Original Research Article

Employee Loyalty and Performance of Taiwan's Semiconductor Industry: Analysis of TSMC's Business Alliance

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ABSTRACT

Taiwan's semiconductor industry plays a critical role in the global economy with its technological innovation, efficient manufacturing, and market leadership, profoundly shaping the global semiconductor landscape. It explores whether there is a positive correlation between employee loyalty and corporate performance and further examines if the parent-subsidiary relationship or business alliance with TSMC or UMC influences the relationship between employee loyalty and corporate performance. The study compiles data from Taiwan's semiconductor industry, with the upstream comprising IP design and IC design, the midstream including IC manufacturing, wafer fabrication, related testing equipment, reticle masks, and chemicals, and the downstream covering IC packaging and testing, IC modules, and IC distribution. Data from 2005 to 2020, comprising 1015 valid data, were used. Correlation and regression analyses were conducted to observe the relationship between employee loyalty and corporate performance.

The study aims to deeply investigate the impact of employee loyalty on the performance of Taiwanese semiconductor companies, especially considering the scenarios of consortium and business alliance cooperation. Through literature review and empirical analysis, the study assesses how employee loyalty affects the performance indicators of semiconductor companies and explores the moderating role of consortium and business alliance cooperation in this impact. By delving into employee loyalty in Taiwan's semiconductor sector, this study aims to provide practical recommendations for human resource management strategies and consortium cooperation decisions to promote the sustainable development of Taiwanese semiconductor companies. The findings reveal a negative correlation between the average seniority and turnover rate of employees and performance variables, while employee growth rate shows a positive correlation in upstream and midstream companies but a negative correlation overall. The results vary slightly across the upstream, midstream, and downstream sectors. In terms of business alliance effects, companies with business ties to TSMC exhibit a moderating effect on the relationship between employee loyalty and performance variables.

Keywords: Employee Loyalty, Corporate Performance, Semiconductor Industry, Business Alliance Cooperation

1. Introduction

Semiconductors are the cornerstone of modern technology, driving the development of electronic products and information technology. These tiny chips containing immense computing power support global communications, computers, medical fields, and other sectors, making them an indispensable core technology in modern society.

Employee loyalty and corporate performance are crucial factors influencing the survival and development of enterprises. Therefore, studying the relationship between employee loyalty and corporate performance helps understand the operational status of enterprises and improve their competitiveness.

The semiconductor industry is widely used in various industries, leading the world forward. The semiconductor industry chain includes IC design (circuit design, brand management, and sales), wafer manufacturing companies, midstream IC manufacturing and wafer fabrication, and downstream IC packaging, IC modules, and IC distribution. Taiwan's semiconductor industry chain is complete and uniquely positioned globally with its professional division of labor. This study aims to understand whether employee loyalty and business performance in Taiwan's semiconductor industry are positively correlated across different positions in the upstream, midstream, and downstream sectors. Alternatively, does the correlation vary with different positions? According to the Expectancy Theory, proposed by American psychologist and behavioral scientist Victor Vroom in his 1964 work "Work and Motivation," employees' work behavior is based on certain expectations. This study aims to understand and verify these results. Taiwan's semiconductor industry chain holds a crucial position in the global semiconductor market. Therefore, studying the relationship between employee loyalty and corporation performance within Taiwan's semiconductor industry chain helps to understand the development status of this industry chain, thereby enhancing its competitiveness. Currently, there is limited research on the relationship between employee loyalty and corporation performance in Taiwan's semiconductor industry chain. Thus, this study can contribute to related research and serve as a reference indicator for enterprises. This study focuses on the semiconductor industry in Taiwan. Taiwan's semiconductor industry began to develop in the 1980s when the Taiwanese government aimed to promote the development of the technology industry. Since then, recognizing business opportunities and seizing the chance, significant investments have been made in the

semiconductor industry, forming a comprehensive upstream, midstream, and downstream supply chain.

In recent years, due to the pandemic and the US-China trade war, Taiwan's semiconductor industry has gained significant global exposure, with TSMC's reputation also rising significantly. Therefore, this study aims to further explore how having business dealings with TSMC or being its subsidiary company affects the relationship between employee loyalty and business performance. Additionally, it compares the effects of having business dealings with UMC or being its parent-subsidiary companies.

This study seeks to understand the relationship between employee loyalty and corporation performance in Taiwan's semiconductor industry. Given the different positions in the upstream, midstream, and downstream sectors, the relationship between employee loyalty and corporation performance is expected to vary. Therefore, this study uses data from publicly listed semiconductor companies in Taiwan to further understand how different positions in the semiconductor industry chain affect the relationship between employee loyalty and business performance. Consequently, companies can adjust their talent retention mechanisms to respond to the competitive advantages and challenges of the industry chain, creating a strategic foothold in a continuously changing market.

This study will use the Taiwan Economic Journal (TEJ) database for empirical analysis, covering the period from 2005 to 2020. The collected data mainly include financial statements, company annual reports, and wage reports related to Taiwan's semiconductor industry chain. To ensure the reliability and validity of the data, this study will use multiple data sources for cross-verification and comparison.

In this study, the independent variables are employee loyalty-related variables, including Employee Seniority, average employee age, Employee Turnover, Employee Growth, and Employee Resign. The dependent variables are business performance variables, including ROA, ROE, and Profit After tax. In addition to the independent and dependent variables, this study will also consider some other control variables, such as Asset and Capital rate. Since many industries show both positive and negative results in the analysis of the relationship between employee satisfaction, loyalty, and performance (Chuang and Liao, 2010; Silvestro, 2002; Stamolampros et al., 2019; Tomic et al., 2018; Yang et al., 2021). We aim to discuss the relationship between employee loyalty and corporate performance in Taiwan's semiconductor industry.

After collecting the data and determining the variables, this study will use regression analysis for empirical analysis. First, the collected data will be cleaned and preprocessed, and then the independent and dependent variables will be subjected to regression analysis. Based on the results of the regression analysis, this study will further investigate the relationship between employee loyalty and corporation performance and the impact of business alliances and parent-subsidiary relationships on this relationship by incorporating interaction terms such as whether there is a business alliance with TSMC, whether the company is a subsidiary of TSMC, whether there is a business alliance with UMC, and whether the company is a subsidiary of UMC.

2. Literature Review

2.1 Relationship between employee loyalty and performance

In both for-profit and non-profit organizations, member loyalty has always been a highly valued aspect. In businesses, the role of loyalty is equally significant, as retaining talent is often a major goal that companies invest considerable effort into achieving. The concept of loyalty has been discussed for a long time. Hirschman (1970) introduced a framework for loyalty, exploring the definitions and frameworks of terms such as exit, voice, and loyalty. Luchak (2003) extended Hirschman's framework, validating it through survey data from employees of a large public utility in Canada. He found that employees who felt attached through emotional connections and those who felt attached through rational connections expressed their concerns differently. Regardless of the reason, employees who felt attached had a lower likelihood of leaving. However, the term "loyalty" is not only used in the context of relationships between businesses and employees, as focused on in this article, but it is also applied in various other fields, such as immigration and patriotism (Schewel, 2020; Moses, 2005).

In previous literature, there has been substantial research on the correlation between employee loyalty-related variables and company performance as well as company value, spanning across various industries. Judge et al. (2001) provide a qualitative and quantitative review of the relationship between job satisfaction and job performance. Harter et al. (2002) point out the relationship of changing in management practices that increase employee satisfaction may increase business-unit outcomes, including profit.

Fulmer, Gerhart, and Scott (2003) conducted an empirical investigation into whether good employee relations are associated with company performance, using a sample that included publicly traded companies listed in the "100 Best Companies to Work for in America." They verified that good employee relations serve as an

intangible and enduring asset and are positively related to company performance. Other studies have examined the impact of employee job satisfaction on company value among companies selected for the "100 Best Companies to Work for in America" list, extending the discussion to the positive effects of responsible investment and corporate social responsibility on the company itself and stock returns (Edmans, 2011; Edmans, 2012). Collins and Smith (2006), focusing on 136 high-tech companies, argued that indicators measuring company atmosphere positively influence revenue from new products and services as well as company sales. Baptiste (2008) discussed the impact of human resource management practices on employee well-being and performance in a local government organization, finding that support and trust-building significantly influence employees' job happiness, thereby enhancing organizational efficiency and productivity. Besides the mentioned industry categories, there are also numerous studies on the relationship between employee loyalty and performance in service-oriented industries. Yee, Yeung, and Cheng (2010) conducted a survey of 210 high-contact service businesses in Hong Kong, finding that employee loyalty is significantly related to service quality, which in turn affects customer satisfaction and customer loyalty, ultimately leading to profitability in high-contact service industries.

Chuang and Liao (2010) analyzed 133 stores in Taiwan, discovering that attention to customers and employees further encourages cooperation between employees and customers as well as mutual assistance among colleagues, thereby impacting market performance. Tomic, Tesic, Kuzmanovic, and Tomic (2018) conducted a survey with 317 questionnaires across 100 service companies in Serbia and Bosnia and Herzegovina, finding a positive relationship between employee loyalty and company performance. Stamolampros et al. (2019) examined the impact indicators of employee satisfaction and turnover rates in US tourism and hospitality firms and found that leadership and cultural values are better predictors of high employee satisfaction, while career progression is critical for employee turnover. Additionally, they quantified the effect of job satisfaction on firm profitability, with a one-unit increase in job satisfaction leading to an increase of between 1.2 and 1.4 in ROA. However, the reverse relationship does not hold true.

Most literature results indicate a positive relationship between employee loyalty and company performance, but some studies have found contrary results. Silvestro (2002) conducted an empirical study on one of the four major chain supermarkets in the UK, finding a negative relationship between employee satisfaction and productivity, efficiency, and profitability, and also a negative correlation between employee loyalty and productivity and profitability. Yang et al. (2021) point out that

the positive relationship between job satisfaction and performance exists in traditional but not high-tech industries.

2.2 Semiconductor Industry Trends in Recent Years

In recent years, the semiconductor industry has been significantly affected by the U.S.-China trade war. Consequently, many studies have explored the transformations within the semiconductor industry and the necessary countermeasures various countries need to implement in response to changes in the industrial chain. Bown (2020) discusses the shifts in the political-economic landscape of the semiconductor industry under the U.S.-China trade war, highlighting the demand and manufacturing supply shifts towards Asia. The article aims to examine how U.S. policymakers should adopt legal measures to restrict exports and the potential costs associated with implementing these measures.

Luo & Van Assche (2023) discuss the U.S. CHIPS and Science Act, noting that its reliance on subsidies, export controls, investment reviews, and guardrail provisions for geopolitical economic purposes signifies a shift from market-oriented liberalism to technological nationalism. They analyze the strategic responses that enterprises must adopt in the face of technological geopolitical uncertainties, proposing four strategies: geo-strategies, reconfiguration, resilience, and corporate diplomacy. Gao, Ren & Shih (2023) investigate the key co-evolutionary conditions under diversity and selective pressure within the global semiconductor industry to understand how third-party manufacturers (Taiwanese foundries) adapt in the context of U.S.-China decoupling. The study reveals that third-party manufacturers can survive and even enhance their strategic and competitive advantages despite international market political interferences.

Amid these geopolitical developments, Taiwan's semiconductor industry continues to play a crucial role in the global industrial chain. Therefore, this study compiles data from Taiwan's semiconductor industry from 2005 to 2020 to understand the relationship between employee loyalty and business performance. It further examines whether different positions in the industrial chain, business alliances, and subsidiary company relationships have a moderating effect on the relationship between employee loyalty and business performance.

3. Research method

This study uses data from the Taiwan Economic Journal (TEJ) database, focusing on the semiconductor industry in Taiwan. The research collects financial statements, annual reports, and employee salary reports from companies across the upstream, midstream, and downstream sectors of Taiwan's semiconductor industry. The goal is to examine the relationship between compensation systems and business performance in Taiwan's semiconductor industry. To ensure data reliability and validity, the study employs multiple data sources for cross-verification and comparison. The sample consists of 77 companies from the upstream, midstream, and downstream sectors of Taiwan's semiconductor industry, covering the period from December 2005 to December 2020. The variables include performance indicators such as ROE, ROA, and Profit, as well as employee loyalty metrics such as Employee Seniority and Employee Turnover. The dataset comprises a total of 1,015 entries, with 438 entries from the upstream sector, 290 from the midstream sector, and 287 from the downstream sector. Specifically, the TSMC Alliance includes 335 entries, with 232 from the upstream sector, 100 from the midstream sector, and 3 from the downstream sector. The TSMC Subsidiary has 32 entries, with 15 from the upstream sector, 16 from the midstream sector, and 1 from the downstream sector. The UMC Alliance includes 229 entries, with 115 from the upstream sector, 63 from the midstream sector, and 51 from the downstream sector. The UMC Subsidiary has 143 entries, with 127 from the upstream sector and 16 from the midstream sector. Due to the limited number of entries for downstream companies in the TSMC Alliance, TSMC Subsidiary, and UMC Subsidiary, the analysis of business alliances and parent-subsidiary effects in subsequent regressions focuses only on upstream and midstream sectors, with the downstream sector only considering the UMC Alliance effect.

Among the data, Employee Turnover has 895 entries, and Employee Resign has 862 entries. In the first stage of regression analysis, both Employee Turnover and Employee Resign are included as independent variables for employee loyalty, resulting in a total of 859 entries, with 373 from the upstream sector, 237 from the midstream sector, and 249 from the downstream sector. In the second stage of regression analysis, excluding Employee Resign as an independent variable, the total number of entries is 895, with 379 from the upstream sector, 260 from the midstream sector, and 256 from the downstream sector.

3.1 Research model and variable description

3.1.1 The first step of regression model:

Performancei=α Intercept term+βa Employee loyaltyi+βb Controli+ϵi

Where the company performance variables for a given year iii include ROA, ROE,

or Profit. The employee loyalty variables for a given year iii are represented by Employee Seniority, Employee Growth, Employee Turnover, and Employee Resign. The control variables in this study include Total Compensation, Asset, Capital Rate, and Year. Here, iii represents the data for a specific company for a particular year.

3.1.2 The Second Step of the Regression Model:

$$\begin{aligned}\text{Performance}_i = {} & \alpha\ \text{Intercept term} + \beta_a \text{Employee loyalty}_i \\ & + \beta_b \text{Employee loyalty X Alliance}_i \\ & + \beta_c \text{Employee loyalty X Parent or Subsidiary}_i + \text{Control}_i + \epsilon_i\end{aligned}$$

The company performance variables for a given year include ROA, ROE, or Profit After Tax. The employee loyalty variables for a given year are represented by Employee Seniority, Employee Growth, and Employee Turnover. The interaction terms between employee loyalty variables and Alliance or Subsidiary companies indicate whether a specific company has business cooperation with or is in a parent-subsidiary relationship with TSMC or UMC. The control variables in this study include Total Compensation, Asset, Capital Rate, and Year. Here, iii represents the data for a specific company for a particular year.

3.2 Variable description

3.2.1 Independent variable: Variables related to employee loyalty

(1) Employee Seniority:

Employee Seniority is measured in years and represents the length of time an average employee has served at the company. In the sample of semiconductor companies, the minimum average employee seniority is 1 year, the maximum is 20 years, with an average of approximately 6 years. Generally, if a company's employee benefits or compensation system is highly satisfactory, the employee tenure tends to be longer. Therefore, this study infers that the longer the employee tenure, the higher the employee loyalty, and expects this variable to be positively correlated with company performance.

(2) Employee Turnover:

Employee Turnover refers to the rate at which employees leave or transfer within an organization over a specific period. It is used as an indicator of employee movement and is typically expressed as a percentage. Employee turnover is a crucial metric for evaluating compensation policies and can help understand whether employee benefits or the company's compensation system are satisfactory.

The formula to calculate employee turnover is:

Employee turnover rate = (number of resignations or transfers / average number of employees) × 100%

In the sample of semiconductor companies, the minimum employee turnover rate is 0.00%, the maximum is 91.00%, with an average of approximately 13%. Therefore, this study infers that higher Employee Turnover indicates poorer employee compensation and expects this variable to be negatively correlated with company performance.

(3) Employee Growth:

Employee Growth Rate refers to the rate of increase in the number of employees within a company. It is an important indicator reflecting the company's expansion and development. This rate can be measured by calculating the number of new employees joining the company over a period and comparing it with the number of employees in the previous period. It also indicates the company's competitiveness and attractiveness in the market.

In the sample of semiconductor companies, the minimum employee growth rate is -92.86%, the maximum is 1885.42%, with an average of approximately 11%. Therefore, this study infers that a higher Employee Growth Rate indicates better employee compensation and expects this variable to be positively correlated with company performance.

(4) Employee Resign:

Employee Resign refers to the number of employees who voluntarily end their employment and leave the job within a specific period. This includes voluntary resignations, dismissals, retirements, or transfers. Employee resignations are an important metric for evaluating a company's compensation policies. If employees are satisfied with the company's compensation system, the Employee Resign rate tends to be lower.

In the sample of semiconductor companies, the minimum number of employee resignations is 0, the maximum is 991, with an average of approximately 213. Therefore, this study infers that a higher Employee Resign rate indicates poorer employee compensation and expects this variable to be negatively correlated with company performance.

3.2.2 Dependent variables: Variables related to performance

(1) ROA:

ROA stands for Return on Assets. It is a financial metric used to assess how

effectively a company utilizes its assets to generate profit. ROA represents the profit level produced per unit of assets owned by the company. It measures the efficiency and effectiveness of a company's asset operations.

The calculation of ROA involves dividing the company's net profit by its average total assets. Generally, net profit refers to the profit after all expenses and taxes have been deducted. Average total assets are the average value of a company's assets over a specific period, usually calculated as the average of the assets at the beginning and end of the period. The higher the ROA value, the more efficient the company is at converting assets into profit. This reflects the company's operational performance and asset utilization efficiency. A higher ROA may indicate that the company's management has made sound decisions regarding capital allocation and operational management, which can help attract investors and shareholders. Conversely, a lower ROA may suggest that the company faces challenges in asset operations, such as idle assets, low profit margins, or poor operational efficiency. This may require further analysis and improvements to enhance asset operation effectiveness and increase the company's economic benefits.

(2) ROE:

ROE stands for Return on Equity. It is a financial metric used to assess how effectively a company uses its shareholders' equity to generate returns. ROE represents the return level produced per unit of shareholders' equity. It measures the efficiency and effectiveness of a company's operations concerning shareholders' equity. The calculation of ROE involves dividing the company's net profit by its average shareholders' equity. Profit refers to the profit remaining after all income taxes have been deducted. Shareholders' equity is the remaining portion of a company's assets after subtracting its liabilities.

(3) Profit:

One of the indicators used to measure a company's profitability is the net profit margin after tax. It indicates the percentage of each dollar of revenue that translates into net profit after taxes. The formula for calculating the net profit margin after tax is as follows: Profit = (Net profit after tax / operating income) × 100%

Where net profit after tax refers to the profit remaining after all taxes have been deducted, and revenue refers to the income earned from the company's operating activities. A higher net profit margin after tax indicates that a larger proportion of

revenue is being effectively converted into net profit after taxes, which is generally considered a good indicator of profitability.

4. Result

4.1 Descriptive statistics

Based on Table 1, since there are only 895 records for Employee Turnover and 862 records for Employee Resign, the number of records used in the first phase of regression analysis is 859, and in the second phase, it is 895. The main independent variables are employee loyalty variables, including Employee Seniority, Employee Turnover, Employee Growth, and Employee Resign. The average seniority of employees in the overall data is approximately six years, the employee turnover rate is about 13%, the employee growth rate is around 11%, and the number of resignations is approximately 139 per year. The dependent variables include ROA, ROE, and Profit After Tax as proxy variables. For the variables of Alliance and Subsidiary companies, commercial alliances are included as long as there is business cooperation, leading to a larger proportion. TSMC Alliance accounts for 33% of the annual data, UMC Alliance accounts for 23%, while for parent-subsidiary companies, UMC Subsidiary accounts for 14% of the annual data, and TSMC Subsidiary accounts for only 3%.

Table 1: Descriptive Statistics

	N	Minimum value	Maximum value	Mean	Standard Deviation	Variance
ROA	1015	-79.24	45.32	6.24	11.00	120.94
ROE	1015	-292.53	152.76	8.20	21.21	449.74
Profit	1015	-353.43	105.71	3.82	28.06	787.45
Employee Seniority	1015	1.00	20.00	5.96	2.48	6.15
Employee Age	1015	23.00	51.00	35.36	3.27	10.68
Employee Turnover	895	0.00	91.00	12.75	11.22	125.89
Employee Growth	1015	-92.86	1885.42	11.15	74.82	5598.50
Employee Resign	862	0.00	991.00	138.53	185.95	34578.75
Total Compensation	1015	0.40	2565.97	86.64	231.93	53791.86
Asset	1015	1.27	27335.05	420.09	1863.53	3472760.83

Capital rate	1015	2.27	100.00	70.60	15.93	253.82
Upstream	1015	0.00	1.00	0.43	0.50	0.25
Midstream	1015	0.00	1.00	0.29	0.45	0.20
Downstream	1015	0.00	1.00	0.28	0.45	0.20
TSMC Alliance	1015	0.00	1.00	0.33	0.47	0.22
TSMC Subsidiary	1015	0.00	1.00	0.03	0.17	0.03
UMC Alliance	1015	0.00	1.00	0.23	0.42	0.18
UMC Subsidiary	1015	0.00	1.00	0.14	0.35	0.12

For control variables and other variables, Total Compensation represents the compensation of all employees. Asset means the total assets of the company. Capital rate is each company's equity capital/total capital*100%. Upstream, Midstream, and Downstream imply the number of our sample that is an upstream company or not. For example, the mean of upstream equals 0.43 representing that there are 43% of companies are upstream companies. TSMC is a famous company in Taiwan, called Taiwan Semiconductor Manufacturing Corporation, and UMC is also a well-known United Microelectronics Corporation. Alliance and Subsidiary indicate whether the company has a business partnership or a parent-subsidiary relationship with the above two companies.

4.2 First step of regression analysis

The first stage of the regression analysis (Tables 2 to 4) discusses the relationship between employee loyalty and corporation performance variables. It presents the results separately based on different positions in the industrial chain, aiming to understand whether upstream, midstream, and downstream companies have different outcomes in the relationship between employee loyalty and corporation performance variables.

An analysis of the results from Tables 2 to 4 reveals a negative correlation between employee seniority and corporation performance variables. Specifically, in upstream companies, employee seniority is significantly negatively correlated with all three performance indicators, indicating that there is a negative relationship between employee seniority and corporation performance in Taiwan's semiconductor industry's upstream companies. The longer (shorter) the employee seniority is, the worse (better) the corporation performance is. In downstream companies, a significant negative correlation is observed only with ROE, while other performance indicators are not significant.

Employee age shows a significant negative correlation with performance variables only in downstream companies. Employee Turnover is significantly negatively correlated with performance variables in both midstream and downstream companies, and there is also a significant negative correlation between Employee Turnover and Profit in upstream companies. This indicates that in Taiwan's semiconductor industry, there is a negative relationship between Employee Turnover and corporation performance variables in midstream and downstream companies; the higher (lower) the employee turnover rate, the worse (better) the business performance.

Employee Growth is mostly significantly positively correlated with performance variables in upstream and midstream companies, while it is significantly negatively correlated with performance variables in downstream companies. This suggests that in Taiwan's semiconductor industry, a higher employee growth rate leads to better performance in upstream and midstream companies, while the opposite is true in downstream companies, where a higher employee growth rate results in worse performance.

Employee Resignation generally shows a negative correlation with performance variables, but most of these correlations are not significant. Therefore, in the second stage of the study, the interaction effect between Employee Resignation and the Alliance will not be discussed.

In terms of the Adjusted R square from the regression results in Tables 2 to 4, the explanatory power of the independent and control variables used in this study is highest in downstream companies, explaining the total variation. Upstream companies only surpass midstream companies in explaining the total variation in ROE by 23.4%, compared to 23.1% in midstream companies. For other performance indicators, midstream companies come second.

Regarding the variables associated with business alliances and parent-subsidiary relationships of TSMC and UMC, TSMC Alliance shows a significant negative correlation in upstream companies and a significant positive correlation in midstream companies. The performance of TSMC's downstream subsidiaries is relatively better than that of other downstream companies; however, due to the limited number of data points, further validation is needed with an increased sample size in future research. As for UMC Alliance and UMC Subsidiary, UMC Alliance is significantly positively correlated with Profit only in downstream companies. UMC Subsidiary shows a

significant negative correlation with Profit only in upstream companies and does not have a significant impact on the other two performance variables.

The above analysis indicates that TSMC Alliance has a greater impact on the selected performance variables compared to UMC Alliance. Therefore, the influence of TSMC Alliance on business performance variables is more notable. In the second stage of the regression analysis, this study further explores whether TSMC Alliance has a moderating effect on the relationship between employee loyalty and business performance. The interaction terms between TSMC Alliance and Employee Seniority, Employee Turnover, and Employee Growth are used to understand the nature of these interactions. The effect of UMC Alliance is also included in the second stage of the regression analysis for comparison.

Table 2: Regression Coefficients and Significance Table with ROA

	Full sample	upstream	midstream	downstream
Intercept	16.506***	5.398	2.309	22.674***
	(2.789)	(0.493)	(0.084)	(3.002)
Employee	-1.392***	-1.122***	-0.365	-0.501*
Seniority	(-7.472)	(-3.045)	(-0.815)	(-1.681)
Employee	-0.103	0.273	-0.231	-0.568***
Age	(-0.653)	(0.953)	(-0.670)	(-2.710)
Employee	-0.316***	-0.110	-0.254***	-0.357***
Turnover	(-9.295)	(-1.510)	(-4.384)	(-6.679)
Employee	-0.009*	0.068**	0.027*	-0.017***
Growth	(-1.885)	(2.398)	(1.664)	(-5.343)
Employee	-0.002	-0.009	0.000	-0.001
Resign	(-0.692)	(-0.886)	(0.004)	(-0.266)
TSMC	0.620	-2.234*	7.197***	_
Alliance	(0.798)	(-1.947)	(3,560)	

TSMC	3.692	-2.620	-17.515	-
Subsidiary	(1.505)	(-0.898)	(-1.218)	
UMC	0.146	-0.961	-3.186	-0.346
Alliance	(0.173)	(-0.730)	(-1.246)	(-0.276)
UMC	0.860	-2.024	-5.496	_
Subsidiary	(0.805)	(-1.384)	(-1.112)	
Total	0.022***	0.101***	0.013**	0.056***
Compensation	(5.456)	(5.806)	(2.445)	(5.920)
Asset	-0.002***	-0.015***	0.001	-0.014***
	(-2.872)	(-2.709)	(1.230)	(-3.026)
Capital rate	0.078***	-0.013	0.102**	0.128***
	(3.357)	(-0.285)	(2.305)	(4.783)
Year effect	Yes	Yes	Yes	Yes
N	859	373	237	249
Adjusted R square	0.230	0.237	0.284	0.471

* indicates significance at the 90% confidence level,** indicates significance at the 95% confidence level,*** indicates significance at the 99% confidence level

(Values in parentheses represent the t-statistic of the coefficients)

Table 3: Regression Coefficients and Significance Table with ROE

	Full sample	Upstream	midstream	downstream
Intercept	28.123***	23.249	3.021	29.930***
	(2.754)	(1.413)	(0.130)	(2.148)
Employee	-2.367***	-1.560***	-0.643	-0.849
Seniority	(-7.364)	(-2.817)	(-0.707)	(-1.543)
Employee Age	-0.213	0.164	-0.444	-0.679**
	(-0.778)	(0.381)	(-0.632)	(-1.756)
Employee	-0.461***	-0.031	-0.298**	-0.564***
Turnover	(-7.876)	(-0.287)	(-2.531)	(-5.717)
Employee	-0.018**	0.093**	0.037	-0.030***
Growth	(-2.192)	(2.180)	(1.146)	(-4.956)
Employee	-0.005	-0.036**	-0.017	-0.001
Resign	(-1.187)	(-2.486)	(-1.524)	(-0.203)
TSMC Alliance	0.560	-3.984**	12.563***	_
	(0.417)	(-2.310)	(3.060)	

TSMC	6.492	-1.708	-20.479	-
Subsidiary	(1.533)	(-0.389)	(-0.701)	
UMC Alliance	0.411	-0.584	-8.913*	-1.651
	(0.283)	(-0.295)	(-1.716)	(-0.713)
UMC	1.589	-1.456	1.124	_
Subsidiary	(0.862)	(-0.663)	(0.112)	
Total	0.034***	0.128***	0.024**	0.091***
Compensation	(4.987)	(4.904)	(2.133)	(5.247)
Asset	-0.003***	-0.012	0.002	-0.018**
	(-2.816)	(-1.475)	(0.706)	(-2.167)
Capital rate	0.113***	-0.111	0.273**	0.132***
	(2.839)	(-1.596)	(3.028)	(2.665)
Year effect	Yes	Yes	Yes	Yes
N	859	373	237	249
Adjusted R square	0.200	0.234	0.231	0.381

* indicates significance at the 90% confidence level,** indicates significance at the 95% confidence level,*** indicates significance at the 99% confidence level

(Values in parentheses represent the t-statistic of the coefficients)

Table 4: Regression Coefficients and Significance Table with Profit

	Full sample	Upstream	Midstream	Downstream
Intercept	10.675	-67.701**	9.290	59.998***
	(0.659)	(-2.447)	(0.237)	(3.198)
Employee	-3.103***	-2.418***	-1.714	-0.703
Seniority	(-6.089)	(-2.596)	(-1.116)	(-0.949)
Employee Age	0.194	2.497***	-0.807	-1.605***
	(0.448)	(3.444)	(-0.682)	(-3.085)
Employee	-1.036***	-0.433**	-1.119***	-0.802***
Turnover	(-11.149)	(-2.351)	(-5.627)	(-6.043)
Employee	0.001	0.136*	0.107*	-0.020**
Growth	(0.110)	(1.893)	(1.951)	(-2.461)
Employee	0.015**	-0.007	0.008	0.001
Resign	(2.223)	(-0.271)	(0.431)	(0.065)
TSMC Alliance	4.248**	1.328	19.842***	_
	(1.996)	(0.458)	(2.893)	

TSMC	-0.446	-8.609	-88.278*	-
Subsidiary	(-0.066)	(-1.167)	(-1.791)	
UMC Alliance	0.824	1.283	-6.133	5.412*
	(0.358)	(-0.386)	(-0.699)	(1.737)
UMC	-5.363*	-6.906*	-19.224	_
Subsidiary	(-1.835)	(-1.869)	(-1.135)	
Total	0.034***	0.127***	0.048**	0.082***
Compensation	(3.089)	(2.899)	(2.534)	(3.496)
Asset	-0.003	-0.012	0.004	-0.020*
	(-1.388)	(-0.835)	(1.011)	(-1.791)
Capital rate	0.184***	-0.112	0.345**	0.209***
	(2.905)	(-0.956)	(2.267)	(3.153)
Year effect	Yes	Yes	Yes	Yes
N	859	373	237	249
Adjusted R square	0.183	0.106	0.266	0.353

* indicates significance at the 90% confidence level,** indicates significance at the 95% confidence level,*** indicates significance at the 99% confidence level

(Values in parentheses represent the t-statistic of the coefficients)

4.3 Second step of regression analysis

From Tables 2, 3, and 4, it can be seen that the effects of employee loyalty variables on performance variables vary depending on the position in the semiconductor industry chain. Therefore, in Tables 5, 6, and 7, this paper directly tests the interaction effects of employee loyalty variables and business alliance variables on samples from the upstream, midstream, and downstream segments. The three tables use ROA, ROE, and Profit, respectively, as dependent variables. The independent variables include interaction terms between three employee loyalty variables (Employee Seniority, Employee Turnover, and Employee Growth) and the business alliances TSMC Alliance and UMC Alliance. In table 5, 6 and 7, model (1) to (4) represent the result of upstream, model (5) to (8) represent the result of midstream and model (9) to (12) represent result of downstream.

For upstream companies, there is a negative relationship between Employee Seniority and performance variables, indicating that the higher the average employee

seniority in upstream companies, the worse the performance. The coefficients for the business alliances with TSMC and UMC are significant only in Table 6 model (1), where a negative relationship is observed, but the level of significance is not high. Therefore, this paper concludes that the interaction effects are not apparent. Interestingly, Employee Growth initially shows a positive relationship with performance variables, suggesting that a higher employee growth rate leads to better company performance. However, the interaction terms between Employee Growth and the TSMC alliance are significantly negative. This indicates that for upstream companies with a business alliance with TSMC, the positive effect of employee growth rate on performance is significantly reduced.

For midstream companies, Employee Turnover shows a significant negative relationship with performance variables, while Employee Growth shows a positive relationship. This indicates that companies with higher employee turnover rates tend to have worse performance, whereas companies with higher employee growth rates tend to have better performance. The interaction terms between Employee Turnover and the TSMC Alliance are significantly positive, while the interaction terms between Employee Growth and the TSMC Alliance are significantly negative. This suggests that for midstream companies engaged in business with TSMC, the effects of employee turnover and employee growth rates on performance are significantly reduced.

For downstream companies, due to the limited number of samples in this study involving business alliances with TSMC, we did not conduct tests specifically on downstream companies with the TSMC Alliance. Regarding the effects of the UMC Alliance, in Table 7 model (10) and (12), the interaction terms between Employee Turnover and the UMC Alliance show a significant positive relationship. This indicates that for downstream companies engaged in business with UMC, the negative effect of employee turnover on performance is reduced.

The interaction effects between TSMC Alliance and UMC Alliance with employee loyalty variables reveal similar results to those found in Tables 2, 3, and 4. The impact of TSMC Alliance on performance is greater compared to UMC Alliance. The sample period of this study spans from 2005 to 2020. In recent years, TSMC's influence on the semiconductor industry has grown even stronger. It is believed that updating the data period in future research will provide further insights into its impact on Taiwan's semiconductor industry.

Table 5: Significance of Interaction Coefficients between Employee Loyalty and Business Alliances with ROA

dependent variable: *ROA*												
	Upstream				Midstream				Downstream			
independent variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Employee Seniority	-1.082***	-1.195***	-0.963***	-0.606	0.057	-0.400	-0.079	0.115	-0.504*	-0.593**	-0.495*	-0.636**
	(-2.718)	(-3.467)	(-2.770)	(-1.427)	(0.106)	(-0.967)	(-0.185)	(0.208)	(-1.741)	(-2.052)	(-1.707)	(-2.163)
Employee Age	0.117	0.156	0.121	0.140	-0.492*	-0.464*	-0.463*	-0.545*	-0.619***	-0.544***	-0.617***	-0.547***
	(0.432)	(0.562)	(0.453)	(0.505)	(-1.747)	(-1.662)	(-1.688)	(-1.928)	(-3.302)	(-2.879)	(-3.278)	(-2.884)
Employee Turnover	-0.175***	-0.150	-0.145**	-0.024	-0.214***	-0.302***	-0.207***	-0.264***	-0.333***	-0.370***	-0.333***	-0.375***
	(-2.844)	(-1.510)	(-2.373)	(-0.222)	(-4.067)	(-5.079)	(-4.162)	(-4.212)	(-7.407)	(-7.706)	(-7.344)	(-7.755)
Employee Growth	0.061**	0.065**	0.208***	0.257***	0.023	0.022	0.072***	0.071***	-0.018***	-0.017***	-0.018***	-0.017***
	(2.161)	(2.318)	(3.327)	(3.769)	(1.469)	(1.468)	(2.925)	(2.892)	(-5.362)	(-5.297)	(-5.358)	(-5.284)
TSMC Alliance	-1.476	-0.604	-0.260	6.794	8.484*	3.277	7.286***	4.313				
	(-0.503)	(-0.347)	(-0.220)	(1.644)	(1.999)	(1.193)	(3.767)	(0.777)				
UMC Alliance	3.445	-1.974	-0.662	2.005	-0.263	-4.282	-4.161*	-3.012	-1.322	-3.633*	-0.041	-11.594*
	(0.926)	(-1.011)	(-0.501)	(0.362)	(-0.061)	(-1.416)	(-1.782)	(-0.625)	(-0.269)	(-1.733)	(-0.034)	(-1.739)
Employee Seniority	-0.016			-0.745	-0.354			0.099				
X TSMC Alliance	(-0.033)			(-1.374)	(-0.496)			(0.129)				
Employee Seniority	-0.768			-0.596	-0.451			-0.428	0.231			1.200
X UMC Alliance	(-1.119)			(-0.747)	(-0.881)			(-0.821)	(0.268)			(1.231)
Employee Turnover		-0.085		-0.236*		0.188*		0.153				
X TSMC Alliance		(-0.718)		(-1.821)		(1.661)		(1.271)				

Employee Turnover		0.134		0.067		0.141		0.214		0.258*		0.336**
X UMC Alliance		(0.997)		(0.449)		(0.997)		(1.400)		(2.054)		(2.403)
Employee Growth			-0.180***	-0.237***			-0.080***	-0.079**				
X TSMC Alliance			(-2.757)	(-3.282)			(-2.652)	(-2.596)				
Employee Growth			0.011	-0.026			0.029	0.053			0.000	0.086
X UMC Alliance			(0.162)	(-0.310)			(0.463)	(0.784)			(0.002)	(0.784)
Control Variable	Yes	Yes	Yes	Yes	Yes							
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes							
Constant	19.266*	18.076	15.449	11.158	16.900*	19.748*	17.259*	18.445*	26.142***	24.496***	26.201***	24.210***
	(1.894)	(1.675)	(1.526)	(1.027)	(1.660)	(1.957)	(1.728)	(1.827)	(3.766)	(3.537)	(3.761)	(3.480)
Observations	379	379	379	379	260	260	260	260	256	256	256	256
Adj. R^2	0.204	0.204	0.220	0.223	0.339	0.350	0.356	0.360	0.453	0.463	0.453	0.462

Employee loyalty variables X TSMC and UMC Alliance represent the interaction term of two variables. Employee loyalty variables include Employee Seniority, Employee Turnover and Employee Growth.

Table 6: Significance of Interaction Coefficients between Employee Loyalty and Business Alliances with ROE

Dependent Variable: ROE												
	Upstream			Midstream				Downstream				
Independent Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Employee Seniority	-1.785***	-1.976***	-1.606***	-1.022	-0.287	-0.793	-0.154	-0.394	-0.874	-1.024*	-0.834	-1.020*
	(-2.972)	(-3.807)	(-3.060)	(-1.600)	(-0.204)	(-0.740)	(-0.139)	(-0.272)	(-1.650)	(-1.928)	(-1.574)	(-1.889)
Employee Age	0.154	0.286	0.167	0.262	-0.584	-0.543	-0.581	-0.607	-0.772**	-0.676*	-0.803**	-0.699**
	(0.376)	(0.685)	(0.414)	(0.629)	(-0.800)	(-0.750)	(-0.811)	(-0.820)	(-2.251)	(-1.945)	(-2.335)	(-2.007)
Employee Turnover	-0.226**	-0.102	-0.182**	0.097	-0.433***	-0.610***	-0.390***	-0.569***	-0.536***	-0.586***	-0.527***	-0.587***
	(-2.433)	(-0.682)	(-1.972)	(0.605)	(-3.169)	(-3.947)	(-3.4007)	(-3.464)	(-6.510)	(-6.643)	(-6.355)	(-6.597)
Employee Growth	0.086**	0.095**	0.293***	0.391***	0.037	0.038	0.127**	0.120*	-0.030***	-0.030***	-0.030***	-0.030***
	(2.018)	(2.237)	(3.108)	(3.809)	(0.914)	(0.966)	(1.978)	(1.864)	(-5.000)	(-4.945)	(-5.016)	(-4.936)
TSMC Alliance	-3.274	-0.299	-1.363	11.976*	20.428*	4.133	14.943***	7.013				
	(-0.739)	(-0.114)	(-0.766)	(1.927)	(1.855)	(0.580)	(2.958)	(0.482)				
UMC Alliance	5.346	-2.249	-0.914	3.267	-8.564	-9.796	-11.355*	-12.233	1.028	-6.327	-1.827	-15.567
	(0.952)	(-0.764)	(-0.458)	(0.393)	(-0.761)	(-1.249)	(-1.861)	(-0.969)	(0.144)	(-1.642)	(-0.837)	(-1.271)
Employee Seniority	0.005			-1.280	-1.288			-0.090				
X TSMC Alliance	(0.007)			(-1.571)	(-0.695)			(-0.045)				
Employee Seniority	-1.133			-0.845	-0.162			0.014	-0.442			1.251
X UMC Alliance	(-1.094)			(-0.795)	(-0.122)			(0.010)	(-0.281)			(0.698)
Employee Turnover		-0.259		-0.502**		0.548*		0.492				

X TSMC Alliance		(-1.449)		(-2.575)		(1.867)		(1.566)				
Employee Turnover		0.170		0.076		0.198		0.285		0.352		0.469*
X UMC Alliance		(0.837)		(0.337)		(0.539)		(0.710)		(1.524)		(1.828)
Employee Growth			-0.258***	-0.368***			-0.144*	-0.136*				
X TSMC Alliance			(-2.618)	(-3.394)			(-1.813)	(-1.703)				
Employee Growth			0.041	-0.023			0.035	0.094			0.153	0.259
X UMC Alliance			(0.383)	(-0.186)			(0.271)	(0.527)			(0.833)	(1.290)
Control Variable	Yes	Yes	Yes	Yes	Yes							
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes							
Constant	35.083**	29.277*	29.235*	18.327	4.402	8.724	4.317	7.536	37.707***	35.275***	38.533***	35.770***
	(2.285)	(1.800)	(1.913)	(1.122)	(0.167)	(0.333)	(0.165)	(0.285)	(2.968)	(2.771)	(3.027)	(2.798)
Observations	379	379	379	379	260	260	260	260	256	256	256	256
Adj. R^2	0.190	0.193	0.205	0.215	0.238	0.251	0.247	0.248	0.377	0.383	0.379	0.382

Employee loyalty variables X TSMC and UMC Alliance represent the interaction term of two variables. Employee loyalty variables include Employee Seniority, Employee Turnover and Employee Growth.

Table 7: Significance of Interaction Coefficients between Employee Loyalty and Business Alliances with Profit

Dependent Variable: Profit												
	Upstream			Midstream				Downstream				
Independent Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Employee Seniority	-2.760***	-2.332***	-1.736**	-1.634	0.274	-1.692	-0.472	0.284	-0.575	-0.815	-0.608	-0.757
	(-2.790)	(-2.731)	(-2.031)	(-1.554)	(0.148)	(-1.213)	(-0.326)	(0.154)	(-0.811)	(-1.146)	(-0.855)	(-1.044)
Employee Age	2.278***	1.920***	2.061***	1.925***	-2.160**	-2.161**	-2.025**	-2.482***	-1.732***	-1.614**	-1.761***	-1.633***
	(3.373)	(2.794)	(3.134)	(2.812)	(-2.244)	(-2.293)	(-2.165)	(-2.620)	(-3.774)	(-3.467)	(-3.816)	(-3.489)
Employee Turnover	-0.484***	-0.824***	-0.417***	-0.566***	-0.890***	-1.343***	-0.898***	-1.199***	-0.742***	-0.807***	-0.736***	-0.800***
	(-3.166)	(-3.345)	(-2.770)	(-2.149)	(-4.938)	(-6.678)	(-5.306)	(-5.702)	(-6.728)	(-6.826)	(-6.616)	(-6.695)
Employee Growth	0.133*	0.119*	0.668***	0.642***	0.089*	0.088*	0.279***	0.274***	-0.020***	-0.020**	-0.020**	-0.020**
	(1.893)	(1.711)	(4.343)	(3.798)	(1.686)	(1.706)	(3.335)	(3.321)	(-2.518)	(-2.457)	(-2.527)	(-2.449)
TSMC Alliance	-1.125	-2.005	7.416**	6.148	19.617	3.325	19.608***	-5.319				
	(-0.154)	(-0.464)	(2.557)	(0.601)	(1.351)	(0.358)	(2.973)	(-0.286)				
UMC Alliance	3.642	0.393	5.233	3.639	4.811	-16.078	-10.181	-9.605	15.656	-0.502	5.719*	0.705
	(0.394)	(0.081)	(1.611)	(0.266)	(0.324)	(-1.575)	(-1.181)	(-0.595)	(1.299)	(-0.097)	(1.953)	(0.043)
Employee Seniority	0.779			-0.188	-0.435			2.440				
X TSMC Alliance	(0.634)			(-0.140)	(-0.178)			(0.943)				
Employee Seniority	0.030			-0.059	-1.898			-2.040	-1.749			-0.320

X UMC Alliance	(0.017)			(-0.030)	(-1.085)			(-1.166)	(-0.829)			(-0.133)
Employee Turnover		0.443		0.183		0.794**		0.754*				
X TSMC Alliance		(1.502)		(0.570)		(2.078)		(1.874)				
Employee Turnover		0.271		0.145		0.991**		1.323**		0.464		0.478
X UMC Alliance		(0.809)		(0.391)		(2.070)		(2.578)		(1.497)		(1.386)
Employee Growth			-0.631***	-0.608***			-0.304***	-0.295***				
X TSMC Alliance			(-3.926)	(-3.406)			(-2.939)	(-2.886)				
Employee Growth			-0.213	-0.197			0.016	0.157			0.088	0.142
X UMC Alliance			(-1.218)	(-0.962)			(0.078)	(0.691)			(0.335)	(0.525)
Control Variable	Yes	Yes	Yes	Yes	Yes							
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes							
Constant	-53.668**	-36.280*	-59.475**	-51.971*	67.470*	81.921**	69.061**	78.791**	67.845***	64.354***	67.946***	65.200***
	(-2.122)	(-1.357)	(-2.390)	(-1.933)	(1.938)	(2.405)	(2.028)	(2.327)	(3.991)	(3.773)	(3.978)	(3.795)
Observations	379	379	379	379	260	260	260	260	256	256	256	256
Adj. R^2	0.090	0.096	0.127	0.119	0.283	0.313	0.306	0.334	0.345	0.350	0.344	0.345

Employee loyalty variables X TSMC and UMC Alliance represent the interaction term of two variables. Employee loyalty variables include Employee Seniority, Employee Turnover and Employee Growth.

5. Discussion and Conclusion

With the occurrence of the COVID-19 pandemic and the US-China trade war, Taiwan's semiconductor industry has occupied a crucial position in the global semiconductor supply chain. Therefore, this study compiles data on Taiwan's semiconductor industry from 2005 to 2020. The research aims to understand the relationship between employee loyalty and business performance in Taiwan's semiconductor industry. Given the significant role of TSMC in the global semiconductor supply chain, especially under geopolitical and economic dynamics like the US-China trade war, the study extends to discuss whether there is a moderating effect on the relationship between employee loyalty and business performance in companies that have business dealings with TSMC or have a parent-subsidiary relationship with TSMC. The study also includes UMC Alliance and UMC parent-subsidiary companies for comparison. In other words, in the first stage of the regression model, we found that the relationship between employee loyalty and corporation performance is as follows: the greater the Employee Seniority in upstream companies, the worse the business performance; the higher the Employee Turnover in the semiconductor industry, the worse the business performance; the greater the Employee Growth in upstream and midstream companies, the better the business performance; while in downstream companies, the greater the Employee Growth, the worse the business performance. Overall, low employee seniority, low employee turnover rate, and high employee growth rate may lead to the best business performance. This indicates that Taiwan's semiconductor industry needs to retain and attract more talented employees, highlighting its competitive nature.

Utilizing a two-stage regression model, the first stage uses ROA, ROE, and Profit as dependent variables to represent business performance, and Employee Seniority, Employee Turnover, Employee Growth, and Employee Resign as key independent variables to represent employee loyalty. Additionally, TSMC Alliance, TSMC Subsidiary, UMC Alliance, and UMC Subsidiary are included as secondary independent variables, along with other control variables such as Total Compensation, Asset, Capital Rate, and year effects. The data is analyzed both in aggregate and segmented by upstream, midstream, and downstream companies. Past literature points out the relationship between employee job satisfaction and job performance (Harter et al., 2002; Judge et al., 2001). In the high-tech industry, Collins and Smith (2006) found a positive relationship between company atmosphere and revenue from new products and company sales. Yang et al. (2021) however point out that the positive relationship between job satisfaction and performance exists in traditional but not

high-tech industries. Our findings indicate that, overall, there is a negative relationship between employee loyalty and business performance, although the results vary slightly across different positions in the industrial chain. The results for upstream and midstream companies are relatively consistent, with Employee Growth showing the most significant effect. Specifically, Employee Growth has a positive relationship with business performance in upstream and midstream companies, but a negative relationship in downstream companies. Employee Resign has the least impact on business performance variables among the employee loyalty measures and is almost insignificant. Therefore, in the second stage, the analysis focuses only on the interaction effects between Employee Seniority, Employee Turnover, Employee Growth, and Alliance effects.

In the second stage, this study includes interaction terms between TSMC Alliance and UMC Alliance with the employee loyalty variables as the main independent variables to explore the moderating role of business alliances. The findings indicate that the TSMC Alliance has a more significant moderating effect than the UMC Alliance. Specifically, for upstream companies with a business alliance with TSMC, the impact of employee growth rate on performance is significantly reduced. For midstream companies with business dealings with TSMC, both employee turnover and employee growth rates have a significantly reduced impact on performance. In downstream companies with business relations with UMC, the negative effect of employee turnover on performance is diminished.

Overall, the impact of employee loyalty on business performance is generally reduced due to the effects of business alliances. This suggests that when companies engage in business with large conglomerates, their business performance is likely to be more stable and less influenced by employee turnover or growth, which aligns with the initial hypothesis of this study.

The following key findings can be summarized from the above results. First, there is generally a negative relationship between employee loyalty variables and business performance, with the exception that employee growth rate has a positive relationship in upstream and midstream companies. This indicates the competitive nature of Taiwan's semiconductor industry in attracting talented individuals. Second, the relationship between employee loyalty and business performance varies slightly depending on the position in the industry chain, with upstream and midstream companies showing more similarity. Third, TSMC Alliance has a more pronounced moderating effect on the relationship between employee loyalty and business

performance compared to UMC Alliance. In other words, the relationship between employee loyalty and business performance is reduced in companies that have business dealings with TSMC, possibly due to the stabilization of business performance resulting from the association with a large conglomerate.

Since the data period in this study only extends to 2020, and in recent years, the prominence and influence of Taiwan's semiconductor industry have continued to rise, it is noteworthy that TSMC's stock price surpassed NT$1,000 in July 2024, a historical first. Therefore, extending the data period to more recent years could potentially reveal even more significant effects. Additionally, this paper provides an analysis of the relationship between employee loyalty and business performance in Taiwan's semiconductor industry, highlighting the moderating effect of business dealings with TSMC, which seems to reduce this relationship. This suggests that collaboration with large conglomerates may help stabilize a company's business performance, aligning with intuitive expectations.

In summary, companies must continue to invest significantly in retaining talented employees, whether through competitive salaries, employee benefits, retirement plans, or other means, to demonstrate their commitment to their workforce. Retaining existing talented employees and attracting new, potential talents are essential skills for businesses. Focusing on market trends and collaborating with major corporations can create a virtuous cycle, helping Taiwan's industries to achieve sustained success and better face future challenges.

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