Article

Cost Structure and Risk Tolerance as Correlates of Firm Internationalization in Japan: Evidence from Structural Equation Modeling (SEM)

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Abstract

This paper examines the factors associated with firm internationalization in Japan and how internationalization relates to domestic employment. Building on the heterogeneous-firm framework, we analyze an industry-year panel constructed from the Basic Survey of Japanese Business Structure and Activities. Using structural equation modeling (SEM) as an exploratory, descriptive tool with explicit time lags, we estimate models separately for the manufacturing sector and the Information and Business Services sector. The estimated association patterns differ across sectors. In manufacturing, internationalization is primarily associated with the fixed-cost proxy, while the direct association with sales scale is not robust once the fixed-cost proxy is included; the association between productivity and internationalization is weak. Internationalization is, in turn, positively associated with domestic employment, consistent with complementarity between overseas expansion and domestic activity. In Information and Business Services, internationalization is strongly associated with sales scale (interpreted as a proxy for risk tolerance, i.e., risk-bearing capacity); productivity shows a modest negative association, whereas the fixed-cost proxy shows no robust association. The internationalization–employment link is not statistically significant. Because the analysis is conducted on industry-level averages, the results should be interpreted as descriptive sector-level relationships rather than within-firm causal effects.

1. Introduction

The globalization of firm activities has become a central issue in international economics, particularly for mature economies. In Japan, demographic changes and prolonged economic stagnation have constrained domestic market growth, leading firms to pursue overseas expansion increasingly. Consistent with this trend, Japanese firms have expanded their overseas operations since the early 2000s (Wakasugi et al., 2014).

Against this background, this paper examines factors associated with firm

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internationalization in Japan and its relationship with domestic employment, considering productivity, cost structure, and sales scale. Using an industry-year panel constructed from the Basic Survey of Japanese Business Structure and Activities (BSJBSA) and applying structural equation modeling (SEM) as an exploratory, descriptive tool with explicit time lags, we estimate separate models for the manufacturing sector and the Information and Business Services sector. The objective is to document structural associations among firm characteristics, internationalization, and domestic employment, rather than to conduct strict confirmatory testing.

Because "risk tolerance" is not directly observed in the BSJBSA, we use the term in an operational sense to denote a firm's risk-bearing capacity under uncertainty—its financial resilience to absorb potential losses and sustain sunk-cost exposure associated with overseas expansion—rather than managerial risk preferences. We proxy this construct using sales per firm (sales scale). Together with the fixed-cost proxy, this sales-based measure captures the risk-side counterpart to cost-side constraints in our extended heterogeneity framework.

2. Theoretical Background and Expectations

2.1. The Productivity-Centric View in the Literature

A large body of research on firm heterogeneity has provided a theoretical framework in which productivity differences are central to explaining firms' participation in foreign markets. Within this framework, more productive firms are more likely to engage in exporting or foreign direct investment (FDI), as only these firms can cover the fixed costs required for international market entry (Melitz, 2003; Helpman, Melitz, & Yeaple, 2004).

Empirically, such sorting is often summarized using "exporters' and FDI-makers' premia," defined as the ratio of the average performance of exporters (or FDI firms) to that of non-exporters (or non-FDI firms) (Mayer & Ottaviano, 2007). Using firm-level manufacturing data from the BSJBSA, Wakasugi et al. (2014; see also Wakasugi et al., 2008) documented large premia for Japanese exporters and FDI firms not only in productivity but also in scale and organizational attributes. For Japan, exporters exhibited premia of roughly three times in employment and about five times in value added relative to domestic firms, while FDI firms showed even larger premia (approximately five times in employment and nearly nine times in value added), as well as higher wages, capital intensity, and skill intensity.

The same study also reported sizable productivity premia within manufacturing. In 2005, exporters were between 34% and 48% more productive than non-exporters depending

on the productivity measure, while FDI firms were 31–44% more productive than non-FDI firms on average. When firms were classified by internationalization status (domestic-only, pure exporters, pure FDI firms, and firms that both export and undertake FDI), productivity distributions shifted systematically to the right for internationalized firms, and the export-and-FDI group exhibited the highest mean productivity among the four categories.

At the same time, evidence for Japan has indicated limits to a productivity-only characterization of cross-mode differences. Wakasugi et al. (2014) emphasized that, relative to evidence reported for European firms, the productivity gap between exporters and FDI firms in Japan is relatively small. This suggests that the choice between exporting and FDI may be shaped by additional factors beyond productivity, including organizational and institutional conditions.

Beyond market-entry decisions, an important but less settled question concerns how internationalization relates to domestic outcomes, such as employment. While Wakasugi et al. (2014) provided descriptive evidence that internationalized firms are larger and more skill-intensive than domestic firms, they did not directly model the structural linkage between internationalization dynamics and domestic employment. Building on this line of inquiry combined with recent exploratory SEM evidence for Japan (Seki, 2025), the present study applies SEM to an industry-year panel constructed from BSJBSA microdata to assess the associations linking internationalization to domestic employment while jointly considering additional observed attributes used in our models, including a fixed-cost proxy and sales scale. Moreover, because internationalization mechanisms and observable firm attributes can differ across industries, we estimate the models separately for the manufacturing sector and the Information and Business Services sector.

2.2. Extending the Framework: Cost Structure and Risk Tolerance

Taken together, the BSJBSA-based evidence indicates that internationalization premia in Japan are multi-dimensional: exporters and FDI firms differ from domestic firms not only in productivity, but also in scale, factor intensity, and skill composition. At the same time, the small productivity gap between exporters and FDI firms suggests that cross-mode differences cannot be fully explained by productivity sorting alone.

Motivated by these findings, this study extends the conventional productivity-centric framework by explicitly considering multiple observed firm attributes as distinct dimensions in the empirical models. We interpret the fixed-cost proxy as capturing an industry's organizational or operational capacity to sustain non-COGS operating expenses (i.e., operating

expenses excluding cost of goods sold (COGS)). These expenses are related to the fixed and sunk costs of overseas expansion. By contrast, we interpret sales scale as an operational proxy for "risk tolerance," defined here as risk-bearing capacity under uncertainty—that is, financial resilience to absorb potential losses and withstand sunk-cost exposure when internationalization attempts are unsuccessful.

Because the relevant constraints may differ across sectors, we expect different correlates across our two samples. In manufacturing, where establishing and managing overseas operations are likely more fixed-cost intensive, internationalization is expected to be primarily associated with the fixed-cost proxy; any direct association with sales scale may diminish once cost structure is accounted for. In Information and Business Services, where intangible activities and uncertainty in overseas delivery may place a premium on financial buffers, internationalization is expected to be primarily associated with sales scale.

2.3. Research Expectations

Based on the discussion above, this study examines whether the correlates of firm internationalization and its association with domestic employment differ across industries. Because our SEM application is exploratory and uses industry-level averages, we present these predictions as expectations rather than strict confirmatory hypotheses.

- Expectation 1 (E1): The correlates of firm internationalization differ by industry. In manufacturing, internationalization is expected to be primarily associated with the fixed-cost proxy; any direct association with sales scale may attenuate once cost structure is accounted for, and the direct association with productivity may be weak at the industry-year level. In Information and Business Services, internationalization is expected to be primarily associated with sales scale (risk tolerance, proxied by sales scale).
- Expectation 2 (E2): Internationalization is positively associated with domestic employment in manufacturing, consistent with complementarity between overseas expansion and domestic activity. In Information and Business Services, the association between internationalization and employment is expected to be weaker and may not be statistically significant.

3. Data and Empirical Methodology

3.1. Data Source and Sample Selection

To examine these expectations empirically, this study constructs an industry-year panel using data from the BSJBSA, conducted annually by the Ministry of Economy, Trade, and Industry (METI). The survey covers firms with more than 50 employees and capital exceeding 30 million yen (METI, 2004–2023) across the mining, manufacturing, wholesale and retail, and service industries. Due to its legal reporting requirement, the survey provides consistent longitudinal information on firm activities.

The analysis covers the fiscal years 2004–2023. To account for differences across industries, the industry-year panel is divided into two subsamples. The first is manufacturing. The second is Information and Business Services, restricted to that sector. These subsamples are analyzed separately in the empirical analysis. Specifically, we aggregate firm-level values within each industry-year cell and convert them to per-firm averages. After imposing the lag structure required by the SEM design, the resulting analysis samples contain 1,359 (Model I) and 1,360 (Model II) industry-year observations for manufacturing, and 423 (Model I) and 422 (Model II) observations for Information and Business Services (see Appendix A, Table A1). This aggregation strategy smooths out firm-level noise and highlights structural differences between the manufacturing and service sectors.

Replication materials (variable construction code and the aggregated industry-year dataset) are available from the author upon request.

4. Variable Definitions and Justification

The empirical analysis uses an industry-year panel in which the unit of observation is the industry-year cell. Within each cell, firm-level values are aggregated and converted to per-firm averages by dividing by the number of firms in the corresponding cell. To implement the lagged SEM design, sales and the fixed-cost proxy are measured at t-2, productivity at t-1, and the outcome variables at t (internationalization stock and domestic employment); in Model II, internationalization stock enters at t-1. Unless otherwise noted, variables are transformed using $\ln(1 + x)$, where x denotes the corresponding non-negative per-firm or per-employee measure. Accordingly, the results should be interpreted as relationships at the industry-year

(average firm) level rather than as within-firm causal effects.[1)]

- Internationalization (outcome): Internationalization is measured as the internationalization stock, defined as the number of foreign subsidiaries and affiliates per firm in the industry-year cell. Formally, IntlStock_it = ln(1 + ForeignSubsAffTotal_it / N_it), where ForeignSubsAffTotal_it is the cell total and N_it is the number of firms in the cell.[2)]
- Cost structure (fixed-cost proxy): Cost structure is proxied by non-COGS operating expenses, defined as operating expenses minus cost of goods sold (OpExp - COGS). In the BSJBSA, the "operating expenses" item corresponds to total operating costs. To approximate non-COGS operating expenses, we subtract the implied COGS component (SalesTotal_it - GrossProfitTotal_it). This accounting-based measure captures cost components that are not directly proportional to current production volume. Formally, FixedCostProxy_it = ln(1 + (OpExpTotal_it - COGS_it) / N_it), where COGS_it = SalesTotal_it - GrossProfitTotal_it. Because (OpExpTotal_it - COGS_it) may be non-positive in a small number of industry-year cells, we treat such cases as missing and exclude them from the estimation.[3)]
- Risk-bearing capacity (proxied by sales scale): We proxy risk-bearing capacity with sales per firm (sales scale). This construct is intended to capture a firm's financial resilience to absorb potential losses and sustain sunk-cost exposure associated with overseas expansion, rather than managerial risk preferences. Larger revenues are interpreted as providing a buffer that helps firms absorb sunk costs when internationalization attempts fail. Formally, Sales_it = ln(1 + SalesTotal_it / N_it).
- Productivity: Productivity is measured as value added per regular employee. Formally, Productivity_it = ln(1 + ValueAddedTotal_it / RegularEmployeesTotal_it).[4)]
- Domestic employment: Domestic employment is defined as the number of regular employees in domestic operations. Formally, DomesticEmp_it = ln(1 + RegularEmployeesTotal_it / N_it).

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1) Because the unit of observation is the industry-year cell, the estimates should be interpreted as associations at the industry-year ("average firm") level rather than within-firm causal effects.

2) The internationalization stock captures reported foreign subsidiaries and affiliates and does not directly reflect other channels of global engagement (e.g., export intensity, licensing, or contract manufacturing).

3) COGS is computed as sales minus gross profit. When the operating expenses net of COGS are non-positive, the value is treated as missing under the log transformation.

4) Productivity is measured per regular employee to reflect a relatively stable employment concept in the survey.

Table 1. Descriptive statistics for variables used in Figure 1 (Manufacturing)

Notes: N = 1,359. Variables are reported as in the analysis dataset (log-transformed as described in the Variable Definitions section).

Variable	Mean	Std. Dev.	Skew.	Kurt.
Sales per firm (t-2)	9.762	0.978	0.820	1.330
Productivity (value added per regular employee) (t-1)	2.462	0.344	0.275	2.055
Foreign subsidiaries and affiliates per firm (t)	1.042	0.644	1.062	1.840
Fixed-cost proxy per firm (t-2)	7.854	0.913	0.379	-0.133

Table 2. Correlation matrix for variables used in Figure 1 (Manufacturing)

Notes: Correlations based on the analysis sample (N = 1,359).

	1	2	3	4
1	1.000	0.737	0.643	0.901
2	0.737	1.000	0.475	0.665
3	0.643	0.475	1.000	0.687
4	0.901	0.665	0.687	1.000

Variable key: 1 = sales per firm (t-2); 2 = productivity (value added per regular employee) (t-1); 3 = foreign subsidiaries and affiliates per firm (t); 4 = fixed-cost proxy per firm (t-2).

Table 3. Descriptive statistics for variables used in Figure 2 (Information and Business Services)

Notes: N = 423. Variables are reported as in the analysis dataset (log-transformed as described in the Variable Definitions section).

Variable	Mean	Std. Dev.	Skew.	Kurt.
Sales per firm (t-2)	9.538	1.113	1.174	1.797
Productivity (value added per regular employee) (t-1)	2.512	0.618	0.677	0.755
Foreign subsidiaries and affiliates per firm (t)	0.532	0.471	1.490	1.832
Fixed-cost proxy per firm (t-2)	7.829	1.013	0.947	1.047

Table 4. Correlation matrix for variables used in Figure 2 (Information and Business Services)

Notes: Correlations based on the analysis sample (N = 423).

	1	2	3	4
1	1.000	0.731	0.731	0.882
2	0.731	1.000	0.485	0.652
3	0.731	0.485	1.000	0.654
4	0.882	0.652	0.654	1.000

Variable key: 1 = sales per firm (t-2); 2 = productivity (value added per regular employee) (t-1); 3 = foreign subsidiaries and affiliates per firm (t); 4 = fixed-cost proxy per firm (t-2).

Table 5. Descriptive statistics for variables used in Figure 3 (Manufacturing)

Notes: N = 1,360. Variables are reported as in the analysis dataset (log-transformed as described in the Variable Definitions section).

Variable	Mean	Std. Dev.	Skew.	Kurt.
Sales per firm (t-2)	9.767	0.984	0.837	1.365
Fixed-cost proxy per firm (t-2)	7.858	0.915	0.378	-0.143
Foreign subsidiaries and affiliates per firm (t-1)	1.029	0.640	1.082	1.941
Domestic employment per firm (t)	5.864	0.579	0.932	1.289

Table 6. Correlation matrix for variables used in Figure 3 (Manufacturing)

Notes: Correlations based on the analysis sample (N = 1,360).

	1	2	3	4
1	1.000	0.901	0.656	0.790
2	0.901	1.000	0.700	0.841
3	0.656	0.700	1.000	0.826
4	0.790	0.841	0.826	1.000

Variable key: 1 = sales per firm (t-2); 2 = fixed-cost proxy per firm (t-2); 3 = foreign subsidiaries and affiliates per firm (t-1); 4 = domestic employment per firm (t).

Table 7. Descriptive statistics for variables used in Figure 4 (Information and Business Services)

Notes: N = 422. Variables are reported as in the analysis dataset (log-transformed as described in the Variable Definitions section).

Variable	Mean	Std. Dev.	Skew.	Kurt.
Sales per firm (t-2)	9.543	1.110	1.183	1.808
Foreign subsidiaries and affiliates per firm (t-1)	0.523	0.470	1.510	1.874
Domestic employment per firm (t)	6.074	0.721	1.198	1.361
Fixed-cost proxy per firm (t-2)	7.833	1.009	0.963	1.070

Table 8. Correlation matrix for variables used in Figure 4 (Information and Business Services)

Notes: Correlations based on the analysis sample (N = 422).

	1	2	3	4
1	1.000	0.739	0.441	0.881
2	0.739	1.000	0.376	0.657
3	0.441	0.376	1.000	0.400
4	0.881	0.657	0.400	1.000

Variable key: 1 = sales per firm (t-2); 2 = foreign subsidiaries and affiliates per firm (t-1); 3 = domestic employment per firm (t); 4 = fixed-cost proxy per firm (t-2).

4.1. Empirical Strategy: Structural Equation Modeling (SEM) — Exploratory Analysis

This study employs SEM as an exploratory, descriptive framework. SEM enables the specification of multiple structural relationships among variables within a single model. In the analysis, a time-lag structure is imposed to organize the relationships among variables across periods. Specifically, cost structure and sales are measured at t-2, productivity is measured at t-1, and internationalization outcomes are measured at t (Model I) or t-1 (Model II).

SEM is particularly well suited to this setting for three reasons. First, the path diagram representation clarifies the assumed temporal ordering and distinguishes between direct and indirect associations. In Figures 1–4, the correlates of internationalization and the lagged linkage to domestic employment are summarized in a single, easily interpretable figure, and the bidirectional arrows explicitly represent correlations among antecedent proxies, such as sales and the fixed-cost proxy.

Second, SEM estimates the entire system simultaneously rather than equation by equation. Each path coefficient is therefore obtained conditionally on the other modeled relationships.

Third, because several accounting-based proxies are strongly correlated at the industry-year level, SEM provides a disciplined way to represent this dependence explicitly while still estimating their distinct associations with internationalization and employment. A set of separate regressions could deliver similar conditional correlations, but they would be less transparent about the implied system and would not yield a unified graphical summary or system-wide fit diagnostics in the same way.

For these reasons, we adopt an exploratory SEM approach as a structure-discovery tool, using the time-lag design to organize association patterns in a temporally ordered manner rather than to claim within-firm causal identification.

Model fit is evaluated using standard fit indices, including the goodness-of-fit index (GFI), the adjusted goodness-of-fit index (AGFI), the root mean square residual (RMR), the root mean square error of approximation (RMSEA), and the chi-square statistic.

5. Empirical Results

The empirical results are presented in Figures 1–4, which depict the estimated SEM models and summarize the association patterns among the explanatory proxies, internationalization stock, and domestic employment.

Note: Asterisks denote statistical significance ($p < 0.05$, ** $p < 0.01$, *** $p < 0.001$).*

5.1. Correlates of Internationalization (Model I)

Manufacturing Sector:

Figure 1 summarizes the results for manufacturing. The estimated path coefficient from productivity (t-1) to foreign subsidiaries and affiliates per firm (t) is 0.033 (not statistically significant). The estimated path coefficient from fixed-cost proxy per firm (t-2) to productivity (t-1) is 0.009 (not statistically significant). By contrast, the estimated path coefficient from fixed-cost proxy per firm (t-2) to foreign subsidiaries and affiliates per firm (t) is positive and statistically significant (0.665***). Sales per firm (t-2) and fixed-cost proxy per firm (t-2) are strongly correlated, with an estimated correlation of 0.901 (Figure 1). Additionally, sales per firm (t-2) is positively and statistically significantly associated with productivity (t-1), with an estimated coefficient of 0.729*** (Figure 1).

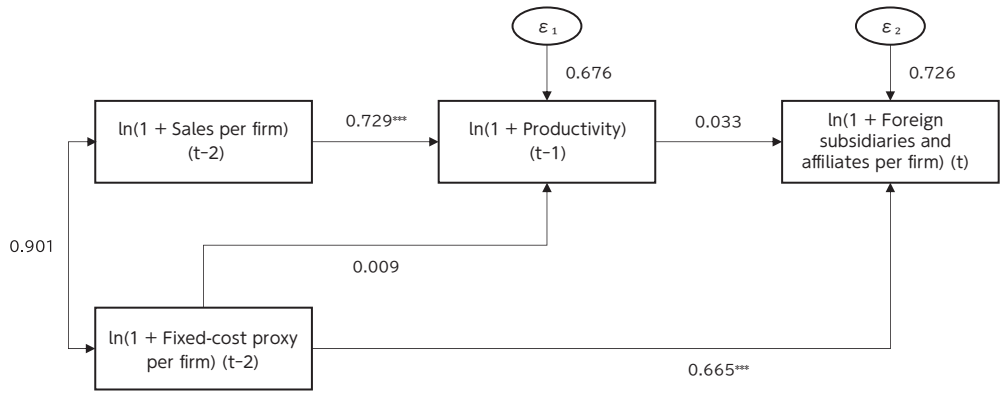


Figure 1. SEM of internationalization (Manufacturing)

This figure presents standardized path coefficients from an exploratory SEM. Sales and the fixed-cost proxy are measured at t-2, productivity at t-1, and foreign subsidiaries and affiliates per firm (internationalization stock) at t. The model is estimated using maximum likelihood (ML) with N = 1,359. Bidirectional arrows indicate correlations.

Note: Goodness-of-fit indices are GFI = 0.998, AGFI = 0.977, RMR = 0.004, RMSEA = 0.063, and $\chi^2 = 6.326$ *(df = 1, p = 0.012).*

Information and Business Services Sector:

Figure 2 reports the results for Information and Business Services. In Information and Business Services, the fixed-cost proxy per firm (t-2) shows no statistically significant association with productivity (t-1) (standardized coefficient = 0.036). Sales per firm (t-2) is positively and statistically significantly associated with productivity (t-1), with an estimated coefficient of

0.699***, as shown in Figure 2. Sales per firm (t-2) is positively and statistically significantly associated with foreign subsidiaries and affiliates per firm (t) (0.808***). Fixed-cost proxy per firm (t-2) is not statistically significantly associated with foreign subsidiaries and affiliates per firm (t). Productivity (t-1) is negatively and statistically significantly associated with foreign subsidiaries and affiliates per firm (t) (-0.105*).

Taken together, these Model I patterns are broadly consistent with Expectation 1 (E1): internationalization is more closely associated with the fixed-cost proxy in manufacturing, whereas sales-based risk tolerance is more strongly associated with internationalization in Information and Business Services.

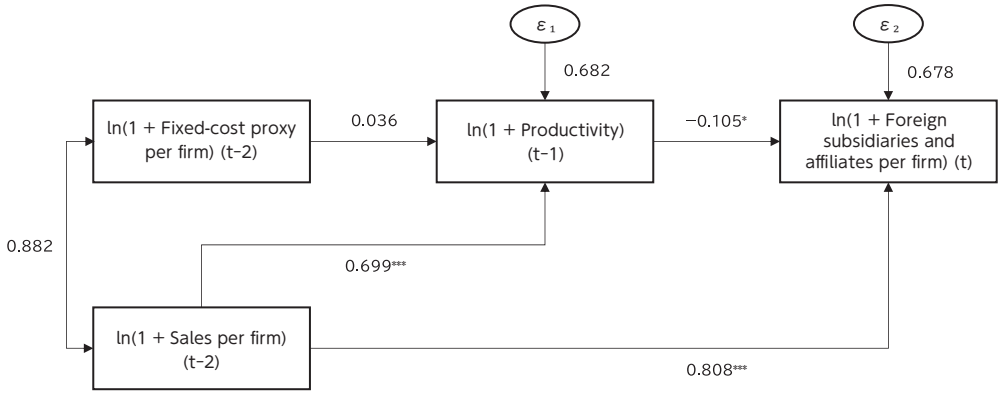


Figure 2. SEM of internationalization (Information and Business Services)

This figure presents standardized path coefficients from an exploratory SEM. The fixed-cost proxy and sales are measured at t-2, productivity at t-1, and foreign subsidiaries and affiliates per firm (internationalization stock) at t. The model is estimated using ML with N = 423. Bidirectional arrows represent correlations.

Note: Goodness-of-fit indices are GFI = 1.000, AGFI = 0.995, RMR = 0.002, RMSEA = 0.000, and $\chi^2 = 0.410$ (df = 1, p = 0.522).

5.2. Lagged Associations with Domestic Employment (Model II)

Manufacturing Sector:

As illustrated in Figure 3, the fixed-cost proxy per firm (t-2) is positively associated with foreign subsidiaries and affiliates per firm (t-1) (0.700***). It also has a direct positive association with domestic employment per firm (t) (0.418***). Foreign subsidiaries and affiliates per firm (t-1) is positively and statistically significantly associated with domestic employment per firm

(t), with an estimated coefficient of 0.460***. In addition, sales per firm (t-2) has a statistically significant direct association with domestic employment per firm (t) (0.113***). Fixed-cost proxy per firm (t-2) and sales per firm (t-2) are strongly correlated, with an estimated correlation of 0.901 (Figure 3).

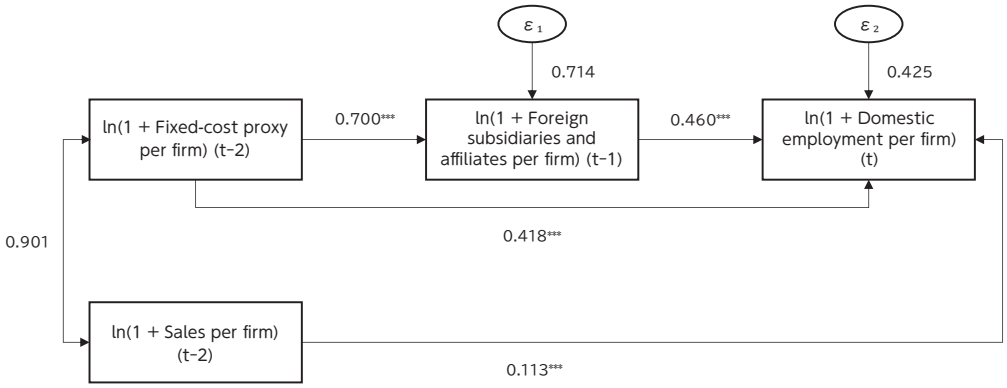


Figure 3. SEM of internationalization and domestic employment (Manufacturing)

This figure presents standardized path coefficients. The fixed-cost proxy and sales are measured at t-2, foreign subsidiaries and affiliates per firm (internationalization stock) at t-1, and domestic employment at t. The model is estimated using ML with N = 1,360. The bidirectional arrow between the fixed-cost proxy per firm (t-2) and sales per firm (t-2) indicates their correlation (0.901).

Note: Goodness-of-fit indices are GFI = 0.997, AGFI = 0.968, RMR = 0.005, RMSEA = 0.076, and $\chi^2 = 8.881$ *(df = 1, p = 0.003).*

Information and Business Services Sector:

Figure 4 reports the corresponding model for Information and Business Services. Fixed-cost proxy per firm (t-2) is associated with foreign subsidiaries and affiliates per firm (t-1) with a coefficient of 0.028 (not statistically significant), whereas sales per firm (t-2) is positively and statistically significantly associated with foreign subsidiaries and affiliates per firm (t-1) (0.714***). The estimated path from foreign subsidiaries and affiliates per firm (t-1) to domestic employment per firm (t) is 0.111 (not statistically significant). Sales per firm (t-2) also shows a statistically significant direct association with domestic employment per firm (t) (0.359***). Fixed-cost proxy per firm (t-2) and sales per firm (t-2) are strongly correlated, with an estimated correlation of 0.881 (Figure 4).

Overall, these Model II results are broadly consistent with Expectation 2 (E2): internationalization is positively associated with domestic employment in manufacturing, while the corresponding association is weaker and statistically insignificant in Information and Business Services.

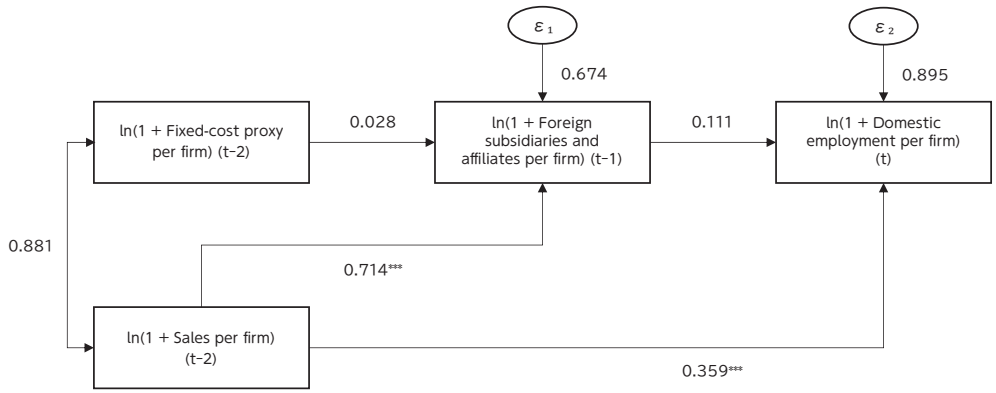


Figure 4. SEM of internationalization and domestic employment (Information and Business Services)

This figure presents standardized path coefficients. The fixed-cost proxy and sales are measured at t-2, foreign subsidiaries and affiliates per firm (internationalization stock) at t-1, and domestic employment at t. The model is estimated using ML with N = 422. The bidirectional arrow between the fixed-cost proxy per firm (t-2) and sales per firm (t-2) indicates their correlation (0.881).

Note: Goodness-of-fit indices are GFI = 1.000, AGFI = 0.997, RMR = 0.002, RMSEA = 0.000, and $\chi^2 = 0.276$ *(df = 1, p = 0.599).*

6. Discussion

This section interprets the association patterns in Figures 1–4. In manufacturing, internationalization is primarily associated with the fixed-cost proxy, and lagged internationalization is positively associated with domestic employment, consistent with complementarity. In Information and Business Services, internationalization is strongly associated with sales scale (interpreted as a proxy for risk tolerance, i.e., risk-bearing capacity), while the internationalization–employment link is not statistically significant; domestic employment is explained primarily by sales.

Because all variables are constructed as industry-year per-firm averages, the estimated paths summarize associations at the sector level (i.e., for the “average firm” within an industry-

year cell). Such aggregate relationships can differ from within-firm relationships due to compositional changes and aggregation bias; accordingly, the discussion should be interpreted as evidence of macro industry tendencies, while firm-level analyses are necessary to assess within-firm mechanisms.

6.1. Implications beyond Productivity-Sorting

The results of this exploratory analysis suggest that the mechanisms associated with firm internationalization in Japan may not be fully captured by productivity-sorting alone, as emphasized in the standard Melitz framework. In manufacturing, internationalization is most strongly associated with the fixed-cost proxy (Figure 1), whereas the direct associations with productivity and sales are weak once cost structure is accounted for. This pattern is consistent with the possibility that cross-border expansion depends on the organizational and financial capacity to sustain fixed costs related to overseas operations, beyond production efficiency per se. In Information and Business Services, internationalization is strongly associated with sales scale (Figures 2 and 4), interpreted here as a proxy for risk tolerance, while the fixed-cost proxy shows no robust association, and productivity exhibits a modest negative relationship. Taken together, these patterns suggest that models of internationalization may benefit from explicitly allowing for heterogeneity in cost structures and risk tolerance alongside productivity, at least as correlates of internationalization decisions.

6.2. Sectoral Heterogeneity and Model Applicability

A key challenge in this study is the difficulty of applying a unified structural model, particularly the employment model (Model II), to the broader non-manufacturing sector, which includes retail and wholesale trade. This limitation reflects substantial within-sector heterogeneity in technologies, internationalization modes, and labor organization across service and trade industries, which may attenuate aggregate relationships when analyzed at a highly aggregated level. Accordingly, the analysis focuses on the more homogeneous subset of Information and Business Services, where model fit and interpretability are more defensible. Future research could adopt a more granular, industry-specific approach within services to isolate, more effectively, mechanisms that may offset each other in sector-level aggregates.

6.3. Diverse Implications for Domestic Employment

Finally, the sectoral contrast in employment outcomes is informative. In manufacturing, the positive and statistically significant association between lagged internationalization and

domestic employment (Figure 3) is consistent with complementarity between overseas expansion and domestic activity, potentially reflecting expanded headquarters functions, coordination needs, or scale effects. In Information and Business Services, the absence of a statistically significant association (Figure 4) need not imply a zero effect; rather, it may reflect offsetting mechanisms, such as substitution of certain tasks with offshore provision alongside the creation of domestic coordination, management, and support roles. This suggests that employment effects in services are likely to be context-dependent, varying with the degree of digitalization and the nature of the service activity.

7. Conclusion

This study examined the correlates of firm internationalization and its association with domestic employment in Japan, using structural equation modeling (SEM) as an exploratory, descriptive tool with explicit time lags. The analysis focused on the estimated relationships among firm characteristics, internationalization, and domestic employment in the manufacturing sector and the Information and Business Services sector.

Results differed across sectors. In manufacturing, foreign subsidiaries and affiliates per firm (t) were positively associated with the fixed-cost proxy, while productivity and sales showed no statistically significant direct association once cost structure was included. In Information and Business Services, foreign subsidiaries and affiliates per firm (t) were strongly associated with sales scale and negatively associated with productivity.

Regarding domestic employment (Model II), manufacturing showed a positive association between lagged foreign subsidiaries and affiliates per firm (t-1) and domestic employment per firm (t), consistent with complementarity. Sales also directly predicted domestic employment. In Information and Business Services, domestic employment per firm was driven primarily by sales, and the association between internationalization and employment was not statistically significant.

8. Limitations and Future Research

First, because we analyzed industry-year averages, the results described sector-level association patterns and may differ from within-firm relationships (e.g., due to aggregation bias). Firm-level microdata would be needed to assess whether the same patterns hold within firms and to distinguish intensive-margin from extensive-margin mechanisms.

Second, although we impose a lag structure, observational SEM does not by itself eliminate endogeneity; reverse causality and simultaneity may remain across both models and sectors. In Model I, operating-expense capacity (fixed-cost proxy) in manufacturing and sales scale (sales-based risk tolerance) in Information and Business Services may facilitate the establishment and maintenance of foreign affiliates, while internationalization may in turn raise fixed and quasi-fixed expenses and expand sales and scale. In Model II, internationalization may affect domestic employment in manufacturing, yet industries with expanding domestic employment and sales may also be better positioned to internationalize; in Information and Business Services, the internationalization–employment link is weaker, but employment and sales growth may still jointly shape internationalization. Accordingly, the estimated paths are interpreted as descriptive associations rather than causal effects.

Third, key constructs relied on accounting-based proxies, which may contain measurement error. In particular, the fixed-cost proxy may attenuate estimated associations. Decomposing operating expenses into components (e.g., labor costs, research and development (R&D), and marketing) could help identify which types of fixed costs are most relevant.

Fourth, internationalization was measured using foreign subsidiaries and affiliates (an FDI-oriented stock measure). Future work could broaden this concept to include non-establishment modes, such as cross-border e-commerce, licensing, or other contract-based overseas activities.

Fifth, domestic employment was measured as the total number of regular employees per firm. Disaggregating employment by occupation, skill, and contract type would help identify qualitative changes in labor composition, especially in the Information and Business Services and distribution industries.

Finally, extending the analysis to the broader non-manufacturing sector and improving model fit (given the nearly saturated df = 1 structure) may require alternative model specifications and systematic model comparison.

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Appendix A. SEM Specification and Identification

This appendix provides the technical details of the structural equation models (SEMs) estimated in the main text. For clarity, "direct effects" refer only to structural paths explicitly specified in the final SEM (i.e., arrows shown in the path diagrams); non-specified paths are treated as zero.

A.1 Model Structure

Two structural models are specified. Model I examines the correlates of firm internationalization (measured at time t), while Model II analyzes the relationship between internationalization stock (measured at time t-1) and domestic employment (measured at time t). In both models, sales and the fixed-cost proxy are included with a two-period lag (t-2), and productivity is measured at t-1.

A.2 Estimation Method

All models are estimated using ML under the assumption of multivariate normality. Standardized path coefficients are reported to facilitate comparisons across variables.

A.3 Identification and Degrees of Freedom

Each model is nearly saturated with one degree of freedom (df = 1). Given the low degrees of freedom, RMSEA is reported for completeness but should be interpreted with caution. Therefore, model fit is assessed jointly using GFI, AGFI, RMR, and the chi-square statistic.

A.4 Error Structure

Bidirectional arrows represent correlations. No cross-equation equality constraints are

imposed, and the models are estimated separately for the manufacturing and the Information and Business Services samples, rather than using multi-group SEM.

A.5 Interpretation

Given the exploratory nature of SEM in this study, the estimated relationships should be interpreted as structural associations rather than causal effects. These results can generate hypotheses for future confirmatory analyses using alternative econometric approaches.

A.6 Model Fit Statistics and Sample Size

Table A1 summarizes the model fit statistics and sample sizes for all estimated models. For each model, the table reports the chi-square statistic, degrees of freedom, RMSEA, GFI, AGFI, RMR, and the number of observations (N). Because the estimated models are nearly saturated with low degrees of freedom (df = 1), standard goodness-of-fit indices (such as RMSEA) may not provide robust measures of model fit. Therefore, these indices are reported primarily for completeness and should be interpreted with caution.

Table A1. Model fit statistics and sample sizes

Model	Industry	N	χ^2	df	p-value	RMSEA	GFI	AGFI	RMR
Model I	Manufacturing	1,359	6.326	1	0.012	0.063	0.998	0.977	0.004
Model I	Information and Business Services	423	0.410	1	0.522	0.000	1.000	0.995	0.002
Model II	Manufacturing	1,360	8.881	1	0.003	0.076	0.997	0.968	0.005
Model II	Information and Business Services	422	0.276	1	0.599	0.000	1.000	0.997	0.002

Notes: χ^2 is the model chi-square statistic and df denotes degrees of freedom. Because the models are nearly saturated (df = 1), fit indices (RMSEA, GFI, AGFI, RMR) are reported for completeness and should be interpreted with caution; N denotes the number of observations.

A.7 Robustness Checks Using Simple OLS Regressions

This subsection reports sector-specific OLS regressions as a robustness check for the SEM results. The specifications mirror the key predictors used in Models I and II and follow the same lag structure; given the strong correlation between the fixed-cost proxy and sales, coefficients in the full specifications should be interpreted as conditional associations and may change in magnitude or sign relative to bivariate regressions. Sample sizes vary across

specifications depending on the availability of lagged variables. The purpose is not causal identification but to confirm whether the qualitative sectoral patterns observed in the SEM are also visible in simpler regression frameworks. Importantly, the signs of the OLS coefficients reported in Tables A2–A5 are directionally consistent with the corresponding SEM estimates presented in the main text, indicating that the qualitative sectoral patterns are not sensitive to the estimation framework.

Table A2. Sector-specific OLS regressions for internationalization (Manufacturing)

Dependent variable: foreign subsidiaries and affiliates per firm (t) (internationalization stock)

Specification	Fixed-cost proxy (t-2)	Sales (t-2)	Productivity (t-1)	R^2	N
(I-1) Fixed cost only	0.687***			0.472	1,359
(I-2) Sales only		0.643***		0.413	1,359
(I-3) Full specification	0.572***	0.126*	0.002	0.475	1,359

*Notes: Reported coefficients are standardized (beta). The fixed-cost proxy is measured as operating expenses net of cost of goods sold per firm (t-2). Sales are measured as sales per firm (t-2). Productivity is measured as value added per regular employee (t-1). All variables are defined as ln(1 + x). Significance: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.*

Table A3. Sector-specific OLS regressions for internationalization (Information and Business Services)

Dependent variable: foreign subsidiaries and affiliates per firm (t) (internationalization stock)

Specification	Fixed-cost proxy (t-2)	Sales (t-2)	Productivity (t-1)	R^2	N
(I-1) Fixed cost only	0.654***			0.428	423
(I-2) Sales only		0.731***		0.535	423
(I-3) Full specification	0.045	0.769***	-0.106*	0.540	423

*Notes: Reported coefficients are standardized (beta). The fixed-cost proxy is measured as operating expenses net of cost of goods sold per firm (t-2). Sales are measured as sales per firm (t-2). Productivity is measured as value added per regular employee (t-1). All variables are defined as ln(1 + x). Significance: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.*

Table A4. Sector-specific OLS regressions for domestic employment (Manufacturing)

Dependent variable: domestic employment per firm (regular employees) (t)

Specification	Fixed-cost proxy (t-2)	Sales (t-2)	INT (t-1)	R^2	N
(II-1) Fixed cost only	0.841***			0.707	1,360
(II-2) Sales only		0.790***		0.624	1,360
(II-3) Full specification	0.417***	0.113***	0.460***	0.820	1,360

*Notes: Reported coefficients are standardized (beta). The fixed-cost proxy is measured as operating expenses net of cost of goods sold per firm (t-2). Sales are measured as sales per firm (t-2). Internationalization is measured as foreign subsidiaries and affiliates per firm (t-1). All variables are defined as ln(1 + x). Significance: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.*

Table A5. Sector-specific OLS regressions for domestic employment (Information and Business Services)

Dependent variable: domestic employment per firm (regular employees) (t)

Specification	Fixed-cost proxy (t-2)	Sales (t-2)	INT (t-1)	R^2	N
(II-1) Fixed cost only	0.400***			0.160	422
(II-2) Sales only		0.441***		0.194	422
(II-3) Full specification	0.048	0.317**	0.110	0.200	422

*Notes: Reported coefficients are standardized (beta). The fixed-cost proxy is measured as operating expenses net of cost of goods sold per firm (t-2). Sales are measured as sales per firm (t-2). Internationalization is measured as foreign subsidiaries and affiliates per firm (t-1). All variables are defined as ln(1 + x). Significance: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.*

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