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The Impact of Individual Characteristics and Branch Characteristics on Housing Agent Performance: Heckit model and Hierarchical Linear Modeling

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Abstract

This study investigates the impacts of individual characteristics and branch characteristics on housing agent performance. Data were analyzed using hierarchical linear modeling (HLM) to provide estimations. The empirical results suggest that individual performance varies significantly from branch to branch and is better in branches with higher levels of compensation for individual performance. Individual characteristics including college level education, having children over the age of six, work experience, the square of work experience, and work experience outside the real estate industry have significant effects on individual performance. Individual performance is also better in branches with requirements for hours worked. The individual performance of salespeople working under team compensation schemes is not significantly better than that of salespeople working in branches without team compensation schemes. When the average housing prices for the areas in which branches operate are higher, individual performance will be higher. As the average housing price for an area increases, however, the corresponding increase in individual performance will be less and less strong. According to the empirical results, there was a degree of self-selection in the samples. The results of two-stage estimation were not significantly different from the estimation results of the original model. Hence, the results demonstrate the robustness of the estimation model used.

Keywords: individual performance, compensation choice, team compensation scheme, self-selection, hierarchical linear modeling

1. Introduction

At present, few studies have examined the performance of real estate salespeople using the concept of the working team. This is likely because intermediary salesperson compensation schemes in the United States, where most of the studies of real estate salesperson performance have been conducted, are mainly based on individual performance. As such, those studies generally have not regarded the effects of team or peer interactions on work performance as being of much relevance at work. The theory of human capital suggests that one's wage varies positively with one's formal education and informal training (Glower & Hendershott, 1988). Benjamin, Jud, Roth, and Winkler (2002) showed that the use of the Internet and other information technologies is positively related to the earnings of Realtors® . Li (2014) explored the relationship between Transaction costs, firms' growth and oligopoly.

The main brokerage salesperson compensation system used in the United States is the piece-rate compensation scheme, which is based on individual business performance without team compensation. In contrast, among Taiwan's housing brokerage firms, business operations are generally branch-based, and some branches can be regarded as a working team. Therefore, some branches may use the team compensation scheme to encourage peer cooperation. The brokerage salesperson compensation system in Taiwan is thus a mixture of piece-rate compensation and team compensation schemes. More specifically, the compensation schemes for real estate brokerage companies in Taiwan use individual performance-based salaries, with some companies also providing team bonuses. (Lee, 2015) Barwick and Pathak (2015) studied the consequences of fixed commissions and low entry barriers in Greater Boston's real estate brokerage industry from 1998-2007. This results suggested that a 50%

cut in commissions would result in 40% fewer agents, social savings that amount to 23% of industry revenue, and 73% more transactions for the average agen.

Although in recent years, there have been some empirical studies that have analyzed the peer effect in educational economics, regional economics and other fields, a few empirical studies have analyzed the effects of teams on individual performance in the real estate industry (Lee, 2014, 2015). The real estate industry attaches great importance to individual performance, teamwork and competition; hence, understanding the effects of teams on housing salesperson performance is an issue worthy of investigation.

It should be noted, however, that if a particular compensation scheme has a sorting function based on employee capabilities, individuals with higher capabilities may self-select to join companies with such a compensation scheme. Lazear (2000) called this the self-selection effect or sorting effect, and Paarsch and Shearer (1999) have pointed out that because of this effect, comparisons of employee productivity under different compensation schemes may be misleading as different types of employers and employees may, in effect, select their preferred compensation schemes. As such, the samples of companies with different compensation schemes would not be random, and if the data are obtained from samples that are not random, then ordinary least squares estimation will not work well (Hill et al., 2012). Therefore, in this study, Heckman's two-step estimation (also known as the Heckit method), is used for estimation. As individual salespeople are nested in brokerage branches, the research data for this study have a nested structural relationship. Hence, this paper applies a two-level hierarchical linear model (HLM) for estimation. This HLM provides an appropriate analytical framework to deal with observation dependence in multilevel data. More importantly, the HLM permits us to explore the nature and extent of the relationships at both micro and macro levels, as well as across levels (Wang et al., 2009).

The purposes of this study are as follows: (1) it distinguishes variance in individual performance resulting from individual-level factors or branch-level factors; (2) it seeks to determine whether or not the requirements of branches regarding working hours and team compensation significantly influence individual performance; (3) it probes the relationship between the average housing prices for the areas in which branches operate and individual performance and tries to find a non-linear relationship between individual performance and average housing prices; and (4) it seeks to determine if there is a self-selection effect in team compensation schemes.

2. Research Method

As individual salespeople are nested in brokerage branches, the research data for this study also had a nested structural relationship. That is, individuals in the same group tend to be alike and share similar attitudes and behaviors relative to individuals from other groups. This paper uses two HLM sub-models, which are the null model and the simplified intercepts-as-outcomes model for empirical studies. In empirical estimation, the continuous variables are centered by the grand mean.

2.1 Null Model

The main purpose of this model was to distinguish the intra-branch (intra-group) and inter-branch (inter-group) variations in individual performance in an analysis similar to the one-way ANOVA. The model settings are as follows (Lee, 2015):

$$\text{Level 1 (micro level):}\quad Y_{ij} = \beta_{0j} + r_{ij}, r_{ij} \sim N(0, \sigma^2), \tag{1}$$

$$\text{Level 2 (branch level):}\quad \beta_{0j} = \gamma_{00} + u_{0j}, u_{0j} \sim N(0, \tau_{00}) \tag{2}$$

where Y_{ij} represents the performance of the i_{th} salesperson in branch j; β_{0j} represents the group mean of the performance in the j_{th} branch; σ^2 represents the variance of the error term, r_{ij} (i.e., variances within groups); γ_{00} represents the grand mean performance for all salespeople in the sample; and the error term u_{0j} represents the random effects associated with branch j and is assumed to have a mean zero and variance of τ_{00}.

In the null model, $Var(Y_{ij}) = Var(u_{oj} + r_{ij}) = \tau_{00} + \sigma^2$ if $\rho = \tau_{00} / (\tau_{00} + \sigma^2)$, ρ is called the intra-class correlation coefficient (ICC) or cluster effect (Raudenbush and Bryk, 2002). This coefficient shows the proportion of variance in performance attributable to differences at the branch level.

2.2 Intercepts-as-Outcomes Model

The simplified intercepts-as-outcomes model primarily aims to validate the influence of explanatory variables at the micro level, and of the characteristic variables at the branch level, on dependent variables, if they both exist. When the null model confirms that the inter-group variation in dependent variables is significant, the explanatory variables of salesperson characteristics are added at the micro level. These characteristics include *GENDER*, *UNI*, *COLLEGE*, *AGE*, *SAGE*, *MAR*, *CHILD*, *MANAGE*, *IHOUR*, *WEXP*, *SWEXP*, *OWEXP*, and *IRATE*, and the

intercept is set as a random effect. The model regards the influence of variables at the micro level as constant. In other words, it assumes that branch-level characteristic variables are able to fully explain the variances of the average of dependent variables at the micro level. Hence, $RHOUR_j$, $GBON_j$, $LOCATION_j$, $PRICE_j$, and $SPRICE_j$ are specified to influence the intercepts of the micro-level prediction equation. This model can be used to verify the effect of the individual-level explanatory variables on individual performance, the requirement of working hours under a team compensation scheme, whether or not individual performance is higher, and whether or not the salespeople working in branches in downtown areas have higher individual performance. The settings are as follows (Lee, 2015):

Level-1 (micro level):

$$\begin{aligned} Y_{ij} = {} & \beta_{0j} + \beta_{1j}GENDER_{ij} + \beta_{2j}UNI_{ij} + \beta_{3j}COLEGE_{ij} + \beta_{4j}AGE_{ij} + \beta_{5j}SAGE_{ij} + \beta_{6j}MAR_{ij} \\ & + \beta_{7j}CHILD_{ij} + \beta_{8j}MANAGE_{ij} + \beta_{9j}IHOUR_{ij} + \beta_{10j}WEXP_{ij} + \beta_{11j}SWEXP_{ij} \\ & + \beta_{12j}OWEXP_{ij} + \beta_{13j}IRATE_{ij} + r_{ij}, r_{ij} \sim N(0, \sigma^2) \end{aligned} \tag{3}$$

Level-2 (branch level):

$$\begin{aligned} & \beta_{0j} = \gamma_{00} + \gamma_{01}RHOUR_j + \gamma_{02}GBON_j + \gamma_{03}LOCATION_j + \gamma_{04}PRICE_j + \gamma_{05}SPRICE_j \\ & + u_{0j}, u_{0j} \sim N(0, \tau_{00}) \end{aligned} \tag{4}$$

$$\beta_{lj} = \gamma_{l0}, l = 1 \sim 13. \tag{5}$$

where $\gamma_{01}, \gamma_{02}, \gamma_{03}, \gamma_{04}, \gamma_{05}$ denote, respectively, the cross-level direct impact of $RHOUR_j$, $GBON_j$, $LOCATION_j$, $PRICE_j$, and $SPRICE_j$ on individual performance. The mixed model is derived by adding Equations 4 and 5 to Equation 3 as follows:

$$\begin{aligned} Y_{ij} = {} & \gamma_{00} + \gamma_{10}GENDER_{ij} + \gamma_{20}UNI_{ij} + \gamma_{30}COLEGE_{ij} + \gamma_{40}AGE_{ij} + \gamma_{50}SAGE_{ij} + \gamma_{60}MAR_{ij} \\ & + \gamma_{70}CHILD_{ij} + \gamma_{80}MANAGE_{ij} + \gamma_{90}IHOUR_{ij} + \gamma_{100}WEXP_{ij} + \gamma_{110}SWEXP_{ij} + \gamma_{120}OWEXP_{ij} \\ & + \gamma_{130}IRATE_{ij} + \gamma_{01}RHOUR_j + \gamma_{02}GBON_j + \gamma_{03}LOCATION_j + \gamma_{04}PRICE_j + \gamma_{05}SPRICE_j \\ & + u_{0j} + r_{ij}, r_{ij} \sim N(0, \sigma^2) \end{aligned} \tag{6}$$

3. Variable Setting and Data Collection

3.1 Variable Setting and Explanations

The variables used are defined as shown in Table 1. Individual performance is measured by the natural logarithmic value of the average monthly turnover of a respondent salesperson over the past three months. The individual-level explanatory variables include dummy variables such as the salesperson's gender, educational level, marital status, whether or not the salesperson has children aged six or older, management level, work experience outside the agency industry and individual compensation rate, as well as continuous variables including age, work hours, work experience and work experience squared. The explanations of the variable settings are shown in Table 1.

The micro-level explanatory variables include dummy variables, such as gender and education level of the salespeople. Many authors have pointed out that the income of female employees is lower than that of men (Glower & Hendershott, 1988; Crellin et al., 1988; Sirmans & Swicegood, 1997; Jud & Winkler, 1998). In contrast, Abelson et al. (1990) argued that the income of female workers is higher than that of men. In this paper, if the agent is male, the variable is set to 1; otherwise, the variable is set to 0, and the expected coefficient is uncertain.

Educational levels represent an investment in human capital, and richer accumulated professional knowledge can result in higher expected levels of performance. In this paper, the educational level of agents is divided into three categories: high school and vocational school; junior college; and university or above. The reference base is high school and vocational school, and two dummy variables are set. If the agent's educational level is college, the variable is set to 1; otherwise, it is 0. If the agent's educational level is university or above, the variable is set to 1; otherwise, it is 0. The coefficients of the two variables are expected to be positive in this paper.

Sirmans and Swicegood (1997; 2000) found that older workers have lower incomes on average. Crellin et al. (1988) noted that the association of older ages with lower income did not reach the 10% significance level. The coefficient of the age variable in this study is expected to be negative. In addition, we consider the non-linear relationship between age and individual performance and include the square of age in the model to find that increased age can decrease individual performance but that the effect will gradually decrease. Hence, we expect

that the coefficient is negative. The performance of employees who are married and have children older than the age of six has been found in other studies to be higher (Mincer, 1970). Therefore, in this study, the performance of married agents with children aged above six is also expected to be higher than that of their counterparts. Many authors have found that management personnel usually have more experience in the industry; therefore, their performance is comparatively better than non-management personnel (Glower & Hendershott, 1988; Crellin et al., 1988; and Sirmans & Swicegood, 1997).

Working longer daily hours usually indicates greater work effort and, thus, better performance (Glower & Hendershott, 1988; Crellin et al., 1988; Sirmans & Swicegood, 1997; Abelson et al., 1990); hence, the coefficient of the hours worked variable is expected to be positive. Many authors have suggested that the longer that an individual has worked, the richer their working experience and the better their performance (Glower & Hendershott, 1988; Crellin et al., 1988; Sirmans & Swicegood, 1997; and Jud & Winkler, 1998); therefore, the coefficient of the years worked variable is expected to be positive. The square of years worked is used to represent the diminishing returns of work experience. In this study, working experience in industries other than housing was used to represent personal industry-specific human capital. If the respondent has engaged in work outside of the house brokerage industry, the variable is set to 1; otherwise, the variable is set to 0. The coefficient of this variable is expected to be positive. If the individual compensation ratio is above 55%, the variable is set to 1; otherwise, it is 0. The coefficient of this variable is expected to be positive.

The branch-level characteristic variables include the requirements of work hours, team compensation scheme, and branch location. In terms of the work hour requirement, if a branch requires salespeople to work for a certain number of hours per day, the variable is set to 1; otherwise, it is set to 0. The coefficient of the work hour requirement variable in this study is expected to be positive. For the team compensation variable, this paper sets the dummy variable based on whether or not a team compensation scheme exists. The variable is set to 1 if the branch provides a team compensation scheme; otherwise, it is set to 0. The coefficient of the team compensation variable in this study is expected to be positive. Intermediary agency branches closer to downtown areas have more business activity and higher transaction prices that result in better performance indicators. Many authors have suggested that agents in the real estate industry who work in branches in the downtown area usually have higher incomes (Follain et al., 1987; Glower & Hendershott, 1988; and Sirmans & Swicegood, 1997). If a branch is located in a downtown area, the variable is set to 1; otherwise, it is set to 0. This study expects the coefficient of locations of branches to be positive. We include a 'LOCATION' term, which reflects whether the branch is in a city center. However, there can be significant heterogeneity within a city center. Furthermore, many suburban locations can be expensive. Thus, the models would be improved if we could measure the average house-price for the branch location. The trading environments for the different locations of different branches are likewise different. We treat the average housing prices for different locations as characteristic variables of the branches and assume that when the average housing prices for the locations of branches are higher, individual performance will also be higher. As the average housing price for an area increases, however, the corresponding increase in individual performance will be less and less strong. There can be a non-linear relationship between average housing prices and individual performance. Hence, we expect that the coefficient of the average housing prices of branches is positive, while the coefficient of the average housing prices squared should be negative.

Table 1. Variable descriptions and definitions

Variable	Definition	Expected signs
Level-1(micro-level) variables		
Y	Individual performance is the natural logarithmic value of the average monthly sales performance of the respondent over the past three months (unit: 10,000 NTD), namely, performance during the period from July to September 2011.	
GENDER	If the salesperson is male, the variable is set to 1; otherwise, the variable is set to 0.	+/--
UNI	Educational level is divided into three categories, with high school and vocational school as the reference base to set the dummy variables. The variable is set to 1 for salespeople with an educational level at university or higher; otherwise, the variable is set to 0.	+
COLLEGE	If the salesperson has a college education, the variable is set to 1; otherwise, the variable is set to 0.	+
AGE	The respondent's age measured in years.	--
SAGE	Square of age.	--
MAR	If the respondent is married, the variable is set to 1; otherwise, the variable is set to 0.	+

CHILD	If the respondent has children aged six or older, the variable is set to 1; otherwise, the variable is set to 0.	+
MANAGE	If the respondent is the shop director, manager or broker, the variable is set to 1; otherwise, the variable is set to 0.	+
IHOUR	An individual's work hours, that is, the average number of hours worked by the respondent every day (unit: hour).	+
WEXP	Work experience, represented by years of working in the salesperson's housing brokerage (unit: year).	+
SWEXP	Square of work experience, as represented by the square of the work experience variable.	--
OWEXP	If the respondent has engaged in work in an industry other than the real estate industry, the variable is set to 1; otherwise, the variable is set to 0.	+
IRATE	If the individual compensation rate is larger than 55%, the variable value is set to 1; otherwise, the variable is set to 0.	+
Level-2(branch-level) variables		
$RHOUR_j$	In terms of work hour requirements, if the branches require salespeople to work for a certain number of hours per day, the variable is set to 1; otherwise, the variable is set to 0.	+
$GBON_j$	The team compensation scheme is a dummy variable. If the branch provides a team compensation scheme, the variable is set to 1; otherwise, the variable is set to 0.	+
$LOCATION_j$	If the branch is located in a downtown area of Kaohsiung, for example, Sanmin District, Hsinhsing District Lingya District, Qianjing District, or Yencheng District, or when the branch is located in a suburban area, such as Qianchen District, Tsuoyin District, Gushan District, Qijin District, Hsiaogang District, or Nantse District, the variable is set to 1; otherwise, the variable is set to 0.	+
$PRICE_j$	Average housing prices of locations of branches; NTD 10,000 is the unit.	+
$SPRICE_j$	Square of average housing prices.	--

3.2 Data Collection

The data used in this study were obtained from a questionnaire. The questionnaire respondents were housing brokerage salespeople in Kaohsiung, Taiwan. The content of the questionnaire was based on the research objective and was modified with reference to past literature and questionnaires (we mainly referred to the studies conducted by Yu and Liu in 2004 and by Lee et al. in 2010). To ensure the validity of the questionnaire, experts and scholars were asked to provide feedback prior to the administration of the formal survey. The questionnaire was then modified on the basis of the feedback received. The contents of the questionnaire include basic personal data on salespeople (e.g., gender, educational level, age, marital status, whether or not the salesperson has children aged six and older, and whether the salesperson is a manager or not), salesperson work-related questions (e.g., years working, performance on the job, work hours, with or without work experience outside the agency industry, and individual performance compensation rates), and data related to agency branch characteristics (e.g., requirements for work hours, team compensation schemes and branch location). (Lee, 2014, 2015).

The survey was conducted in October 2011 through mailed questionnaires. The brokerage companies covered in the survey were chain branch companies, including Pacific Rehouse, Sinyi, 21st Century, U-trust, H&B Housing, Eastern Realty, China Trust Real Estate, Taiwan Housing, and Yung Ching Realty. The survey was anonymized. This anonymity should have mitigated any mis-reporting issues, decreasing or even eliminating any incentive the respondents would have had to misstate their income. This study distributed 867 questionnaires by mail to salespeople at these companies' branches in Kaohsiung and obtained 776 responses. After eliminating samples with missing data, 518 valid samples remained, for a valid return rate of 66.7%. The sample included 518 surveys with micro-level observations and 47 surveys with branch-level observations. (Lee, 2014, 2015).

3.3 Description of Sample Statistics

The basic statistical characteristics of the variables are shown in Table 2. The average value of individual performance is NT$ 126,000 (exchange rate of US$ 1 to NT$ 29.6 in April 2012). Most of the respondents are male, accounting for 56% (290 people). Respondents with a university or higher education account for 43% of the total respondents (223 people), and college graduates account for 25% of respondents (130 people). The average age of respondents is 37. Married respondents account for 50% of the total (259 people). Respondents with children over six years of age account for 38% (197 people), and respondents at the management level account for 11% of the total surveyed (60 people). The average daily number of hours worked is 8.93 hours. The average number of years worked is approximately 4.76 years. Salespeople with work experience outside the real estate industry account for 63% (326 people) of respondents. Branches with individual compensation rates above

55% account for 22% (114 people) of all branches. Branches with requirements for work hours account for 32% (15 branches) of all branches, and branches with team compensation schemes account for 33% (16 branches) of all branches. In addition, branches in downtown areas account for 32% (15 branches) of all branches. (Lee, 2015) Average housing prices of branches are NT$ 4.3996 million.

Table 2. Micro-level and branch-level descriptive characteristics

Variables	Mean	S.D.	Min.	Max.
Level-1 (micro-level) variables				
Y	12.60	11.82	1	100
GENDER	0.56	--	0	1
UNI	0.43	--	0	1
COLLEGE	0.25	--	0	1
AGE	36.75	8.88	20	77
SAGE	1429.31	701.94	400	5929
MAR	0.50	--	0	1
CHILD	0.38	--	0	1
MANAGE	0.11	--	0	1
IHOUR	8.93	2.37	2	18
WEXP	4.76	5.39	0.5	31
SWEXP	51.59	112.96	0.25	961
OWEXP	0.63	--	0	1
IRATE	0.22	--	0	1
Level-2 (branch-level) variables				
$RHOUR_j$	0.32	--	0	1
$GBON_j$	0.33	--	0	1
$LOCATION_j$	0.32	--	0	1
$PRICE_j$	439.96	136.57	235	658
$SPRICE_j$	211815.79	124660.61	55225	432964

4. Empirical Results and Analysis

4.1 Null Model

Table 3 provides estimates for the null model. The random effects section shows the decomposition of the variance into its micro-level and branch-level components. The reported χ^2 statistic is 77.096, with 46 degrees of freedom. The results show that the variance at the branch level is statistically significant, at better than the required 5% level of significance. The ICC is then 0.0397 / (0.0397+0.6781) = 0.055 for the model, suggesting that 5.5% of the variance in performance is the result of differences at the branch level. This result suggests that individual performance levels vary across branches (Lee, 2015). As indicated by the ICC value of the null model, if this ratio is zero, there is no autocorrelation and only a single-level model is needed. But if the ratio is not zero, the HLM approach exploits this dependence to derive improved estimates, while the standard errors of the estimates are adjusted to take account of the autocorrelation (Goldstein, 1987). As we have already seen for the null model, the ratio is 0.055 and the estimate for τ_{00} is statistically significant, suggesting that a HLM model is needed for these data.

4.2 Intercepts-as-Outcomes Model

The intercepts-as-outcomes model A are indicated as shown in Table 3. In the fixed effects at the micro level, in terms of gender, the estimated coefficient value is –0.0435, which is not significant. Regarding the effect of gender on performance, the results conflict with the conclusions of previous studies. For example, the findings by Glower and Hendershott (1988), Crellin et al. (1988), Sirmans and Swicegood (1997), and Jud and Winkler (1998) suggested that female salespeople earn less than male salespeople. However, Abelson et al. (1990) argued that female salespeople earn more than their male counterparts. This paper concludes that the performance of men is not significantly higher than the performance of women.

The estimation coefficient for educational levels of university and higher is –0.0049, which is not significant. The estimation coefficient for a college educational level is 0.1724, reaching the 10% significance level. These

results suggest that the performance of salespeople with a college education is better than the performance of salespeople with a high school or vocational school education. However, the performance of salespeople who are university graduates or higher is not significantly higher than the performance of salespeople with a high school or vocational school education. Education represents an investment in human capital. A higher education should result in better performance. However, the empirical results suggest that the effects of education level on salesperson performance are determined by the type of education. Jud and Winkler (1998) and Carroll and Clauretie (2000) showed that the salaries of salespeople who graduated from college are significantly higher than the salaries of salespeople with high school degrees; however, salespeople with a master's degree did not earn significantly more than salespeople with a high school degree.

The estimation coefficient for age is –0.0111, which is not significant. This result is not consistent with the findings of Sirmans and Swicegood (1997; 2000), who found that older salespeople had lower incomes. In addition, the estimation coefficient of square of age is -0.0001, which is insignificant. This means that as age increases, the corresponding decline in individual performance is less and less pronounced. The empirical result does not support the expectation of this study. The coefficient of married respondents is –0.0435, which was not significant. The estimation coefficient for having children aged above six is 0.1739, reaching the 10% significance level. This result suggests that salespeople with children over the age of six have more time to work than salespeople with children under the age of six, resulting in better performance at work, which is consistent with Mincer (1970).

The estimation coefficient of MANAGE is 0.1720, which is not significant. This result suggests that a manager's performance is not significantly better than salespeople who are not in management, which was not suggested in previous studies. For example, Glower and Hendershott (1988), Crellin et al. (1988), and Sirmans and Swicegood (1997) found that being in management represents having richer experience in the industry; thus, the performance of such individuals is relatively better. Regarding daily hours worked, longer daily hours worked results in a higher level of effort and better job performance. The estimated coefficient of the daily number of hours worked is 0.0057, which is not significant.

The coefficient estimate of *WEXP*, γ_{100} is 0.0779, reaching a 5% significance level. The coefficient estimate of *SWEXP*, γ_{110} is –0.0017, reaching the 10% significance level. These results suggest that increased work experience can improve an individual's performance but that the effect will gradually diminish with the accumulation of more work experience. This result is consistent with Glower and Hendershott (1988) and Sirmans and Swicegood (1997), who showed that experience increases the performance of brokers or salespeople; however, after a certain point, additional experience is of lesser value. The estimation coefficient of with working experience outside the real estate industry is 0.1495, reaching a 10% significance level. This result suggests that salespeople with work experience outside the real estate industry perform better. The estimation coefficient of individual performance compensation rate is 0.2147, reaching a 5% significance level. This result suggests that salespeople with higher individual performance compensation rates perform better than salespeople with lower individual performance compensation rates.

In terms of cross-level direct impact, the estimation coefficient of $RHOUR_j$ is 0.1940, reaching a 5% significance level. This result suggests that if the branch requires salespeople to work for a certain number of hours every day, the expected individual performance is better.

The branch-level coefficient estimate of $GBON_j$, γ_{01}, is 0.0218 and does not reach a 5% significance level, suggesting that team compensation schemes have no direct significant impact on individual performance. Lazear (1998) noted that although team compensation schemes may improve team performance, they might also result in a free-rider problem by reducing individual salespeople's work incentives. Van der and Van de Vilert (2002) summarized the empirical studies of team reliance and found that team reliance has a positive effect on team performance. However, the effect of team reliance on individual performance is still debatable, primarily because studies on team performance have neglected individual member differences, and cross-level adjustment variables have not been detected. The findings of this study suggest that team compensation schemes have a positive effect on individual performance; however, the impact is not significant. According to this study's survey, individuals with compensation rates above 50% account for 83% of the total, with individual compensation rates as high as 70%. Among branches with team compensation, the highest team compensation rate is 8%, suggesting that Taiwan's house brokerage industry emphasizes competition among individual salespeople. Moreover, the individual compensation rate seems to act as a work incentive, and the effect of team compensation seems relatively insignificant.

The estimation coefficient of branch location is 0.2091, reaching the 10% significance level. This result suggests

that the individual performance of salespeople working in branches in a downtown area is higher than that of branches in suburban areas, confirming the findings of previous studies. For example, Follain et al. (1987), Glower and Hendershott (1988), and Sirmans and Swicegood (1997) suggested that the average income of salespeople working in the house brokerage industry in metropolitan areas is higher than that of those working in outlying areas. The estimation coefficient of average housing prices of locations of branches is 0.0033, reaching the significance level of 10%. The estimation coefficient of square of average housing prices is -0.0002, also reaching the significance level of 10%. Hence, when average housing prices of locations of branches are higher, individual performance will be higher. As the average housing price for an area increases, however, the corresponding increase in individual performance will be less and less strong. There is non-linear relationship between average housing prices and individual performance. The empirical result supports the expectation of this study.

In order to ensure the robustness of the estimation result, we eliminate the highest and lowest 5% of individual performance in observation for estimation (see e.g. Moeller et al., 2005; Fich et al., 2012). According to the estimation results of the intercepts-as-outcomes model B, the coefficient of MANAGE reaches the significance level of 5%. The coefficient of SWEXP, on the other hand, is insignificant. The rest of the estimation results are not significantly different (see Table 3). This demonstrates the robustness of the estimation results of this study.

In addition, to address concerns regarding the self-selection of samples, in this study, Heckman's two-step estimation (also known as the Heckit method), is used for estimation. The first step is to use the logit to estimate the selection of compensation scheme (the regression equation of self-selection), and obtain the inverse Mills ratio (IMR) as the independent variable for the second step. The second step is to use the OLS and HLM to estimate the individual performance. In the self-selection regression equation, the team compensation scheme is used as the dependent variable, without the characteristics of a team compensation scheme used as the reference base. The explanatory variables include gender, educational level, age, age squared, married state, whether or not the salesperson has children aged six or older, work hours, work experience, work experience squared, work experience outside the agency industry, individual compensation rate, and work hour requirements. Estimation results are shown in Table 3 (Model C). The estimation coefficient of IMR reaches the significance level of 5%. Hence, there is self-selection in the samples. The estimation coefficient of team compensation is insignificant. The coefficients of the individual's compensation rate, locations and average housing prices are significant. These results are not different from the estimation results in Table 3. Therefore, the estimation results of this study are robust.

Table 3. Empirical results and analysis (dependent variable is individual performance Y)

Model	Null model	Intercepts-as-outcomes model A	Intercepts-as-outcomes model B	Intercepts-as-outcomes model C
γ_{00}	2.1840	1.8374	1.9536	2.3328
	(0.0467)**	(0.0925)**	(0.1127)**	(0.2127)**
GENDER γ_{10}		-0.0435	-0.0034	0.0350
		(0.0536)	(0.0521)	(0.0630)
UNI γ_{20}		-0.0049	0.0127	-0.02696
		(0.0942)	(0.0521)	(0.1506)*
COLLEGE γ_{30}		0.1724	0.1891	0.1822
		(0.0884)*	(0.0887)**	(0.0897)**
AGE γ_{40}		-0.0111	-0.0313	-0.0335
		(0.0362)	(0.0290)	(0.0372)
SAGE γ_{50}		-0.0001	-0.0003	0.0003
		(0.0004)	(0.0003)	(0.0005)
MAR γ_{60}		-0.0435	-0.0114	-0.0832
		(0.0974)	(0.0775)	(0.0964)
CHILD γ_{70}		0.1739	0.0996	0.0788
		(0.1045)*	(0.0884)*	(0.1070)
MANAGE γ_{80}		0.1720	0.2180	0.1575
		(0.1315)	(0.1089)**	(0.1311)
IHOUR γ_{90}		0.0057	0.0053	0.0058
		(0.0190)	(0.0153)	(0.0189)

WEXP γ_{100}		0.0779	0.0473	0.0737
		(0.0259)**	(0.0199)**	(0.0255)**
SWEXP γ_{110}		-0.0017	-0.0009	-0.0017
		(0.0010)*	(0.0008)	(0.0010)*
OWEXP γ_{120}		0.1495	0.0642	0.1284
		(0.0832)*	(0.0816)*	(0.0828)
IRATE γ_{130}		0.2147	0.2080	0.4446
		(0.0107)**	(0.1135)*	(0.1604)**
IMR γ_{140}				-0.2221
				(0.1066)**
$RHOUR_j$ γ_{01}		0.1940	0.1781	0.1924
		(0.0905)**	(0.0839)**	(0.0910)**
$GBON_j$ γ_{02}		0.0218	-0.0067	0.0035
		(0.0866)	(0.0817)	(0.0878)
$LOCATION_j$ γ_{03}		0.2091	0.0687	0.2036
		(0.1129)*	(0.1191)	(0.1082)*
$PRICE_j$ γ_{04}		0.0033	0.0039	0.0043
		(0.0019)*	(0.0021)*	(0.0020)**
$SPRICE_j$ γ_{05}		-0.0002	-0.0003	-0.0003
		(0.0001)*	(0.0001)**	(0.0001)**
u_{0j}	0.0397	0.0220	0.0329	0.0217
	(77.0955)**	(65.6167)**	(86.9116)**	(65.6887)**
r_{ij}	0.6781	0.5935	0.4031	0.5885
Deviance	1292.0185	1215.7825	966.0768	1211.3403
Number of estimated parameters	3	21	21	22
AIC		1257.7825	1008.0768	1255.3403

Note. Model B: dependent variable is individual performance Y; the highest and lowest 5% of individual performance in the observation values are eliminated. Model C: Heckman's two-step estimation. Logit estimation result of the first stage is not listed in the table. *p<0.10, **p<0.05. Regarding the fixed effect part, the content within the () is the robust standard errors; regarding the random effect parts, the content within the () is the value of χ^2.

5. Conclusions and Suggestions

This study analyzes housing brokerage salespeople and applies HLM for verification with the following major purposes: (1) to determine to what degree individual performance variance can be attributed to the impact of individual variables as compared to the impact of team (branch) differences; and (2) if individual performance differences exist between teams, to determine what team characteristic variables may cause such differences.

The empirical results suggest that individual performance varies significantly from branch to branch. A 5.5% variance in individual performance is caused by branch differences, implying that 94.5% of the differences in individual performance are caused by individual characteristics or demographic attributes. Individual characteristics including education at the college level, having children over the age of six, work experience, the square of work experience, and work experience outside the real estate industry have significant effects on individual performance. When the individual performance compensation rate is higher, individual performance is better. Branches with requirements for working hours apparently have better individual performance than branches without such requirements. Individual performance is not significantly higher in branches with team compensation schemes than in branches without a team compensation schemes. The individual performance of salespeople working in branches in downtown areas is higher than that of salespeople working in branches in suburban areas. When average housing prices of locations of branches are higher, individual performance will be higher. With the increase of average housing prices increase of individual performance will be decreased. There is non-linear relationship between average housing prices and individual performance. According to the empirical results, there was a degree of self-selection in the samples. The results of two-stage estimation were not significantly different from the estimation results of the original model. Hence, the results demonstrate the robustness of the estimation model used.

This study helps clarify the effects of branch (team) characteristic variables on individual performance and whether or not theories relating to teams can be detected through actual data. The empirical results suggest that

the interactions between branch members or team members and the effects of branch or team characteristics are worthy of further study. The research topics of this study can be further explored in the following directions. The model intercepts still have random components, implying that other important branch-level characteristic variables were not considered. In the future, other important characteristic variables might be incorporated into the model for estimation. For instance, variables such as incomes and wealth can represent the characteristics of branches.

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