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**Price Discrimination and Social Network:
Evidence from North American Auto Dealership Transaction Data**

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Abstract

Using personnel and transaction data obtained from two auto dealerships located in a large city in Canada, we examine whether same or different ethnic matches between salespersons and customers affect the prices and quantities of transactions. First, compared with White-White matches, we find little evidence of price discrimination for different ethnicity matches (such as White vs. Middle East), and we detect neither premium price setting nor discounting among same ethnicity matches (such as Asian vs. Asian) relative to different ethnicity matches. Regarding quantity, however, sales ratios to ethnically-same customers are substantially higher than is the case for ethnically dissimilar customers. For example, East Asian salespersons concluded more than 30% of their sales with East Asian customers. Moreover, we find that high-performing salespersons skillfully utilize social networks to conclude transactions with customers of the same ethnicity, especially when business conditions are unfavorable. This finding suggests that social networks are important to understanding the nature of auto retail markets.

JEL Classification Codes: M12, M5, J15, J33

1. Introduction

With populations throughout North America and other regions becoming increasingly diverse, it is all the more important to understand how ethnic affinities affect economic transactions. Markets are composed of buyers and sellers. Anyone with experience traveling through Asia and Africa knows that business transactions conducted among buyers and sellers of different ethnicity, or persons lacking a common language, can be fraught with difficulty. However, economic theory has taught us that, in competitive markets, price discrimination stemming from a seller's taste for discrimination can reduce firm profits. As a result, competitive markets should drive out discrimination over the long term (Becker 1957). And yet, there seem to be significant gaps between experience and theory.

Empirical research on this issue is divided into two lines. The first takes up price discrimination related to ethnic differences between employees and customers. Ayres and Siegelmen (1995), conducting a controlled experiment in the Chicago area, find that auto dealers offer prices to minorities and women substantially higher than those made to White males. In contrast, Goldberg (1996), using data taken from the Consumer Expenditure Survey, finds no evidence of price discrimination. Consequently, this line of research has produced mixed results. The second line of research highlights the effect of ethnic matches between salespersons and customers. Churchill, Collins, and Strang (1975) find that a more favorable outcome is likely to obtain when the salesperson and customer are similar than when they are dissimilar. However, Leonard, Leonard, and Giuliano (2009), matching data from a large-scale retail chain to data from the U.S Bureau of Census, find that there is almost no payoff gained from efforts to match ethnicities of salespersons and customers, with the exception of Asian and Hispanic ethnic enclaves.

Our research seeks to overcome two problems recurrent in previous studies. First, most earlier work utilizes micro data or panel data, but none include micro-level information on both buyers and sellers. In contrast, we have analyzed detailed information on both buyers and sellers. A second problem concerning previous studies is that they have not adequately controlled for the characteristics of sellers or for the business environments in which they operate. Although these variables strongly influence the behavior of salespersons, they have been regarded as unobservable factors. However, we clearly identify and analyze these variables.

This paper uses personnel and transaction data obtained from two auto dealerships located in an auto mall in a large city in Canada. The crucial feature of this data is that it includes detailed information on transactions: number of sales, model, serial number, transaction date, price, gross profits, commission, salesperson ID, and customer last name. In addition, the data entails information on salespersons, including birthday, entry date, termination date, and ethnicity. The distinctive feature of this data is that it includes micro data on both *transaction* and

salespersons.

We emphasize that ethnic similarities and dissimilarities between salespersons and customers can strongly influence economic transactions, but also that the nature of the influence can differ greatly with regard to quantity and price. Two results concerning price are obtained. First, we do not find any evidence of the price discrimination against non-white customers posited by some earlier studies. If the incentive intensity for the sales staff and product characteristics such as car model are controlled for, no significant price-raising or discounting is identified for any ethnic pair relative to the base case, i.e., transactions conducted among White salespersons and customers. Second, no significant price differential is identified in comparing transactions conducted among ethnic pairs with the ethnically dissimilar salesperson-customer pairs. In theory, it is possible that the prices resulting from transactions conducted among same-ethnic pairs could be either comparatively high or comparatively low. On the one hand, individual salespersons may attempt to use social networks to enhance reputation by lowering prices for same-ethnic customers. On the other hand, customers might attempt to gain maximal benefit from their ease of communication with ethnically similar salespersons in return for higher sales prices. However, neither tendency was identified in our analysis.

Two results regarding quantities were obtained. First, transaction shares among same-ethnic pairs were higher than for other salesperson-customer pairs. The likely reason for this result is the effect of social networks in enhancing communication by providing ready channels for referrals and by facilitating contacts between sales staff and customers sharing a common language. However, no substantial price differentials between ethnic pairs and ethnically heterogeneous pairs can be detected; the evidence suggests instead that the existence of social networks do not lead salespersons to offer preferential discounts to increase sales, but rather that social networks facilitate the building of trust relationships conducive to ensuring product quality and aftercare service. Second, the case provides insights on salesperson ability and performance. Our analysis indicates that high performers make more sales to ethnically similar customers than low performers, and also that their sales to same-ethnic customers increase when business conditions deteriorate. This result further affirms the importance in economic transactions of personal relationships formed through social networks.

2. Previous Studies and Research Questions

This section lays out our framework for analyzing the effects of price discrimination and social networks. First, we examine the results of previous studies, and then outline our core research questions.

2.1 Literature review

The auto retail sector is a classic case of an industry in which bargaining between salespersons and customers is common (Saloner, Spence, and Marti 2000). For this reason, several researchers have used auto sales data to attempt to determine whether intensive bargaining results in ethnicity-related price discrimination.

First, Ayres and Siegelman (1995) and Ayres (2001) have used extensive paired-audit testing to argue that discrimination is a common occurrence in retail sales. In a controlled experiment in the Chicago area, 38 testers bargained for 306 cars at 153 auto dealerships. For both the initial and final offers, prices quoted to blacks and white women were much higher than those made to white men. The results strongly suggest that salespersons often engage in statistical discrimination against customers by inferring reserve prices from ethnicity or gender.

In contrast, Goldberg (1996) detects no discrimination against minorities. Using the Consumer Expenditure Survey (issued by the U.S. Bureau of Labor Statistics) for the years 1983 through 1987, she analyzes car purchase transactions for 1300 households, and finds no significant final price differentials for dummies for minorities (blacks and Hispanics) or for women. She does, however, find a much wider variance in final prices paid by blacks than in those paid by whites.

Scott Morton, Zettelmeyer, and Silva-Risso (2003) find evidence of discrimination against minorities, but less than indicated by earlier research, in an analysis of 670,000 transactions involving 3,562 auto dealers from January 1999 through February 2000. Without controls, they find a minority premium in the 2% range (an average of \$500 per car), but when controlling for search costs (using a dummy for accompanied trade-ins) the premium declines to the 0.6-0.8% range. Furthermore, using a dummy for the internet service Autobytel.com and an interaction term for ethnicity eliminates nearly all the remaining minority premium.

As the above review shows, previous research has produced both positive and negative evidence regarding the existence of ethnicity-related price discrimination. Moreover, research so far suggests that even if price discrimination does occur, it could correspond to variations in perceived consumer reserve prices.

Although considerable research has been conducted on discrimination, there is little work focusing on the ethnic affinities among customers and salespersons, the effects of ethnic networks, and salesperson reputation among affiliate ethnic groups. Ibarra (1992, 1995) shows that employees may attract customers using personal connections within social networks. Churchill, Collins, and Strang (1975) find that placing ethnically similar salespersons amongst customers enhances communications and raises sales performance as well (see also Holzer and Ihlanfeldt (1998). However, because their analysis is not based on transaction data, no direct

evidence of the impact of racial similarity on prices and profits is provided (on the relationship between diversity and business performance, see Kochan et al (2003)).

The major empirical research in this area has been conducted by Leonard, Levine, and Joshi (2004), Giuliano, Levine, and Leonard (2009), and Leonard, Levine, and Giuliano (2009). Using store-level data for a national retail chain with over 800 stores and more than 70,000 employees, they analyze the effect of salesperson-customer ethnic affinity on store performance (sales). They find that higher rates of ethnic matching do not necessarily improve store performance, except when customers (especially Asians and Hispanics) speak English poorly.

However, they base their ethnicity data on the U.S. Bureau of Census data for the regions in which stores are located. Consequently, the data apply to the “potential customer” group (the population living near the store) rather than to the stores’ customers per se. As we explain below, this paper makes direct use of ethnicity data on individual customers and salespersons, enabling us to calculate more accurately the effect of ethnic affinity between salespersons and customers.

2.2 Research questions

Our investigation of preceding studies has led us to identify the following questions for investigation.

1. Do our data provide evidence of price discrimination against particular ethnic groups? In particular, do minorities pay price premiums?
2. Do our data indicate significant effects for social networks? More concretely, are business transactions more frequent among persons of similar ethnicity than among those of dissimilar ethnicity? If ethnic affinity generates a higher rate of business transactions, what kind of salespersons are most effective?
3. Can ethnicity-based price discrimination or social network effects be detected if the incentive intensities faced by the salespersons are controlled for?

3. The Data

3.1 The Data

We analyze personnel and transaction data obtained from two auto dealerships located in an auto mall in a large city in Canada.¹ The data covers the period from April 2005 to December

¹ Because of confidentiality agreements, clearly necessary in this instance, the location of the dealerships cannot be disclosed, but we were fortunate to find an area with a diverse population.

2006, and includes number of sales, model, serial number, transaction date, price, gross profits, commission, salesperson ID, and customer last name. In addition, we have information on salespersons, including birthday, entry date, termination date, and ethnicity. During the twenty-month period studied, Dealership A sold 2,823 new cars, and employed forty-one people, including managers, in its sales department, while Dealership B sold 1,994 new and 820 used cars, and employed twenty-eight people in its sales force. All the salespersons were male. The summary statistics are shown in Table 1. The following section presents details of the ethnicity of the workers and customers. This information is central to our core task, explaining the effect of ethnicity on sales transactions.

3.2 The Ethnic composition of the salespersons

Table 1 shows the ethnicity of the 69 salespersons employed during the twenty-month period. The most numerous group was Whites (29 persons), followed by South Asians (15) and East Asians (9). There were only two Blacks and two Hispanics. Figure 1 shows the ethnic composition on a month-to-month basis. It also indicates that about 30 sales staff were employed in any given month, with Whites accounting for about one-third of the total. Over the course of the period, the number of South Asians declined somewhat while that of East Asians grew. The total number of Black and Hispanic salespersons was always either zero or one.

3.3 Customer ethnic composition

Since information on the ethnicity of the car buyers was not included in the dataset, we obtained this information in the following manner. First, we classified customers by race/ethnicity/national origin using data provided by the U.S. Bureau of Census, which discloses the ethnic distribution for each surname for which sufficient data exist. We identified a customer as White, Black, Asian, or Hispanic if more than 50% of citizens with that surname was categorized as such by the U.S. Bureau of Census. Surnames that did not correspond to any group and names that did not meet the 50% threshold were labeled “Others.” Because Statistics Canada has not released equivalent information, we rely on information from the U.S. Second, we sub-classified Asian surnames into four subgroups with the professional assistance of economists and sociologists who themselves are of either East Asian, Southeast Asian, South Asian, or Middle Eastern Asian descent.²

Table 1 shows the ethnic composition of the customers. It indicates that the most numerous customers of the 4,032 cars sold by individual salespersons were Whites (1,508 units, 37.4%), followed by South Asians (606 units, 15.0%) and East Asians (528 units, 13.1%). Excluding

² To ensure accuracy, all of the initial results were double-checked the results by scholars from the same region working in pairs.

transactions for which the ethnicity of the buyer could not be determined (918 units, 22.8%), the ethnicity ratio of the three largest ethnic groups of buyers closely matched those of the salespersons. This strong correlation is also pronounced on a month-to-month basis (the corresponding graph is not presented in this paper).

4. The Incentive System

This section presents an overview of the compensation systems adopted by companies A and B. In both firms, pay is 100% commission-based.

4.1 Nonlinear pay scheme

As can be seen in Table 2, companies A and B utilize the same system, a compensation scheme in which the commission rate rises stepwise according to the number of vehicles sold. For salespeople who are in charge of new cars, the commission rate is (1) 25% with pack if the total monthly sales volume is between one and eleven units; (2) 25% without pack between twelve and thirteen units; (3) 30% without pack between fourteen and fifteen units; and (4) 35% without pack for at least sixteen units. For those in charge of used cars, the thresholds are lower: (1) 25% with pack if the total monthly sales volume is between one and five units; (2) 25% without pack between six and seven units; (3) 30% without pack between eight and eleven units; and (4) 35% without pack for at least twelve units.³

Pack is the amount subtracted from the gross profit before multiplying the commission rate to compute the amount of the commission. Pack is explained to the employees as the typical inventory cost and it is subtracted only for low performers. At dealerships A and B, pack is 2% of invoice price but is capped at a maximum of C\$400.

For example, if pack is charged on a gross profit of C\$1000, $(1000-400) \times 0.25 = \text{C}\150 is the

³ Companies A and B, which are owned by the same businessperson, instituted a new compensation scheme in April 2005, replacing a system in which commissions were calculated on a quarterly (3-month) basis. The previous scheme specified the commission rate according to ranks (called silver, gold, or platinum) determined on the basis of sales volume in the previous quarter: 35-39 cars – silver; 40-42 cars – gold; 43 cars or more – platinum. The commission rates were 25%, 30%, and 35%, all without pack, for silver, gold, and platinum, respectively. The commission rate for sales of 34 cars or fewer was 25 percent with pack. The system had two problems. First, the pay was quite high relative to the average in the regional market. Second, the salespersons were able to bargain with managers each quarter about their assigned ranks. As a result, once a salesperson had reached gold or platinum, it was difficult to lower his rank even if his performance started to lag. For these reasons, the new owner changed the compensation system upon buying the two companies in late 2004.

take-home pay, but without pack the calculation is $1000 \times 0.25 = \text{C}\250 . This system has two faces: a penalty to ensure that salespersons work hard to avoid being charged pack, and the adjustment needed by the company to recover fixed costs of employment, especially fringe benefits for low performers.

Figure 2 indicates how employee commission increases stepwise according to the number of cars sold, assuming an average price of C\$25,000 and gross profit of 5 percent for new cars.

4.2 Marginal commission

We calculate marginal commission in order to obtain the time-varying incentive intensity under the non-linear compensation scheme used by companies A and B. Marginal commission is the increase in monthly commission income earned through the sale of each additional car.

For example, if a salesperson who has already sold 13 cars during a given month sells one additional car (notching a fourteenth sale), his commission rate for the month increases from 25 percent to 30 percent, not only for the 14th car but for all fourteen cars sold. Therefore, the increase in monthly commission gained by reaching one of the three thresholds is substantially larger than the actual commission for the particular sale below the threshold. Figure 3 shows how marginal commission, given the same conditions assumed for Figure 2, changes along the pay schedule. As can be seen in Table 2, the marginal commission makes a sudden jump upon reaching each of the thresholds.

4.3 Compensation scheme and practices implemented

Here we examine the distinctive characteristics of the compensation scheme. First is the manner in which salespersons and customers interact. The latter tend to be walk-in customers or people referred by earlier customers. The referrals are made by persons – typically repeat customers – employed at the same workplaces, members of the same social organizations, or residents of the same communities as the new customers. The reasons that new customers seek referrals or recommendations include desires to get better prices, to ensure quality, and, in some cases, to speak with sales staff conversant in languages other than English. While customers deficient in English will likely wish to deal with particular salespersons, walk-in customers are likely to be assigned to available sales staff by the reception staff in pre-determined order. Without a pre-determined order system, salespersons may compete to service or poach customers, creating a poor working environment. However, receptionists will generally ignore the order system in the case of customers with English communication problems (notably Asian customers in the case of companies A and B) and try to pair them with sales staff conversant in the customer's native language.

Second, some sales are joint sales, involving two or three salespersons in a single transaction. In these cases, commission rates are determined on a case-by-case basis. The most common scenario is that the main salesperson is clearly known, and the assisting salesperson simply helps with delivery of the vehicle. The assisting salesperson generally receives a C\$50 fixed rate allowance drawn from the main seller's commission. In such a case, only the main seller receives credit for the sale with regard to calculation of the commission.

A third characteristic is determination of the sales price. Only managers have the authority to determine car prices, but salespersons often bargain energetically, demanding lower prices in order to make sales. In this way, sales staff also exert a significant impact on actual prices.

Fourth, a carry-over provision affects determination of the commission rate. If a salesperson sells more than 16 new cars (or more than 12 used cars) in a month, the cars sold in excess of the threshold are counted in the following month's commission.⁴ For example, should a salesperson sell 20 new cars one month, and 12 the following month, the 4 cars sold in excess of the threshold ($20-16=4$) in the first month are added to the calculation of the commission for the subsequent month ($12+4=16$), for which the commission rate becomes 35% without pack. However, the commission on the extra 4 cars themselves is paid in the first month – the period when the cars were actually sold – and not in the following month, when the salesperson is paid the highest commission rate, 35%, but only for the 12 cars sold that month.

Fifth, there are several types of irregular bonuses. For example, special bonuses called “spiff” are paid for the first deal concluded on a Saturday. Bonuses are also paid when cars are sold from “dead stock” (i.e., in inventory for more than 100 days).

Sixth, profits or losses on trade-ins are calculated in the gross profit before the commission rate is determined. In this manner, employees bear the risks of trade-ins.

Table 1 shows monthly salesperson-based data on commission rates related to non-linear pay. It shows that three-fourths of sales ($500/733=75.4\%$) are with 25% pack (charged when sales are fewer than 11 new cars a month, or 5 used cars). Further, the information on individual salespersons shows a clear divide between high performers who routinely carry over sales and low performers who usually get charged 25% pack. Finally, we can see that the present compensation system seems to be responsible for the high level of turnover evident since its introduction in April 2005.

5. Does Price Discrimination Exist?

⁴ The number of cars sold beyond the threshold can be carried over for only one month.

Two methodologies are used to determine whether the affinities between salespersons and customers affect gross profits (profitability) on new car sales. First, in Section 5.1, the average gross profit rate for new car sales is calculated and correlated with the ethnicity of salespersons and customers to determine whether transactions concluded between ethnically similar persons result in significantly higher or lower levels of profitability than other transactions. In Section 5.2, the determinants of average gross profit rate of new cars are analyzed after controlling for the incentives created by the non-linear compensation system used by companies A and B, as described in the preceding section. This result enables us to conduct a more detailed analysis on the findings for Section 5.1.

5.1 Comparisons of average gross profit rates for new cars

This section compares average gross profit between transactions conducted by ethnically similar pairs and the other transactions to learn whether a significant differential exists. Gross profits for sales among ethnically similar salespersons and customers present two important but contradictory implications for short-term firm profitability. On the one hand, it is possible that salespersons seeking to enhance their reputation among social networks, as analyzed in the next section, will offer preferential discounts to members of their own ethnic groups. Large preferential discounts reduce profitability. On the other hand, it is possible that customers dealing with a salesperson speaking their native language may be willing to pay some degree of premium in order to facilitate communications. This pattern, of course, enhances firm profitability. Moreover, Ayres, and Seigelman (1995) and Scott Morton, Zettelmeyer, and Silva-Risso (2003) have shown that price discrimination could occur when salespersons and customers are ethnically dissimilar.

Table 3 shows the distribution of average gross profit rates for new cars correlated with ethnicity matches between salespersons and customers. The diagonal cells (shaded) show the sales made among same ethnic matches. In order to conduct a rigorous analysis, the sample is limited to standard transactions not involving spiff or other irregular bonuses. The calculation shows that transactions among ethnically similar persons bring average gross profit rates below the average (3.76%) for Blacks (2.90%), Southeast Asians (3.20%), and South Asians (3.97%). A *t*-test was conducted for differentials in transactions among ethnic pairs, compared with White salespersons and customer pairs. We found a significant tendency for differentials to occur in transactions conducted among ethnic pairs for just three groups: East Asians, Southeast Asians, and Hispanics.

In addition, we investigated the likelihood of ethnicity-related price discrimination by examining gross profit rates by customer ethnicity, as shown in the bottom row of the table. We found a slightly higher average gross profit rate (4.22%) for Hispanics, but the rates were in the

3% range for other ethnic groups, so we could not detect a large differential.

5.2 Regression to control for incentives and other transaction characteristics

The results indicated in the previous section, which compare average gross profit rate for new car sales by ethnic match between salesperson and customer, do not necessarily indicate price discrimination. Customers who have special needs or face peculiar situations may tend to choose a salesperson with similar ethnic backgrounds. To check this possibility, more rigorous analysis is conducted regarding the results found through the above comparative investigation of ethnicity-related average gross profits on new car sales. More concretely, we control for the incentives created by car models and by the nonlinear compensation scheme, and use an OLS to estimate the average gross profit rate of new cars sold (R_j).

$$R_j = X_j\beta + B_j\gamma + \lambda m_comm_j + \theta ethnicity_j + e$$

The suffix j represents the transaction. Asch (1990) and Larkin (2007) have shown that the use of nonlinear compensation systems is likely to result in gaming near the end of transaction periods. To control for this, X_j represents variables that affect gross profit rate, including transaction date, purchase timing, car model, market condition, and whether sales are joint or individual. B_j indicates whether a discretionary bonus applied, including the amount of any such bonus. m_comm_j indicates the amount (in dollars) of the marginal commission (see Section 4.2) generated by the sale. To these explanatory variables we add the interaction terms regarding ethnicity of salespersons and customers.

The result is shown in Table 4. Taking as our base case transactions involving Whites as either salespersons or customers, the coefficients of the interaction terms indicate that there is a significant gross profit rate differential (at the 10% level) only when Southeast Asian salespersons sell to East Asians or Hispanics. However, no differential can be detected for ethnically-similar transaction pairs.

No such significant differences in average profit rate could be attributed to the possibility that preferential discounting to enhance reputation offered by salesperson could cancel out price premiums paid by customers to facilitate communication. The discounting or premium may appear, depending on car model or price range.

For example, we might assume that most buyers of high-end cars will be high-income, speak English without difficulty, and have little trouble communicating with salespersons. Further, buyers of high-priced cars may receive significant discounts. On the other hand, we expect that

customers searching for low-end cars will tend to be low-income, to speak English with difficulty, and to incur large communication costs for salespersons. In addition, low margins for low-priced cars mean that significant discounts are unlikely. The re-estimated results (not shown here) of the profit equation specified above indicate no clear tendency related to ethnicity if the sample is divided into the minivan/SUV vs. sedan/truck subsamples or the high-priced vs. low-priced subsamples.

Based on the above estimates for transactions at companies A and B, we find that little statistical price discrimination related to ethnicity exists. The calculations reveal no preferential discounting between salespersons and customers of the same ethnicity.

6. Do Social Networks Matter?

Social networks based on ethnicity may play an important role in promoting communication and building trust, and in disseminating information on individuals' reputations. Such arguments have long been advanced by practitioners as well as social scientists conducting research on diversity (Bantel and Jackson 1989; Cox 1993). However, there is little empirical evidence for such arguments. This section attempts to help fill this gap by verifying whether ethnicity-generated differentials can be observed in sales transactions.

Section 6.1 uses cross tabulations to find out whether a significant difference exists in the frequency of transactions between ethnically similar persons and all other transactions. Based on these results, Section 6.2 presents regression results that reveal which ethnic group salespersons are likely to conduct frequent transactions with ethnically similar customers.

6.1 Transactions by ethnicity match

Table 5 presents the distribution for individually transacted new car sales. Salesperson ethnicity is indicated on the left side of the table and ethnicity for customers at the top. The shaded diagonal cells indicate that the sales staff and customers are ethnically similar.

The table's shaded cells indicate a very high proportion of sales concluded among ethnically similar pairs. For example, the two companies' sales to East Asian customers accounted for only 13.1% (528 vehicles) of total sales. However, 31.3% (348) of sales made by East Asian salespersons were to East Asian customers. While no other sales staff ethnic group reaches such a high proportion of sales made to ethnically similar customers, the general tendency toward concentrations of sales on ethnically similar persons is also strongly indicated for all other ethnic groups except Hispanics. In other words, customers are especially apt to buy cars sold by salespersons from their own ethnic groups.

6.2 Which ethnically similar pairs conclude numerous sales?

As noted above, the likely reasons for the high concentration (ratio) of sales shares among ethnically similar pairs include high trust, a common language, and ease of communication (though we found no statistical evidence for preferential discounting). In addition, there is a strong possibility that many customers are referred to particular salespersons through social networks based on strong religious or residential ties.

Next, we seek to discern what kinds of salespersons are largely responsible for transactions among ethnically similar pairs. The most likely candidates would seem to be the company A and B salespersons who usually earn only commissions with 25% pack attached. In short, low performers are likely to seek to augment their income by appealing to customers that can be contacted through social networks.

However, we can also envision contrary cases. As shown in Table 1, some salespersons are routinely able to earn high commissions and carry over sales. It is possible that sales to ethnically similar customers help to account for their high performance.

To explore this hypothesis, we separate salespersons into high and low performing groups to find out whether any significant differences in sales ratios to ethnically similar persons can be observed. We define high performers as those who earned high commissions without pack in over half of the months they were employed between April 2004 and December 2006, and low performers as those who earned commissions with pack in over half of the months they were employed during the same period. Then we select high performing salespersons from ethnic groups. Through this process we identify a total of seven high performing salespersons from two ethnic groups, East Asian and South Asian. We then investigate how tendencies in their sales (number of sales, their shares of both total sales, and average gross profits for their firms) correlate with the ethnicity of their customers.

As seen in the top portion of Table 6, East Asian salespersons concluded a high 31.3% ratio of sales (348 vehicles) to ethnically similar customers, far exceeding the two companies' combined ratio of sales to East Asians (10.9%). Further, it was clearly the high performing salespersons who drove this result: The ratio of total sales by high performing salespersons to East Asian customers was quite high at 34.4% (278 cars), while the low performers' ratio of sales to East Asian customers was just 23.0% (70 cars). The low performers' 23.0% ratio was high relative to companies A's and B's total sales, but very low compared to the high performers' output. Moreover, average gross profits were 3.23% for high performers compared to 3.52% for low performers.

A similar tendency is observed with regard to South Asian salespersons, as shown in the bottom row of Table 6. High performing South Asian salespersons made 35.6% (134 vehicles) of their new car sales to ethnically similar customers compared to just 24.6% (77 vehicles) sold to ethnically similar customers by low performing South Asian salespersons. Furthermore, the high performing South Asians attained a high 4.10% average gross profit rate on their sales to ethnically similar customers, compared to a 3.75% rate for the low performers. The significantly lower average gross profit rate for low performers is the reverse of the tendency identified for East Asian salespersons.

The comparative analysis of customer ethnicity demonstrates that both high performing East Asian salespersons and high performing South Asian salespersons – both represented by multiple employees – concluded high ratios of their new car sales to ethnically similar customers. It further suggests that selling to ethnically similar customers has been a major factor supporting the strong performance of both groups. However, contradictory patterns in the average gross profit rates for the two ethnic groups are also found, so no clear tendency can be identified. The reason is that high performing East Asian salespersons tend to sell high-priced cars with generally lower profit rates, and high performing South Asian salespersons sell low-priced cars with generally higher profit rates.

In order to understand the behavioral differences between high performers and low performers, we examine differences in adaptation to changes in business conditions. To obtain the logarithm of the ratio of cars sold each month by salespersons to ethnically similar customers, we use month-to-month new car sales data for each salesperson. Using the result as the dependent variable ($\ln(c_s_same_ethnicity)$), we conduct a regression, strengthening the result presented in Table 6.

$$\ln(c_s_same_ethnicity) = \alpha \ln(c_ethnicity) + \beta \ln(s_ethnicity) + \chi \text{High performer dummy} + \delta \text{High performer dummy} * \ln(\text{macro_car}) + \varepsilon \text{Company A dummy} + e$$

More concretely, to obtain the ethnicity variable influencing the ratio of new car sales for salespersons to customers of similar ethnicity, we use the ratio of sales made by the two companies' salespersons each month to customers of similar ethnicity ($c_ethnicity$) and the ratio of salespersons of the same ethnicity ($s_ethnicity$). In addition, we calculate a regression using a high performer dummy, a cross term for the high performer dummy and provincial (namely, intrastate) car sales ($\text{High performer dummy} * \ln(\text{macro_car})$), and a dummy to control for particular characteristics of Company A. Further, we performed a calculation limited to salespersons with ten months or longer tenure. The reason for limiting the sample is a concern that a salesperson with short tenure could have a strong sales performance during a short period purely by chance. For example, a person with a single month on the job might have strong sales for that month, leading us to inaccurately classify him as a high performer, and making it

impossible to generate a meaningful result.

We use an interaction term for the high performer dummy and the provincial new car sales to identify the sales trends for high performing salespersons. For example, a positive interaction term coefficient would indicate that the dependence of high performers on ethnically similar customers rises when economic conditions are favorable. A negative coefficient would signify that salespersons are less dependent on such customers during periods of growth.

The results are shown in Table 7. The high performer dummy is positive. The interaction term for the high performer dummy and the provincial car sales amount is negative. And two out of three cases are significant (at the 10% level). In short, high performers are heavily dependent on ethnically similar customers to maintain their high performance. Moreover, high performers depend very strongly on sales to ethnically similar customers during recessions, but become considerably less reliant on them when economic conditions are favorable.

From the above results, we derive the following conclusions about the effect of social networks on sales. First, customers and salespersons are positively inclined toward conducting transactions with ethnically similar persons. Second, the reasons for this positive inclination do not include the desire for preferential pricing so much as desires to enhance communication and to build mutual trust to ensure product quality and reliable after-sales service. However, such enhanced communication and mutual trust are not associated with price premiums. Third, by dividing high from low performers, we are able to find evidence that high performers make skilled use of social networks, enabling them to maintain strong sales performance even under unfavorable macroeconomic conditions.

7. Conclusions

This paper has used transaction data on North American auto dealerships to investigate the likelihood of price discrimination and the effects social networks regarding everyday economic activities. The main results are summarized below.

First, we do not find any evidence of price discrimination against non-white customers posited by some earlier studies. If incentive intensities for the sales staff and product characteristics such as car model are controlled for, no significant price-raising or discounting is identified for any ethnic pair relative to the base case, i.e., transactions conducted among White salespersons and customers.

Second, no significant price differential is identified in comparing transactions conducted among ethnic pairs with the ethnically dissimilar salesperson-customer pairs. In theory, it is

possible that the prices resulting from transactions conducted among same-ethnic pairs could be either comparatively high or comparatively low. On the one hand, individual salespersons may attempt to use social networks to enhance reputation by lowering prices for same-ethnic customers. On the other hand, customers might attempt to gain maximal benefit from their ease of communication with ethnically similar salespersons in return for higher sales prices. However, neither tendency was identified in our analysis.

Third, transaction shares among same-ethnic pairs were higher than for other salesperson-customer pairs. The likely reason for this result is the effect of social networks in enhancing communication by providing ready channels for referrals and by facilitating contacts between sales staff and customers sharing a common language. However, no substantial price differentials between ethnic pairs and ethnically heterogeneous pairs can be detected; the evidence suggests instead that the existence of social networks does not lead salespersons to offer preferential discounts to increase sales, but rather that social networks facilitate the building of trust relationships helpful to ensuring product quality and aftercare service.

Fourth, the case provides insights on salesperson ability and performance. Our analysis indicates that high performers make more sales to ethnically similar customers than low performers, and also that their sales to same-ethnic customers increase when business conditions deteriorate. This result further affirms the importance of personal relationships formed through social networks in facilitating economic transactions.

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Table 1. Summary Statistics**Transaction-based data (in Canadian dollars)**

	New Cars					Used Cars				
	Obs.	Mean	S.D.	Min	Max	Obs.	Mean	S.D.	Min	Max
Price	4978	27159	7440	13991	62090	1141	15534	6057	689	44000
Gross profit	4978	1031	598	-1452	4898	1141	1668	907	-911	6174
Gross profit rate	4978	3.87%	2.02%	-5.05%	19.32%	1141	13.03%	9.99%	-7.59%	70.96%
Commission	4978	264.67	179.77	0	2150	1141	500.11	280.64	0	2161

(Note) Sales made between April 2005 and December 2006. Excluding the sales made by the managers.

Daily salesperson-based data

	Obs.	Mean	S.D.	Min	Max
Number of cars sold	14210	0.42	0.928	0	12.5
Incentive intensity (in C\$)	14210	200.2	249.1	38.9	2613

Monthly salesperson-based data

	Obs.	Mean	S.D.	Min	Max
Number of cars sold	663	9.01	6.03	0	36.5
Carry-over	663	0.62	2.19	0	20.5
Salesperson characteristics					
Age	663	42.01	9.21	21.17	70.58
Tenure	663	2.83	3.3	0	16.58
New vs. used cars	New car sales 563		Used car sales 100		Total 663
Commission rate applied	25% w pack 500	25% wo pack 53	30% 40	35% 70	Total 663

Ethnic background of salespeople

Ethnicity	Total	White	Black	East Asia	Southeast Asia	South Asia	Middle East	Hispanic
Number of salespeople	69 100%	29 42.0%	2 2.9%	9 13.0%	7 10.1%	15 21.7%	5 7.2%	2 2.9%

(Note) Excluding the managers.

Ethnic background of customers

Ethnicity	Total	White	Black	East Asia	Southeast Asia	South Asia	Middle East	Hispanic	Others
Number of customers	4032 100%	1508 37.4%	27 0.7%	528 13.1%	183 4.5%	606 15.0%	127 3.1%	155 3.8%	918 22.8%

Figure 1. The Number of Salespersons by Ethnicity

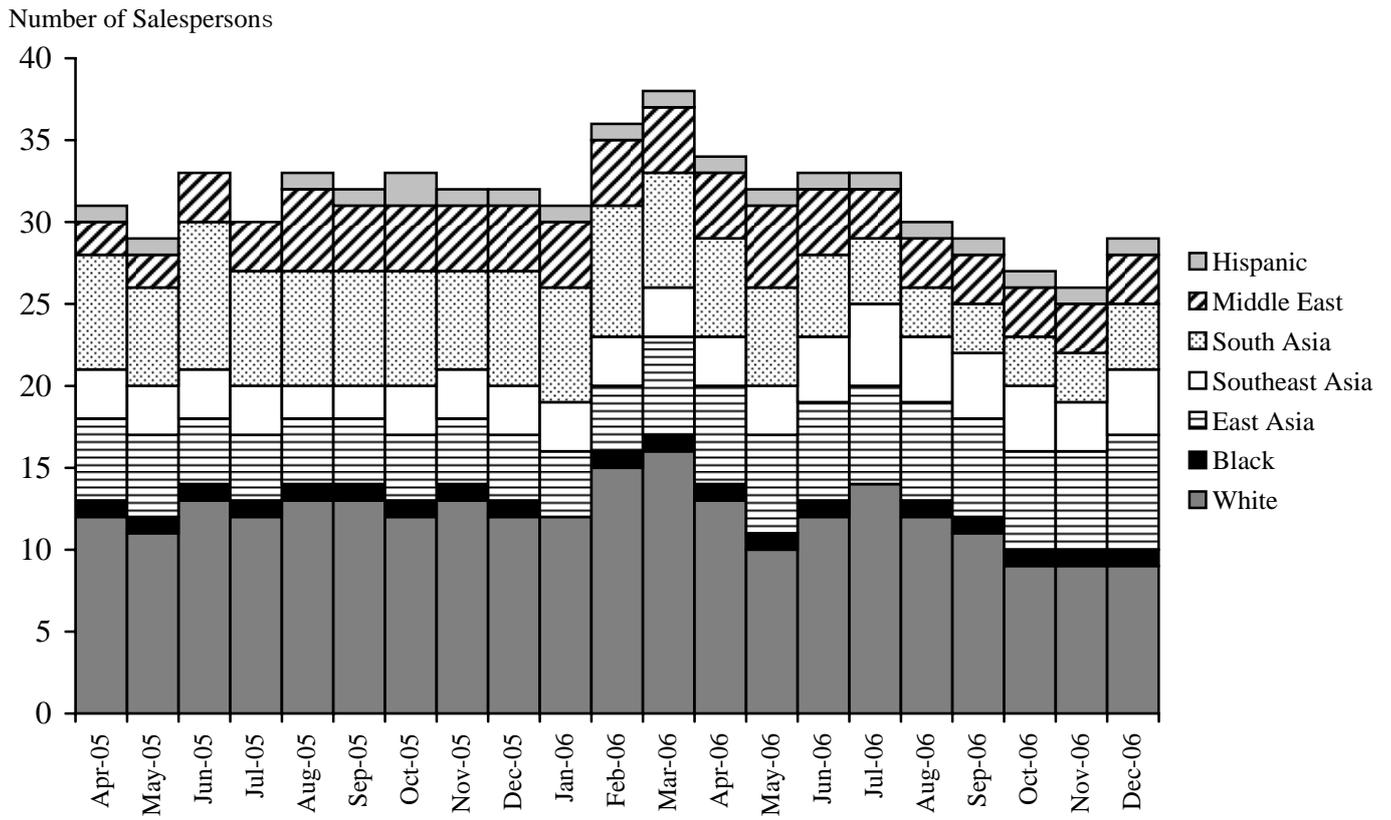


Table 2. Commission Schedule Used by Companies A and B, New Car Sales

Number of Cars Sold		Commission Rate
New Cars	Used Cars	
1-11	1-5	25% with pack
12-13	6-7	25% without pack
14-15	8-11	30% without pack
16 and over	12 and over	35% without pack

(Note) Commission=(gross profit-pack)×commission rate

Pack is 2% of the purchase price or \$400, whichever is smaller.

For example, with a gross profit of \$1,000 and a price above \$20,000.

25% with pack:(1,000-400)×25%=\$150

25% with pack:(1,000-0)×25%=\$250

Figure 2. Illustrative Commission Schedule at Companies A and B

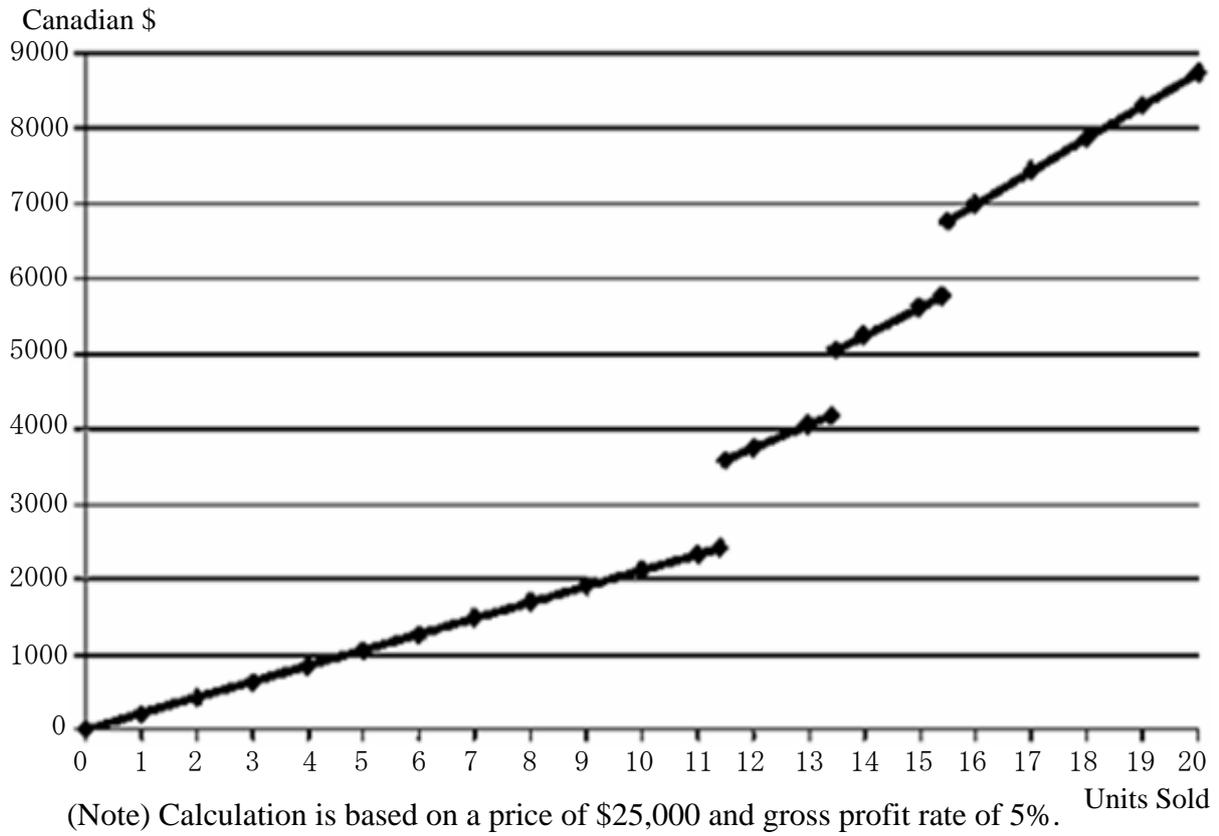
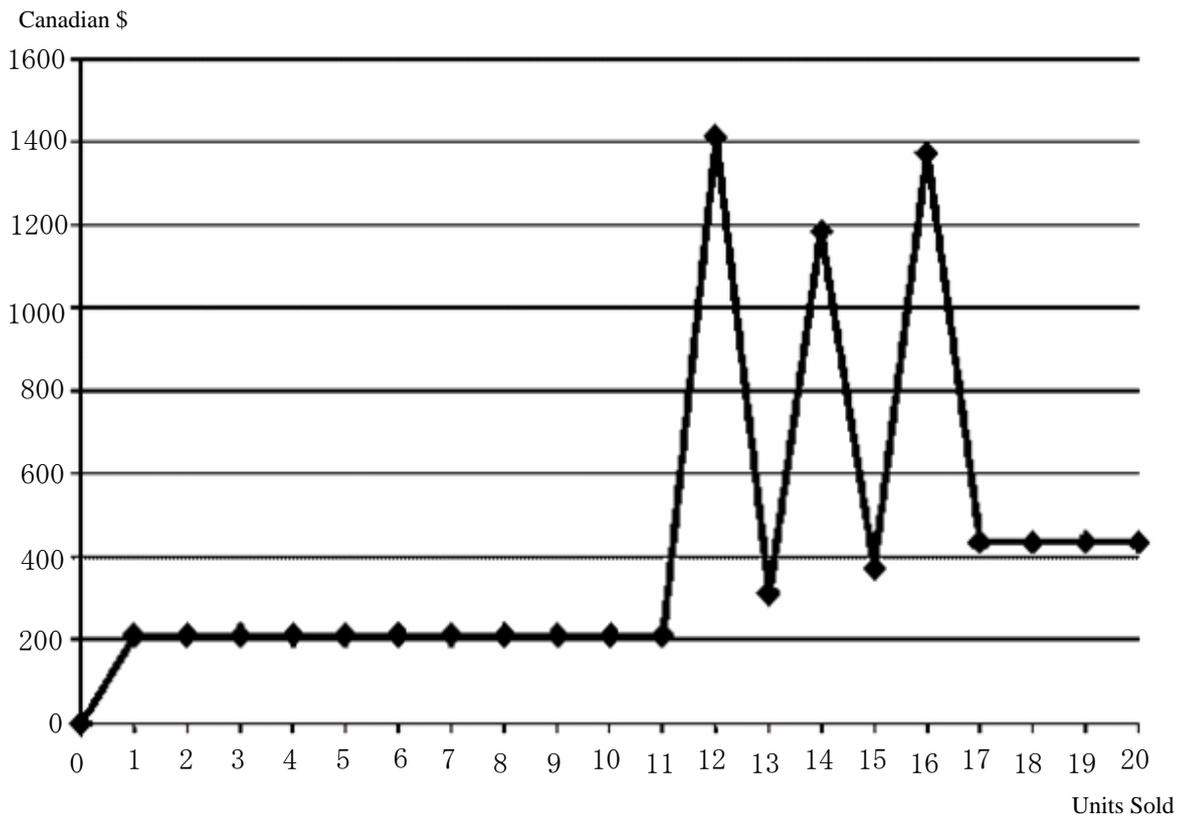


Figure 3. Illustrative Marginal Commission for New Car Sales



(Note) Calculation is based on a price of \$25,000 and gross profit rate of 5%.

Table 3. Average Gross Profit Rate by Ethnicity Match (New Car Sales by Single Salespersons)

Salesperson Ethnicity	Customer Ethnicity								Average
	White	Black	East Asia	Southeast Asia	South Asia	Middle East	Hispanic	Others	
White	3.86	3.93	3.41	3.10	3.47 *	3.18	4.44	3.83	3.78
Black	4.31	2.90	3.40	4.52	3.89	3.20	4.65	4.54	4.16
East Asia	3.78	3.56	3.29 ***	3.65	3.50 *	2.94 *	3.90	3.68	3.56
Southeast Asia	3.66	N.A.	3.85	3.20 **	3.75	3.34	3.63	3.36 **	3.56
South Asia	4.18 *	4.94	3.13	4.50	3.97	4.38	4.93 ***	4.44 ***	4.19
Middle East	3.71	4.10	3.66	3.05 *	3.49	3.81	3.85	3.75	3.67
Hispanic	3.89	4.05	3.85	4.99	3.56	4.70	5.64 *	3.72	3.94
Average	3.86	3.87	3.38	3.50	3.69	3.70	4.22	3.84	3.76

(Notes) Diagonal cells indicate the same ethnicity for salesperson and customer.

"Others" include the transactions for which the customers' ethnicities are not identified.

This table includes transactions: (a) consisting of new car only;

(b) conducted by single salespersons; and (c) to which irregular bonuses are paid.

t-test was conducted to test for differentials in transactions among ethnic pairs, compared with White salespersons and customer pairs. ***, ** and * indicate significance at the 1, 5 and 10 percent levels.

Table 4. Coefficient for Interactions of Salesperson Ethnicity and Customer Ethnicity, New Car Sales by Single Salespersons

Salesperson Ethnicity		Customer Ethnicity							
		White	Black	East Asia	Southeast Asia	South Asia	Middle East	Hispanic	Others
Total			-0.162 (0.478)	-0.305 (0.216)	-0.197 (0.414)	-0.205 (0.151)	-0.274 (0.351)	0.497 (0.387)	0.036 (0.116)
White									
Black	0.634 * (0.349)		-0.853 (0.986)	-0.312 (0.659)	0.107 (0.714)	-0.453 (0.621)	-0.786 (0.698)	-0.607 (0.667)	-0.348 (0.494)
East Asia	-0.568 *** (0.116)		-0.609 (0.714)	-0.230 (0.248)	0.118 (0.458)	0.024 (0.234)	-0.465 (0.451)	-0.590 (0.445)	-0.237 (0.178)
Southeast Asia	-0.211 (0.129)			0.526 * (0.314)	-0.293 (0.458)	0.208 (0.316)	-0.205 (0.462)	-0.833 * (0.460)	-0.267 (0.212)
South Asia	-0.301 ** (0.138)		0.770 (0.816)	-0.205 (0.432)	0.583 (0.699)	-0.060 (0.220)	0.226 (0.508)	-0.057 (0.505)	0.207 (0.223)
Middle East	-0.628 *** (0.130)		0.272 (1.418)	0.212 (0.348)	-0.388 (0.547)	-0.143 (0.258)	0.202 (0.439)	-0.184 (0.469)	0.061 (0.208)
Hispanic	-0.291 (0.353)		-0.524 (1.459)	0.024 (0.572)	0.790 (1.332)	-0.033 (0.567)	0.276 (0.701)	0.856 (1.416)	-0.055 (0.495)

(Notes) Base case transactions involve Whites as either salesperson or customer.

Diagonal cells indicate the same ethnicity for salesperson and customer.

This table includes transactions: (a) consisting of new car only;

(b) conducted by single salespersons; and (c) to which irregular bonuses are paid.

The figures in parentheses are standard errors.

***, ** and * indicate significance at the 1, 5 and 10 percent levels.

Table 5. New Car Sales by Ethnicity Match (above: number of sales; below: percentage of the total sales made by the salespersons in each ethnic group)

(%)

Salesperson Ethnicity	Customer Ethnicity								Average
	White	Black	East Asia	Southeast Asia	South Asia	Middle East	Hispanic	Others	
White	467	8	55	12	100	26	28	259	955
	48.9	0.8	5.8	1.3	10.5	2.7	2.9	27.1	100
Black	41	4	8	3	17	4	4	26	107
	38.3	3.7	7.5	2.8	15.9	3.7	3.7	24.3	100
East Asia	305	6	348	61	111	15	41	224	1,111
	27.5	0.5	31.3	5.5	10.0	1.4	3.7	20.2	100
Southeast Asia	157	0	40	50	47	10	27	101	432
	36.3	0.0	9.3	11.6	10.9	2.3	6.3	23.4	100
South Asia	237	4	19	13	211	27	32	146	689
	34.4	0.6	2.8	1.9	30.6	3.9	4.6	21.2	100
Middle East	255	3	48	21	98	37	19	139	620
	41.1	0.5	7.7	3.4	15.8	6.0	3.1	22.4	100
Hispanic	46	2	10	3	22	8	4	23	118
	39.0	1.7	8.5	2.5	18.6	6.8	3.4	19.5	100
Average	1,508	27	528	163	606	127	155	918	4,032
	37.4	0.7	13.1	4.0	15.0	3.2	3.8	22.8	100

(Notes) Diagonal cells indicate the same ethnicity for salesperson and customer.

This table includes transactions: (a) consisting of new car only;

(b) conducted by single salespersons; and (c) to which irregular bonuses are paid.

Table 6. Sales Characteristics by Salesperson Ethnicity and Ability

Salesperson Ethnicity			Customer Ethnicity								Average
			White	Black	East Asia	Southeast Asia	South Asia	Middle East	Hispanic	Others	
East Asia	High performer	Sales volume	209	5	278	35	75	11	33	161	807
		Percentage	25.9%	0.6%	34.4%	4.3%	9.3%	1.4%	4.1%	20.0%	100%
		Profit rate(%)	3.66%	3.71%	3.23%	3.56%	3.14%	2.82%	4.00%	3.41%	3.41%
	Low performer	Sales volume	96	1	70	26	36	4	8	63	304
		Percentage	31.6%	0.3%	23.0%	8.6%	11.8%	1.3%	2.6%	20.7%	100%
		Profit rate(%)	4.04%	2.84%	3.52%	3.76%	4.26%	3.27%	3.52%	4.37%	3.97%
	Total	Sales volume	305	6	348	61	111	15	41	224	1111
		Percentage	27.5%	0.5%	31.3%	5.5%	10.0%	1.4%	3.7%	20.2%	100%
		Profit rate(%)	3.78%	3.56%	3.29%	3.65%	3.50%	2.94%	3.90%	3.68%	3.56%
South Asia	High performer	Sales volume	117	1	6	5	134	16	16	81	376
		Percentage	31.1%	0.3%	1.6%	1.3%	35.6%	4.3%	4.3%	21.5%	100%
		Profit rate(%)	4.53%	3.65%	4.14%	5.26%	4.10%	4.64%	4.93%	4.75%	4.44%
	Low performer	Sales volume	120	3	13	8	77	11	16	65	313
		Percentage	38.3%	1.0%	4.2%	2.6%	24.6%	3.5%	5.1%	20.8%	100%
		Profit rate(%)	3.84%	5.37%	2.67%	4.02%	3.75%	4.00%	4.93%	4.05%	3.89%
	Total	Sales volume	237	4	19	13	211	27	32	146	689
		Percentage	34.4%	0.6%	2.8%	1.9%	30.6%	3.9%	4.6%	21.2%	100%
		Profit rate(%)	4.18%	4.94%	3.13%	4.50%	3.97%	4.38%	4.93%	4.44%	4.19%
Other Ethnic Groups	High performer	Sales volume	232	2	36	17	84	33	17	115	536
		Percentage	43.3%	0.4%	6.7%	3.2%	15.7%	6.2%	3.2%	21.5%	100%
		Profit rate(%)	3.63%	4.83%	3.43%	2.53%	3.22%	3.83%	3.74%	3.58%	3.53%
	Low performer	Sales volume	734	15	125	72	200	52	65	433	1696
		Percentage	43.3%	0.9%	7.4%	4.3%	11.8%	3.1%	3.8%	25.5%	100%
		Profit rate(%)	3.87%	3.58%	3.67%	3.43%	3.70%	3.48%	4.20%	3.80%	3.80%
	Total	Sales volume	966	17	161	89	284	85	82	548	2232
		Percentage	43.3%	0.8%	7.2%	4.0%	12.7%	3.8%	3.7%	24.6%	100%
		Profit rate(%)	3.81%	3.73%	3.62%	3.26%	3.56%	3.62%	4.11%	3.75%	3.73%

Table 7. Determinants of the Sales Ratio to Same Ethnicity Customers, OLS

Dependent variable = The sales ratio to same ethnicity	Three definitions of high performers		
	70%	50%	30%
Rate of same ethnicity customers	1.037 *** (0.136)	1.027 *** (0.135)	1.022 *** (0.136)
Rate of same ethnicity salespersons	-0.071 (0.187)	-0.046 (0.186)	-0.054 (0.186)
High performer dummy	13.754 (8.910)	15.059 * (8.262)	14.434 * (7.762)
Number of provincial new car sales	0.680 (0.482)	0.763 (0.505)	1.006 (0.613)
High performer dummy × Number of provincial new car sales	-1.321 (0.873)	-1.445 * (0.810)	-1.390 * (0.760)
CompanyA dummy	0.562 *** (0.126)	0.541 *** (0.128)	0.546 *** (0.129)
cons	-6.905 (4.928)	-7.925 (5.176)	-10.360 (6.249)
Number of observations	464	464	464
F-Statistics	58.64	51.67	50.54
Adjusted R-squared	0.3552	0.3497	0.3492

(Notes) We define high performers as those who earned high commissions without pack in: (a) over 70%;

(b) over 50%; or (c) over 30% of months they were employed. The figures in parentheses are standard errors.

***, ** and * indicate significance at the 1, 5 and 10 percent levels.