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Does High-Speed Railway Affect the Cost Behavior of Tourism Firms? Evidence From China

Abstract: Cost stickiness, which is also termed cost asymmetry, describes the asymmetric relationship between revenue and cost. In this paper, we examine whether the High-Speed Railway (HSR) connection affects the cost stickiness of tourism firms. Employing a sample of 324 Chinese tourism firms from 2003 to 2018 and applying a Difference-in-Difference (DID) method, we find that the cost stickiness of tourism firms increases after the HSR connection. Our results also reveal that the relationship between HSR connection and cost stickiness is more pronounced in firms with more free cash flow (FCF), higher labor cost, and in State-Owned Enterprises (SOEs). Our research advances an in-depth understanding of the cost behavior in tourism firms and sheds light on the policy effect of HSR connection.

Keywords: High-Speed Railway; Cost asymmetry; Cost stickiness; Difference-in-Difference

1 Introduction

High-Speed Railway (HSR) has been developing rapidly in China. By February 2020, China has 35,388km HSR in operation which accounts for about two thirds of high-speed track worldwide. It has been evidenced that the operation of HSR has a significant impact on tourism development (Albalate et al., 2017; Chen and Haynes, 2012; Gao et al., 2019). Existing literature finds that the opening of HSR provides a positive shock to tourism firm value because of the enhanced tourist mobility (Zhang et al., 2020a), and firms from communication-intensive and travel-dependent industries benefit more in terms of productivity, profitability, and growth through the reduction of communication costs after HSR connection (Kuang et al., 2021). It is obvious that firm value and firm profitability are fundamentally determined by revenue and cost, so focusing only on the revenue of tourism firms fails to explain where the change in profitability derives from. Although the relationship between the HSR connection and tourism firms' value, firms' revenue and firms' profitability has been examined in existing studies (Albalate et al., 2017; Gao et al.,2019; Kuang et al., 2021; Zhang et al., 2020a), limited research has focused on the cost and cost behavior of tourism firms. According to the cost management literature, cost stickiness, which is also termed cost asymmetry, plays an important role in earnings prediction and earnings quality of firms (Banker et al., 2013; Banker and Byzalov, 2014). In this context, we explore the association between HSR connection and cost stickiness to open the black box of tourism firms' cost management activities.

Cost stickiness describes the asymmetric relationship between revenue and cost, and arises when the amount of increased costs with the increased sales is higher than that of decreased costs with the declined sales changing in the same proportion (Anderson et al., 2003). Prior

literature shows that as managers believe that the decrease in sales is just temporary, they are reluctant to trim the redundant resources when faced with sales reduction (Anderson et al., 2003; Chen et al., 2019). Consequently, the costs would not change in the same proportion as when sales increase, which forms cost stickiness (Anderson et al., 2003). Cost stickiness has significant implications. Previous literature indicates that efficient cost management contributes to more accurate earnings prediction (Banker and Chen,2006; Weiss, 2010) and higher future earnings of firms (Anderson et al., 2007), while deficiencies in resources adjustment decisions may induce high operating risk (Holzhacker et al., 2015) and ultimately damage firm value (Baños-Caballero et al., 2014; Dhole et al., 2019).

Existing literature shows that the selling, general, and administrative (SG&A) cost ratio (calculated as the ratio of SG&A costs to the total assets) reflects the operating efficiency of firms and the capacity of managers to control costs (Anderson et al., 2007; Chen et al., 2012). In our sample, the SG&A cost ratio of tourism firms is 19.3%, which is much higher than that in other industries (see table I in the appendix). Considering the high proportion of the SG&A cost ratio and the materiality level of SG&A costs in the tourism industry, it is vital for both researchers and practitioners to understand how managers in tourism firms make deliberate decisions to adjust resources and control the SG&A spending. However, there is limited literature on cost behavior in the tourism industry. Our research fills this gap and provides important empirical evidence on how tourism firms make cost adjustment decisions.

Generally, the cost adjustment decision is made by the top management team, so managers are crucial in the process of cost adjustments (Anderson et al., 2003; Banker et al., 2013). Previous literature has documented that managers are mostly empire builders who increase the

firm size in excess of the optimal size to satisfy their own ambitions (Hope and Thomas, 2008; Jensen, 1986), and those managers with empire building incentives would retain more resources when sales decrease (Chen et al., 2012). However, there is limited research focusing on managerial empire building in the tourism industry. Given the dramatic impact of managerial empire building behavior on corporate governance efficiency, our study explores managerial behavior in the tourism industry by examining the heterogeneous effect of HSR connection on cost stickiness under different levels of empire building incentives.

In addition to the managerial empire building incentives, cost structure also has a significant influence on the cost adjustment decisions (Anderson et al., 2003; Balakrishnan and Gruca, 2008). Tourism is a labor-intensive and asset-light industry (Sohn et al., 2013), and labor costs constitute a significant proportion of the total costs. Therefore, the complexity levels of cost adjustments in tourism industry could be distinctive. In the existing tourism literature, it remains unexplored how tourism managers adjust costs under different complexity levels of resource adjustments after the introduction of HSR. We use the unit labor cost as the complexity level of cost adjustments to analyze the heterogeneous effect of HSR connection on cost stickiness. Addressing this issue can advance the understanding of how tourism managers allocate resources in different complexity levels of cost adjustment decisions.

Exploiting the Difference-in-Difference (DID) method, we find that the cost stickiness of Chinese tourism listed firms increases after the introduction of HSR. Moreover, the association between HSR connection and cost stickiness is more pronounced in firms with more free cash flow (FCF) and higher unit labor cost, which provides important evidence of the heterogeneous effect of empire building incentives and unit labor cost. Our additional analysis also indicates

such impact is more significant in State-Owned Enterprises (SOEs).

Our paper has theoretical and practical implications to understand tourism industry and cost behavior of tourism firms. First, to the best of our knowledge, it is the first study to investigate how the HSR connection affects the asymmetric cost behavior of tourism firms. Prior literature mostly investigates the impact of the HSR connection on firm value and firm profitability in the tourism industry (Kuang et al., 2021; Zhang et al., 2020a), but little attention has been paid to the link between the opening of HSR and corporate cost behavior. Our study bridges the tourism literature with the cost management literature, which advances the understanding of tourism firms' cost behavior with the influence of HSR.

Second, different from previous tourism literature that examines the agency problem by investigating the role of ownership structure (Al-Najjar, 2015; Yeh, 2019), board characteristics (Al-Najjar, 2014), and managerial compensation structure (Kim and Gu, 2005), this paper analyzes the managerial empire building incentives from the perspective of cost behavior, which complements the tourism literature and widens the angle of studies on the agency problems of tourism firms. We find that the opening of HSR triggers managerial empire building incentives, which also has practical implications for shareholders to take proactive actions to prohibit managers from conducting opportunistic activities before the efficiency of the business falls.

Third, our study extends the tourism literature by studying the labor cost stickiness of tourism firms. Previous literature employs the listed firms from different industries as their sample to study labor cost stickiness (Gu et al., 2020; Prabowo et al., 2018), however, the extent of labor cost stickiness varies with industries. Our paper focuses on the tourism industry in

which labor costs account for a significant proportion of the total costs. We find that tourism firms are more likely to retain human resources when sales shrink after the HSR introduction, which sheds light on the employment and macroeconomy in the cities with and without HSR connection.

The rest of the paper is organized as follows. Section 2 reviews extant literature and develops hypotheses regarding the influence of HSR connection on corporate cost stickiness; Section 3 presents the research methodology; Section 4 presents the research findings, and Section 5 concludes with a discussion of our results and the implications and contributions.

2 Literature review and hypotheses development

2.1 HSR connection and the development of the tourism industry

The literature on the consequences of HSR connection falls at two levels: the regional level (Chen and Haynes, 2012; Gao et al., 2019; Masson and Petiot, 2009) and the firm level (Kuang et al., 2021; Zhang et al., 2020a; Zhang et al., 2020b).

At the regional level, vast literature explores the influence of HSR connection on the regional tourism economy, however, the conclusions are inclusive. For example, Chen and Haynes (2012) find that HSR boosts foreign arrivals and overseas tourism revenues in China by using the provincial level data from 1999 to 2010. Masson and Petiot (2009) conclude that tourism activities are reinforced after HSR connection owing to the main impact of agglomeration. Nevertheless, the negative relationship between HSR connection and tourism growth is also found in the previous literature (Albalate and Fageda, 2016; Albalate et al., 2017). The studies attributed the negative impact of HSR connection on the tourism development to

the substitution impact of peripheral hospitality (Gao et al., 2019) and the reduction of airline services (Dobruszkes and Mondou, 2013).

The introduction of HSR also affects firms' behavior profoundly. Prior literature shows that HSR connection promotes tourism firm value through the enhanced tourist mobility (Zhang et al., 2020a). Kuang et al. (2021) find that firms from communication-intensive and travel-dependent industries obtain more profitability and growth after the opening of HSR. Zhang et al. (2020b) argue that HSR connection accelerates the flow of innovation factors among different regions and induces the spillover effect of technology innovation, thus promoting firm innovation. Moreover, the analysts' earnings forecasts are more accurate after the HSR connection through the increased analysts' visit to the firms (Kong et al., 2020).

Although previous literature examines the impact of HSR connection on the regional development in the tourism industry and firms' behavior, the reason for the mixed effect of HSR connection remains a myth. Firms' cost behavior is an important determinant factor of corporate profitability, so the association between HSR connection and cost behavior of tourism firms would provide great significance for an in-depth understanding of the HSR effects.

2.2 The determinants of cost stickiness

According to Anderson et al. (2003), costs are sticky when they respond more to business activity augments than to contemporaneous activity reductions. The level of cost stickiness is determined by three factors: managerial empire building incentives, adjustment costs, and managerial expectation (Anderson et al., 2003; Banker et al., 2020; Chen et al., 2012).

Managerial empire building incentives point to managers intentionally expanding firm size beyond the optimal level to maximize their personal interests. Managers with empire building

incentives have more probability to increase excessive resources when activities rise and are less likely to cut unused resources when activities decline. Prior literature uses FCF to measure the magnitude of managers' overspending and finds that the empire building incentives positively affect cost stickiness (Chen et al., 2012). Another study by Cannon et al. (2020), documents that the level of cost stickiness is lower after the enforcement of international Mergers and Acquisitions laws, which means that good corporate governance will reduce the level of cost stickiness through curbing opportunistic managerial behavior.

Adjustment costs are defined as the costs incurred when managers increase the firm's scale or cut down the firm's resources (Anderson et al., 2003; Banker and Byzalov, 2014). They usually include the redundancy pay, recruitment costs in the hiring process, organization costs such as the loss of morale among remaining employees, and the erosion of human capital during termination (Anderson et al., 2003). When the resource adjustment is related to human resources, adjustment costs refer particularly to the layoff costs and recruitment costs (Banker et al., 2013). Generally, when the adjustment costs of cutting resources are higher, managers tend to remain redundant resources with sales reduction and augment the required resources with an increase in sales (Anderson et al., 2003). Therefore, cost stickiness will increase with the level of upward adjustment costs.

Managerial expectation is another determinant of cost stickiness. When managers are optimistic about future demand, they are more likely to retain unused resources during sales decrease as they believe that sales reduction is just temporary (Anderson et al., 2003). Accordingly, they will utilize these resources after the demand recovers, which can increase the firm's cost stickiness. On the contrary, the pessimistic managers would decrease unused

resources (Banker et al., 2020).

2.3 Hypotheses development

The impact of HSR connection on cost stickiness can be analyzed from two aspects. First, the opening of HSR affects the level of cost stickiness through triggering managers' empire building incentives. Specifically, as the HSR connection escalates the tourist arrivals and tourism revenues (Albalate and Fageda, 2016; Chen and Haynes, 2012), managers have incentives to expand the business and hire more employees to accommodate the increasing demands. The process of enlarging firm size provides opportunities for managers to conduct empire building behaviors (Hope and Thomas, 2008; Masulis et al., 2007), such as investing resources more rapidly when sales rise, but retaining slack resources when sales decline. Consequently, the selling, general, and administrative (SG&A) expenditure would increase with the surge of sales. However, owing to the empire building incentives, managers would not cut resources when sales decline, which induces a higher level of cost stickiness.

Second, HSR connection influences the cost stickiness of tourism firms by affecting the adjustment costs. According to previous studies, the opening of HSR augments the level of labor costs of firms by improving the regional labor productivity rate (Arbués et al., 2015; Deng, 2013), decreasing the labor supply (Dalenberg and Partridge, 1997; Lin, 2017), and promoting population mobility (Ortega and Verdugo, 2014). As a result, both the recruitment costs and redundant costs of firms would increase. When sales shrink, managers tend to retain unutilized employees rather than dismissing them, because the layoff costs are high (Anderson et al., 2003). When sales increase, although recruitment costs increase, managers will still revive more committed resources such as recruiting more employees, because managers consider that the

benefits of adding resources outweigh the adjustment costs incurred by increasing resources after the HSR connection (Banker et al., 2013). Consequently, the costs of tourism firms would increase more when the activity rises than they would decrease when the activity falls by an equivalent amount, leading to a greater extent of cost asymmetry.

H1: The cost stickiness of the tourism firms would increase after the opening of HSR.

According to the economic theory of cost behavior, the most crucial conceptual underpinning of cost management research is that costs result from managers' resource commitment decisions, which are dedicated by various constraints, incentives and behavioral biases (Banker et al., 2018; Cooper and Kaplan,1992). Therefore, existing literature integrates the determinants of cost stickiness and boils them down to three aspects: managerial empire building incentives, adjustment costs and optimistic expectations (Anderson et al., 2003; Banker et al., 2020; Chen et al., 2012). In the first hypothesis, we propose that the HSR connection affects cost stickiness through managerial empire building incentives and adjustment costs. In order to verify the mechanism of the empire building incentives and adjustment costs, we explore the moderating impact of empire building incentives and adjustment costs on the relationship between HSR connection and cost stickiness of tourism firms in the next two hypotheses.

Firstly, we examine the impact of empire building incentives on the relationship between HSR connection and cost stickiness. Free cash flow (FCF), which is defined as net cash flow from operating activities excluding cash outflows supporting regular operations and maintaining capital assets, has been proved as a good proxy for empire building incentives (Chen et al., 2012). Prior literature shows that firms with an abnormal level of FCF are related

to more over-investment activities (Jensen, 1986; Richardson, 2006). For instance, when the level of FCF is high, managers are strongly motivated to over-invest in projects with negative net present value (Chen et al., 2012). Specifically, they would choose to add more resources when sales rise, while delaying cost cutting when sales decline. As a result, the costs of tourism firms are stickier. After the introduction of HSR, managers in firms with more FCF tend to engage in empire building activities aimed at increasing their personal utility and perquisites consumption (Hope and Thomas, 2008; Stulz, 1990). Therefore, the impact of HSR connection on cost stickiness would be amplified in firms with a higher level of FCF.

H2: The relationship between HSR connection *and cost stickiness is more pronounced for tourism firms with more FCF.*

Secondly, we intend to examine the moderating effect of the adjustment costs. Labor costs constitute a large proportion of SG&A costs as tourism is a labor-intensive industry. The unit labor cost reflects the difficulty of adjusting the labor resources of the tourism industry, and a higher unit labor cost represents a higher adjustment cost (Dierynck et al., 2012). Existing literature demonstrates that compared with firms whose unit labor cost is lower, firms with higher unit labor cost would pay higher redundancy fees and have higher opportunity cost of recruiting new employees (Anderson et al., 2003). After the opening of HSR, firms are prone to retain employees during the periods of sales declining, with the consideration of the high adjustment costs of labor resources. Therefore, we conjecture that tourism firms with higher unit labor cost would have a stronger influence on cost stickiness after the HSR connection.

H3: The relationship between HSR connection and cost stickiness is more pronounced for tourism firms with higher unit labor cost.

3 Methodology

3.1 Data

The sample of our paper consists of local listed tourism firms in China from 2003 to 2018. The local listed tourism firms refer to the listed tourism firms that operate over 80% of their business locally. Tourism firms that have branches all over the country are excluded from our sample. We retain only local tourism firms to precisely capture the net effect of the HSR connection on the tourism firms. If the whole sample included the non-local firms, the impact of HSR connection on cost stickiness would be calculated repeatedly due to the different locations of the non-local samples. We choose tourism firms according to the industrial classification standard used by the Wind database, which includes hotel, chain catering, travel agency, travel services, scenic spots, sports tourist industry, and theme park firms. Cost management data is collected from the China Stock Market and Accounting Research (CSMAR) database and the Wind database. We collect the HSR data from the Chinese Research Data Services (CNRDS) database and then manually check the data with the National Railway Administration of the People's Republic of China.

Table 1 presents the process of sample selection. After deleting some missing data on total SG&A expenses, sales revenue, other main variables, and observations for which leverage are greater than 1, we get a final sample which contains 324 firm-year observations for 48 tourism firms. Panel A and panel B of table 2 present the distribution of firms by subdivision of the tourism industry and by the HSR opening year, respectively. Most firms are from the scenic spots industry and chain catering industry, and most cities where those firms are located were connected by HSR from 2015 to 2018. By the end of 2018, 38 firms were located in HSR-

connected cities, and 10 firms were located in cities not linked by HSR.

[Insert Table 1 and 2 Here]

3.2 Empirical models

We established the logarithmic model to measure cost stickiness (Anderson et al., 2003; Banker et al., 2013)

$$\Delta SG\&A_{i,t} = \beta_0 + \beta_1 \Delta Revenue_{i,t} + \beta_2 \times Dummy_{i,t} \times \Delta Revenue_{i,t} + u_{i,t} \quad (1)$$

Where *SG&A* represents selling, general, and administrative expenses. *Dummy* is an indicator variable, which coded one when sales revenue decreases from period t-1 to t, and zero otherwise. Δ*SG&A* and Δ*Revenue* represent the logarithmic change of SG&A expenses and sales revenue from year t-1 to t, respectively. The coefficient β_1 measures the change in SG&A costs with a 1% change in sales revenue when sales have increased, and coefficient $\beta_1 + \beta_2$ captures such change when sales revenue has declined. If SG&A cost stickiness exists, the coefficient β_2 would be negative, indicating that when sales change equally, the amount of increased SG&A costs during the period of sales increase is larger than that of the decreased SG&A costs during the period of sales reduction. Therefore, the degree of cost stickiness could be represented by the coefficient β_2.

We employ equation (2) and equation (3) to study the influence of HSR connection on cost stickiness (Banker et al., 2013; Gao et al., 2019). First, we include the variables expected to affect how SG&A costs change with the increase of sales on the right side of the equation, and the coefficient β_1 on the left side, as in equation (2). Then we introduce equation (3) to capture the determinants that influence the change of SG&A costs when sales decline. These

determinants include both HSR connection and other control variables that may affect the asymmetric cost behavior of tourism firms.

$$\beta_1 = \lambda_0 + \lambda_1 \times HSR_{i,t} + \lambda_2 \times Growth_{i,t} + \lambda_3 \times EI_{i,t} + \lambda_4 \times AI_{i,t} + \mu_{i,t} \quad (2)$$

$$\beta_2 = \gamma_0 + \gamma_1 \times HSR_{i,t} + \gamma_2 \times SUC_{i,t} + \gamma_3 \times Growth_{i,t} + \gamma_4 \times EI_{i,t} + \gamma_5 \times AI_{i,t} + v_{i,t} \quad (3)$$

$HSR_{i,t}$ is our key independent variable. It is coded one if the office location of the firm i in year t is connected by HSR, and zero otherwise. Moreover, since many of the HSR lines in the sample were opened in December and considering the lagging effect of HSR connection, we lag the HSR variable of those lines by one year (Albalate et al., 2017; Gao et al., 2019). The dummy variable *SUC* equals 1 when the sales revenue of the tourism firms declined in two successive periods, and zero otherwise. *Growth* represents the growth rate of Gross Domestic Product (GDP) during year t. We also include *AI* and *EI* in equation (2) and equation (3) to control the influence of adjustment costs. *AI* is the logarithm of asset intensity (the ratio of total assets to sales revenue), and *EI* is measured as the logarithm of employee intensity (the ratio of the number of employees to sales revenue). By substituting equation (2) and equation (3) into equation (1), we can establish our main model as follows:

$$\begin{aligned}\Delta SG\&A_{i,t} = {} & \beta_0 + \beta_1 \Delta Revenue_{i,t} + \beta_2 \times Dummy_{i,t} \times \Delta Revenue_{i,t} \\ & + \beta_3 \times Dummy_{i,t} \times \Delta Revenue_{i,t} \times HSR_{i,t} + \beta_4 \times Dummy_{i,t} \times \Delta Revenue_{i,t} \times SUC_{i,t} \\ & + \beta_5 \times Dummy_{i,t} \times \Delta Revenue_{i,t} \times Growth_{i,t} + \beta_6 \times Dummy_{i,t} \times \Delta Revenue_{i,t} \times EI_{i,t} \\ & + \beta_7 \times Dummy_{i,t} \times \Delta Revenue_{i,t} \times AI_{i,t} + \beta_8 \times \Delta Revenue_{i,t} \times HSR_{i,t} \\ & + \beta_9 \times \Delta Revenue_{i,t} \times Growth_{i,t} + \beta_{10} \times \Delta Revenue_{i,t} \times EI_{i,t} \\ & + \beta_{11} \times \Delta Revenue_{i,t} \times AI_{i,t} + \sum v_i + \sum u_t + \varepsilon_{i,t}\end{aligned} \quad (4)$$

As the opening time of HSR varies across cities, we employ a staggered DID method to discuss the causal effect of HSR connection on cost stickiness of tourism firms in the model (4). The treatment group refers to those firms whose cities became connected by HSR between 2003

and 2018, and the control group comprises those firms which are located in non-HSR-connected cities. v_i represents the firm fixed effect, which fully controls the fixed differences between firms in treatment groups and control groups. u_t is the year fixed effect, which controls the fixed differences of treatment (control) groups before HSR opening years and after HSR opening years. The coefficient β_3 captures the net effect of HSR connection on the cost stickiness of tourism firms, and the standard errors are clustered at the firm level to alleviate the bias caused by the serial correlation (Petersen, 2009).

3.3 Descriptive statistics

Table 3 shows the detailed definitions of all the variables in this paper. The summary statistics of the main variables of our models are represented in table 4. In order to alleviate the effect of outliers, we winsorized all the continuous variables at the 1st and 99th percentiles. As shown in Table 4, the mean of $\Delta Revenue$ and $\Delta SG\&A$ is 11% and 10%, respectively, indicating that both the sales revenue and SG&A costs keep the increasing trend. Combining with the summary statistics of *SUC*, we can infer that about 12% of observations experience revenue decline for two consecutive years. Besides, the average labor wage per employee is 70,660 RMB per year. On average, approximately 69% of the sample are SOEs.

[Insert Table 3 and 4 Here]

4 Results

4.1 Hypotheses testing

The result for H1 is shown in table 5. In column (1), the significantly positive coefficient of $\Delta Revenue$ (0.481) means that the SG&A costs increase by 0.481% with sales increasing by

1%. The coefficient of the interaction term Δ*Revenue* × *Dummy* is -0.297 and significant, which means that the SG&A costs decrease by 0.184% (0.481-0.297) when sales revenue decreases by 1%. The result indicates that when sales change equally, the amount of increased SG&A costs during the period of sales increasing is higher than that of decreased SG&A costs during the period of sales decreasing, confirming the existence of SG&A cost stickiness in tourism firms. Similarly, the coefficient of the interaction term Δ*Revenue* × *Dummy* × *HSR* in column (2) is significantly negative, demonstrating that SG&A cost stickiness of tourism firms increases after the opening of HSR. Thus, H1 is supported.

We do not focus on the interaction term Δ*Revenue* × *Dummy* in column (2) because it could not reflect the original level of cost stickiness in the tourism industry, as shown in equation (2). If we want to calculate the level of cost stickiness, we need to consider the joint effect of other control variables.

[Insert Table 5 Here]

To test H2, we divide the data into two groups according to the median of FCF by year. *FCF_high* (*FCF_low*) is a dummy variable coded one if the FCF of the firm is above (below) the median values in that year, and zero otherwise. Results are shown in Column (1) and column (2) of Table 6, respectively. The coefficient of the interaction term Δ*Revenue* × *Dummy* × *HSR* is significantly negative in the *FCF_high* group, but insignificant in the *FCF_low* group. We can conclude that the positive effect of HSR connection on cost stickiness only holds in firms with more FCF, not in firms with less FCF. Therefore, H2 is supported.

To test H3, our sample is also split into two groups according to the median values of wage per employee in year. *Wage_high* (*Wage_low*) is the dummy variable coded one if the wage per

employee is above the median values of the sample in that year. Column (3) and column (4) of table 6 present the results. The significantly negative coefficient of $\Delta Revenue \times Dummy \times HSR$ only exists in the *Wage_high* group, not in the *Wage_low* group, indicating that the positive influence of HSR connection on cost stickiness holds in firms with a higher level of wage per employee. Thus, H3 is supported.

[Insert Table 6 Here]

4.2 Additional Analysis

4.2.1 Ownership property heterogeneity

After discussing the heterogeneous effect of HSR connection on tourism firms' cost stickiness in terms of different levels of FCF and labor costs, we further explore the moderating role of the firms' ownership to understand the causal effect of HSR connection on the increased cost stickiness better. In China, SOEs need to fulfill some social tasks such as avoiding layoffs to retain the employment rate and maintain social stability (Gu et al., 2020; Lin et al., 1998). After the opening of HSR, in order to achieve political promotion and social goals, SOEs are more prone to retain redundant resources such as labor force with sales declining, inducing a higher level of cost stickiness.

To validate our speculation, our sample is divided into SOE groups and non-SOE groups according to whether the ultimate controller of the tourism firm is government or not. We run model (4) for SOE and Non-SOE tourism firms, respectively, and the results are shown in column (1) and column (2) of Table 7. The interaction term $\Delta Revenue \times Dummy \times HSR$ is significantly negative in the SOE tourism firms, but insignificant in the group of private-owned tourism enterprises. The result shows that compared with non-SOE tourism firms, the extent of

cost asymmetry is greater in SOE tourism firms after the HSR connection

[Insert Table 7 Here]

4.2.2 The opening of HSR and labor cost stickiness

As tourism is an employment intensive industry, labor costs comprise a significant portion of SG&A costs in tourism firms. If the impact of HSR connection on cost behavior exists, the adjustment of employees in tourism firms should also be influenced by HSR and the labor cost stickiness would change correspondingly. Following Gu et al. (2020), we use equation (5) to verify whether HSR connection has an impact on labor cost stickiness. Equation (5) is quite similar to equation (4), with only slight differences.

$$\begin{aligned}\Delta L\cos t_{i,t} / \Delta E\cos t_{i,t} = {} & \eta_0 + \eta_1 \Delta Revenue_{i,t} + \eta_2 \times Dummy_{i,t} \times \Delta Revenue_{i,t} \\ & + \eta_3 \times Dummy_{i,t} \times \Delta Revenue_{i,t} \times HSR_{i,t} + \eta_4 \times Dummy_{i,t} \times \Delta Revenue_{i,t} \times SUC_{i,t} \\ & + \eta_5 \times Dummy_{i,t} \times \Delta Revenue_{i,t} \times Growth_{i,t} + \eta_6 \times Dummy_{i,t} \times \Delta Revenue_{i,t} \times Unempr_{i,t} \\ & + \eta_7 \times Dummy_{i,t} \times \Delta Revenue_{i,t} \times AI_{i,t} + \eta_8 \times Dummy_{i,t} \times \Delta Revenue_{i,t} \times Newlaw_t \\ & + \eta_9 \times \Delta Revenue_{i,t} \times HSR_{i,t} + \eta_{10} \times \Delta Revenue_{i,t} \times Growth_{i,t} \\ & + \eta_{11} \times \Delta Revenue_{i,t} \times Unempr_{i,t} + \eta_{12} \times \Delta Revenue_{i,t} \times AI_{i,t} \\ & + \eta_{13} \times \Delta Revenue_{i,t} \times Newlaw_t + \sum v_i + \sum u_t + \varepsilon_{i,t}\end{aligned} \quad (5)$$

Two variables ($\Delta Lcost$ *and* $\Delta Ecost$) are used to measure the dependent variable (the change in labor costs) to improve the robustness of our results. $\Delta Lcost$ is calculated as the logarithmic change of labor costs (cash outflow item "cash paid to and for employees") in year t to that in year t-1. $\Delta Ecost$ is the logarithmic change of the employment costs ("cash paid to and for employees" minus the total compensation of all executives) during the period t minus the logarithmic change of that during the period t-1. *Unempr* is measured as the change of the registered urban unemployment rate in year t. *Newlaw* is an indicator variable coded one if the year is in or after 2008, and zero otherwise. We choose 2008 as the cut point because it is the

year of implementing employment protection legislation. The coefficient of η_3 is our primary focus, which is expected to be negative. Other specifications in equation (5) are the same as in equation (4).

Column (3) and Column (4) in Table 7 present the impact of HSR connection on labor cost stickiness. In both of these columns, the interaction term $\Delta Revenue \times Dummy \times HSR$ is significantly negative at 1% level, verifying that after the HSR connection, the change of labor cost is also asymmetrical, and the change of SG&A costs mostly derives from the change of labor costs.

4.2.3 The impact of HSR connection on firms' costs

The aforementioned analyses demonstrate that HSR connection indeed augments the level of cost stickiness of tourism firms. Previous literature has revealed that HSR connection would improve the regional tourism revenue (Chen and Haynes, 2012; Masson and Petiot, 2009). However, the influence of HSR connection on tourism firms' costs is unclear. Thus, we construct the model (6) to answer this question:

$$\begin{aligned} SG\&A\_Ratio_{i,t} = {} & \beta_0 + \beta_1 HSR_{i,t} + \beta_2 Lev_{i,t} + \beta_3 Age_{i,t} + \beta_4 Lns_{i,t} + \beta_5 Magshare_{i,t} \\ & + \beta_6 Duality_{i,t} + \beta_7 FCF_{i,t} + \sum v_i + \sum u_t + \sigma_{i,t} \end{aligned} \tag{6}$$

Where *SG&A_Ratio* is calculated as SG&A expenses divided by the total asset. Equation (6) controls various characteristics of firms, including leverage (*Lev*), firm age (*Age*), managerial ownership (*Magshare*), duality (*Duality*), and free cash flow (*FCF*). We also control *Lns* to control the impact of sales on the costs, and table 2 presents the definitions of these variables. The results in Table 8 indicate that after the debut of HSR, the SG&A cost ratio increases by 2.2% on average (the coefficient is 0.022, and the t value is 2.03).

[Insert Table 8 Here]

4.3 Robustness check

4.3.1 Placebo test

We conduct several placebo tests to alleviate the concern that the increased cost stickiness is as a result of other factors rather than HSR connection. Specifically, we construct a fake HSR connection by moving the first opening year of the HSR lines forward 1–3 years in our sample, and re-estimating the equation (4). The results are presented in Table 9, from which we can find the three-interaction term $\Delta Revenue \times Dummy \times HSR\ (t\text{-}1,\ t\text{-}2,\ t\text{-}3)$ is not significant in each column. The results indicate that the cost stickiness of tourism firms increases only after the year of HSR opening, verifying the robustness of our results.

[Insert Table 9 Here]

4.3.2 Common trend test

It is necessary to fulfill the common trend assumption before using the DID method, which can ensure the causality relationship between HSR connection and cost stickiness of the tourism firms. Specifically, the common trend assumption requires that the treatment group and the control group have the same trend before the event occurs. Following prior literature (Beck et al., 2010; Moser and Voena, 2012), we verify the common trend assumption by showing the significance of the coefficients of the HSR dummy variable in figure I. As shown, the coefficients of the HSR dummy variable on cost stickiness are insignificant for all six years before the HSR connection at the 10% level, which indicates that there is no significant difference in the degree of cost stickiness between treatment groups and control groups before the HSR connection, satisfying the parallel trend hypothesis. Besides, the impact of HSR on

cost stickiness is significant in the first, fourth, fifth, and seventh years after the opening of HSR, which demonstrates the dynamic effect of the HSR opening on cost stickiness.

[Insert Figure I Here]

4.3.3 Change the definition of the treatment group

As firms that are not located in HSR-connected cities but adjacent to HSR-connected cities would also be affected by the opening of HSR, we conduct the robust test by including the firms that are close to the HSR-connected cities as the treatment group. Specifically, if a firm is located in the city that is 50 or 150 kilometers away from the HSR-connected cities, it is included in the treatment group. Accordingly, the variable $HSR_{i,t}$ is coded one if the firm i is located in or adjacent to the HSR-connected city in year t, and zero otherwise.

Table 10 shows the results. The first column is based on the treatment firms that are 50 kilometers away from the HSR-connected cities, and the second column refers to the sample based on the treatment firms that are 150 kilometers away from the HSR connected cities. The coefficient of the interaction of $\Delta Revenue \times Dummy \times HSR$ is negative and significant in two columns, indicating the robustness of our results.

[Insert Table 10 Here]

4.3.4 Control the CEO-level and TMT-level variables

As the cost management decision is generally made by the top management team, managers play an important role in the process of cost adjustment activities (Anderson et al., 2003; Banker et al., 2013). We control the CEO-level and TMT-level characteristics in our model, and reexamine the impact of HSR connection on cost stickiness of tourism firms. Specifically, we control CEO gender, CEO age and CEO duality as the CEO-level variables,

and the number of TMT, the ratio of the number of female executives to the number of TMT as the TMT-level variables. *CEO_gender* is a dummy variable coded one when the CEO of the firm in year t is female, and zero otherwise. *CEO_age* is the age of the CEO, which is calculated as the logarithm of the 1 plus the age of the CEO. *Duality* is an indicator variable which is equal to one if the CEO and the board chair are the same person, and zero otherwise. *TMT_number* refers to the number of the top management team in year t, and *TMT_gender* is the number of female executives divided by the number of TMT.

We add the CEO-level and TMT-level control variables step by step, the regression results are shown in table 11. Column 1 controls the *CEO_gender* and *TMT_number,* column 2 controls *CEO_gender, CEO_age, TMT_number* and *TMT_gender.* Column 3 controls all the CEO level and TMT level variables. As demonstrated in table 11, the coefficient of the interaction term $\Delta Revenue \times Dummy \times HSR$ is significantly negative among the three columns. The result indicates that the positive association between HSR connection and cost stickiness still exists after controlling the CEO-level and TMT-level control variables.

[Insert Table 11 Here]

4.3.5 Strengthen the managerial empire building hypothesis

We propose that the HSR connection would influence cost stickiness by triggering managers' empire building incentives in the first hypothesis. The foundation of the managerial empire building incentives hypothesis is the separation of the ownership and management, only in this case would managers have incentives to expropriate shareholders' interest and engage in empire building behavior. As a result, we reexamined the distribution of the owner-managed and non-owner-managed firms in our sample, where the owner-managed firms are identified

according to whether the ultimate controller and the CEO of a firm are the same person (Lins et al.,2013). Table 12 shows the results of the sample distribution, we find that the number of owner-managed firms is 45, accounting for 13.89% of the total sample. The remaining 86.11% of companies are not owner-managed firms, which illustrates that most of the tourism firms in China are non-owner-managed. According to the regression result, we find that the significantly positive relationship between HSR connection and cost stickiness only exists in firms which have separated ownership and management, indicating the reliability of managerial empire building incentives in the tourism industry. Although the result in the owner-managed group is not significant, the baseline results (table 5) still exist as the possible mechanism of HSR connection affecting cost stickiness in the tourism industry includes both managerial empire building incentives and adjustment costs.

[Insert table 12 Here]

5 Conclusions and discussions

This study examines the impact of HSR connection on cost behavior of the tourism firms by using the DID method. The whole sample contains Chinese listed firms in the tourism industry from 2003 to 2018. Our results show that both cost and the cost stickiness of tourism firms increases after the introduction of HSR, indicating that HSR has a dark side. The relationship between HSR connection and the degree of cost asymmetry of tourism firms is more pronounced in firms whose FCF and unit labor cost are higher. Moreover, we compare the ownership heterogenous effect of HSR connection on cost stickiness and our results suggest that the influence is more significant in SOEs. We further investigate the relationship between HSR connection and labor cost adjustment decisions, and evidence that the degree of labor cost

stickiness in tourism firms is higher after the introduction of HSR. By conducting the placebo test and a common trend test as a robustness check, we confirm the validity of the DID method.

5.1 Theoretical implications

Taken together, these results contribute to an in-depth understanding of cost behavior in tourism. First, different from prior literature that mostly explores the relationship between the opening of HSR and tourism growth (Albalate and Fageda, 2016; Gao et al., 2019), this study complements the tourism research through examining the impact of HSR connection on cost stickiness of tourism firms, which advances the understanding of corporate cost management and operating efficiency of firms in tourism industry after the opening of HSR, and further reflects the managerial resource adjustment decisions based on tourism firms' future development.

Second, our paper extends the tourism literature through analyzing the tourism firms' agency problems from the perspective of cost stickiness. Most of the prior literature analyzes the agency problem in the tourism sector through the examination of the role of ownership structure (Al-Najjar, 2015; Yeh, 2019), board characteristics (Al-Najjar, 2014; Ooi et al., 2015; Song et al., 2021; Yeh, 2018), CEO characteristics (Trinh and Seetaram, 2022) and managerial compensation structure (Kim and Gu, 2005). However, scant tourism literature examines the agency problem from the perspective of firms' cost behavior. Our research explores the moderating impact of managerial empire building incentives on the association between HSR connection and cost stickiness of tourism firms, which widens the angle of studies on the agency problems of tourism firms.

Third, we advance the understanding of labor cost adjustment decisions in tourism firms

by studying the labor cost stickiness. Prior literature demonstrates the existence of labor cost stickiness and their sample are composed of the listed firms (Gu et al., 2020; Prabowo et al., 2018), but these studies overlook the industry differences. Our results focus on the tourism industry in which labor costs account for a significant proportion of the total costs. We find that the labor cost stickiness of tourism firms increases after HSR connection, indicating that the firms are more prone to retaining more human resources when sales shrink after HSR connection in tourism industry.

5.2 Practical implications

This study also has important practical implications for shareholders, managers, employees of tourism firms, and policy makers. First, our paper demonstrates that managers in tourism firms are more likely to conduct empire building behaviors after the opening of HSR. That is, managers tend to over-invest and increase the firm's size, exceeding the optimal level, which would consequently jeopardize the firm's profitability and shareholder wealth in the long run (Hope and Thomas, 2008). Shareholders could intervene at an earlier stage to prohibit managers from conducting opportunistic activities before the efficiency of the business falls. At the same time, they need to evaluate whether the current cost management decision is rational, and facilitate the implementation of more informed cost adjustment plans. Eventually, this may ensure tourism firms are exempt from the higher operating risks and develop healthily.

Second, the increased cost stickiness after the opening of HSR would aggravate the operating risks of tourism firms, which may bring further financial constraints for tourism firms (Baños-Caballero et al., 2014) and lead to the reputation loss of managers in the managers' markets (Jian and Lee, 2011). As the main executives of firms, managers of tourism firms

should make informed cost management decisions according to the current economic environment after the introduction of HSR, and improve the firm's governance structure such as strengthening the internal control to avoid opportunistic behaviors.

Third, our paper also shows that the labor cost stickiness increases after the opening of HSR, implying that tourism firms are not inclined to lay off employees when sales decrease after HSR connection. The conclusion provides implications for employees choosing where to seek employment in the tourism sector, cities connected by HSR are an excellent option for them.

Fourth, although previous studies indicate that HSR connection would boost local economic growth (Albalate and Fageda, 2016; Campa et al., 2016), our study shows that HSR connection has a dark side for tourism firms, which manifests in cost stickiness increases after the opening of HSR. The increase of cost stickiness both exacerbates the firms' operating risks and raises the labor costs of the firms. Consequently, policy interventions aimed at controlling for excessive expansion of tourism firms and providing the supporting measures to help companies limit the increase of the labor cost are recommended.

5.3 Limitations

We should admit that our study has some limitations. First, our sample size is limited because we need data of two consecutive years to measure the change in SG&A expenses and sales revenue. Besides, in order to analyze the net impact of HSR connection on the cost behavior of tourism firms, we need to exclude non-located firms which have branches all over the country. Second, the management's attitude (e.g. optimistic or pessimistic) and estimate towards the tourism development could be an important factor that influences the resource

adjustment decisions of tourism firms. However, there are limited appropriate proxies to measure them so far. If reliable measures could be identified, we would have deepened understanding of the association between the operation of HSR and tourism.

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Table 1. Sample selection

	Number of firm-year observations
Chinese listed Tourism firms during the period of 2003 to 2018	941
Less:	
Non-Local tourism firms including Chinese listed firms during the period of 2003 to 2018	(309)
Missing Observations of total SG&A expenses and sales revenue in year t and year t-1	(216)
Observations that the ratio of liabilities to assets is smaller than 1	(11)
Missing Observations of other Variables	(81)
Final sample	324

Table 2. Sample distribution

Panel A: The distribution of firms by tourism industry	
Subdivision of tourism industry	The number of firms
Hotel	7
Chain catering	10
Travel agency	6
Travel services	3
Scenic spots	17
Sports tourist	2
Theme park	3
Total	48

Panel B: The distribution of HSR-connected firms and HSR-connected firm-year observations by year

Year	The number of HSR-connected firms	The number of HSR-connected firm-year observations
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0
2008	1	1
2009	1	2
2010	1	3
2011	0	2
2012	1	3
2013	2	5
2014	0	5
2015	12	16
2016	10	26
2017	6	29
2018	4	32
Total	38	124

Notes: The subdivision of tourism industry in panel A is in line with Wind Industry Classification Standard, and the tourism industry includes hotel, chain catering, travel agency, travel services, scenic spots, sports tourist industry, theme park, lottery, cruise, and gambling house. Panel B demonstrates the distribution of HSR-connected firms and HSR-connected firm-year observations by year.

Table 3. Variable definitions

Variable	Definition
Dependent variable	
$\Delta SG\&A$	The logarithm of the ratio of selling, general and administrative expenses between period t and period t-1.
Independent variables	
$\Delta Revenue$	The change in the logarithm of sales revenue in year t to that in year t-1.
Dummy	An indicator variable, coded one when sales revenue decline from period t-1 to t, and zero otherwise.
HSR	A dummy variable, coded one if the office location of the firm i in year t is connected by HSR, and zero otherwise.
Control variables	
SUC	An indicator variable, coded one when the revenue of the firm declined in the two successive periods, and zero otherwise.
Growth	The growth rate of Gross domestic product (GDP) during year t.
EI	The logarithm of the employee intensity that measured as the number of employees dividing by the sales revenue.
AI	The logarithm of the asset intensity that calculated as total assets dividing by the sales revenue.
Other main variables	
FCF	The ratio of net cash flow from operations activities minus common and preferred dividends to total asset.
Wage	The wage of total employees scaled by the number of employees. The wage of total employees is measured as the item "cash paid to and for employees" from cashflow statement less the total compensation of executives. In addition, the number of employees is also calculated as the number of total employees excluding the number of executives.
SG&A_Ratio	The ratio of selling, general and administrative expenses to the total asset
Lev	Leverage, calculated as total debt dividing by total asset
Age	Firm age, the logarithm of one plus the current year minus firm establishment year
Lns	The logarithm of total sales
Magshare	Managerial ownership. The ratio of managerial holdings dividing by number of outstanding shares.
Duality	An indicator variable coded one if manager and director are the same person
$\Delta Lcost$	The change in the logarithm of cash outflow item "cash paid to and for employees" in the current year and that in the prior year.
$\Delta Ecost$	The change in the logarithm of cash outflow item "cash paid to and for employees" minus the total compensation of all executives between the current year and the prior year.
Unempr	The change of registered urban unemployment rate in year t.
Newlaw	An indicator variable, coded one if the year is in or after 2008, and zero otherwise.

Table 4. Descriptive statistics

Variable	Mean	Sd	Min	Median	Max
SG&A Expense	176.351	198.354	4.693	110.156	1387.331
Δ*SG&A*	0.100	0.250	-0.620	0.084	1.300
Δ*Revenue*	0.110	0.290	-0.680	0.079	1.400
Dummy	0.310	0.460	0	0	1
HSR	0.380	0.490	0	0	1
Revenue	590.241	557.136	15.886	420.819	3040.758
SUC	0.120	0.320	0	0	1
Growth	0.130	0.058	0.004	0.110	0.270
EI	-3.500	0.780	-5.600	-3.500	-1.800
AI	0.820	0.840	-1.600	0.980	2.400
FCF	0.058	0.085	-0.240	0.059	0.370
SOE	0.690	0.460	0	1	1
Wage	7.066	4.157	1.083	6.265	21.928

Notes: *SG&A Expense* is selling, general and administrative expenses (in millions of RMB) from income statement; *Revenue* means sales revenue (in millions of RMB) obtained from income statement; *Wage* is average wage per employee (in ten thousand RMB) of firm, which measured as the wage of total employees scaled by the number of employees. The definitions of other variables are given in Table 3. We winsorize all the continuous variables at the 1st and 99th percentiles.

Table 5. The impact of HSR connection on cost stickiness

Variable	Dependent Variable: Δ*SG&A*	
	(1)	(2)
Δ*Revenue*	0.481***	0.359**
	(5.31)	(2.21)
Δ*Revenue* × *Dummy*	-0.297***	0.130
	(-4.13)	(0.80)
Δ*Revenue* × *Dummy* × *HSR*		-0.396**
		(-2.18)
Δ*Revenue* × *Dummy* × *SUC*		-0.062
		(-0.46)
Δ*Revenue* × *Dummy* × *Growth*		-3.558**
		(-2.28)
Δ*Revenue* × *Dummy* × *EI*		-0.207
		(-1.37)
Δ*Revenue* × *Dummy* × *AI*		-0.134
		(-0.87)
Δ*Revenue* × *HSR*		0.209
		(1.31)
Δ*Revenue* × *Growth*		1.302
		(1.27)
Δ*Revenue* × *EI*		0.046
		(0.92)
Δ*Revenue* × *AI*		-0.004
		(-0.06)
Constant	0.149	0.156
	(1.36)	(1.25)
Observations	324	324
Year Fixed Effect	YES	YES
Firm Fixed Effect	YES	YES
Adjusted R^2	0.358	0.382

Notes: The robust *t* statistics shown in parentheses are on the basis of firm clustered standard errors. *, **, ***represents the statistical significance level of 10%, 5%, and 1%, respectively.

Table 6. The agency cost and labor cost heterogeneity effect of HSR connection on cost stickiness

Variable	Dependent Variable: Δ*SG&A*			
	(1)	(2)	(3)	(4)
	FCF high	*FCF low*	*Wage high*	*Wage low*
Δ*Revenue*	0.762	0.491***	0.728	0.322
	(1.10)	(2.84)	(0.80)	(1.43)
Δ*Revenue* × *Dummy*	0.351	0.006	0.291	-0.102
	(1.49)	(0.03)	(1.18)	(-0.44)
Δ*Revenue* × *Dummy* × *HSR*	-0.764**	0.191	-0.757***	0.057
	(-2.19)	(1.11)	(-2.94)	(0.22)
Δ*Revenue* × *Dummy* × *SUC*	-0.589	0.202	0.371	-0.103
	(-1.59)	(1.06)	(1.64)	(-0.73)
Δ*Revenue* × *Dummy* × *Growth*	-1.972	-3.154	-0.121	-3.310
	(-0.58)	(-1.49)	(-0.04)	(-1.15)
Δ*Revenue* × *Dummy* × *EI*	-0.007	-0.302	-0.123	0.086
	(-0.03)	(-1.38)	(-0.35)	(0.45)
Δ*Revenue* × *Dummy* × *AI*	-0.344	-0.121	-0.354	-0.353*
	(-1.65)	(-0.59)	(-1.35)	(-1.99)
Δ*Revenue* × *HSR*	0.442	-0.078	0.442**	0.239
	(1.61)	(-0.46)	(2.09)	(1.00)
Δ*Revenue* × *Growth*	1.630	1.549	1.623	1.366
	(0.77)	(0.97)	(0.54)	(0.90)
Δ*Revenue* × *EI*	0.142*	0.062	0.149	0.046
	(1.73)	(0.84)	(1.10)	(0.73)
Δ*Revenue* × *AI*	-0.192	-0.073	-0.002	-0.031
	(-1.55)	(-1.01)	(-0.01)	(-0.37)
Constant	0.211***	0.090	0.370	0.031
	(3.12)	(0.33)	(1.60)	(0.32)
Observations	159	165	159	165
Year Fixed Effect	YES	YES	YES	YES
Firm Fixed Effect	YES	YES	YES	YES
Adjusted R^2	0.455	0.386	0.415	0.449

Notes: The robust *t* statistics shown in parentheses are on the basis of firm clustered standard errors. *, **, ***represents the statistical significance level of 10%, 5%, and 1%, respectively.

Table 7. Additional analysis: The ownership nature heterogeneity effect and the impact of HSR connection on labor cost stickiness

Variable	Dependent Variable: Δ*SG&A*		Dependent Variable: Δ*Lcost* /Δ*Ecost*	
	(1)	(2)	(3)	(4)
	SOE=1	*SOE=0*	Δ*Lcost*	Δ*Ecost*
Δ*Revenue*	0.496**	-0.633	-2.815	-3.098
	(2.24)	(-0.79)	(-1.04)	(-1.05)
Δ*Revenue* × *Dummy*	-0.091	0.141	-0.156	-0.219
	(-0.36)	(0.32)	(-0.59)	(-0.73)
Δ*Revenue* × *Dummy* × *HSR*	-0.487***	-0.017	-0.639***	-0.632***
	(-3.00)	(-0.03)	(-5.04)	(-4.62)
Δ*Revenue* × *Dummy* × *SUC*	0.232**	-0.458	0.045	0.064
	(2.17)	(-0.83)	(0.46)	(0.63)
Δ*Revenue* × *Dummy* × *Growth*	-2.963	-1.827	-1.685	-1.719
	(-1.54)	(-0.40)	(-1.38)	(-1.29)
Δ*Revenue* × *Dummy* × *EI*	-0.252	-0.134		
	(-1.28)	(-0.47)		
Δ*Revenue* × *Dummy* × *Unempr*			-2.485***	-2.714***
			(-3.17)	(-3.12)
Δ*Revenue* × *Dummy* × *AI*	0.167	-0.058	-0.224	-0.284
	(0.72)	(-0.14)	(-1.45)	(-1.60)
Δ*Revenue* × *Dummy* × *Newlaw*			0.606*	0.719**
			(2.00)	(2.10)
Δ*Revenue* × *HSR*	0.375***	0.270*	0.277**	0.268*
	(2.88)	(1.80)	(2.23)	(1.98)
Δ*Revenue* × *Growth*	2.230*	0.270	2.531**	2.629**
	(1.80)	(0.10)	(2.50)	(2.35)
Δ*Revenue* × *EI*	0.100*	-0.159		
	(1.82)	(-1.31)		
Δ*Revenue* × *Unempr*			0.673	0.736
			(1.06)	(1.07)
Δ*Revenue* × *AI*	-0.049	0.164	0.170	0.229
	(-0.26)	(1.39)	(1.36)	(1.52)
Δ*Revenue* × *Newlaw*			-0.342	-0.395
			(-1.67)	(-1.63)
Constant	0.073	0.551	-0.091	-0.138
	(1.20)	(1.34)	(-0.93)	(-1.08)
Observations	223	101	273	273
Year Fixed Effect	YES	YES	YES	YES
Firm Fixed Effect	YES	YES	YES	YES
Adjusted R^2	0.503	0.352	0.296	0.277

Notes: The robust *t* statistics shown in parentheses are on the basis of firm clustered standard errors. *, **, ***represents the statistical significance level of 10%, 5%, and 1%, respectively.

Table 8. Additional analysis: The impact of HSR connection on the SG&A cost ratio of tourism firms

Variable	Dependent Variable: *SG&A Ratio*	
	(1)	(2)
HSR	0.020**	0.022**
	(2.05)	(2.03)
Lev		-0.040
		(-0.91)
Age		0.009
		(0.23)
Lns		0.033***
		(3.39)
Magshare		0.028
		(0.36)
Duality		0.033*
		(2.00)
FCF		0.058
		(0.90)
Constant	0.164***	-0.456**
	(13.08)	(-2.68)
Observations	325	325
Year Fixed Effect	YES	YES
Firm Fixed Effect	YES	YES
Adjusted R^2	0.078	0.196

Notes: The robust *t* statistics shown in parentheses are on the basis of firm clustered standard errors. *, **, ***represents the statistical significance level of 10%, 5%, and 1%, respectively.

Table 9. Placebo test

Variable	Dependent Variable: Δ*SG&A*		
	(1)	(2)	(3)
Δ*Revenue*	0.379*	0.439*	0.470**
	(1.92)	(1.88)	(2.16)
Δ*Revenue* × *Dummy*	0.172	0.243	0.245
	(0.76)	(0.86)	(0.84)
Δ*Revenue* × *Dummy* × *HSR (t-1)*	-0.320		
	(-1.21)		
Δ*Revenue* × *Dummy* × *HSR (t-2)*		-0.352	
		(-0.91)	
Δ*Revenue* × *Dummy* × *HSR (t-3)*			0.135
			(0.34)
Δ*Revenue* × *HSR (t-1)*	0.061		
	(0.25)		
Δ*Revenue* × *HSR (t-2)*		0.090	
		(0.24)	
Δ*Revenue* × *HSR (t-3)*			-0.133
			(-0.39)
Δ*Revenue* × *Dummy* × *SUC*	-0.092	-0.088	0.080
	(-0.72)	(-0.60)	(0.64)
Δ*Revenue* × *Dummy* × *Growth*	-3.192	-3.336	-2.420
	(-1.44)	(-1.08)	(-0.73)
Δ*Revenue* × *Dummy* × *EI*	-0.180	-0.241	-0.288
	(-1.06)	(-1.40)	(-1.49)
Δ*Revenue* × *Dummy* × *AI*	-0.102	-0.072	-0.109
	(-0.61)	(-0.33)	(-0.52)
Δ*Revenue* × *Growth*	1.073	1.295	1.504
	(0.82)	(0.60)	(0.67)
Δ*Revenue* × *EI*	0.025	0.030	0.038
	(0.45)	(0.33)	(0.41)
Δ*Revenue* × *AI*	-0.050	-0.121	-0.148
	(-0.50)	(-0.84)	(-1.05)
Constant	0.172	0.165*	0.139
	(1.50)	(1.80)	(1.45)
Observations	273	227	188
Year Fixed Effect	YES	YES	YES
Firm Fixed Effect	YES	YES	YES
Adjusted R^2	0.311	0.309	0.342

Notes: This table is a placebo test of the main regression. *HSR (t-1), HSR (t-2), HSR (t-3)* represents the moving forward of the opening year of the first HSR line by 1–3 years, respectively. The robust t statistics shown in parentheses are on the basis of firm clustered standard errors. *, **, ***represents the statistical significance level of 10%, 5%, and 1%, respectively.

Table 10. The impact of HSR connection on cost stickiness（change the definition of the treatment group）

Variable	Dependent Variable: Δ*SG&A*	
	(1)	(2)
	Treatment group 50*km*	*Treatment group* 150*km*
Δ*Revenue*	0.239	0.233
	(0.90)	(0.88)
Δ*Revenue* × *Dummy*	0.258	0.275
	(1.17)	(1.27)
Δ*Revenue* × *Dummy* × *HSR*	-0.539**	-0.560**
	(-2.33)	(-2.50)
Δ*Revenue* × *Dummy* × *SUC*	-0.054	-0.059
	(-0.48)	(-0.52)
Δ*Revenue* × *Dummy* × *Growth*	-4.893**	-5.020**
	(-2.01)	(-2.11)
Δ*Revenue* × *Dummy* × *EI*	-0.164	-0.163
	(-0.86)	(-0.86)
Δ*Revenue* × *Dummy* × *AI*	-0.200	-0.203
	(-1.02)	(-1.03)
Δ*Revenue* × *HSR*	0.357	0.363
	(1.28)	(1.30)
Δ*Revenue* × *Growth*	3.002	3.039
	(1.20)	(1.21)
Δ*Revenue* × *EI*	0.039	0.038
	(0.29)	(0.27)
Δ*Revenue* × *AI*	0.064	0.066
	(0.49)	(0.51)
Constant	0.212	0.215
	(1.57)	(1.60)
Observations	324	324
Year Fixed Effect	YES	YES
Firm Fixed Effect	YES	YES
Adjusted R^2	0.384	0.385

Notes: The robust *t* statistics shown in parentheses are on the basis of firm clustered standard errors. *, **, ***represents the statistical significance level of 10%, 5%, and 1%, respectively.

Table 11. The impact of HSR connection on cost stickiness (control the CEO-level and TMT-level variables)

Variable	Dependent Variable: Δ*SG&A*		
	(1)	(2)	(3)
Δ*Revenue*	0.372**	0.332	0.336
	(2.13)	(1.36)	(1.33)
Δ*Revenue* × *Dummy*	-0.093	2.171	1.559
	(-0.12)	(0.48)	(0.34)
Δ*Revenue* × *Dummy* × *HSR*	-0.466**	-0.521***	-0.493**
	(-2.49)	(-2.73)	(-2.66)
Δ*Revenue* × *Dummy* × *SUC*	-0.061	-0.051	-0.027
	(-0.38)	(-0.30)	(-0.16)
Δ*Revenue* × *Dummy* × *Growth*	-3.702	-4.350*	-4.392*
	(-1.62)	(-1.92)	(-1.92)
Δ*Revenue* × *Dummy* × *EI*	-0.227	-0.172	-0.166
	(-1.24)	(-1.06)	(-1.05)
Δ*Revenue* × *Dummy* × *AI*	-0.116	-0.139	-0.165
	(-0.74)	(-0.95)	(-1.14)
Δ*Revenue* × *Dummy* × *CEO_gender*	0.022	-0.033	-0.063
	(0.08)	(-0.08)	(-0.15)
Δ*Revenue* × *Dummy* × *CEO_age*		-0.459	-0.255
		(-0.44)	(-0.24)
Δ*Revenue* × *Dummy* × *Duality*			-0.346**
			(-2.03)
Δ*Revenue* × *Dummy* ×*TMT_number*	0.119	-0.072	-0.141
	(0.29)	(-0.18)	(-0.35)
Δ*Revenue* × *Dummy* ×*TMT_gender*		-0.383	-0.440
		(-0.66)	(-0.81)
Δ*Revenue* × *HSR*	0.219	0.275	0.284
	(1.37)	(1.60)	(1.64)
Δ*Revenue* × *Growth*	1.432	1.931	1.988
	(0.85)	(1.02)	(1.06)
Δ*Revenue* × *EI*	0.063	0.020	0.021
	(0.73)	(0.26)	(0.26)
Δ*Revenue* × *AI*	-0.026	0.008	0.000
	(-0.27)	(0.09)	(0.00)
Δ*Revenue* ×*CEO_gender*	0.364	0.485	0.488
	(1.50)	(1.08)	(1.06)
Δ*Revenue* × *CEO_age*		-0.128	-0.115
		(-0.83)	(-0.69)
Δ*Revenue* × *Duality*			-0.002
			(-0.01)
Δ*Revenue* ×*TMT_number*	0.022	0.165	0.136
	(0.10)	(0.55)	(0.43)
Δ*Revenue*×*TMT_gender*		-0.121	-0.103
		(-0.19)	(-0.16)
Constant	0.149	0.189	0.188
	(1.05)	(1.17)	(1.16)
Observations	324	324	324
Year Fixed Effect	YES	YES	YES
Firm Fixed Effect	YES	YES	YES
Adjusted R^2	0.378	0.377	0.376

Notes: The robust *t* statistics shown in parentheses are on the basis of firm clustered standard errors. *, **, ***represents the statistical significance level of 10%, 5%, and 1%, respectively.

Table 12. The heterogeneous impact of HSR connection on cost stickiness between owner-managed firms and non-owner managed firms

Variable	Dependent Variable: Δ*SG&A*	
	(1)	(2)
	Owner-managed firms	*Non-owner-managed firms*
Δ*Revenue*	6.246***	0.354**
	(3.80)	(2.19)
Δ*Revenue* × *Dummy*	0.804	0.186
	(0.93)	(1.09)
Δ*Revenue* × *Dummy* × *HSR*	0.785	-0.338*
	(0.94)	(-1.93)
Δ*Revenue* × *Dummy* × *SUC*	-7.305***	-0.021
	(-7.56)	(-0.15)
Δ*Revenue* × *Dummy* × *Growth*	32.584***	-3.613**
	(4.83)	(-2.19)
Δ*Revenue* × *Dummy* × *EI*	0.202	-0.186
	(0.62)	(-1.19)
Δ*Revenue* × *Dummy* × *AI*	1.562***	-0.194
	(9.34)	(-1.27)
Δ*Revenue* × *HSR*	-2.047	0.211
	(-1.62)	(1.25)
Δ*Revenue* × *Growth*	-19.539**	1.385
	(-2.34)	(1.29)
Δ*Revenue* × *EI*	0.042	0.045
	(0.21)	(0.87)
Δ*Revenue* × *AI*	-0.260	-0.013
	(-0.66)	(-0.14)
Constant	0.108	0.159
	(0.39)	(1.25)
Observations	45	279
Year Fixed Effect	YES	YES
Firm Fixed Effect	YES	YES
Adjusted R^2	0.928	0.344

Notes: The robust *t* statistics shown in parentheses are on basis of firm clustered standard errors. *, **, ***represents the statistical significance level of 10%, 5%, and 1%, respectively.

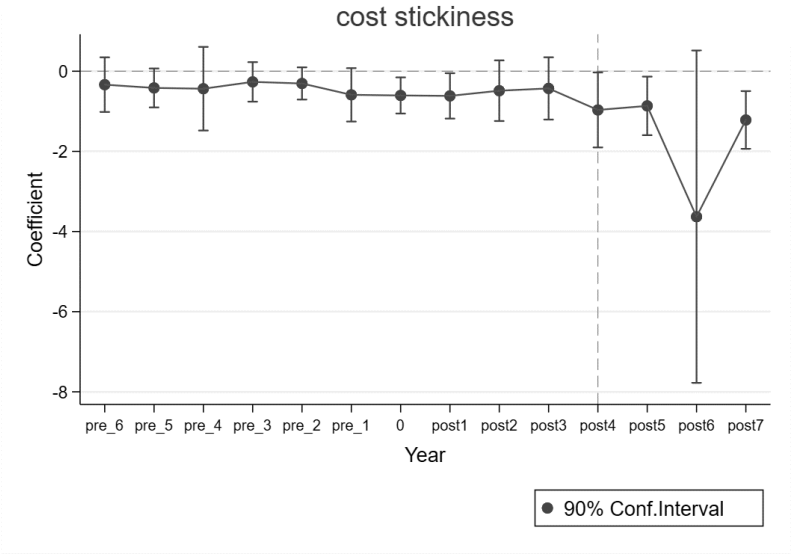

Figure I Common trend test