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Finding Good Managers: An Econometric Case Study of a Large Japanese Auto Dealership

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Abstract

Using the personnel and transaction data from a large auto dealership in Japan, this paper discusses the value, incentives, assignments, determinants of performance, and learning of managers. We find that: (1) moving one standard deviation up the distribution of manager fixed effects raises a branch's profit by 9.3%; (2) the relationship between managers' branch assignments and their performance is more consistent with tournament theory rather than screening or learning mechanism; (3) better managers are systematically selected to run less profitable branches; and (4) managers with smaller age difference with subordinates and broader experience tend to perform better.

I. Introduction

In labor economics literature, it is customary to assume that worker productivity primarily depends on workers' abilities and effort, and other factors that affect productivity are constant within an organization or occupation. Even empirical studies in personnel economics often neglect the potential impact of middle managers.

Managers, however, can have substantial influence over their subordinates' productivity through several channels: (1) supervision and monitoring of worker inputs to reduce shirking and errors; (2) assignment of tasks to workers to optimally allocate human capital; (3) provision of on-the-job training and coaching; and (4) motivation of workers through encouragement and recognition. How well managers function as supervisors, task assigners, trainers, and motivators should critically affect the performance of workers.

Despite the potential importance of middle management, there has been scant evidence of the degree to which managers affect worker productivity in business organizations. Most prior research has focused on the effect of CEO turnovers or their personal attributes and background on firm performance (Bennedsen, Nielsen, Perez-Gonzalez, and Wolfenzon 2007; Bennedsen, Perez-Gonzalez, and Wolfenzon 2007; Bertrand and Schoar 2003; Jenter and Lewellen 2010; Kaplan, Klebanov, and Sorensen 2008; Perez-Gonzalez 2006; Perez-Gonzalez and Wolfenzon 2012). In an analogous vein, the contributions of managers and head coaches to team performance in professional sports have also been examined (Bridgewater, Kahn, and Goodall 2011; Dawson, Dobson, and Gerrard 2000; Frick and Simmons 2008; Goodall, Kahn, and Oswald 2011; Kahn 1993; Porter and Scully 1982).

Although CEOs affect long-term worker productivity by choosing markets,

structuring organizations and processes, and appointing senior managers, their direct influence on the day-to-day productivity of workers is quite limited. Middle managers have much greater impact on workers' efforts and skill accumulation. It is also unknown how applicable results from studies of professional sports teams are to more conventional businesses because the nature of teamwork and daily operations are quite different between the corporate world and professional sports.

There are some works in the economics of education literature that try to identify the magnitude of teacher effects using panel data for individual students. Rockoff（2004）uses student test scores and teacher assignment to estimate more accurately how much teachers affect student achievement. His results indicate that moving one standard deviation up the distribution of teacher fixed effects raises both reading and math test scores by about 0.1 standard deviations on the national scale. Branch, Hanushek, and Rivkin (2012) use principal-student matched data to estimate the effect school principals have on student achievement and find that moving one standard deviation up the distribution of principal fixed effects raises students' mean achievement from the 50th to the 58th percentile.

The research most closely related to this paper is the recent work by Lazear, Shaw, and Stanton (2012). Using four years of productivity data on 23,878 workers and 1,940 managers in a large IT service company, they show that: (1) bosses in the top decile are 12.6% more productive than bosses in the bottom decile in terms of workers' output; (2) the impact of good bosses is largely persistent, implying that training is a primary channel while supervision and motivation are secondary; (3) bosses in the lowest 10% of the quality distribution are 67% more likely to leave the firm than bosses in the top 90%; and (4) there is complementarity between boss skills and worker skills and

therefore good bosses should be matched with good workers, although this sorting effect is not large.

In this paper, we aim to extend the analyses in Lazear, Shaw, and Stanton (2012) to a more common workplace situation where the assignment of managers to heterogeneous workplaces is endogenous. We also address issues that are not explored in their study, such as how managers are assigned to workplaces, who are likely to be good managers, and how much they improve their productivity during their job tenure. We use seven years of personnel and transaction records between December 1998 and November 2005 provided by one of the largest auto dealerships in Japan, a firm that has 158 branch managers and 1,006 new car salespeople working in 70 branches.

The dataset has both advantages and disadvantages. On the positive side, we have detailed information about managers' and branches' characteristics, and managers' job histories. These details allow us to discuss how managers are assigned and what attributes of managers affect a branch's profitability. Second, we have wage and bonus information for managers that enable us to discuss how they are compensated for their contributions to the firm.

The biggest disadvantage of the dataset is that managers are regularly reassigned to different branches, but salespeople rarely change branches prior to promotion. Therefore, the identification of manager effects is primarily obtained through their transfers across branches. Branch effects and worker effects, however, cannot be separately identified. This feature constrains the interpretation of the estimated magnitude of branch effects and worker effects estimated separately.

Our primary findings are:

(1) Middle managers are important. Moving one standard deviation up the

distribution of manager fixed effects raises a branch's profit from new car sales by 9.3% (equivalent to ¥13,340,000) at an annual rate. Pay-performance linkage, however, is very weak and insignificant despite the firm's adoption of pay-for-performance compensation.

(2) In most cases, new managers are assigned to small branches and laterally moved to larger branches as they accumulate experience. Better managers are more likely to be assigned to less profitable branches than their equally experienced peers.

(3) Young managers and those with broader experience tend to perform better than managers who are older or who have not worked in sections other than new car sales.

(4) Leaning-by-doing among managers is relatively limited, implying that selecting good managers is more important than training managers to improve their performance.

II. Data and the Role of Branch Managers

Our analysis is based on seven years of personnel and transaction records between December 1998 and November 2005 from Auto Japan (a pseudonym used to conceal the identity of the firm), as well as interviews conducted with the executive director and general manager in human resource management, and a few branch managers. The personnel records include employee ID number, birth date, education, date of hire, date of separation, current and previous job assignments in the firm, and detailed monthly wage information. Sales transaction records are used to calculate sales and gross profits earned by new car sales staff as well as sources of profits (corporate vs. individual

customers) for each branch. Based on the above records, human capital variables for managers including age, tenure, and the scope of previous functional experience, and education, and branch characteristics variables including sales and profits from new car sales and the composition of branch employees (inexperienced vs. experienced employees) are calculated. The summary statistics are shown in Table 1.

In the rest of this section, we explain Auto Japan's human resource management policies, including job assignment, and the responsibilities of branch managers based on interviews and internal material we obtained through a number of company visits.

A typical branch is divided into four sections—new car sales, used car sales, service and repairs, and administration—each of which has specialized staff and section managers. New car sales is Auto Japan's primary business and large branches typically have two groups of sales staff and two sales managers in new car sales. Auto Japan's promotion policy is designed so that one-third of all employees will eventually be promoted to frontline section managers.

New branch managers are selected from these section managers. The minimum requirements to become a branch manager are four years of experience as a section manager and an evaluation grade of "S" or "A," which are the two highest grades on the firm's five-point scale. Important criteria include performance in sales and collection of claims, and the capability to supervise and develop subordinates. More than 60% of branch managers are promoted from new car sales section managers. For new branch managers who had previously worked only in new car sales, their first task is to study operations in used car sales and service. As it takes time to grasp the entire operations of a branch, some trusted section managers are groomed by being assigned to multiple jobs before becoming branch managers.

Most non-managerial employees in the field stay a long time in the first branch they were assigned to, and transfers across branches before promotion are extremely rare. More precisely, when new employees are assigned to a branch, they are allocated a territory that they will be in charge of for many years. Except for special circumstances such as the opening of a new branch, salespeople stay in the same branch, and will remain there for a few years after being promoted to sales section manager. It is also rare for employees to undergo cross-functional transfers across new car sales, used car sales, service, and headquarters operations before getting promoted to the rank of frontline section manager, unless the employees themselves strongly desire to do so or their superiors recommend such a transfer.

In the 1990s, Auto Japan had many baby-boomers in middle management and their large numbers meant that very capable young employees were not being promoted. To counter this problem, the firm set an upper age limit for new managers—50 years old for section managers and 53 years old for branch managers. Auto Japan also introduced an upper age limit for incumbent branch managers and forced all above 55 years old to leave their managerial position Despite these new policies, the age distribution for managers did not change significantly, as Figure 1 shows. We suspect that the policy was either not strictly enforced or only helped to prevent the average age of managers from rising further.

Branch managers are given targets for car sales in vehicle units and gross profits for their branches during the annual budget process and at monthly sales meetings. These targets are set in accordance with the annual sales plan agreed upon between Auto Japan and the automaker. All branch managers need to develop a strategic plan and breakdown figures to achieve their goals, including allocating sales quotas to sections and

salespeople, whose quotas are based on their individual experience and capability as well as the abilities of their section managers. Branch managers need to monitor daily performance and engage in skill development of young salespeople. A branch manager's performance evaluation and pay depend on whether the branch's sales and gross profit goals are met and if so, how much the actual sales and gross profit exceed the goals. To sum up, branch managers play a critical role in achieving Auto Japan's company goals.

In the analysis that follows, we use the total gross profits net of inventory cost earned by each new car salesperson in a branch as the dependent variable and identify manager effects on the worker's performance. As Table 1 shows, a new car salesperson earns an average of 1.4 million yen per month. A branch has 8.5 new car salespeople on average.

We do not include used car sales or service staff in our analysis for two reasons: first, because demand-side factors and branch size effects are easier to control for when we focus on new car sales; and secondly, because our transaction data do not contain the profits earned in service sections. As a result, it should be kept in mind that our performance measure captures only part of the overall performance of branch managers who are responsible for total profitability in their branches.

III. Can Middle Managers Make a Difference?

How important are branch managers? How large is the contribution of branch managers? More precisely, how much difference can they make by monitoring, motivating, training, and assigning tasks to workers properly? Answering these questions will give us important implications about the potential returns to selecting and

training good managers. As we mentioned earlier, Lazear, Shaw, and Stanton (2012) answer this question for the first time, showing that managers in the top decile make their subordinates 12.6% more productive than those in the bottom decile. In this study, we first estimate the following manager fixed effect model in order to examine the variation of manager quality:

$$y_{ijt} = \alpha + X_{ijt}\beta + \delta_{k(j,t)} + \theta_i(+\kappa_j) + \varepsilon_{ijt} \qquad \textbf{(1)}$$

where y_{ijt} denotes monthly gross profit earned by worker *i* in branch *j* in period *t*, X_{ijt} is a vector of control variables including firm-wide gross profits from new car sales, a cubic function of worker tenure, and branch size, δ_k is a fixed effect of manager *k*, θ_i is a fixed effect of worker *i* with $E[\varepsilon_{ijt} \mid X_{ijt}, \delta_k, \theta_i] = 0$, κ_j is a fixed effect of branch *j*. Note that κ_j is not identified in the presence of θ_i because workers do not move across branches until they gain some experience as section manager.

Table 2 summarizes the standard deviation of estimated manager effects.[1] The first column shows the calculation based on the model with branch and manager fixed effects, whereas the second column presents the estimate based on the model with manager and worker fixed effects. Both models indicate that the standard deviation of

[1] Alternatively, we also estimated a manager random effect model with an additional assumption of $E[\delta_k \mid X_{ijt}, \kappa_j] = 0$. According to the model, standard deviation of manager effects is estimated to be 4.5% of the mean gross profit per worker. We decided not to report this result in the table because $E[\delta_k \mid X_{ijt}, \kappa_j] = 0$ is unlikely to hold given the finding that the worker fixed effects are correlated with some branch characteristics due to the endogenous assignment of workers.

the estimated manager fixed effects is quite large—12-13% of the mean gross profit per worker. This figure, however, overstates the actual variation of manager quality because of sampling error. Let d_k be the estimate of δ_k. Then,

$$V(d_k) = V(\delta_k + (d_k - \delta_k)) = V(\delta_k) + V(d_k - \delta_k) + 2\,\mathrm{cov}(\delta_k, d_k - \delta_k) \qquad (2)$$

Because $\mathrm{cov}(\delta_k, d_k - \delta_k) = 0$ is immediate from our assumption that $E[\varepsilon_{ijt} \mid X_{ijt}, \delta_k, \theta_i] = 0$, we obtain $V(\delta_k) = V(d_k) - V(d_k - \delta_k)$.

Column 3 in Table 2 shows the standard deviation of estimated manager fixed effects after correcting for sampling error using this formula. According to this estimate, moving one standard deviation up the distribution of manager quality raises the branch profit from new car sales by 9.3%. What is the economic significance of this improvement? According to Table 1, the average branch has 8.48 new car salespeople. If each worker makes ¥131,200 more profit, the total profit from new car sales for the branch will increase by ¥131,200 × 8.48 = ¥1,113,000 per month or ¥13,356,000annually. Note that the average annual income of branch managers is ¥9,991,000 and its standard deviation is only ¥611,000. The salary of branch managers seems to be substantially compressed compared with the range of their contributions to the firm's profits.

Our dataset contains annual compensation of all employees enabling us to examine whether manager quality is compensated fairly in the firm. Figure 2 plots the relationship between the estimated manager fixed effects and a manager's annual compensation (salary plus bonus). The fitted line is very flat and we cannot recognize any significant correlation. In fact, we estimated the OLS model:

$$I_{k,t} = \alpha + \beta_1(\delta_k \times Size_{j(k),t}) + \beta_2 Size_{j(k),t} \qquad (3)$$

where $I_{k,t}$ is the annual compensation for manager *k* in year *t*, and $Size_{j(k),t}$ is the number of new car salespersons in branch *j*(*k*), denoting the branch that manager *k* manages. The estimated pay-performance sensitivity β_1 is only 0.03 and insignificant.

This result is puzzling because branch managers receive performance-based pay which depends on the gross profits earned by their subordinates. In fact, when pay-performance sensitivity is calculated using the actual total gross profits earned by new car sales staff instead of the estimated manager fixed effects, the coefficient is significant and sizable. Figure 3 depicts the positive correlation between a manager's annual compensation and the branch's gross profit from new car sales.

As we discuss later, the difference between Figure 2 and Figure 3 can be attributed to the way managers are assigned to branches. In the next section, we look at how branch managers are screened, moved across branches, and promoted to higher level positions.

IV. How are branch managers assigned to particular branches?

We answer this question by conducting two different analyses. First, we illustrate "career patterns" observed in the relationship between branch size and the experience of branch managers by drawing a graph of movement during the careers of branch managers based on job assignment history data. Second, we calculate a number of correlation measures among manager fixed effects, branch fixed effects, manager experience, and branch size in order to clarify how managers are matched with branches.

A. Career patterns for branch managers

Figure 4 depicts the overall patterns of promotion, transfers, and job changes among 207 branch managers who were observed at least once during our observation period and their predecessors.[2] In order to avoid truncation, we obtained additional job assignment history data for these managers up to February 2011 from Auto Japan and dropped several managers in the sample who were still branch managers as of February 2011 so that the chart characterizes their entire tenure as branch managers. The vertical axis indicates branch size, expressed using categories from Auto Japan's internal documents, and the horizontal axis counts the number of branches headed by a given branch managers. The size of the arrow signifies the percentage of managers who follow the path among those who are in the starting-point category. The figures in the rectangle for each pair of categories indicate the number of managers in the category, the number of those who were next assigned to jobs other than branch managers (in parentheses), and the number who were next promoted is shown (in brackets).

The numbers under the chart show the overall breakdown figures explaining how the number of branch managers in each experience category changed. More precisely, the first row shows the total number of managers in each experience category. The second row indicates the number of managers who moved to different jobs after the assignment in the focal experience category. The figure in parentheses is the number promoted to higher level positions after the focal assignment. The fourth row shows the number of branch managers who were assigned to another position before being

[2] Since we can go back to early 1990s for job assignment history records, we included the predecessors of those in our observation period. Dropping them from Figure 4 does not change the overall patterns.

reinstated as branch managers.

According to the chart, roughly half of newly promoted branch managers (100 people, 48% of our sample) were assigned to one of the “small” branches and only a very limited number (38 people, 18% of the sample) were assigned to “large” or “very large” branches. When transferred, they typically move to larger branches. This trend continues to the third branches where the 41% (47 people) direct one of the “very large” branches, while a much smaller number manage small to medium-sized branches. Overall, as managers accumulate more experience, they are transferred to larger branches in Auto Japan.

The typical branch manager runs 2 to 4 branches, and high performers are selected for promotion to higher level positions such as sales director. Low performers are demoted or transferred to other jobs. Among 207 branch managers in the chart, 59 individuals (28.5%) were promoted after serving as branch managers.

B. Issue of Complementarity

One question that cannot be answered using Figure 4 is whether manager quality and branch profitability are complements or substitutes. One possibility is that good managers should be assigned to less profitable branches because they are more likely to be able to turn around troubled ones. In other words, managerial capability is more valuable in branches that face more competition or more external and internal problems including worker quality. Another possibility is that good managers should be assigned to more profitable ones because it is more difficult to maintain high profit levels than to raise low profit levels due to mean reversion.

In order to examine whether the actual manager assignment pattern is more consistent with complementarity or substitutability, we calculate the coefficients of correlation between manager fixed effects and branch fixed effects. The second row in Table 3 shows the correlation coefficients for the entire sample (Column 1) and for subsamples divided by the number of branches managed (Columns 2-4). They all show that manager quality is negatively associated with branch profitability—consistent with the story that they are substitutes. This negative correlation is largest among managers in their second branch assignment.

We also calculate the other correlation coefficients. We first find that larger branches tend to be more profitable (row 3). The result is quite natural because the firm will increase the number of salespersons until marginal profit equals marginal cost. The average profit rate is greater in larger branches because inframarginal profits are higher. It is also possible that there are some increasing returns to scale from more specialization and larger inventories.

High quality managers should supervise more workers, so it is natural to observe a positive correlation between manager quality and branch size (row 4). This result is perhaps the driving force behind our earlier finding that managers are transferred to larger branches as they accumulate more experience. Note that low-performing managers are demoted or transferred to other jobs with greater frequency than higher performers are promoted out of the pool. More experienced managers are assigned to larger branches because their average quality improves over time and their individual qualities are more apparent to upper management. The correlation between manager quality and branch size, however, is relatively weak, presumably due to the negative correlation between manager quality and branch profitability (note the previous result

that larger branches tend to be more profitable).

Finally, younger managers tend to be assigned to more profitable branches in the initial assignment, but this association disappears in the subsequent assignment and in the entire sample (row 5). Employees promoted to branch manager at a young age may be the most promising candidates for leadership roles later in their careers. If so, upper management may be placing these "star" employees in profitable branches to protect them from potentially disastrous failures.

V Which middle managers perform better?

In Section 3, we demonstrate that branch managers can have significant impacts on branch profits. Given that impact, what differences in characteristics can we observe between managers who perform better and those who perform worse? In order to characterize "good managers," we estimate the OLS models of the following performance equation:

$$y_{ijt} = \alpha + X_{ijt}\beta + Z_{k(j,t)t}\gamma + e_{ijt} \qquad \textbf{(4)}$$

where y_{ijt} is gross profit earned by new car sales staff i in branch j in period t and X_{ijt} is a vector of control variables including company-wide gross profits from new car sales, a cubic function of worker i's tenure, worker i's education, and branch size as included in Equation 1. The primary difference between this equation and Equation 1 is that manager fixed effects are replaced by a vector of managers' human capital variables $Z_{k(j,t)t}$ where $k(j,t)$ denotes the manager in branch j in period t. $Z_{k(j,t)t}$ has three components: (1) general human capital variables such as age and education; (2)

job-specific human capital measured by the number of branches managed; and (3) the scope of human capital measured by work experience outside of new car sales

The simple OLS specification has a serious endogeneity problem when the results are interpreted as showing some causal relationship. First, unobservable branch characteristics such as the competitiveness of its local market and the share of customers who are loyal to the car brand Auto Japan sells are presumably correlated with manager characteristics, such as their job-specific experience, because the assignment of managers is endogenously determined. For the same reason, unobservable worker characteristics may also be correlated with manager characteristics. Furthermore, some experience variables in $Z_{k(j,t)t}$ should also be correlated with unobservable manager ability because the former is shaped by the firm's assignment policy.

These endogeneity problems can be solved by adding branch, worker, and manager fixed effects to the model, respectively, as we did when estimating Equation 1, although branch and worker fixed effects cannot be included simultaneously because of the lack of worker movement across branches. One problem with such an approach is that including manager effects forces us to omit time-invariant, manager human capital variables such as scope of experience. Therefore, we attempt the following three different error term specifications in addition to the simple OLS model: (1) branch fixed effects only ($e_{ijt} = \kappa_j + \varepsilon_{ijt}$); (2) worker fixed effects only ($e_{ijt} = \theta_i + \varepsilon_{ijt}$); and (3) manager and worker fixed effects ($e_{ijt} = \theta_i + \delta_{k(j,t)} + \varepsilon_{ijt}$).

The simple OLS results with only branch fixed effects are summarized in Table 4. Column 1 shows some interesting relationships. First, branch managers' age and branch

performance are significantly negatively correlated, implying that younger managers perform better. This result cannot be attributed to the earlier finding that younger managers tend to be placed in more profitable branches in their first branch manager assignment (see the bottom row of Table 3) because we control for branch fixed effects in this analysis. If the result shows a causal relationship, replacing a branch manager with another who is ten years younger will improve the branch profit by 9%, other things being equal. Second, managers with experience beyond new car sales tend to perform better. Both results are significant at the 1% level and robust across specifications.

Although the first result sounds counter-intuitive in light of human capital theory, we have three interpretations. The first interpretation attributes the result to selection. If more capable individuals get promoted to the branch manager position earlier and exit to move up to higher level positions earlier, the quality of younger branch managers should be higher on average. Another possible selection explanation is the aforementioned policy the firm implemented in 2000 that placed an upper limit on the age of new appointees to branch and section manager. It is possible that promotion criteria changed from emphasizing seniority and experience to emphasizing competency, thus creating a pool of younger and more qualified managers beginning in 2000.

The second interpretation is young managers may have an advantage in communicating with their subordinates and promoting group identity because they are closer in age to their subordinates.

The third explanation is the incentive effect caused by symmetric learning (Holmstrom 1982). Since the employer initially has insufficient information about the managers' capability to manage a branch, managers work harder early in their careers to

demonstrate their managerial capability and improve their prospects for promotions and pay raises.

In order to test the first explanation that selection due either to the different timing of entry and exit in the ranks of branch managers or due to the age cap set in 2000 is causing a spurious relationship, we add three variables: *Age at the first assignment* (age at the time when first promoted to branch manager); *Promoted after branch manager stint* (an indicator of branch managers who were later promoted to higher positions); and *Promoted to branch manager after 2000* (an indicator of employees who were first promoted to branch manager after the age cap was set in 2000) in the model shown in Column 2.

Suppose it is true that more productive branch managers are the ones who became branch managers when they were younger, the ones who left the branch manager position early due to further promotion, or the ones who became branch managers after the age cap. Then, controlling for these three variables will at least reduce the negative correlation between age and performance. As can be seen in Column 2, only the second variable has a significant coefficient, indicating that branch managers who were promoted to higher posts tended to perform better. Although the result assures us that high performers are rewarded by promotion, it does not seem to explain the age effect we found earlier because the coefficient of *age* is not significantly different from the one in Column 2 and is in fact larger. Overall, the “selection” hypothesis is not supported by the data.

Next, we examine the second explanation by adding the age difference between the branch manager and the new car sales staff to the control. Since positive and negative age differences may have asymmetric impacts on a worker’s performance, we include

positive and negative differences separately in the equation. As shown in Column 3, the age difference variables are insignificant. Note, however, that the original age effect almost disappears after the inclusion. Furthermore, the coefficient of age difference (age of branch manager - age of worker) is almost identical in magnitude with the coefficient of age itself in Columns 1 and 2 and the p-value for the positive age difference is 12.8%. Thus, we suspect that the lack of strong significance may simply be due to multicollinearity caused by the high correlation between age and age difference. It is also likely to be true that the age difference effect is very diverse—very heterogeneous across workers but explaining supervisors' productivity well at the aggregate level. To show the importance of age difference, in Column 5, we dropped *age* but additionally included *Promoted after branch manager stint* that was significant in Column 2. Reassuringly, the coefficient of (the positive component of) age difference turns out to be significant at the 1% level.

Thirdly, we examine the possibility that the incentive effect due to symmetric learning is causing the age effect. If this mechanism is at work here, productivity should decline with job tenure as more information about manager quality is revealed to the employer. In order to test this hypothesis, we first include the quadratic form of job tenure as branch manager in Column 4. The variables have insignificant coefficients and indicate that the productivity does not decline with job tenure for the first six years, which is at odds with the age effect. The coefficient of age also does not become smaller with the inclusion of job tenure.

As a robustness check, we also estimated the models restricting the sample to managers whose job tenure is three years or less (the results are not disclosed in this paper but are available upon request). Few managers are promoted to sales director

within three years and it is therefore hard to imagine that managerial capability is revealed within three years, or that selection through exit for promotion will cause the age effect in this subsample. In these analyses of the subsample, the age effect becomes even greater and the age difference effects continue to replace the age effect when they are both present. Thus, we conclude that the major mechanism behind the initial age effect is actually explained by age difference—presumably better communication and possibly stronger group identity resulting from smaller age heterogeneity.

We next investigate the second finding from Table 4—managers with experience in jobs other than new car sales tend to perform better as branch managers than those with only new car sales experience. As Table 4 shows, this finding is robust across specifications. The result is also consistent with Lazear (2010) and Frederiksen and Kato (2011). As in these prior works, we need to be careful about how to interpret the positive association between broader experience and performance. A straightforward interpretation is that broad experience enhances one's ability to understand customers' needs, and coordinate efforts across new car sales, used car sales, and service, leading to higher branch revenue. But, our interviews with the firm's executives also reveal that highly capable individuals are assigned a wider range of tasks as preparation for becoming a manager. Therefore, the causality is ambiguous: more capable managers are given more cross-training.

Another important issue is the role of career patterns observed in Figure 4. Branch managers may become more productive as they accumulate more experience having run multiple branches. If this interpretation is true, the same manager becomes more productive after controlling for time-invariant human capital characteristics and unobserved branch profitability. Another interpretation is that the observed career

pattern may be a sequential screening process in which underperforming managers are transferred out or demoted after the first or second assignment to branches. If this is a main mechanism, managers will not become more productive after running multiple branches once their manager fixed effects are accounted for.

There is a third interpretation that is close to the one implied by the tournament theory. Assignment to a larger branch may be a "reward" for a winning manager, making it an incentive mechanism. There may not be a strong reason why more experienced managers are assigned to larger branches although larger branches tend to be the more profitable ones, providing managers with more benefits such as higher performance pay, more learning opportunities, and higher status. This benefit is given to winners of the competition for promotion. If this interpretation of the career pattern captures the reality, the branch managers' productivity will not improve over time or rather decline over time as the incentive effect of the tournament diminishes after controlling for branch profitability by including branch fixed effects.[3]

In Table 5, we add the branch manager experience variable measured by the number of branches managed. As expected, running the *2nd branch*, and the *3rd branch or more* both have positive coefficients in the OLS model estimation (Column 1) although only the variable *3rd branch or more* is significant. The result is consistent with all three interpretations—learning-by-doing, screening, and tournament theory—because they all imply that this experience variable should be positively correlated with branch performance in simple OLS. There are, however, a few model specifications that allow us to distinguish among three interpretations. Correlation caused by learning-by-doing should be most robust and remain observed after including

[3] Here in this argument, we assume that the branch profitability, which reflects the size of the reward for the winner, is relatively stable over time.

branch, and manager fixed effects. On the other hand, correlation caused by screening should disappear once unobserved manager characteristics are accounted for. Similarly, correlation reflecting the tournament mechanism should vanish after unobserved branch characteristics are accounted for.

The results are most consistent with the tournament theory hypothesis. First, the coefficient of *2nd branch* turns to negative and that of the *3rd branch or more* becomes insignificant after including manager fixed effects (Column 2), which provides strong support for the tournament theory hypothesis but are not consistent with the explanations based on learning-by-doing or screening. At the same time, both variables have become insignificant at the 5% level after including both branch and manager fixed effects (Column 4), which clearly indicates that the effects of screening managers and their learning-by-doing are weak, if any. In the next section we again show that learning-by-doing is very limited for branch managers using a different model specification.

One puzzle is that *3rd branch or more* has a significant coefficient in the model with worker fixed effects (Column 3) unlike the model with branch fixed effects (Column 2). The difference produced by including either branch fixed effects or worker fixed effects should not be so large given that workers do not move around among branches until promoted to management, especially when the number of salespeople are controlled for.

Finally, one more important finding in Table 5 is that college education is important for branch managers but does not raise the productivity of salespeople: only the college education dummy for branch managers has a positive and significant coefficient in model 1 and 3. One caveat is that the education-of-manager variable loses significance in the branch fixed effects models (Columns 2 in Table 5). It may be the case that

college-educated managers get favorable treatment in the branch assignment process and therefore have a better chance of promotion to higher level positions. Although it is an interesting topic, exploring such a hypothesis is the beyond the scope of this paper.

The main findings in Section 5 can be summarized as follows. First, younger branch managers tend to perform better, and this effect is mainly explained by smaller age differences between branch managers and salespeople, which presumably improve communication and group identity. Second, experience in areas other than new car sales prior to becoming a branch manager increases branch performance, but this relationship is likely to be biased upward due to selection. Third, a branch manager's education and experience, measured by the number of branches managed, are positively correlated with branch performance, but the endogeneity of branch assignment should be exaggerating the effect of human capital variables. The observed pattern is most consistent with the explanation based on tournament theory—winners of competitions are more likely to be assigned to larger and thus more profitable branches.

VI. How significant is learning-by-doing for branch managers?

Note that the estimated quadratic form of job tenure in Column 4 of Table 4 exhibits a typical learning curve although the coefficients are insignificant. Column 4 of Table 5 also implies that the learning-by-doing might play some role, albeit small, in branch managers' productivity. In this section, we rigorously evaluate how much managers gain through learning-by-doing.

We estimate the following econometric model:

$$y_{ijt} = \alpha + X_{ijt}\beta + \gamma_2 x_{k(j,t)t}^{\ 2} + r_1 x_{k(j,t)t} + D_{jk(j,t)t}\phi + \delta_{k(j,t)} + e_{ijt} \quad \textbf{(5)}$$

where y_{ijt}, X_{ijt} are identical to the definitions in Equation 4, x_{kt} is branch management experience in years for manager *k* (total years in all branches), D_{jkt} is a vector of within-branch job tenure dummies (total months as manager of branch *j* for manager *k*)—1-6 months, 7-12 months, 13-18 months, 19-24 months, 25-30 months, 31-36 months, and over 36 months. These dummies are included to examine whether there is any branch or relation-specific human capital for branch managers. δ_k is the manager fixed effects. Then, the coefficients of $x_{k(j,t)t}^{\ 2}$ and $x_{k(j,t)t}$ capture the learning curve of the typical manager. We can also eliminate any potential bias caused by selection and sorting by including worker and branch fixed effects.

As shown in Table 6, learning-by-doing is not noticeable as the coefficient of x_{it} is insignificant. There may be no substantial learning-by-doing, but we should be careful about this conclusion because heterogeneity in learning capability may be so large that the significance of the average impact becomes insignificant due to a large standard deviation. Assuming that learning capacity heterogeneity is great, we calculate how fast and how much the typical branch manager can improve branch profitability using the estimates of γ_2 and γ_1. Based on the results in Columns 1-3, our estimates imply that it typically takes 2.3 to 3.3 years to reach the peak of learning, and that learning improves branch profitability by 0.8 to 2.2%. The magnitude cannot be ignored although it is very small compared with the 9.3% standard deviation of manager contribution to the gross profit described in Section 3.

We find no evidence of branch or relation-specific human capital as manager

productivity does not improve with the length of same-branch job tenure. Replacing branch managers does not seem to disrupt the business activities within a branch. However, it is puzzling why branch profit dips significantly in the latter halves of the second and third years. One possible explanation is that as the end of a fiscal year approaches, incumbent branch managers push sales into the next fiscal year. Note that branch managers rotate among branches every two to three years unless they are promoted, demoted, or transferred to another position. In efforts to signal their managerial capability in the process of symmetric learning (Holmstrom 1982), branch managers may try to pull in sales in their first year. It also may be the case that, prior to being transferred to another branch, incumbent managers push out sales to help their successors. An implicit agreement to help new managers may be welfare-enhancing if reaching the firm's revenue targets in one's first year is very difficult for new managers and a strong norm of reciprocity exists.

To sum up, although it is very difficult to accurately estimate the impact of learning-by-doing due to the presumably large heterogeneity of learning capability and the endogenous sorting of managers to branches, the average manager's productivity is estimated to improve by 1-2% through learning-by-doing. Hence, the productivity differences due to differences in experience are much smaller than the productivity differences caused by variation in aptitude. The career pattern shown in Figure 4, a sequence of transfers from smaller branches to larger ones, may work as a screening mechanism to sort out good managers rather than a mechanism to train good managers.

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VII. Conclusion

Middle managers can have substantial influence over their subordinates' productivity wherever: (1) the productivity of workers is hard to measure objectively; (2) task re-assignment of workers is necessary in response to changes in the environment; (3) the returns to on-the-job training are high; and (4) coordinated efforts in team production are vital in raising productivity and quality. Despite the potential importance of middle management, there has been scant evidence of the degree to which managers affect worker productivity in business organizations. Most prior studies have focused either on the effect of CEO turnovers or CEOs' personal attributes and backgrounds on firm performance or the contribution of managers and head coaches to team performance in professional sports.

Using personnel and transaction data from Auto Japan, one of the largest auto dealerships in Japan, this paper discusses how large the impact of having a good manager is, how managers are assigned to workplaces, which managers are more likely to achieve high productivity, and how much managers can improve their performance through learning by doing.

We have four primary findings. First, middle managers are important and have substantial impacts on worker profitability but they are not fairly compensated for their true contribution. Second, new managers are assigned to small branches and laterally moved to larger branches as they accumulate experience. This observed pattern is most consistent with tournament theory rather than the explanations based on screening and learning-by-doing. Third, given the same experience, better managers are more likely to be assigned to less profitable branches. Fourth, young managers and those with work experience in multiple areas tend to perform better than older ones and those who have worked only in new car sales. Finally, selecting good managers is more important than

training managers in order to improve their performance.

There are some remaining questions such as why a smaller age difference between managers and their subordinates help to improve the latter's performance and whether a manager's cross-training actually generates more profits and, if so, how. Other questions include how important the incentive effect and screening effect of the manager assignment process are, whether managers with college degrees enjoy favorable treatment in the branch assignment process and, if so, why. Our unexpected finding of declining branch performance in the latter half of the second and third years of branch managers' tenure also merits further investigation. Answering these questions will require more thorough investigation into the behavior of individual managers and salespeople and individual transactions and is beyond the scope of this paper.

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Table 1 Summary Statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
Performance					
Gross profit earned by salesperson in month (yen)	46040	1,414,661	1,026,609	-173,800	9,374,158
Company-wide gross profit from new car sales (yen)	46040	775,697,588	234,578,090	388,595,648	1,352,333,696
Manager characteristics					
Age	46040	52.3	3.1	39.4	59.4
Age at the first appointment as a branch manager	46040	47.8	2.6	39	54
Education (dummy for college)	46040	0.35	0.48	0	1
Experience (dummy for no new car sales experience)	46040	0.08	0.27	0	1
Experience (dummy for both new car sales and other function)	46040	0.53	0.50	0	1
Dummy for promotion to senior manager in later years	46040	0.04	0.19	0	1
Dummy for the first appointment in 2000 and after	46040	0.34	0.47	0	1
# of branches managed as the branch manager.	46040	2.18	1.24	1	6
Job tenure as breanch manager (within branch)	46040	1.43	1.03	0.08	6.00
Job tenure as breanch manager (accumulated)	46040	3.99	2.72	0.08	14.67
Employee characteristics					
Age	46040	33.8	8.3	20	63
Tenure	46040	11.98	9.38	0.17	44.17
Age difference withmanager	46040	18.5	8.8	-13.5	36.3
Dummy for mid-career hires	46040	0.12	0.33	0	1
Education (dummy for college)	46040	0.64	0.48	0	1
Branch characteristics					
Branch size measured by # of new car sales staff	46040	8.48	2.11	2	16

Figure1 Age Distribution of Branch Managers

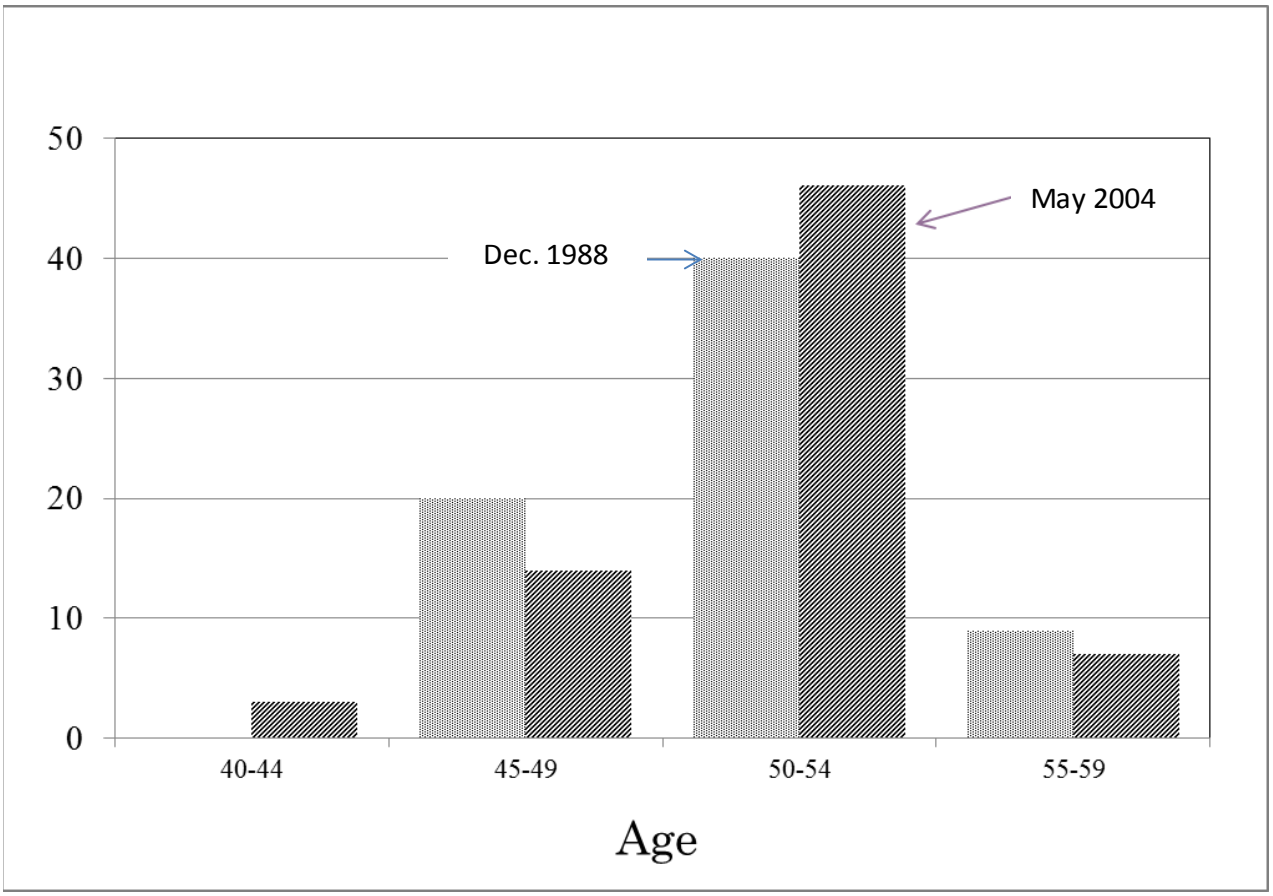


Table 2 Branch Manager and Worker Effects

	Branch and Manager Effects	Worker and Manager Effects	Worker and Manager Effects (adjusted for sampling error)
Standard Deviation of Branch Fixed Effects weighted by worker-months	271,226 (19.2%)		
Standard Deviation of Manager Fixed Effects weighted by worker-months	165,802 (11.7%)	188,226 (13.3%)	131,162 (9.3%)
# of observations	46040	44490	44490
# of branches	70	70	70
# of managers	158	158	158
# of workers	1006	996	996

Note: Percentage figures in the parentheses are the ratios to the mean gross profit per worker in the sample.

Figure 2 Weak Pay-Performance Linkage When Branch/Worker Quality is Controlled for

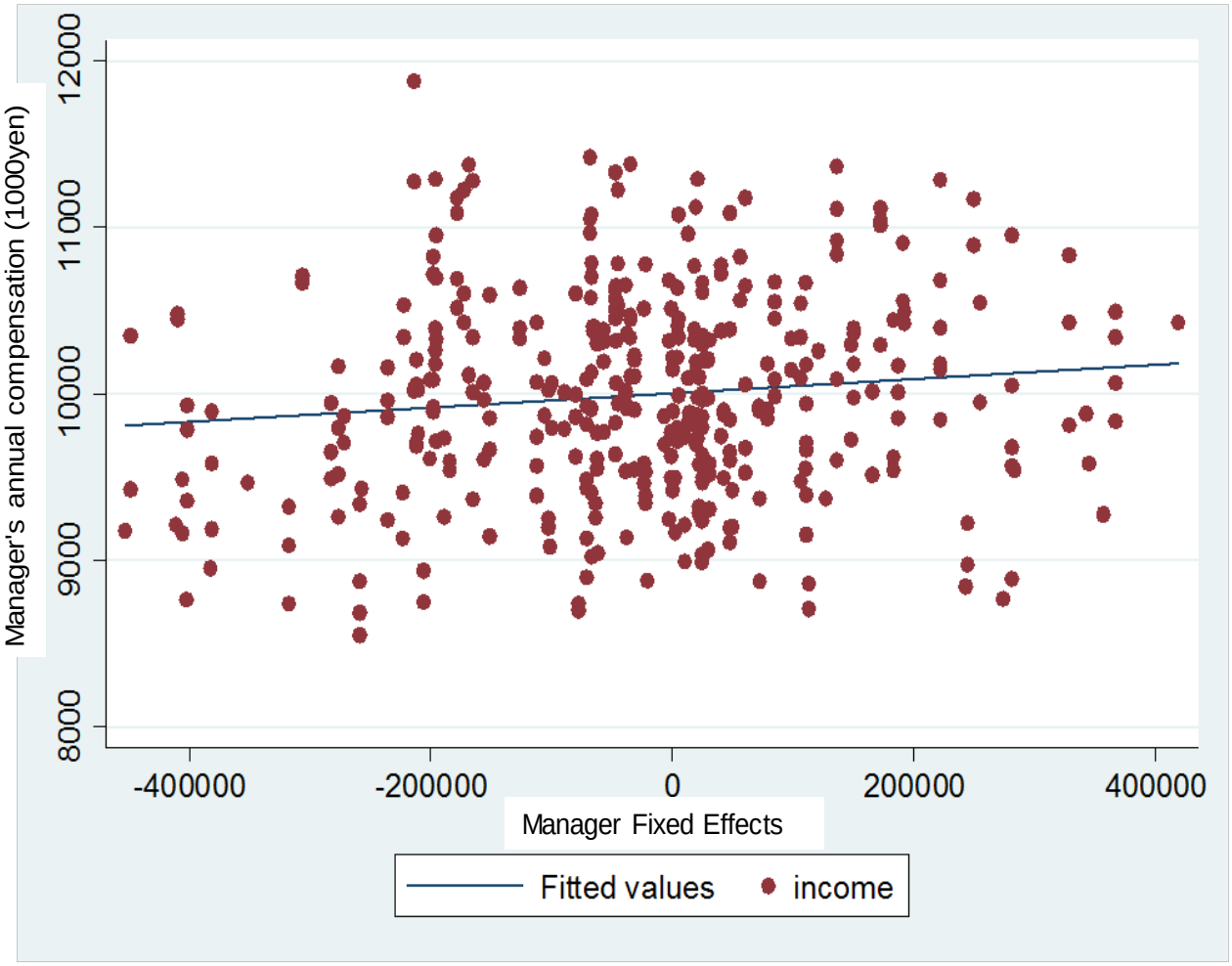


Figure 3 Pay-Perfomance Linkage when Nominal Branch Profits are Used

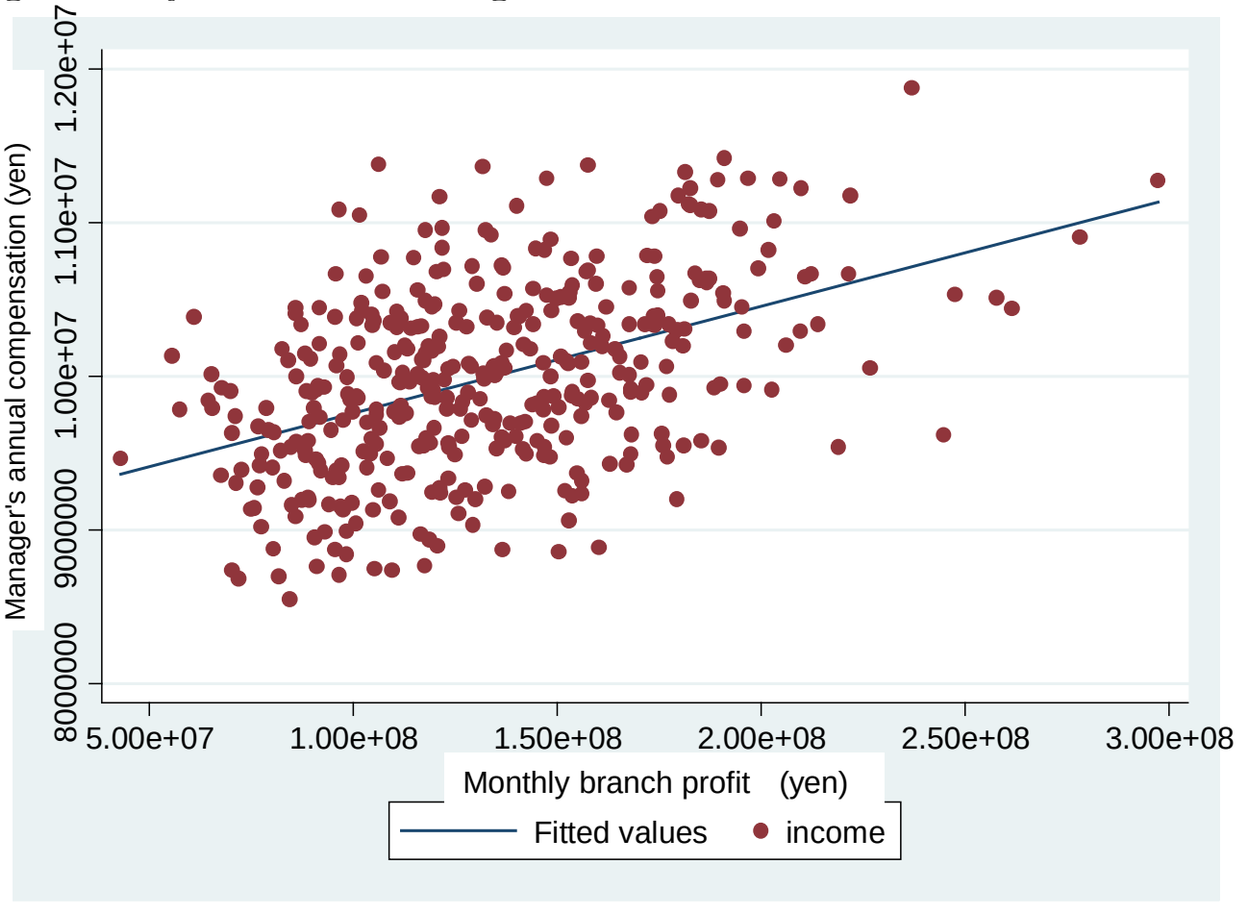
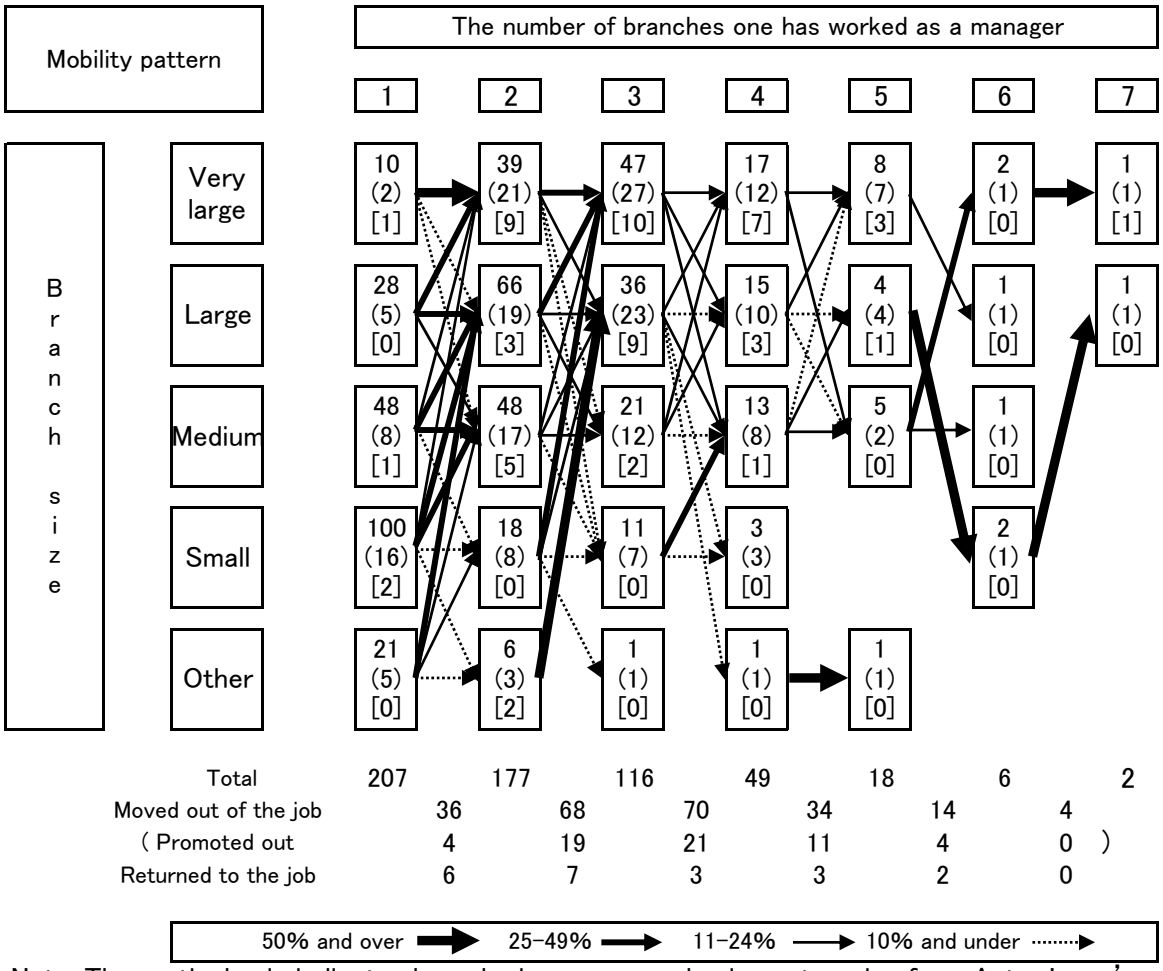


Figure 4 How are branch Managers assigned to Branches?



Note: The vertical axis indicates branch size, expressed using categories from Auto Japan's internal documents, and the horizontal axis counts the number of branches headed by a given branch managers. The size of the arrow signifies the percentage of managers who follow the path among those who are in the starting-point category. The figures in the rectangle for each pair of categories indicate the number of managers in the category, the number of those who were next assigned to jobs other than branch managers (in parentheses), and the number who were next promoted is shown (in brackets). The numbers under the chart show the overall breakdown figures explaining how the total number of branch managers in each experience category changed. More precisely, the first row shows the total number of managers in each experience category. The second row indicates the number of managers who moved to different jobs after the assignment in the focal experience category. The figure in parentheses is the number promoted to higher level positions after the focal assignment. The fourth row shows the number of branch managers who were assigned to another position before being reinstated as branch managers.

Table 3 Coefficients of Correlation Between Manager Fixed Effects and Branch Fixed Effects

	All	1st branch assignment	2nd branch assignment	3rd and more branch assignment
# of observations	46,040	15047	15,407	15,586
Correlation				
bet. branch and manager F.E.s	-0.3603	-0.2929	-0.5176	-0.3991
bet. branch F.E.s and branch size	0.4874	0.4026	0.4793	0.3856
bet. manager F.E.s and branch size	0.1432	0.1655	0.0242	0.2548
bet. branch F.E.s and manager age	0.0048	-0.3376	-0.0538	-0.0249

Table 4 Which Branch Managers Perform Better ?

Dependent vars = monthly gross profit made by worker	(1)	(2)	(3)	(4)	(5)
[Control Variables]					
Monthly firm-wide total profit	0.0018 ***	0.0018 ***	0.0018 ***	0.0018 ***	0.0018 ***
	(0.00003)	(0.00003)	(0.00003)	(0.00003)	(0.00003)
# of new car sales representatives	-65553.1 ***	-65346.8 ***	-65186.4 ***	-65347.8 ***	-66252.2 ***
	(9121.6)	(9130.0)	(9100.5)	(9115.9)	(9166.2)
[Managers' age and career information]					
Age	-12130.2 ***	-13046.5 ***	349.5	-12246.0 ***	
	(2682.1)	(3580.2)	(8949.4)	(3400.5)	
Age at the first assignment (when first becoming a branch manager)		3027.8			
		(3910.0)			
Promoted after branch manager stint		68407.3 **			61899.3 **
		(27546.2)			(27158.5)
Promoted to branch manager after 2000		14014.4			
		(20402.1)			
Age difference (age of branch manager - age of worker if >0)			-13030.3 †		-12944.6 ***
			(8564.0)		(3281.4)
Age difference (age of worker - age of branch manager if >0)			-3448.9		-3405.6
			(31692.5)		(30425.6)
Accumulated experience as branch manager				5876.1	
				(9208.2)	
(Accumulated experience as branch manager)^2				-584.4817	
				(750.014)	
【Manager's education】					
＜ Base : high school or lower ＞					
2 year college or vocational school	29202.2	17738.6	30629.0	29124.3	26998.1
	(30244.8)	(30687.5)	(30345.7)	(30570.6)	(30740.6)
College	21365.7	8956.0	21979.8	22524.5	12803.2
	(23449.0)	(25001.0)	(23566.8)	(23618.1)	(24189.0)
【Scope of experience】					
＜Base: Only new-car sales＞					
Other job experience but no new car sales	90759.4 ***	79326.1 **	90321.1 ***	89019.9 ***	81479.1 **
	(32863.9)	(34474.3)	(32978.0)	(32561.9)	(34083.1)
Experience in both new-car sales and other jobs	73617.3 ***	65731.1 ***	74577.6 ***	74941.4 ***	71084.9 ***
	(24058.3)	(25098.9)	(24023.1)	(24236.6)	(24092.6)
【Worker's education】					
＜ base: high school or lower ＞					
2-y college or vocational school	-41222.7	-41184.0	-58333.3	-41193.4	-57071.4
	(57009.1)	(57297.7)	(56187.0)	(57004.9)	(56331.8)
College	-28027.1	-28932.4	-66577.7	-28305.4	-64943.2
	(49606.1)	(50256.4)	(54436.7)	(49605.6)	(49282.0)
【Worker's career information】					
Tenure	148429.9 ***	148327.1 ***	136003.8 ***	148372.8 ***	136032.5 ***
	(9077.4)	(9075.7)	(13337.0)	(9079.2)	(10124.4)
Tenure^2	-6711.74 ***	-6702.20 ***	-6786.90 ***	-6708.90 ***	-6778.86 ***
	614.28	614.03	(691.54)	(614.45)	(689.76)
Tenure^3	85.649 ***	85.393 ***	88.667 ***	85.597 ***	88.478 ***
	(10.934)	(10.932)	(13.554)	(10.939)	(13.553)
Mid-career hire	153461.7 ***	152332.4 ***	81931.5	153361.6 ***	83333.8
	(53422.3)	(53805.0)	(68622.3)	(53460.3)	(54206.6)
Branch fixed effects	Yes	Yes	Yes	Yes	Yes
# of observations	46040	46040	46040	46040	46040
F test	57.87	56.18	57.03	56.63	57.2
R squared	0.2752	0.2755	0.2757	0.2752	0.2759

Notes : Inside the brankets are the standard errors, *** significant at 1% level, ** 5% level and * 10% level.

† The p-value for the coefficient is 12.8%.

Table 5 Manager's Experience and Performance

Dependent vars = monthly gross profit made by worker	OLS (1)	Branch FE (2)	Worker FE (3)	Branch and manager FE (4)
Monthly firm-wide total profit	0.00183 ***	0.00179 ***	0.00176 ***	0.00178 ***
	(0.00003)	(0.00003)	(0.00002)	(0.00003)
# of new car sales representatives	-14967.5 **	-68446.3 ***	-62069.5 ***	-81734.7 ***
	(7622.7)	(9117.5)	(5233.2)	(9160.1)
【 Managers' age and career information 】				
Age	-19619.2 ***	-14229.9 ***	-16959.3 ***	-10425.3
	(4476.0)	(3006.6)	(1890.3)	(6722.6)
【Manager's education】				
＜ Base : high school or lower ＞				
2 year college or vocational school	-4492.7	33820.0	20755.6	
	(41729.0)	(30393.0)	(21966.4)	
College	84689.1 ***	22979.5	30994.3 **	
	(33025.3)	(23584.2)	(15348.2)	
【Scope of experience】				
＜Base: Only new-car sales＞				
Other job experience but no new car sales	74333.0	100645.6 ***	88429.3 ***	
	(45234.8)	(33393.3)	(21765.9)	
Experience in both new-car sales and other jobs	132200.7 ***	77084.0 ***	68188.1 ***	
	(33671.6)	(24284.3)	(15620.5)	
【The # of branches the manager have managed】				
2nd branch	54231.4	-14315.8	12430.5	76449.1 *
	(33090.5)	(24002.4)	(16762.5)	(41607.6)
3rd branch or more	119008.4 ***	34310.9	68484.2 ***	62018.5
	(37528.7)	(29111.6)	(19569.1)	(57206.5)
【Worker's education】				
＜ Base : high school or lower ＞				
2 year college or vocational school	-28052.0	-41242.6		-40583.5
	(58011.2)	(57006.5)		(57384.4)
College	-19926.7	-26968.5		-32616.1
	(52256.9)	(49726.7)		(50678.2)
【Worker's career information】				
Tenure	139575.5 ***	148723.0 ***	122361.5 ***	151595.4 ***
	(9692.7)	(9073.1)	(6503.3)	(9188.0)
Tenure^2	-6254.52 ***	-6725.24 ***	-4131.93 ***	-6855.83 ***
	(647.15)	(613.49)	(457.26)	(619.95)
Tenure^3	78.875 ***	85.850 ***	37.202 ***	87.136 ***
	(11.449)	(10.909)	(8.735)	(10.993)
Mid-career hire	147692.1 **	154844.5 ***		153382.5 ***
	(60824.1)	(53567.3)		(54275.0)
# of observations	46040	46040	46040	46040
F test	254.51	56.55	1197.76	29.61
R squared	0.2452	0.2754		0.2822
R squared (within)			0.2420	

Notes : Inside the brankets are the standard errors, *** significant at 1% level, ** 5% level and * 10% level.

Table 6 Learning-by-doing by Branch Managers

Dependent var = log (monthly branch profit)	Base Model (1)	(2)	(3)
Monthly firm-wide total profit	0.00177 ***	0.00177 ***	0.00177 ***
	(0.00002)	(0.00002)	(0.00002)
# of new car sales representatives	-66514.6 ***	-82711.0 ***	-82259.7 ***
	(6480.2)	(7087.4)	(7097.3)
【Job Tenure】			
Accumulated experience as branch manager	19555.1	9918.9	18593.7
	(46949.3)	(9644.7)	(12073.2)
(Accumulated experience as branch manager)^2	-3004.21 ***	-2140.20 **	-2774.14 ***
	(932.20)	(970.49)	(1021.97)
Within-branch job tenure			
＜Base : 1-6 months＞			
7-12 months			-9274.4
			(13031.2)
13-18 months			-16049.3
			(14684.6)
19-24 months			-35597.2 **
			(17416.0)
25-30 months			-28467.8
			(20347.4)
31-36 months			-42258.6 *
			(24851.7)
37 months or more			10758.3
			(27942.3)
【Worker's career information】			
Tenure	106746.6 **	151570.1 ***	151504.5 ***
	(46332.9)	(3161.8)	(3162.0)
Tenure^2	-4059.92 ***	-6855.37 ***	-6849.51 ***
	(470.29)	(205.13)	(205.14)
Tenure^3	34.993 ***	87.121 ***	87.001 ***
	(8.988)	(3.645)	(3.646)
Mid-career hire		152860.1 ***	152849.7 ***
		(15760.3)	(15760.5)
【Manager's education】			
＜ Base : high school or lower ＞			
2 year college or vocational school		-40719.3 ***	-41320.0 ***
		(15740.2)	(15741.3)
College		-33198.7 **	-33534.1 **
		(14950.4)	(14952.0)
_cons	101459.2	200037.4	337590.5
	(333443.8)	(337282.3)	(306033.4)
Manager Fixed Effect	Yes	Yes	Yes
Worker Fixed Effect	Yes	Yes	No
Branch Fixed Effet	No	No	Yes
# of workers	1006		
# of observations	46040	46040	46040
F test	92.09	76.96	75.1
Adjusted R squared		0.2786	0.2786
R squared (within)	0.2507		
corr(u_i, Xb)	-0.1431		

Notes : Inside the brankets are the standard errors, *** significant at 1% level, ** 5% level and * 10% level.