemployment plays a less prominent role. Because labor market clearing is sufficient to close the model and our primary focus is on establishment dynamics rather than welfare analysis, we abstract from the household's intertemporal consumption choices.[27]

[25] Without a fixed cost, low-productivity firms could suspend operations and wait for better shocks rather than exit. Also, one might argue that larger firms incurred higher overhead, and thus c_f could depend on productivity s_t. However, its effect would resemble a size-correlated labor tax, which we study in Online Appendix Section B.3.

[26] In Online Appendix Section B.3, we study the effects of introducing additional distortions into this expression.

[27] One could instead assume an aggregate utility function with employment lotteries, following Hopenhayn and Rogerson (1993). While such a framework captures the trade-off between work and leisure, it does not fundamentally alter the establishment dynamics examined here.

Competitive Equilibrium. Denote by $\mu_t(S)$ the measure of firms operating at period t with productivity $s_t \in S$, and let $M_t \equiv \int d\mu_t(s)$ be the total mass of operating firms. Total labor demand in period t is

$$N_t(\mu_t, w_t) = \int n(s, w_t)\, d\mu_t(s) + c_f\, M_t.$$

The law of motion for μ_t is

$$\mu_{t+1}(S) = \iint_{\substack{s' \in S \\ s \geq \bar{s}_t}} dF(s' \mid s)\, d\mu_t(s) + m_{t+1} \int_{s' \in S} dG_{t+1}(s'),$$

where m_{t+1} is the mass of entrants in period $t+1$.

In a competitive equilibrium with positive entry, the free entry condition must hold, $V^e(\mathbf{w}_t) \geq 0$, or else entry would be infinite or zero.[28] Moreover, labor market clearing requires $N_t = L_t$ in each period. Incumbent demand alone must be below total labor supply for entry to be strictly positive, since entrants act as a flexible but nonnegative wedge to absorb any excess labor supply. This mechanism, as shown in later quantitative exercises, is central to how labor supply growth affects entry rates. Another key feature of the equilibrium is the block-recursive structure: conditional on the equilibrium wage, individual firm decisions do not depend on the productivity distribution. Indeed, the wage sequence is the only aggregate state that influences both incumbent and entrant behavior and is pinned down by the free entry condition. For practical purposes, instead of the entire set of competitive equilibrium where the state variable is an infinite sequence of future wages that agents perfectly foresee, we focus on stationary equilibria, where the wage, exit threshold, and the productivity distribution of operating establishments remain constant over time. In addition, block recursivity simplifies extending these stationary equilibria to balanced growth paths by introducing exogenous labor supply growth, as described next.

Balanced Growth Path. Suppose labor supply L_t grows at a constant rate η. Normalize incumbents and entrants by labor to define $\tilde{\mu}_t = \mu_t / L_t$ and $\tilde{m}_t = m_t / L_t$, and assume the distribution of entrants' initial productivity, G, is time-invariant. Then a balanced growth equilibrium, if it exists, is characterized by a constant wage w^*, a constant exit threshold $\bar{s}^*$, constant per-worker firm measure $\tilde{\mu}^*$, constant per-worker entry mass $\tilde{m}^*$, and the firm decisions $n(s, w)$ and $X(s, \bar{s})$ that satisfy:

1. The labor demand $n(s, w^*)$ and exit strategy $X(s, \bar{s}^*)$ maximize the incumbent value function in (2).

2. The free entry condition holds with equality, $V^e(w^*) = 0$.

3. Labor market clears in each period,

$$1 = \int \left\{ n(s, w^*) + c_f \right\} d\tilde{\mu}^*(s).$$

[28] We normalize the outside option of potential entrants to 0 since it cannot be separately identified from the entry cost.

4. The law of motion holds,

$$\tilde{\mu}^*(S) = \frac{1}{1+\eta} \iint_{\substack{s' \in S \\ s \geq \bar{s}^*}} dF(s' \mid s)\, d\tilde{\mu}^*(s) + \tilde{m}^* \int_{s' \in S} dG(s').$$

In such a balanced growth path, the total mass of establishments and the mass of entrants both grow at rate η, maintaining a constant establishment entry rate. When $\eta > 0$, the entry rate must exceed the exit rate, because new labor supply each period is absorbed by entrants and their labor demand. The distribution of productivity remains stable along the balanced growth path.

Finally, even when the labor supply growth rate η_t changes over time, the equilibrium remains what Hopenhayn et al. (2020) term an aggregate-state stable path: the market wage w^* and exit threshold $\bar{s}^*$ from the initial balanced growth path remain fixed during the transition to a new equilibrium.[29] This outcome arises primarily because labor supply is perfectly inelastic and the entrant margin is assumed perfectly elastic, ensuring that any shifts in labor supply are absorbed by entrants without requiring a wage adjustment.[30] Under the block-recursive structure, changes in the entry mass induced by fluctuations in η_t alter the distribution of firms over productivity and size, but do not affect the optimal decisions of individual firms. However, these compositional shifts can influence aggregate incumbent labor demand, which in turn shapes further entry responses and ultimately the distribution of firms along the transitional path to the new steady state.

3.2 Calibration

To calibrate our model, we first specify functional forms following standard practice in the firm dynamics literature. The production function is set as $f(s, n) = sn^\theta$, where θ is the span-of-control parameter. The evolution of the log productivity is modeled as an AR(1) process, $\log(s_{t+1}) = a + \rho \log(s_t) + \varepsilon_{t+1}$, where a is the drift parameter, ρ is the persistence parameter, and ε is an i.i.d. normal error term with standard deviation σ_ε. The initial productivity distribution for entrants, G, is assumed to be lognormal with mean μ_G and standard deviation σ_G.

Given that the observed data do not clearly identify a balanced growth path, we calibrate the model to average establishment moments across periods. Specifically, we calibrate to average entry rate and employment size distribution between 1969 and 2006. For lifecycle growth, we use interpolated trajectories from cohorts born between 1969 and 1981.[31] We set labor supply growth to 2%, roughly matching the average rate in Japan's early post-war period. This choice also facilitates matching relatively high exit rates observed historically and supports later counterfactual exercises. Two parameters,

[29] See Hopenhayn et al. (2020) for a formal characterization of the aggregate-state stable transition under varying labor supply growth rates.

[30] If entry were not perfectly elastic and instead responded to changes in the market wage, then additional wage adjustments could be necessary to balance incumbent and entrant labor demand. Even with perfectly elastic entry, there is a practical lower bound: the entry mass cannot become negative. Although this scenario is unlikely unless labor supply growth drops abruptly, it highlights that the perfect-elasticity assumption on entry can be strong in extreme cases.

[31] The post-1981 birth cohorts lack sufficient data to observe their complete lifecycles. Moreover, our calibration aims to reflect earlier post-war conditions, so heavily incorporating the decline in early lifecycle growth post-1981 could bias the model away from these historical conditions.

the discount factor β and the span-of-control parameter θ, are assigned directly from the literature: $\beta = 0.96$ and $\theta = 0.64$. The remaining parameters, $\{c_e, c_f, a, \rho, \sigma_\varepsilon, \mu_G, \sigma_G\}$, are calibrated jointly to match nine key moments: the entry rate; average sizes of all establishments and new entrants; lifecycle growth over two intervals (ages 1–10 and 1–20); and the employment size distributions (share of establishments with 1–9 workers and their share of total employment) for both overall establishments and entrants.[32] We use nine moments to calibrate seven parameters for a better match on the dynamic and distributional moments, and thus the model is over-identified. Yet, additional untargeted size-distribution moments help to validate the model.

Table 2 presents the assigned and calibrated parameters. One notable feature is that the calibration yields a low drift and high persistence in the AR(1) productivity process, indicating strong path dependency and an absence of systematic productivity trends. Another notable outcome is the large estimated entry cost, reflecting long average establishment lifespans and high expected future profits, which must be offset by a significant entry cost to satisfy free entry.

Table 3 reports the associated model and data moments. The model closely aligns with the data for entry rates, lifecycle growth, and the size distributions of both overall establishments and entrants, including a set of moments not directly targeted. However, the model slightly underpredicts the average size of incumbents and overpredicts that of entrants, perhaps due to the difficulty of the simple AR(1) process in capturing the movements witin low and high ends of the productivity distribution. Figure 9 depicts the average lifecycle growth and survival rates for a typical cohort in the calibrated benchmark equilibrium. The lifecycle growth, closely resembling that of the earliest cohorts in our data, is modest—around 20% over the first 10 years and just under 30% by age 20—and flattens at older ages. The survival rate declines slowly and in a nearly linear trend, leaving around 40% of establishments operating 25 years after entry. These features—namely, low lifecycle growth, low exit rates, and flat age-exit profile—in together result in low ex-posted heterogeneity in our calibrated economy. Figure 10 further illustrates this by comparing the productivity distributions of entrants and all operating establishments. Entrants and incumbents differ only slightly, with overall establishments showing a marginally thinner left tail and minor increases in the mode and right tail. Thus, ex-ante heterogeneity (from the entrant productivity distribution) dominates ex-post heterogeneity from selection and growth.[33] As we will see in Section 4, this property significantly shapes how different economic forces generate counterfactual outcomes within our model.

4 Results on Different Drivers

In this section, we use the calibrated model from Section 3.2 to evaluate several potential drivers of market dynamism. Our objective is to identify the forces that, through the lens of our model, can generate changes in establishment dynamics consistent with the observed empirical patterns, in particular

[32]Model moments are computed directly from the stationary equilibrium. We employ the method of moments that minimizes the weighted sum of squared differences between model and data moments, with weights equal to the reciprocal of the data moments to normalize units.

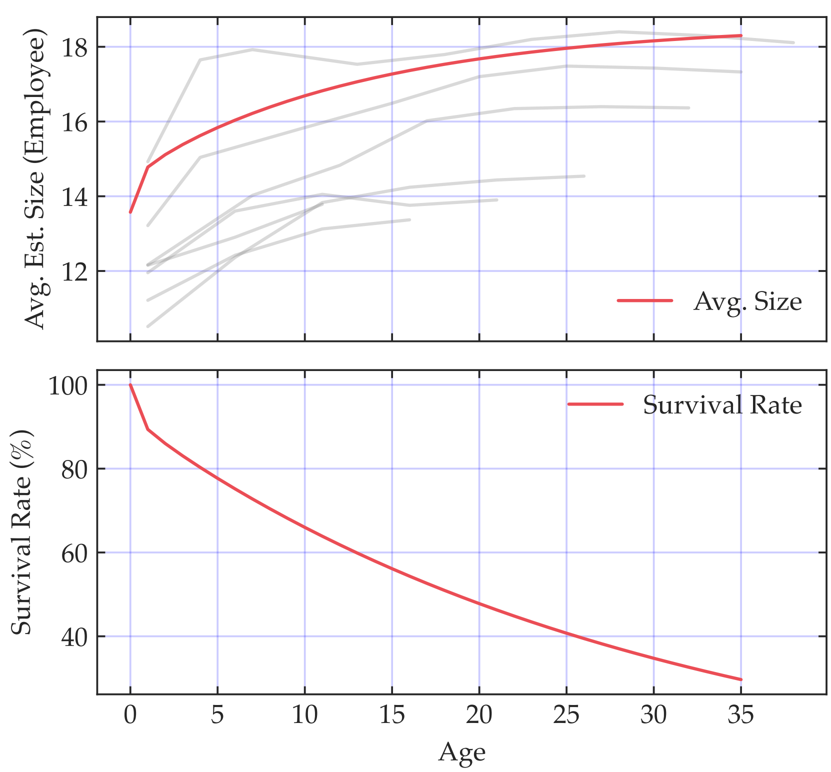
[33]See also Online Appendix Figure B4 for the evolution of a single cohort's productivity distribution over time.

Table 2: Assigned and Calibrated Model Parameters

Parameters	Values	Definition	Calibration
β	0.96	Discounter factor	Assigned
θ	0.64	Labor share ("span of control")	Assigned
η	0.02	Average labor force growth rate	Assigned
c_e	76.050	Entry cost (in unit of product)	Jointly Calibrated
c_f	2.123	Operation cost (in unit of labor)	Jointly Calibrated
a	0.008	Drift in AR(1)	Jointly Calibrated
ρ	0.966	Persistence in AR(1)	Jointly Calibrated
σ_ε	0.181	Std. of AR(1) shocks	Jointly Calibrated
μ_G	1.200	Mean of entrant productivity (log normal)	Jointly Calibrated
σ_G	0.527	Std. of entrant productivity (log normal)	Jointly Calibrated

Notes: The 2% labor supply growth rate is assigned to roughly match its average rate in the early post-war period. The discount factor β and the span of control parameter θ are assigned based on standard practice in the literature. All other parameters are jointly calibrated to match the data moments.

Figure 9: Average Lifecycle Growth in Benchmark Model



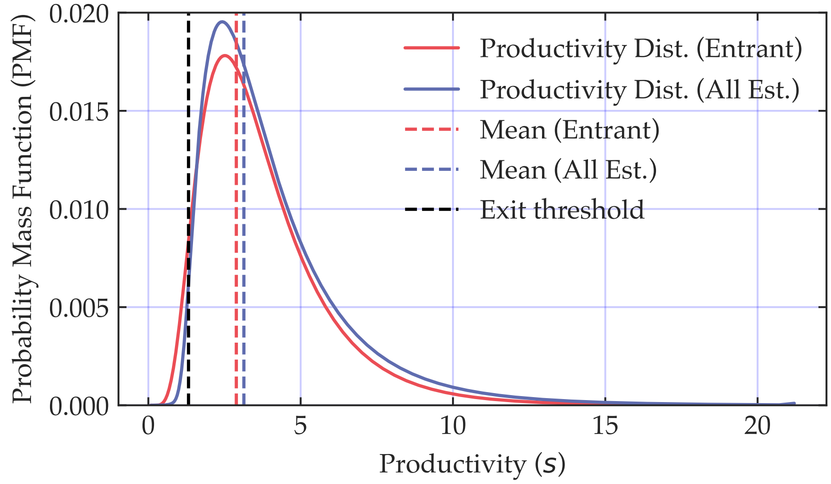
Notes: The red lines are the average lifecycle growth rates and survival rates over age for a typical cohort generated from our calibrated stationary equilibrium. The grey lines in the first panel is the interpolated lifecycle trajectories in the data that we have shown in Figure 7.

Table 3: Model and Data Moments

Moments	Data	Model	
Entry rate, %	5.76	5.62	Target
Exit rate, %	3.76	3.62	
Average establishment size	17.57	16.82	Target
Average entrant size	12.63	13.57	Target
Average life-cycle growth rate, %			
(conditional on survival)			
Age 1-10	21.65	21.88	Target
Age 1-20	30.17	29.72	Target
Age 1-26	31.98	32.32	
Number share by size, %			
Employment 1-9	61.64	63.86	Target
Employment 10-29	27.14	25.13	
Employment 30-99	9.03	8.76	
Employment 100+	2.16	2.25	
Employment share by size, %			
Employment 1-9	16.60	19.39	Target
Employment 10-29	25.37	24.80	
Employment 30-99	25.23	26.64	
Employment 100+	32.80	29.16	
Number share of entrants by size, %			
Employment 1-9	67.98	67.40	Target
Employment 10-29	24.21	23.66	
Employment 30-99	6.55	7.53	
Employment 100+	1.19	1.41	
Employment share of entrants by size, %			
Employment 1-9	23.99	23.72	Target
Employment 10-29	30.68	28.85	
Employment 30-99	24.65	27.84	
Employment 100+	20.68	19.59	

Notes: The data moments are calculated as the average statistics across the observed periods of our dataset. In particular, we average 1969-2006 statistics as entry rate and employment size distribution moments and 1969-1981 born cohorts' interpolated trajectories as lifecycle growth rates moments. The data moment of exit rate is calculated as the difference between the targeted entry rate and our assigned 2 percent labor supply growth rate, which roughly matches the exit rate in early post-war periods and helps to facilitate later counterfactual experiments.

Figure 10: Productivity Distribution in the Benchmark Model



Notes: The red and blue solid lines depict the productivity distribution of entry and overall establishments, respectively, in our calibrated benchmark model. The dashed red and blue lines represent the means of these distributions. Since establishment size differences in the model are full determined by productivity variations, these distributions also reflect the size distributions of establishments. The black dashed line indicates the exit threshold in the calibrated model.

the declines in entry rates and in establishment sizes across both entrants and incumbents. Section 4.1 examines whether exogenous changes in labor supply growth rates can account for the prolonged decline in entry rates documented in our data. Section 4.2 analyzes how changes in fundamental market parameters—entry costs, exit values, fixed operation costs, and distribution of entry productivity—can shape market dynamics, establishment size distributions and lifecycle growth. These analyses shed light on how various drivers operate within the model and how key features of Japan's market dynamics influence their quantitative implications. In Section 4.3, we conduct a joint evaluation of most drivers, decomposing how parameter changes transform two separately calibrated economies representing the 1969 and 2006 markets. Taken together, both the individual and joint analyses show that three particular forces—declining labor supply growth, reduced fixed operation costs, and decreased ex-ante heterogeneity—stand out as capable of explaining important aspects of the observed trends without producing strong counterfactual patterns. Finally, Online Appendix B. presents additional analyses, including extensions that incorporate labor market distortions.

4.1 Labor Supply Growth

In this subsection, we investigate the hypothesis proposed by two recent studies on the U.S. market—Karahan et al. (2019) and Hopenhayn et al. (2020)—that an exogenous decline in the labor force growth rate is a primary driver behind falling entry rates. The underlying intuition is straightforward: under inelastic labor supply and labor market clearing, new entrants can only be formed by hiring workers not already employed by incumbents. Slower labor force growth therefore restricts the residual labor pool available to new firms, limiting entry. Given Japan's extended decline in entry rates and its distinct labor supply dynamics, this setting provides an opportunity to test this hypothesis outside the U.S. context.

To study these effects, we begin from our calibrated equilibrium representing Japan in the early 1950s and feed the observed annual labor supply growth rates to simulate a transitional path. We measure labor supply as the number of employees at non-primary sectors from the Labor Force Survey.[34] We treat changes in its growth rate as exogenous to our model and discuss potential endogeneity concerns later. Figure 11 shows that the simulated entry rates in the traintional path trace a long-run decline comparable to that observed in the data.[35]

However, Figure 11 also shows that our model-generated entry rates mirror labor supply growth rates remarkably closely throughout the transitional path. This close alignment indicates that changes in labor supply growth feed directly into entry rate adjustments via a "direct channel," where the perfectly elastic entry margin serving as the primary mechanism clearing the labor market. Any excessive or insufficient labor demand generated by shifts in labor supply growth is met through adjustments in the entry margin, which results in one-for-one relationship between these two rates. The near-parallel evolution of labor supply growth and entry rates further suggests that "indirect channels"—feedback effects stemming from shifts in the age and size distribution induced by the direct effect—are minimal in our Japanese context. In principle, such compositional changes could drive the entry rate away from the path of labor supply growth during transition or between steady states, even with a perfectly elastic entry margin.[36] By contrast, empirical findings for the U.S. (Karahan et al., 2019; Hopenhayn et al., 2020) show that compositional effects triggered by labor supply changes significantly shape entry and other margins of firm dynamics.[37]

A natural question thus arises: why do these compositional feedback effects and transitional dynamics remain small in Japan, even amid significant labor supply fluctuations? The answer lies in the distinctive features of Japanese establishments: low exit rates, flat age-exit profiles, and modest lifecycle growth, as described in Section 3.2. These features imply limited ex-post heterogeneity, so reweighting

[34] We use this series instead of the series of total employment or labor force because it excludes primary-sector employment and self-employed or unpaid family workers to better align with our establishment data. In Online Appendix Section B.1, we discuss that our main findings are robust to alternative measures of labor supply.

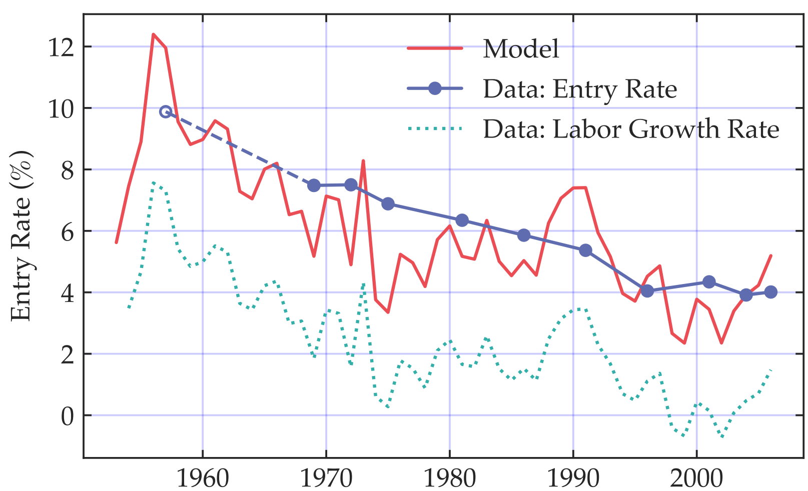
[35] Entry rates in our data are measured only every three or five years and thus appear smoother than our simulation, which uses annual labor supply data and produces significant short- and medium-term fluctuations. Other factors may further explain this discrepancy. For instance, calculating entry rates via lagged age-one establishment counts can mask higher-frequency fluctuations, and our model's perfectly elastic entry margin may overstate short-term responses. In Online Appendix Figure B3, we illustrate that applying a low-frequency filter (HP(6.25)) to the labor supply growth rate aligns the model's long-term entry trend more closely with the data. Further, some sharp changes in the model's generated series, such as the drop in the mid-1970s or spike around 1990, do match fluctuations in other Japanese entry measures from the firm registration and taxation data (Online Appendix Figure A2).

[36] To illustrate, suppose a permanent decline in labor supply growth immediately reduces entry by shrinking the available labor for newcomers. This pushes the establishment distribution toward older and larger units, lowering the share of younger firms (which have higher exit rates and smaller labor demands). The resulting decline in average exit rates keeps incumbent labor demand relatively high, necessitating further entry reductions in subsequent periods. Hence, the initial shock may be amplified, producing non-monotonic transitions with entry falling below its new steady-state level and only gradually recovering once older establishments exit and younger cohorts expand.

[37] Hopenhayn et al. (2020) formalize this via an accounting framework in which changes in the entry rate combine a "direct effect" from labor force growth with a "feedback effect" from adjustments in exit rates and average firm size. This feedback effect reflects both long-run differences between steady states (Karahan et al., 2019) and transient effects during the transition.

the economy toward older establishments when entry margins adjust hardly changes the overall exit rate or incumbent labor demand.[38] The result is a relatively age-homogeneous environment where large shifts in the age distribution do not induce significant feedback effects or transition dynamics, leaving labor supply growth as the dominant and direct driver of entry outcomes. Notably, although not obvious in Figure 11, our simulation still detects a small but measurable compositional effect. As shown in the first two columns of Table 4, reducing labor supply growth by 2 percentage points lowers entry rates by 2.2 percentage points between two steady states, implying a 10% feedback effect beyond the direct link—or an elasticity of 1.1 between entry rates and labor supply growth, far smaller than the elasticity of 1.5 reported for the U.S.[39] Hence, while feedback effects exist, they play a much smaller role than in the U.S. context. The decline in labor supply growth emerges as the primary mechanism behind Japan's falling entry rates during this period.

Figure 11: Model-Generated Entry Rate Evolution



Notes: The red line represents the entry rate generated by our benchmark model. The simulation begins from the calibrated steady-state equilibrium and then feeds with annual labor supply growth data since 1954. The blue line shows the actual observed entry rate in our dataset, with the dashed segment indicating extrapolated values based on the percentage change in the entry rate of all private establishments. The green dotted line depicts the labor supply growth rates in the labor census that are feed into the model.

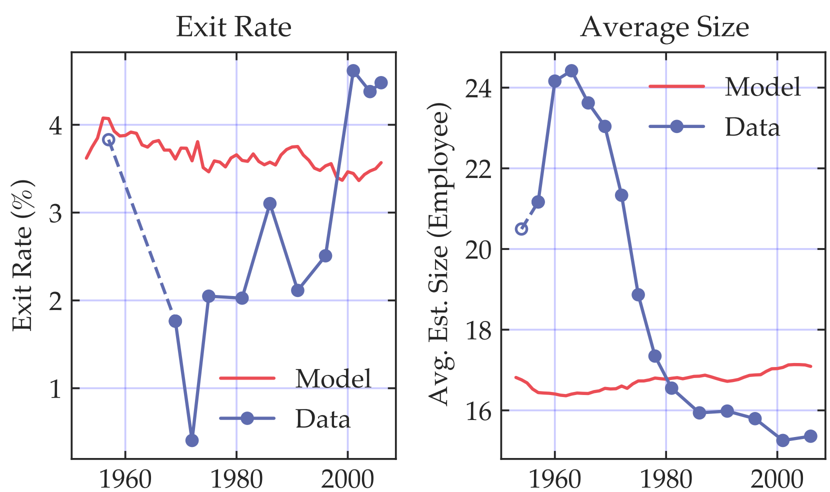
Figure 12 further illustrates this limited compositional impact by showing that exit rates and average establishment size barely shift over our simulated transition, diverging notably from the substantial fluctuations observed in the data. In particular, the simulated exit rate declines only by about 0.5 percentage points from 1960 to 2000, reflecting the gradual aging of establishments toward slightly lower exit hazards, whereas the empirical series exhibits much larger variability. Likewise, our model

[38] In an extreme case with constant exit rates across ages and zero lifecycle growth, entry-rate changes would not affect the economy-wide exit rate or incumbent labor demand, allowing entry to immediately settle at any new steady-state level.

[39] This differs notably from the U.S. results in Hopenhayn et al. (2020), where the elasticity is 1.5 in steady states and rises to 3 when transitional effects are included. Because transitional dynamics stem from and thus scale with the feedback effect between two steady states, an accounting of elasticity incorporating the transitional effect would yield an substantially larger gap betwee Japan and the U.S., leading to distinct transition dynamics.

predicts a slight upward drift in average size, reflecting a tilt toward older establishments that are marginally larger, in stark contrast to the pronounced size reductions that occurred in Japan over this period. In fact, under block recursivity and stable aggregate-state properties, labor supply shocks do not alter individual firms' labor uses or lifecycle growth at all in this environment; both remain at their calibrated steady-state levels. Consequently, while our model captures the direct link between labor supply growth and entry rates, it is not able to replicate the substantial fluctuations in exit rates and establishment size observed in the data.

Figure 12: Counterfactual Results on Exit rates and Average Size



Notes: The red line shows the exit rate (left panel) and average establishment size (right panel) generated by our benchmark model. As in Figure 11, the simulation starts from the calibrated steady state, subsequently incorporating labor supply growth data post 1954. The blue line represents the actual observed exit rate and average size in our dataset, with dashed segments indicating interpolated values based on percentage changes in exit rates among all private establishments and average size among employer establishments.

One remaining question for our simulation analysis is the extent to which changes in labor supply growth rates, that we input into the model, should be viewed as exogenous instead of equilibrium outcomes. In Online Appendix Section B.1, we decompose the labor supply growth series and find that demographic shifts (i.e., declining population growth of those aged 15 and over) account for at least 2 percentage points of the slowdown since the 1960s. These changes are largely predetermined and likely independent of economic conditions when the shifts in labor force occurs. In our model, this directly translates into about a 2.2 percentage point reduction in entry rates, capturing a major share of the observed 3.5 percentage point drop from the late 1960s to early 2000s. Additional declines in labor supply growth rates may reflect reallocation from the primary sector or self-employment into non-primary employment, making it difficult to distinguishing between labor supply and demand drivers.[40]

[40]Furthermore, the failure of our model-generated entry rates to replicate the consistent decline during the 1970s and 1980s—a period with no labor supply growth measures exhibited systematic declines—suggests that other factors may also play a role.

4.2 Market Structural Drivers

Having established that labor supply growth changes alone cannot fully account for the evolution of Japanese establishment dynamics, we now examine other structural drivers that may contribute to declining entry rates, shrinking establishment sizes, and muted lifecycle growth. In particular, we focus on three classical market structural parameters—entry cost (c_e), exit value (V^x), and fixed operation cost (c_f)—as well as parameters of the entrant productivity distribution (μ_G and σ_G). Our goal is to see whether substantial shifts in these structural market features can replicate Japan's long-run trends, and to assess whether such changes produce any counterfactual implications for lifecycle growth or other moments of the distribution.

Entry Cost, Exit Value, and Fixed Operation Cost. We first investigate whether changes in c_e, V^x, and c_f could explain the decline in entry rates and average establishment sizes. These parameters are commonly recognized in the literature as fundamental determinants of market entry and exit (e.g., Hopenhayn (1992); Melitz (2003); Karahan et al. (2019)). Following our findings in Section 4.1, we focus on steady-state comparisons, given that transitional dynamics play a minimal role in the Japanese market. Table 4 summarizes the results.

The second column of Table 4 revisits the impact of a labor supply growth decline from 2% to zero, which reduces the entry rate by 2.2 percentage points (2.0 directly and 0.2 via compositional feedback), while leaving equilibrium wages, exit thresholds, entry size, and lifecycle growth unchanged due to block recursivity. The next three columns show that achieving the same drop in entry rates through parameter changes alone requires a large increase in entry cost c_e (from 76 to 136), a substantial decrease in exit value V^x (from 0 to -21), or a 60% reduction in fixed operation cost c_f (from 2.12 to 0.86). The magnitude of the first two adjustments is considerable, given that the annual labor cost per worker (w^*) is about 1 in the model unit. Each of these adjustments weakens endogenous selection by lowering the exit threshold $\bar{s}^*$, thereby reducing the attrition of incumbent labor demand and the need for new entrants to absorb excess labor demand.[41] However, these scenarios all yield negative or near-zero lifecycle growth, an unrealistic outcome at odds with empirical evidence. The explanation lies in that relaxing the exit threshold admits a proliferation of small, low-productivity firms, shifting the overall productivity distribution left relative to that of entrants (see Online Appendix Figure B5). In Japan's case, extremely low exit rates, flat age-exit profiles, and limited lifecycle growth imply little separation between ex-ante and incumbent productivity distributions (i.e. low ex-post heterogeneity), so slackened selection due to large adjustments in c_e, V^x, or c_f can easily invert their relative positions and produce negative average lifecycle growth. Hence, within our calibrated model of the Japanese economy, these structural forces are implausible explanations for a drop in entry rates as large as 2-percentage-point.[42]

[41] Formally, in the stationary equilibrium of Hopenhayn model, entry rates are inversely related to the sum of survival rates. A lower $\bar{s}^*$ raises survival at every age, hence reducing entry rates. See Hopenhayn (1992) for derivations. Note that despite having a similar selection effect, these three scenarios vary in their price effects, i.e. the changes in equilibrium wage w^*, since different adjustments affect the free entry condition differently.

[42] This "knife-edge" result partly reflects how the canonical Hopenhayn model becomes rigid and sensitive under Japan's distinct environment of low exit rates and minimal growth. More flexible frameworks may be needed to generate less extreme responses, but that lies beyond our present scope.

In fact, we show in Online Appendix Section B.2 that aiming to generate an extra 1 percentage point drop in entry rates—beyond the 2.2 percentage point decline from labor supply growth—yields more realistic lifecycle growth patterns across all three scenarios. However, changes in entry cost c_e and exit value V^x are still large and produce counterfactual increases in average or entrant establishment sizes. In contrast, a moderate reduction in fixed operation cost c_f strikes a balanced combination of price and selection effects, lowering both entrant and incumbent sizes in closer alignment with observed data trends. We consider this adjustment as a more plausible driver.

Table 4: New Steady States with Declined Entry Through Various Market Drivers

	Benchmark	Labor Growth	Entry Cost	Exit Value	Fixed Cost
η, %	2.00	0.00	-	-	-
c_e	76.05	-	136.05	-	-
V^x	0.00	-	-	-20.79	-
c_f	2.12	-	-	-	0.86
w^*	0.98	0.98	0.78	0.95	1.09
$\bar{s}^*$	1.32	1.32	0.82	0.82	0.82
Entry Rate, %	5.62	3.43	3.41	3.41	3.41
Exit Rate, %	3.62	3.43	1.41	1.41	1.41
Avg. Entry Size	13.57	13.57	23.49	14.68	9.46
Avg. Entry Size (post-exit)	14.89	14.89	23.84	14.89	9.61
Avg. Est. Size	16.82	17.31	21.61	13.58	8.71
LifeCycle Growth Rate 10y, %	21.88	21.88	-2.51	-2.36	-2.51
LifeCycle Growth Rate 20y, %	29.72	29.72	-7.71	-7.25	-7.71

Notes: This table illustrates the new steady states required to achieve a 2.2 percentage point decline in the entry rate from the original steady state. This targeted decline mirrors the effect observed when the labor growth rate decreases from 2 percent points to zero. Of this 2.2 percent point decline, 2 percentage points represent the direct effect, with an additional 0.2 percentage points attributed to the feedback effect arising from compositional changes. This panel compares the adjustments needed across four different cases: a decrease in labor growth rate, an increase in entry costs, a decrease in exit value, and a reduction in fixed operation costs.

Impact of Adjusting Ex-Ante Productivity Distribution We next consider adjustments to the ex-ante productivity distribution upon entry—specifically the location (μ_G) and scale (σ_G) parameters of the lognormal distribution G. Unlike the structural parameters above, μ_G and σ_G directly shape the entrant-size distribution—beyond the aforementioned price or selection effects—and thus can explicitly account for the decline in average entry size and the downward shift in lifecycle growth observed in our data. Table 5 presents the counterfactural results of reducing each parameter to various degrees.

The results indicate that lowering the shift parameter μ_G efficiently decreases average entrant size but also reduces equilibrium wages (a price effect), boosting labor demand and widening the right-tail gap between entrant and overall productivity distributions (Online Appendix Figure B6). Consequently, lifecycle growth increases, contradicting the observed downward trend. By contrast, reducing σ_G thins out the right tail of the lognormal productivity distribution at entry, thereby lowering both entrant and overall establishment. In a setting with low ex-post heterogeneity, an enterprise's initial productivity is critical; thus, compressing dispersion at entry yields a near-uniform contraction of establishment sizes across all ages, consistent with the observed parallel downward shifts.[43] Reducing σ_G also lowers the entry rate by reducing the mass of marginal entrants who would otherwise lie near the exit threshold and, consequently, the attrition of establishments in the economy. Overall, a decline in ex-ante productivity dispersion stands out as a sensible mechanism for Japan's smaller establishment sizes and subdued lifecycle growth. We discuss potential underlying causes of such distributional shifts in Section 5.

Table 5: Effect of Adjusting Ex-ante Productivity Distribution

	Benchmark	Location		Scale	
	-	$\mu_G \times 0.8$	$\mu_G \times 0.6$	$\sigma_G \times 0.8$	$\sigma_G \times 0.6$
η, %	2.00	2.00	2.00	2.00	2.00
μ_G	1.20	0.96	0.72	1.20	1.20
σ_G	0.53	0.53	0.53	0.42	0.32
w^*	0.98	0.80	0.66	0.98	0.97
$\bar{s}^*$	1.32	0.86	0.55	1.29	1.29
Entry Rate, %	5.62	4.01	2.96	4.93	4.58
Exit Rate, %	3.62	2.01	0.96	2.93	2.58
Avg. Entry Size	13.57	12.57	11.13	12.63	11.90
Avg. Entry Size (post-exit)	14.89	13.17	11.35	12.97	11.93
Avg. Est. Size	16.82	16.80	17.38	15.81	15.33
LifeCycle Growth Rate 10y, %	21.88	24.65	32.09	19.90	20.35
LifeCycle Growth Rate 20y, %	29.72	38.18	55.26	32.80	37.92

Notes: This table compares the moments of benchmark model with the ones of new model equilibrium under changes in ex-ante productivity distribution G. In particular, we test with reducing the values of the shift and dispersion of the productivity distribution, represented by μ_G and σ_G, respectively.

4.3 A Joint Test of Different Drivers

Rather than testing each parameter change in isolation, we now consider them jointly to assess how parameter adjustments collectively account for the observed empirical trends. To implement this analysis, we separately calibrate our model to fit both the 1969 and 2006 economies, yielding two distinct parameter sets. For the 1969 calibration, we maintain a 2% labor supply growth rate, as in the baseline model, and use average lifecycle growth from the 1969–1972 cohorts along with the remaining 1969 data moments. For the 2006 calibration, we set labor supply growth to 0%, consistent with prior analyses, and measure lifecycle growth using the 1981–1996 cohorts (since data on more recent cohorts' full lifecycle are unavailable). Starting from the 1969 calibrated model, we sequentially replace each parameter with its 2006 value, and track five key outcomes: entry rates, average establishment

[43] In other words, in the Japanese market, "being born large" matters more than "growing large." Meanwhile, decreasing ex-ante dispersion magnifies the importance of random shocks from the AR(1) process, slightly broadening the gap between entrant and incumbent productivity distributions (Online Appendix Figure B6) and modestly raising lifecycle growth after age 10.

size, average entrant size, and 10-year and 20-year lifecycle growth. Because our calibrations include the AR(1) productivity process parameters, this exercise also enables to evaluate the role of ex-post heterogeneity in shaping the data.[44]

Table 6a reports the decomposition. The parameters found to generate effects most consistent with the data are exactly those identified in our individual tests: (i) a lower labor supply growth rate, (ii) a reduced fixed operation cost, and (iii) a narrower dispersion of entry productivity. Each of these forces depresses entry rates while either preserving establishment size (in the case of declining labor supply growth) or reducing sizes of both entrants and incumbents (in the other two cases). Also, none of these changes induces large distortions in lifecycle growth rates. By contrast, other parameter changes produce outcomes that sharply conflict with empirical observations. For instance, lowering entry costs markedly raises entry rates, reducing the entry distribution location substantially inflates average size, and altering the AR(1) drift or volatility leads to implausibly large shifts in lifecycle growth.[45]

Additional evidence for the primacy of these three drivers emerges from Table 6b, which allows only labor supply growth, fixed cost, and the entry distribution's scale to change to their 2006 values. Together, these adjustments account for a majority of the differences between the 1969 and 2006 economies. In particular, they produce a 2.9% decline in entry rates, a 4.3-worker reduction in average size, and a 2.4-worker decrease in entrant size—capturing much of the observed 3.4% decline in entry rates and 4-worker declines in both entrant and average sizes. Labor supply growth decline contributes most to the decrease in entry rates, whereas changes in fixed costs and entry distribution dispersion (especially the former) explain the reductions in size measures. The main missing arises with lifecycle growth: reducing fixed costs and narrowing entry productivity dispersion lowers average size more than entrant size, resulting in a dip in lifecycle growth rates that contrasts with the relatively stable patterns in data results. However, post-1980 cohorts (see Figure 7) did exhibit declining lifecycle growth that the 2006 calibration fails to fully capture, due to limited lifecycle data for these later periods. Overall, these findings confirm that declining labor supply growth, lower fixed costs, and compressed entry productivity dispersion are the most plausible and empirically consistent channels driving Japan's long-run changes in establishment dynamics in our model.

5 Discussion

In this section, we examine empirical aspects that our standard firm dynamics model does not capture, as well as other potential factors that may explain these remaining facets of Japanese establishment

[44]Instead, we do not incorporate the exit value parameter studied earlier because our baseline calibration normalizes its value, and our previous analysis shows that unrealistic changes in this parameter would be required to meaningfully alter entry rates and other moments. We also exclude the labor market distortion parameters studied in Online Appendix Section B.3 because they necessitate model extensions that complicate direct comparisons and turn out to have limited empirical relevance in the Japanese context.

[45]While combining multiple factors could reconcile some data patterns, doing so requires finely balancing multiple strong forces, calling the robustness of such outcomes into question. This observation does not necessarily invalidate such potential mechanisms, but it does suggest that their implementation within a canonical, yet overly parsimonous, Hopenhayn-style model may be highly sensitive when calibrated to markets like Japan's. More flexible firm dynamics models might more reliably accommodate these channels, but developing such models lies beyond our scope.

Table 6: Decomposition of Sequential Parameter Changes from 1969 to 2006 Calibrated Models

(a) Decomposition of Effects of All Calibrated Parameters

Parameter	1969	2006	Entry Rate	Average Size	Entrant Size	Growth 10y	Growth 20y
Initial Value	-	-	7.37	20.31	17.06	20.20	25.29
Labor Growth (η)	0.02	0.00	-2.12	0.31	0.00	0.00	0.00
Entry Cost (c_e)	97.89	32.67	5.01	-9.18	-10.11	54.12	63.81
Fixed Cost (c_f)	1.84	1.35	-0.85	-2.13	-1.15	-6.28	-6.52
Entry Dist. Shift (μ_G)	1.50	0.34	-4.10	9.86	-0.09	56.31	167.06
Entry Dist. Scale (σ_G)	0.61	0.51	-0.55	-0.70	-0.37	-9.93	5.57
AR(1) Drift (a)	-0.04	-0.03	-0.07	3.92	-2.22	23.77	152.07
AR(1) Persistence (ρ)	0.99	0.99	-0.30	-1.73	0.38	-13.13	-59.12
AR(1) Volatility (σ)	0.22	0.16	-0.38	-4.39	9.61	-106.79	-322.10
Total Change	-	-	-3.35	-4.04	-3.95	-1.94	0.77

(b) Decomposition of Effects of 3 Key Parameters

Parameter	1969	2006	Entry Rate	Average Size	Entrant Size	Growth 10y	Growth 20y
Initial Value	-	-	7.37	20.31	17.06	20.20	25.29
Labor Growth (η)	0.02	0.00	-2.12	0.31	0.00	0.00	0.00
Fixed Cost (c_f)	1.84	1.35	-0.59	-3.26	-1.57	-8.47	-11.44
Entry Dist. Scale (σ_G)	0.61	0.51	-0.22	-1.32	-0.80	-3.52	-2.71
Total Change Achieved	-	-	-2.93	-4.27	-2.37	-11.99	-14.15

Notes: This table presents the sequential effects of changing model parameters from their 1969 calibrated values to 2006 calibrated values. Initial Value row shows the key moments in the 1969 calibrated model. Each subsequent row reports the changes in these moments when the corresponding parameter is adjusted to its 2006 value, holding other parameters at their previous values. Panel (a) shows changes for all calibrated parameters, while Panel (b) allows only changes on three key parameters: labor supply growth, fixed cost, and entry distribution scale. Total Change row reports the cumulative changes from all parameter adjustments. Growth 10y and 20y indicate the percentage changes in average establishment size between age 1 and ages 10 and 20, respectively.

dynamics. Our discussion draws on both recent firm dynamics and lifecycle growth literature and on empirical evidence specific to post-war Japan.

First, although a considerable portion of the decline in entry rates can be attributed to changing labor supply growth, particularly when combined with other forces in the joint simulations, the exit rate follows its own distinctive fluctuations and is seemingly tied to broader macroeconomic events. For instance, exit rates peaked in the early 1970s and late 1990s, coinciding with periods of economic turbulence and slowdown, especially the latter episode when older establishments exited at higher rates than younger ones, producing a temporarily inverted age-exit profile. Because our model omits aggregate productivity shocks (to maintain tractability for stationary equilibria and transitional path analysis), it cannot directly capture any macro-driven impact in exit and entry.[46] If such external factors do indeed shift exit behavior, they could also, through the channels present in canonical firm dynamics models, influence entry and lifecycle growth.

Second, it is natural (and popular in the literature) to suspect that labor market distortions—such as size-based labor costs (Restuccia and Rogerson, 2008; Hsieh and Klenow, 2009, 2014) or labor adjustment frictions (Hopenhayn and Rogerson, 1993)—might impede efficient use of labor, restraining firm expansion and potentially explaining the declines in average size and lifecycle growth seen in post-war Japan. However, our model extensions in Online Appendix Section B.3 reveal that neither of these two distortion types have substantial intended effects in the Japanese context. The reason behind is again limited ex-post heterogeneity. Productivity distributions across ages are similar, so size-correlated labor taxes affect entrants and incumbents almost uniformly. And low, smooth lifecycle growth yields minimum labor turnover, leaving labor adjustment costs with only a trivial impact. Furthermore, there is little empirical evidence of heightened labor market distortions in the 1970s and 1980s, precisely when average size and lifecycle growth declined. Hence, although labor market distortions are often regarded as a revelant feature of Japan's economy, we find that they offer little help in explaining the particular trends in establishment dynamics that we document.[47]

Third, a small but growing body of literature examines how initial conditions and entry-stage decisions shape a cohort's subsequent lifecycle growth. For instance, Bento and Restuccia (2017) underscores that input-market distortions, akin to those in Online Appendix Section B.3, may have amplified effects when a firm's early investments strongly determine the efficiency of later investments. Separately, Sedláček and Sterk (2017) shows that entrants adopt different strategies on product positioning—mass versus niche—depending on the business cycle, and once set, they significantly influence the firm's long-term growth. In a related context, Sterk et al. (2021) highlights the importance of ex-ante growth potential among new firms, arguing that a drop in the entry of high-growth startups, combined with

[46] Khan, Senga, and Thomas (2016) and Ayres and Raveendranathan (2023) are recent works on this line with a focus on aggregate shocks and financial frictions.

[47] Another labor market relevant hypothesis is that capital-embodied automation technologies substituted labor, producing the observed reductions in establishment size and employment-based growth. For instance, Ignaszak (2020) finds that in Germany, an increasing supply of skilled labor prompts higher demand for both capital and labor inputs, lowering the number of workers in new businesses under higher wages while accelerating their growth. Yet in Japan, labor shares dropped more in services than in manufacturing where technology advanced most (Fukao and Perugini, 2021), and we do not observe faster growth in the data.

diminished growth potential, has contributed to the decline in U.S. business dynamism. Collectively, these theories may shed light on the downward shifts in cohort-level lifecycle growth observed in the 1960s and 1970s Japan. Because our aggregate statistics contain limited information on intra-age or intra-size heterogeneity, our simulations can only address ex-ante heterogeneity in a broad manner, leaving richer channels unexplored. Identifying the specific initial conditions and decisions that drive variation in lifecycle trajectories remains an important topic for future work.

Following this line of reasoning, an additional hypothesis is that the rapid expansion of subcontracting relationships, especially in manufacturing and construction, drove the observed decline in both average size and lifecycle growth during the 1960s and 1970s. As illustrated in Online Appendix Figure B9, there is a clear negative correlation between the manufacturing subcontractor ratio and the average size of age 0–5 establishments. It seems plausible that many new entrants began as subcontractors with limited growth potential. This mechanism could also explain why older incumbents shrank over the same period. Post-1980s, as Japanese manufacturers increasingly outsourced to other East and South Asian countries, new domestic entrants were forced to become independent producers or downstream suppliers, leading to a rise in entry size. This scenario resembles the "initial condition" channel described by Sedláček and Sterk (2017), although here the driving force is not business cycle variation but the industrial development stage and shifting trade patterns. Outsourcing could also help explain why fixed operating costs declined over time. We believe this line may merit some further investigation.

6 Conclusion

In this paper, we investigate the long-term evolution of establishment dynamics in post-war Japan, identifying three previously undocumented empirical facts: a persistent decline in entry rates since the early post-war period, a sharp decrease in average establishment size across all age groups during the 1960s and 1970s, and a significant downward shift in cohort lifecycle growth during the same period especially within the manufacturing and construction sectors. Through the lens of a standard firm dynamics framework, we find that among a variety of factors, a combination of decreases in labor supply growth rate and reductions in fixed operation costs and ex-ante productivity heterogeneity, can plausibly account for most of the observed dynamics in establishment behavior. Despite these coherent explanations, we note that our analysis here is more an exercise in testing the most likely and established hypotheses posited within the literature than a definitive unveiling of the historical mechanics at play. Further evidence is required to robustly establish causality of the suggested mechanisms, and analysis incorporating factors such as macroeconomic conditions and sector-specific determinants will further facilitate the understanding of the observed establishment dynamics, especially in terms of fluctuations in the exit rate and shift in lifecycle growth trajectories. As such, our study underscores the potential complexity in the evolution of market dynamics and the important roles of both long-run economics force and historical contingencies in fully understanding the drivers underlying these trends.

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Online Appendices

Online Appendix A. Additional Empirical Facts

A.1 Nonemployer Establishments

An important classification within our data is the distinction between different legal statuses of private establishments in the census. Establishments are categorized as either corporation, which is legally incorporated under the law, or individual proprietorship, which is not. Following the empirical literature on business dynamism, we refer to the former as employers and the latter as nonemployers. This terminology reflects the typical nature of these business units: while individual proprietorships are usually self-employed businesses with very limited size, corporations hire employees and can vary greatly in size.

In particular, in our data, the average size of employer establishments ranges from 15 to 23 workers over time, with establishments employing over one hundred workers accounting for more than 30 percent of total employment among employers. In contrast, 97 percent of nonemployer establishments employ fewer than nine workers, with an average size of approximately three throughout the period (see Figure A1). Thus, despite the fact that nonemployer establishments once comprising 80 percent of all business units and 25 percent of employment in the early post-war period, their significance and impact on the economy and market dynamism rapidly diminished in the post-war time and became particularly minor after the 1980s.[48]

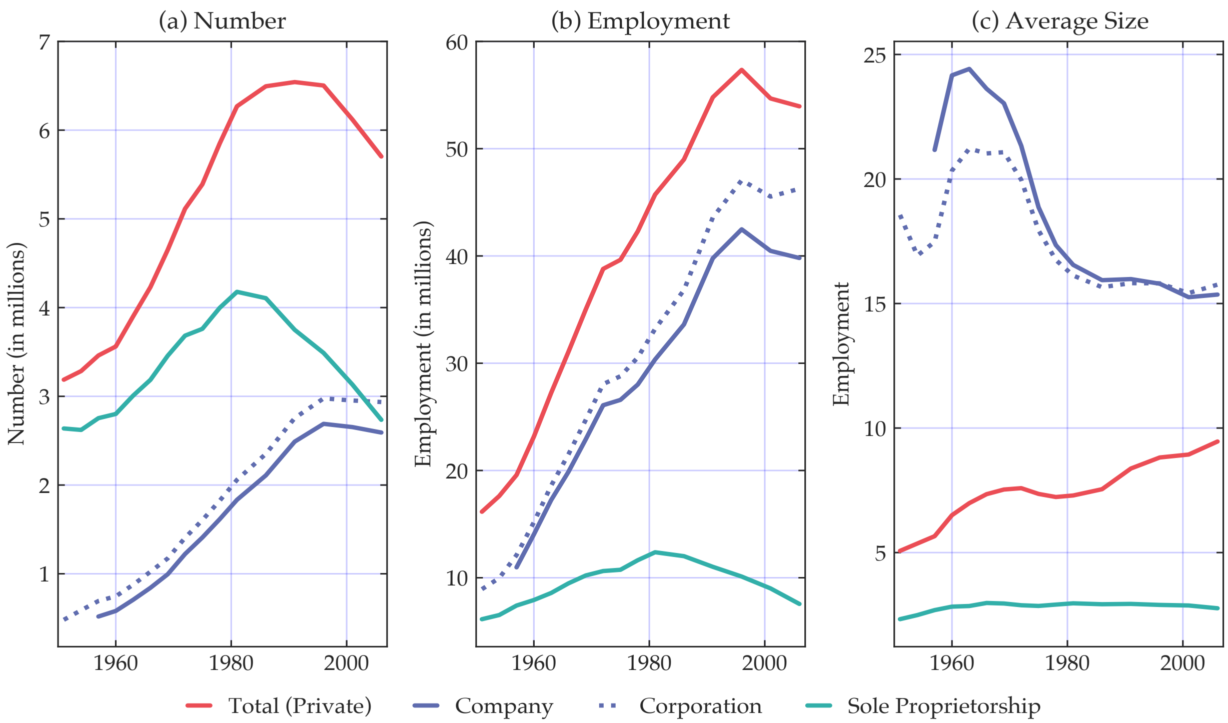
Moreover, while there is no direct data to verify this, it is plausible to assume that a nonemployer establishment would transform into an employer establishment if it encountered growth opportunities and/or if the entrepreneur altered the initial intention and decided to expand. In such cases, the establishment would be recorded as an exit in the nonemployer category and an entry in the employer category. Accordingly, it is reasonable to assume that establishments are selected into these two cosmoses, based on varied initial endowments and expected growth paths, and leading to distinct features in the establishment dynamics of two groups. Figure A1 illustrates that employers have experienced higher growth in both number and employment compared to nonemployers, whose economic share has continued to decline, especially since the 1980s, suggesting a significant transfer of employment from one group to the other.

A.2 Firm Entry and Exit Rates from Administrative Data

The long-term dynamics of firms (corporations) in Japan can be also traced using data from the Taxation Statistics and the Statistics on Registration. These sources enable us to calculate the entry rate of corporations dating back to 1940. As shown in Figure A2, the firm entry rate surged to a peak of over 30 percent in the late 1940s, then quickly declined to just above 10 percent by the mid-1950s, followed by a prolonged and steady decline thereafter. The observed disparity between the firm entry rate and

[48] Interestingly, there appears to be a turning point around the 1980s, after which the number and employment of nonemployer establishments significantly declined, while the number and employment of employer establishments only stagnated from the end of the 1990s onwards. This may reflect changes in the decision-making mechanisms of agents in the Japanese labor market regarding self-employment versus employment, potentially impacting the dynamics of employer establishments studied in this paper. While this is an interesting and noteworthy feature, we consider that it is beyond the scope of this study, and thus abstract from any effects of the nonemployer sector in our analysis. We leave future research to explore the potential drivers and impact of this sector.

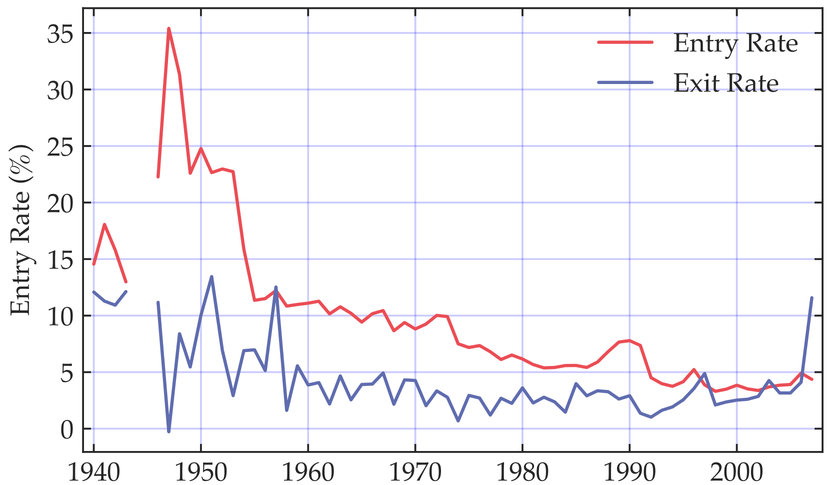
Figure A1: Aggregate Trend of Establishment by Type



Source: Establishment Census of Japan.
Notes: In Japan, all private establishments are classified into two main groups based on their organizational type: corporation (employers) and sole proprietorship (nonemployer). Within the category of corporations, the predominant group comprises establishments that belong to companies, alongside other forms of corporations including business union, mutual corporation, and other corporations. These "company" establishments here are the "employers" that we employed in our main text, and the notion of company further contains general partnership company, limited partnership company, joint-stock company, limited company, mutual company, and foreign company. For all corporations, the employment encompasses paid executives, regular workers, as well as temporary, part-time, and outsourced workers. For sole proprietorship, the employment involves mainly self-employer and family workers.

the employer establishment entry rate discussed in the main text can be attributed to several factors. Primarily, while most entries are home offices and thus counted as firms, the denominator for establishments includes a substantial proportion of branches. Additionally, the firm entry rate calculations draw from two distinct sources, each with different coverage scopes, which contributes to the observed differences. Despite these discrepancies, the long-term trend of the firm entry rate is consistent with the employer establishment entry rate, suggesting that the decline in the entry rate is a general feature of the Japanese market dynamics.

Figure A2: Long-Run Entry/Exit Rate for Firms



Source: Firm counts are from Taxation Statistics. Firm setup counts are from Statistics on Registration.
Notes: The entry rate is calculated as firm setup counts divided by firm counts in the preceding year. Both the number of firms and setup counts include only head establishments, which means the resulting entry rate is at the firm level. Also, the firm data here covers all industries, while the establishment data used in the main text does not include first (primary) sector industries.

A.3 Exit Rate by Age

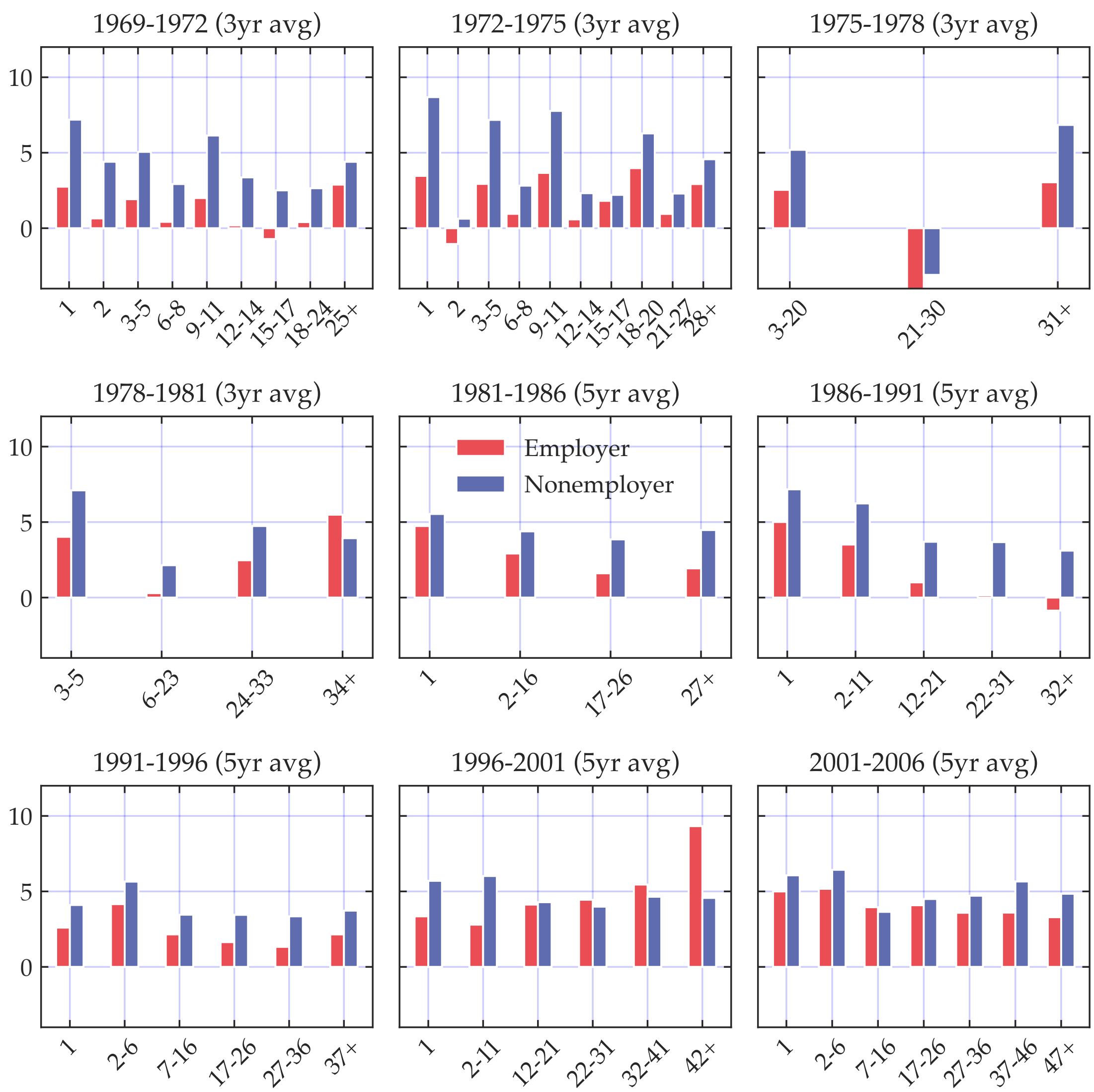
Figure A3 illustrates the yearly exit rates for different age groups between two neighboring censuses. Unlike Figure 1b, where overall exit rates are calculated from entry rates and changes in total establishment numbers, here we directly track corresponding age cohorts across two successive census years and computes the yearly average of their disappearance rates. Due to inconsistencies in age group categorizations across different census years, the age groups for which exit rates can be calculated vary across different pairs of successive census years, and the age at the earlier census year is used as the label on the x-axis. For some age groups in certain years, the exit rate is abnormally low or even negative, suggesting potential measurement errors in the raw data.

Figure A3 reveals that in general, for both employer and nonemployer establishments, the exit rate decreases with age, though this decline is rather moderate in many census years. However, for employer establishments, certain periods such as 1972-1975 and 1996-2001, show older establishments experiencing no lower, but rather higher, exit rates compared to their younger counterparts. The latter period is particularly striking, indicating that the increased exit rate in the late 1990s was not due to increased exits among young establishments but rather due to surges in exits among old establishments. Given that these periods coincide with economics recessions, it could be posited that market dynamism acted as a cleansing mechanism, leading to higher exit rates among older and potentially less efficient establishments. Indeed, Figure A3 shows that the exit rate for mature employer businesses fluctuates significantly, increasing in the 1970s, declining in the 1980s, and surging again in the late 1990s, whereas the exit rate for young employer businesses remains more stable, within the 3-5 percent per year range. However, this hypothesis contradicts with evidence of the sullying mechanism of market dynamics during Japan's "lost decade" as documented in existing studies (see, e.g., Nishimura et al., 2005; Caballero et al., 2008). Further research is needed to resolve this empirical discrepancy. For nonemployer establishments, such reverse patterns in the age-exit relationship are mostly not observed.

The exit rates of nonemployers shown in Figure A3 also indicates that the significantly higher exit rates for all establishments compared to employer establishments between late 1960s and middle 1990s shown in Figure 1b are attributable to the higher exit rates among nonemployer establishments. Over time, as this exit rate discrepancy gradually decreased, along with nonemployer establishments gradually declining in share and fading from the economy, the gap between these trends narrowed and disappeared. Additionally, Figure 1b and Figure A3 indicate that the exit rate for nonemployer establishments fluctuates less over time compared to their employer counterparts, possibly reflecting fewer outside options for nonemployer establishments, leading to fewer market exits in response to negative aggregate shocks in the economy.

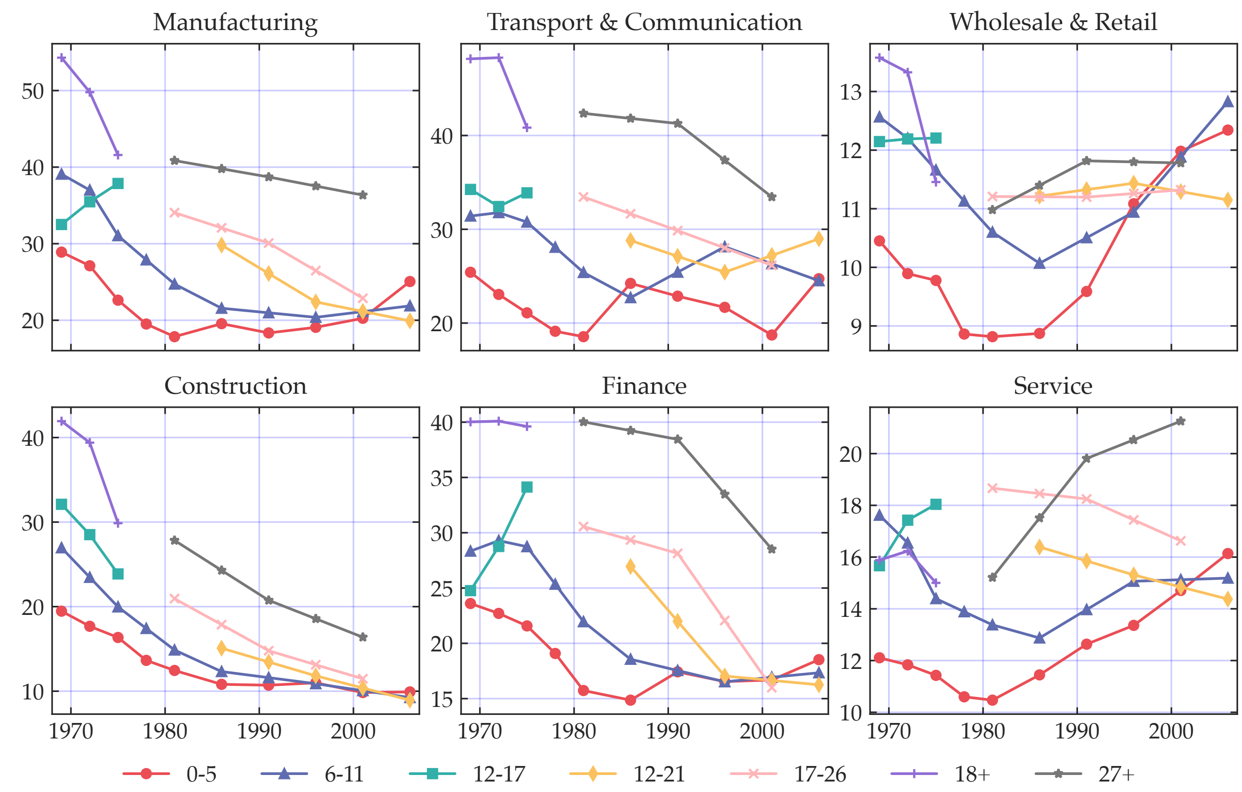
A.4 Additional Figures for Establishment Size and Lifecycle Growth

Figure A3: Exit Rate for Establishments in Japan by Age



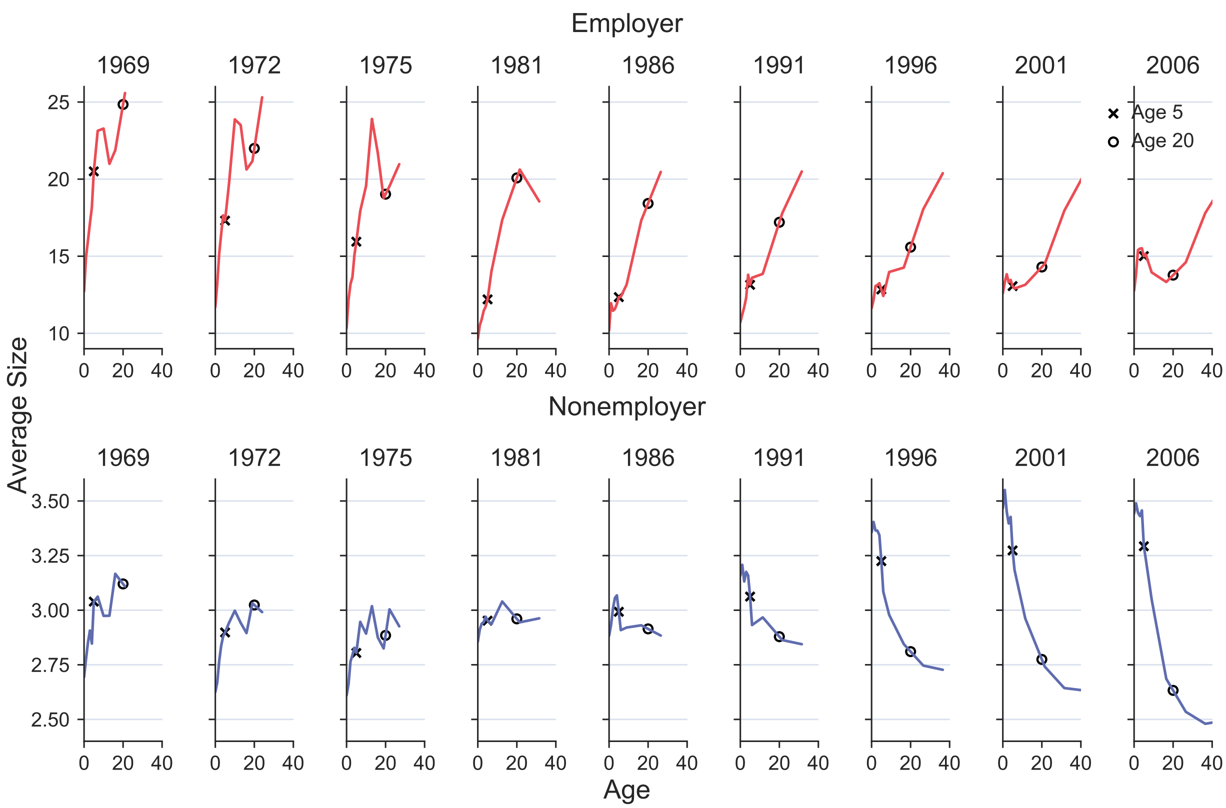
Source: Establishment Census of Japan.
Notes: These exit rates are directly calculated from the disappearance rates of corresponding age cohorts in two successive census years and are presented as yearly averages. The age cohorts represented on the x-axis correspond to the age at the earlier census year. It is important to note that the derived exit rates in some census years prior to 1981, particularly for employer establishments, exhibit inconsistent variations across age cohorts, including negative values for specific ages. We suspect these inconsistencies may stem from measurement issues in the raw data collection, such as rounding errors regarding the self-reported establishment year; however, we think that the overall exit rates presented and analyzed in the main text are less subjective to such measurement issues.

Figure A4: Average Size by Industry



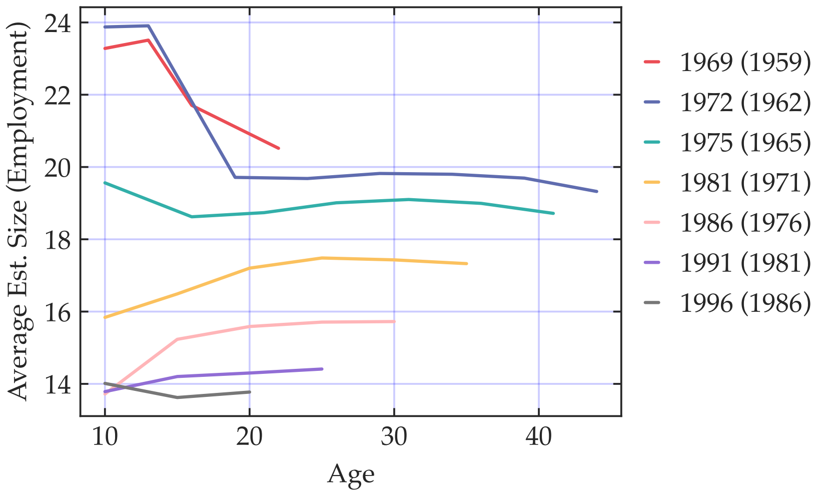
Source: Establishment Census of Japan.
Notes: For Retail & Wholesale, Services, and Transport & Communication, the coverage of the industry in 2006 is different from the years before.

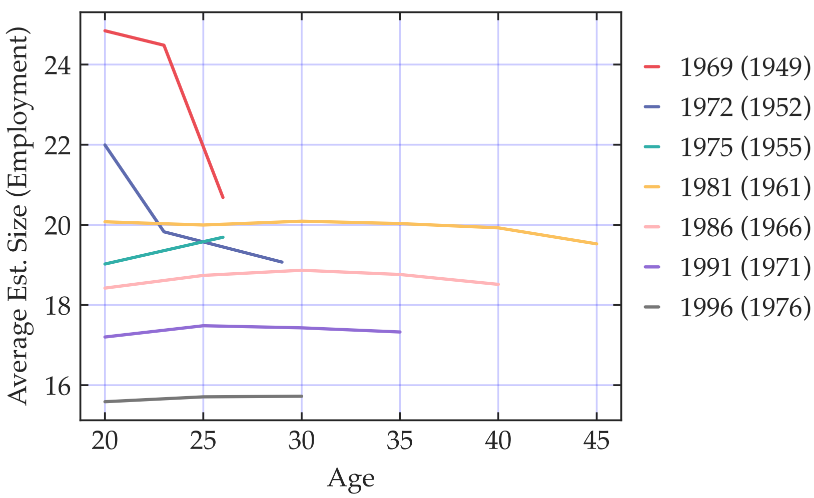
Figure A5: Interpolated Correlations between Age and Average Size



Source: Establishment Census of Japan.
Notes: The average size is plotted as the average employment in a certain age cohort at the geometric mean of this age cohort. The last age cohort of each year has been removed because its mean is not available. The black circle in each single figures represents average employment size of establishments in age 20.

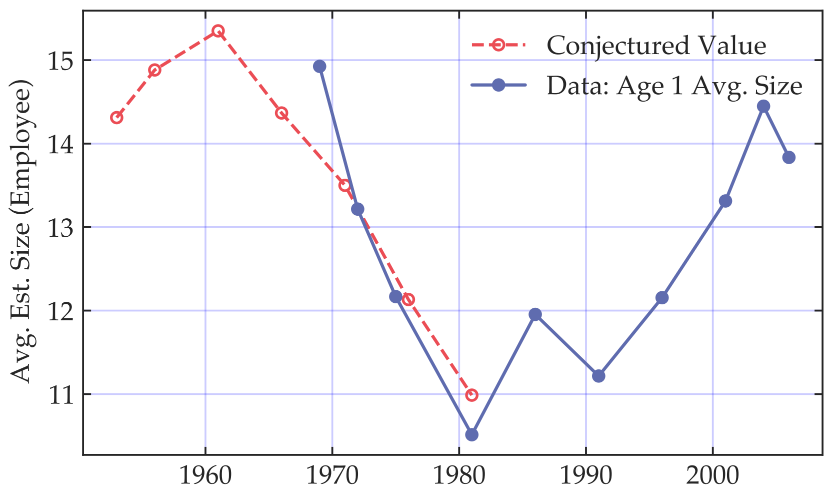
Figure A6: Average Lifecycle Growth for Age 10 and Age 20 Cohorts





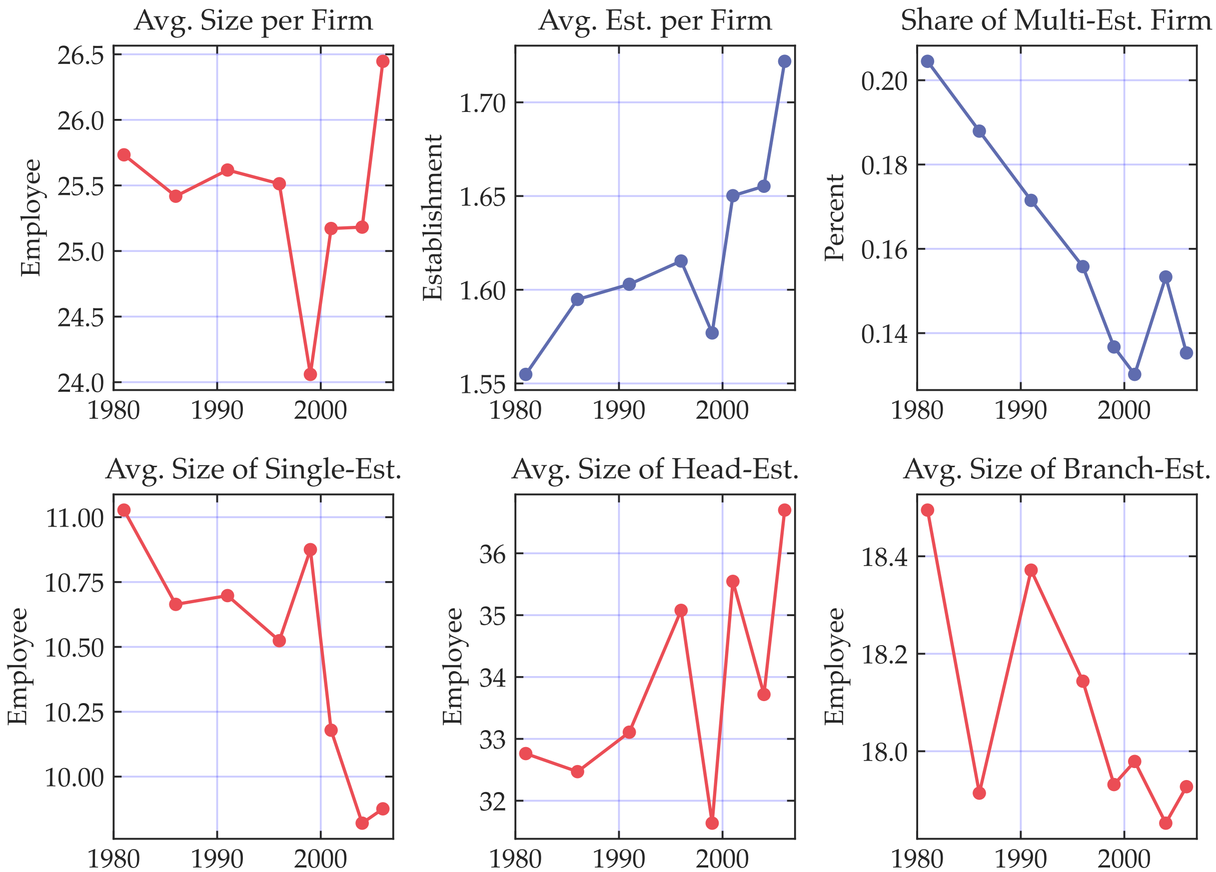
Source: Establishment Census of Japan.
Notes: The lines are plotted by using the same method as the one in Figure 7 except that we now target not age 1 birth cohorts but age 20 cohorts.

Figure A7: Extrapolated Establishment Entry Size at Early Periods



Source: Establishment Census of Japan.
Notes: By applying the average life-cycle growth of the birth cohorts between 1969 and 1981 to the average size of elder groups in census years after 1981, we back out the average entry size in early periods when no age data is available.

Figure A8: Average Size and Average Establishment of Firms



Source: Establishment Census of Japan.
Notes: This figure presents calculations where firm counts include all single-establishment firms and head-establishments of multi-establishment firms, excluding branches. The average size per firm is derived by dividing the total employment by the number of firms. The average number of establishments per firm is computed by dividing the total number of establishments by the number of firms. The share of multi-establishment firms is the proportion of head-establishments relative to the total number of firms.

Online Appendix B. Additional Discussions on Potential Drivers

B.1 To What Extent is Labor Supply Growth Exogenous

In our model, we treat the labor force growth rate as an exogenous driving force that influences the entry margin and overall market dynamism. However, the labor supply observed in the data is an equilibrium outcome jointly determined by the labor demand and supply functions. If the labor supply elasticity is not close to zero, other forces affecting the entry margin and labor demand could also influence the equilibrium labor supply through price changes, leading to potential inverse causality. Hopenhayn et al. (2020) utilize demographic data to assert that the decline in the U.S. labor force growth rate was primarily driven by demographic trends determined 16 years earlier, hence likely independent of economic conditions at the time of labor force changes. In other words, they propose that the evolution of labor force growth is primarily driven by exogenous shifts in the labor supply function. In this subsection, we apply a similar rationale to evaluate the extent to which the changes in labor supply growth rate in our Japanese data can be attributed to predetermined demographic shifts.

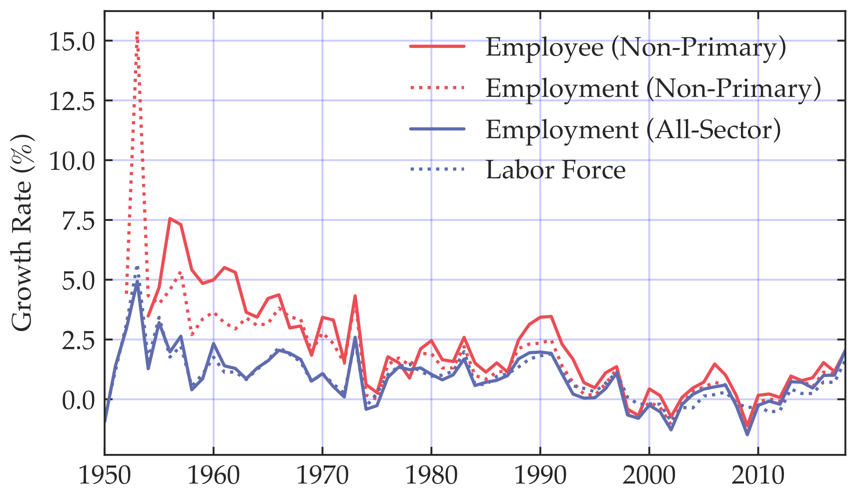
Firstly, in Figure B1, we plot the annual growth rates of various labor supply measures from the Labor Force Survey. The labor force growth rate peaked above 2.5 percent in the mid-1950s, fluctuated between 2.5 percent and 0 percent until the late 1990s, and subsequently moved down and fluctuated around 0 percent. The growth rate of employment across all sectors closely followed the labor force growth rate throughout the whole period, indicating that unemployment was not a significant issue in post-war Japan. By contrast, the growth rates of employment and employees in non-primary sectors were more volatile and significantly higher during the 1950s and 1960s, ranging from 2.5 percent to 7.5 percent. These two growth rates declined markedly after peaking in the mid-1950s and converged to trends similar to those of overall labor force and all-sector employment by the second half of 1970s. The large discrepancy in the early post-war period and its subsequent convergence illustrate a transformation of the labor force from primary to non-primary sectors. The growth rate of employees in the non-primary sector often exceeded that of employment in the non-primary sector, as the employment figures include self-employed workers and unpaid family workers, whose proportion in the economy was decreasing over time and converting into employees, as previously discussed. In the main text, we select the growth rate of employees in non-primary sectors as the exogenous labor supply growth rate input for our model simulations, as it best matches our measure of establishment used in empirical analysis.

Next, we examine to what extent these measures of labor supply growth rates can be accounted by demographic changes, which are arguably predetermined and not confounded by other potential factors affecting establishment and firm market dynamics or resulting from inverse causality. To this end, we simply decompose the growth rates of the labor force and employee in non-primary sectors as follows:

$$\begin{aligned} \dot{LF}_t &= \dot{POP}_t + \dot{PR}_t, \\ \dot{EE}_t &= \dot{LF}_t + \dot{TR}_t = \dot{POP}_t + \dot{PR}_t + \dot{TR}_t, \end{aligned}$$

where $\dot{}$ denotes growth rate, and LF means labor force, POP is population age 15+, EE denotes employee of non-primary sectors, PR means participation rate, and TR is transformation rate from unemployment, primary sector, or self-employment into employees of non-primary sectors. Figure B2 presents the results of these two decompositions for the entire post-war period. For labor force growth rate, the growth rate of the population age 15+ accounts for the majority of the trend, with the participation rate occasionally serving as negative contributor. For the growth rate of employees in non-primary sectors, we observe a strong positive contribution from the sum of participation rate and transformation rate, particularly in the early post-war period, indicating substantial shifts of labor force from primary sector and self-employment to non-primary sectors. Both series show that the population growth rate contributes to

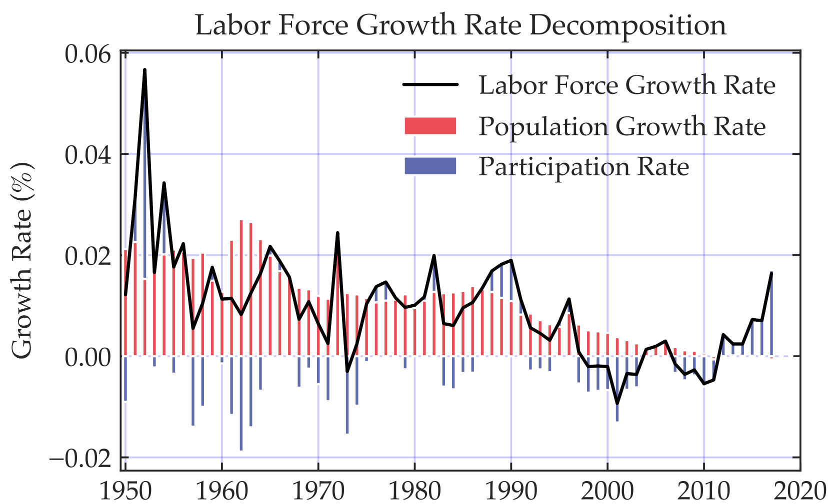
Figure B1: Labor Supply Growth Rate

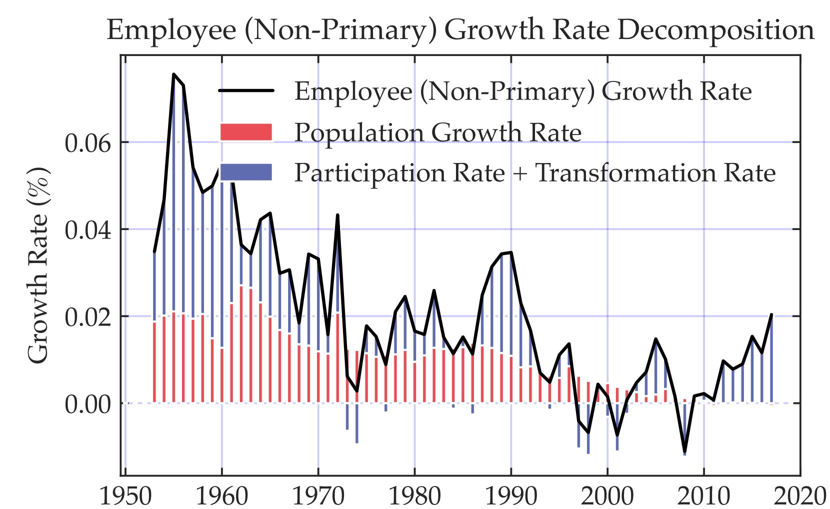


Source: Labour Force Survey.
Notes: This figure presents annual data for four key labor supply measures: total labor force, employment across all sectors, employment in the non-primary sector, and employees in the non-primary sector. The labor force includes both employed and unemployed individuals. The employment figure encompasses all types of workers. The difference between employment and employees is the category referred to as "other employment" in the official records, including individual owners, family workers, and firm executives. Given that firm executives comprise only a minor fraction, "other employment" can generally be considered as representing the employment of nonemployer establishments. Moreover, since only legally incorporated establishments are able to employ "employees," this number can typically be associated with the employment of employer establishments as recorded in the Establishment Census. However, these figures are not completely consistent between the Labor Census and the Establishment Census due to differences in coverage and definitions of labor.

about a 1.5-2 percent point decline from the 1960s to the 2000s, depending on the selection of the beginning and ending years. Thus, it seems reasonable to argue that for the decline in labor supply growth rate, whether measured by labor force or employees in non-primary sectors, at least close to 2 percent can be attributed to demographic changes, which are arguably exogenous shifts in labor supply. For the remaining decline, which is mainly due to the transformation rate, it resembles more of an equilibrium outcome of both labor demand and labor supply changes, making it difficult to discern the contribution from each side. Another point to note is that the decline in the population growth rate, akin to the employee labor supply growth rate used in the main text, is mainly concentrated before the early 1970s and after the mid-1980s, somewhat inconsistent with the steady decline of the entry rate in the 1970s and 1980s. This might suggest either a lagged response of entry margins to the changes in labor supply growth rate or the presence of other forces affecting the entry rate during those periods.

Figure B2: Labor Supply Growth Rate Decomposition





B.2 Separated Joint Analysis

Building on the results in Section 4.2, here we undertake separated joint exercises that combine the decline in labor supply growth rate (those driven by demographic changes) with each adjustment of the three discussed factors in Section 4.2 respectively. The results shown in Table B1 provides a more clear look at changes in the key parameters, and we offer a brief interpretation and discussion on these results below.

To be specific, in Table B1, we explore the new steady states that would result from changes in these three parameters aimed at achieving an additional 1 percentage point decline in the entry rate, following the 2.2 percentage point decline resulting from a 2 percentage point decrease in labor supply growth. In all three scenarios, the lifecycle growth rates now fall within a more reasonable range, though still significantly lower than the original benchmark values. However, in the scenario where entry costs increase, a strong price effect, manifested as a decline in equilibrium wage, leads to an increase in both entrant and incumbent average sizes, which is inconsistent with our data. Similarly, in the scenario where exit values decline, entry size increases due to a moderate price effect, while the overall establishment size decreases due to a dominant selection effect, again misaligning with empirical observations. In contrast, a moderate reduction in fixed operation costs produces a rather balanced combination of price and selection effects, reducing both entrant and incumbent sizes and aligning most closely with the empirical data.

While the combination of labor supply decline and fixed cost reduction appears to be a relatively plausible explanation for the evolution of Japanese establishment dynamics through the lens of our calibrated model, this interpretation is not definitive, and several caveats apply. First, the specific combination of these two channels is somewhat arbitrary, and other combinations, though likely more complex, might yield similarly compelling results. Second, questions remain about the precise nature of this abstract fixed operation effect, its historical timing, particularly in the 1960s and 1970s, and its specific impact within the Japanese manufacturing and construction industries. Third, the critical aspects of this fixed cost decline, involving a negative price effect that reduces labor input demand across all firms and a weakened selection that allows smaller incumbents to survive, require further direct supporting evidence. Addressing these questions is crucial for identifying the key mechanisms behind the evolution of Japanese market dynamism, yet they remain beyond the scope of this paper.

B.3 Labor Market Distortions

In this subsection, we extend our benchmark model to investigate the impact of two types of labor market distortions frequently highlighted in the literature on firm dynamics and growth. Such distortions, which can hinder optimal input utilization and block firm expansion, can be argued to explain the observed declines in lifecycle growth trajectories in post-war Japan. However, we find that due to the lack of ex-post heterogeneity in our calibrated economy, these distortions have rather limited intended effects and generate counterfactual outcomes that are inconsistent with empirical observations.

The first distortion we consider is size-correlated labor cost, a setting where labor costs increase with firm size. It has been argued as an important source of resource misallocation and an impediment to firm growth in various countries (Restuccia and Rogerson, 2008; Hsieh and Klenow, 2009, 2014). We integrate this distortion into our model by introducing a labor wage tax that scales with firm productivity. Since firm size in our model is only determined by productivity, this tax effectively becomes size-dependent. Formally, we define the post-tax labor cost as $(1+\tau^w)\,w$, where the tax rate $\tau^w(s) \equiv s^\gamma - 1$, and the parameter γ controls the degree of wage distortion between larger and smaller firms. For small firms, τ^w can be negative and is effectively a subsidy. We evaluate this mechanism by comparing our benchmark model, where $\tau^w = 0$, against new steady states at varying levels of size-

Table B1: Combine Entry Rate Decline and Other Derivers Separately

	Benchmark	Labor Growth	Entry Cost	Exit Value	Fixed Cost
η, %	2.00	0.00	0.00	0.00	0.00
c_e	76.05	-	99.88	-	-
V^x	0.00	-	-	-10.35	-
c_f	2.12	-	-	-	1.39
w^*	0.98	0.98	0.89	0.96	1.03
$\bar{s}^*$	1.32	1.32	1.09	1.09	1.09
Entry Rate, %	5.62	3.43	2.46	2.46	2.46
Exit Rate, %	3.62	3.43	2.46	2.46	2.46
Avg. Entry Size	13.57	13.57	17.29	14.22	11.30
Avg. Entry Size (post-exit)	14.89	14.89	18.15	14.90	11.86
Avg. Est. Size	16.82	17.31	18.98	15.57	12.40
LifeCycle Growth Rate 10y, %	21.88	21.88	9.01	8.74	9.01
LifeCycle Growth Rate 20y, %	29.72	29.72	10.68	10.36	10.68

Notes: This table displays the new steady states required to achieve an additional 1 percentage point decline in the entry rate, following the initial 2.2 percentage point decrease induced by the 2 percentage point reduction in labor supply growth. This further analysis examines the adjustments in entry costs, exit value, and fixed operation costs necessary to compound the effects of the initial labor supply changes, offering insights into the combined influence of demographic trends and economic parameters on market dynamics.

correlated labor tax. The outcomes, presented in Table B2, show that as the gap in labor cost between larger and smaller firms widens, the average size of incumbent firms decreases while the size of new entrants remains essentially unaffected, reducing the lifecycle growth. However, this result is not due to the intended effects of size-correlated labor cost—decreasing the labor demand of larger firms and increase it for smaller ones. In fact, due to the close similarity between the entry and overall productivity distribution (Figure B7), the size-correlated labor cost does not produce substantial differential effects between these two groups but affect the dispersion of labor demand within them comparably. With its counteracting effects on two sides of the distribution, the distribution means largely remain unchanged. Instead, the reduction in average size of overall establishment stems from a weakened selection effect that allows more marginal incumbents to survive and shifting the overall productivity distribution leftward. Hence, size-correlated labor costs are less relevant for lifecycle growth in a market context like Japan's. Additionally, empirical data from the manufacturing sector reveals that labor expenses across different establishment size groups have not diverged substantially since early 1960s (see Figure B8), further challenging a diverging labor cost scenario.

Next, we examine another type of labor market distortion: labor adjustment costs, which has been extensively studied since the seminal work of Hopenhayn and Rogerson (1993). Formally, we incorporate both firing and hiring costs into our model, defined respectively as $\Phi^-(n_t, n_{t-1}) = \tau^a \cdot \max\{0, n_{t-1} - n_t\}$ and $\Phi^+(n_t, n_{t-1}) = \tau^a \cdot \max\{0, n_t - n_{t-1}\}$, where the parameter τ^a controls the magnitude of adjustment costs. These input adjustment costs transform the firm's static input decision into a dynamic problem, where current employment levels become a state variable along with productivity, affecting future costs and labor decisions. The integration of these dynamics, following standard approaches in the literature, is omitted here for conciseness. The outcomes of introducing different levels of adjustment costs, presented in Table B3, show results opposite to those observed with size-correlated labor costs. In particular, adding firing costs lead to a notable decline in the average size of entrant

Table B2: Effect of Size-Correlated Labor Cost

	Benchmark	γ=0.04	γ=0.07	γ=0.12	γ=0.20
w^*	0.98	0.92	0.87	0.80	0.71
w min	0.98	0.83	0.72	0.58	0.43
w max	0.98	1.04	1.09	1.17	1.30
w max / w min	1.00	1.25	1.50	2.00	3.00
w (mean)	0.98	0.96	0.93	0.90	0.85
w (entry mean)	0.98	0.95	0.93	0.90	0.86
$\bar{s}^*$	1.32	1.26	1.20	1.12	0.99
Entry Rate, %	5.62	5.29	4.99	4.60	4.06
Exit Rate, %	3.62	3.29	2.99	2.60	2.06
Avg. Entry Size	13.57	13.59	13.60	13.63	13.67
Avg. Est. Size	16.82	16.07	15.44	14.62	13.55
LifeCycle Growth Rate 10y, %	21.88	16.77	12.53	7.11	0.47
LifeCycle Growth Rate 20y, %	29.72	22.31	16.20	8.40	-1.18

Notes: This table compares the moments of benchmark model with the ones of new model equilibrium extended with size-correlated labor cost. More specifically, we set the wage to be $\left(1+\tau_i^w\right)w$, where $\tau_i^w = s_i^\gamma - 1$. The parameter, γ, controls the wage gaps between high productivity and low productivity firms.

establishments, while the size of incumbent firms remains relatively unchanged. However, this pattern again does not arise from the intended labor market distortion effects. As the calibrated AR(1) process of productivity evolution in our model features high persistentency and limited lifecycle growth, firms well above the exit threshold typically incur minimal adjustment costs. Only marginal firms, operating under productivity near or below the exit threshold, adjust their hiring strategies to minimize potential future firing costs when exiting the market. These marginal firms are more prevalent among new entrants, leading to a reduction in their average size. Consequently, traditional labor adjustment costs exert minimal influence in an economy characterized by subdued market dynamism and low lifecycle growth typical of post-war Japan.

To sum up, we find that neither types of labor market distortion plays an important role in our calibrated economy and adequately explains the observed changes in average size and lifecycle growth. Specifically, size-correlated labor costs affect entrants and incumbents in a similar way due to the close similarity between their productivity distributions. Moreover, labor adjustment costs have a minimal impact because the low and smooth lifecycle growth in the calibrated model renders the adjustment costs of labor inputs across periods unimportant.

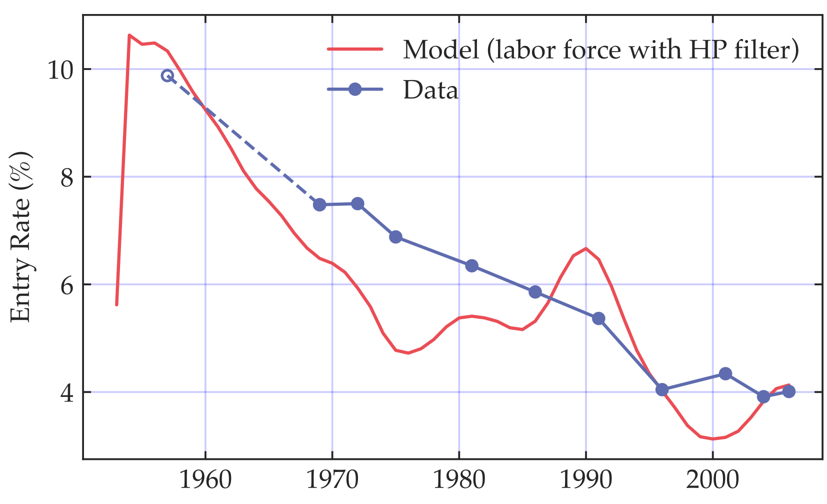
B.4 Additional Figures for Section 4

Table B3: Effect of Labor Adjustment Cost

	Benchmark	Firing Cost		Firing + Hiring Cost	
	τ^a=0.00	τ^a=0.25	τ^a=0.50	τ^a=0.25	τ^a=0.50
w^*	0.98	0.95	0.93	0.92	0.88
$\bar{s}^*$ (mean)	1.32	1.29	1.26	1.26	1.20
Entry Rate, %	5.62	5.45	5.29	5.29	5.01
Exit Rate, %	3.62	3.45	3.29	3.29	3.01
Avg. Entry Size	13.67	11.56	10.70	10.64	9.71
Avg. Est. Size	16.93	16.51	16.34	16.28	15.92
LifeCycle Growth Rate 10y, %	21.85	42.10	53.53	53.74	67.03
LifeCycle Growth Rate 20y, %	29.66	50.47	61.82	62.07	75.62
Job Turnover Rate, %	0.47	0.29	0.24	0.24	0.18

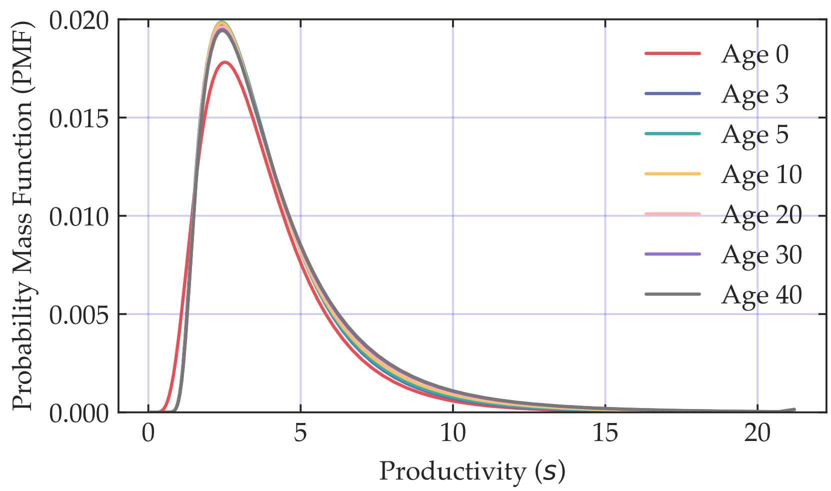
Notes: This table compares the moments of benchmark model with the ones of new model equilibrium extended with labor adjustment costs. Two cases are tested: only allowing firing cost and allowing both firing and hiring costs. These adjustment costs are proportional to the size of labor use. The adjustment cost parameter, τ^a, controls the scale of adjustment cost.

Figure B3: Model-Generated Entry Rate Evolution



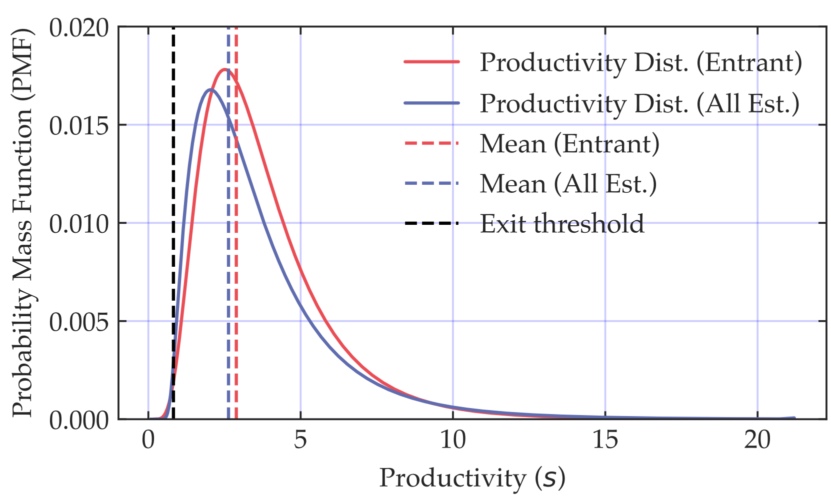
Notes: See the note in Figure 11. The only difference is that the labor force growth used here is smoothed by using an HP filter with parameter of 6.25.

Figure B4: Model Generated Evolution of Cohort Productivity Distribution



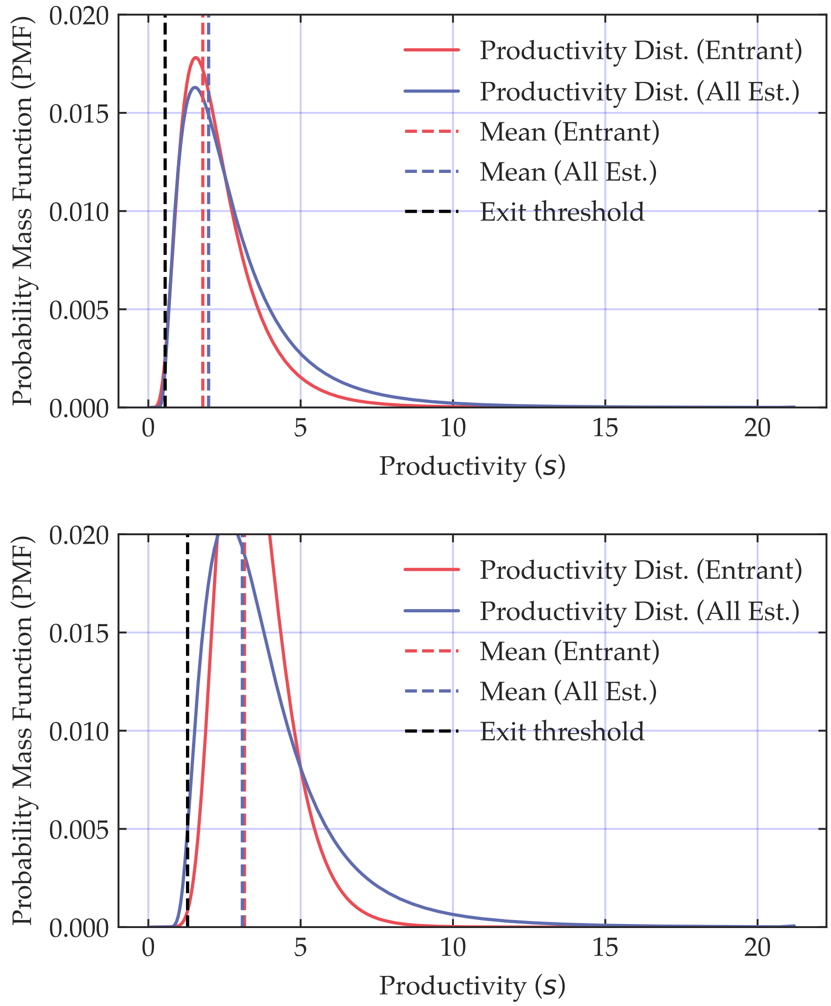
Notes: This figure shows the evolution of the productivity (s) distribution for a typical cohort in our calibrated benchmark model conditional on survival.

Figure B5: The Productivity Distribution after Adjusting Entry Cost, Exit Value, and Fixed Cost



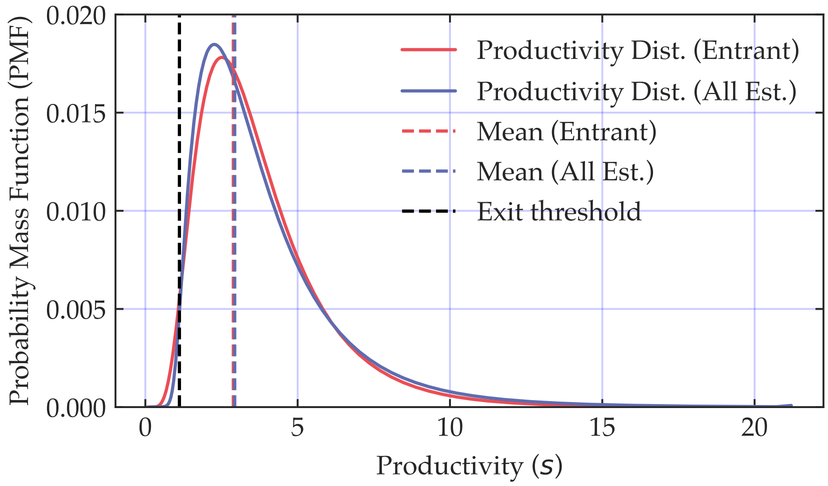
Notes: This figure illustrates the productivity distributions under the new equilibrium after entry cost, exit value, and fixed operation cost changes that achieve a 2.2 percent points decline in entry rate, as discussed in Section 4.2. All three adjustments generate the same productivity distribution changes as they reduce the exit threshold in the same amount. However, the price effects vary across cases and thus the establishment size distribution will be different.

Figure B6: The Productivity Distribution after Reducing Location and Scale of Entry Productivity Distribution G



Notes: This figure illustrates the productivity distributions under the new equilibrium after setting the location (upper panel) and scale (bottom panel) parameters of the entry productivity distribution to be 0.6 times the original value in the calibrated benchmark equilibrium.

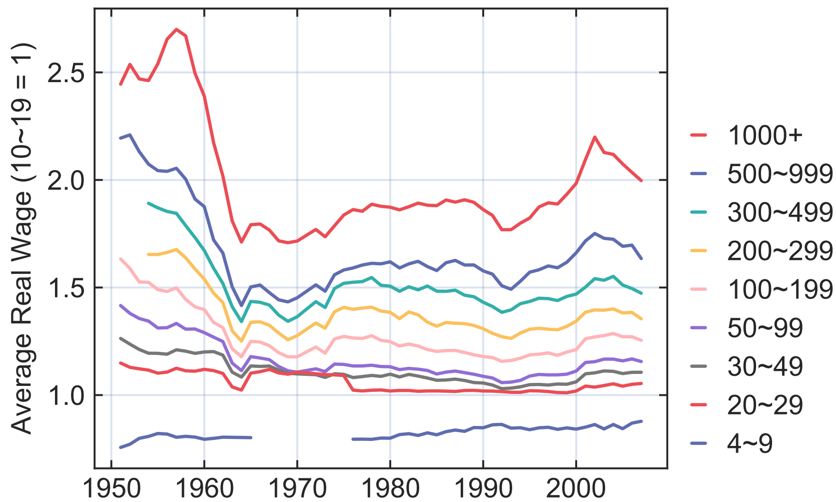
Figure B7: The Productivity Distribution after Setting a Size-correlated Labor Cost



Notes: This figure illustrates the productivity distributions under the new equilibrium after setting a size-correlated labor cost $\left(1+\tau_i^w\right)w$, where $\tau_i^w = s_i^{\gamma} - 1$ and γ is assigned so that the wage gap between the largest and smallest firms is two-fold.

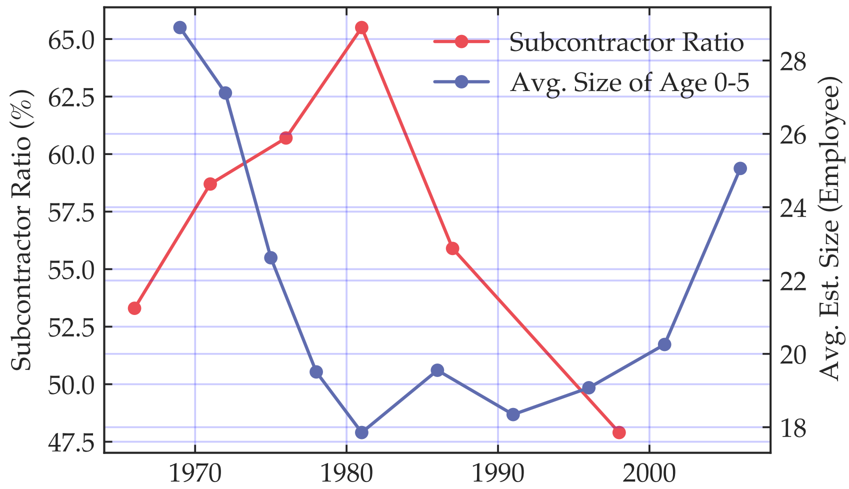
B.5 Additional Figures for Section 5

Figure B8: Labor Expense by Firm Size in Manufacturing Sector



Source: Manufacturing Census.

Figure B9: Subcontracting Ratio in Manufacturing Sector



Source: Basic Survey on Commercial and Manufacturing Structure and Activities.
Notes: The red line is the ratio of the firms that mainly conduct as a subcontractor in the manufacturing sector. The blue line is the average size of the age 0-5 group in the manufacturing industry in our main data.

Figure B10: Real Wage Growth Rate

Source: Labour Force Survey.