How Do Analyst Characteristics Affect Analyst's Disagreement?

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Abstract

We investigate determinants of analyst's disagreement in earnings forecasts and stock recommendations. Our empirical results show that analyst's characteristics help explain analyst's disagreement after considering target firm's characteristics, and analysts in brokerage with similar size or with equivalent experience are less likely to disagree with each other. Our finding corroborates analyst's information acquisition and integration role on capital markets.

1. Introduction and Related Literature

Analysts play important roles in acquiring and integrating information on capital markets. They issue stock recommendations and earning forecasts based on their private and public information, and consequently their opinions influence stock prices and contribute to efficient capital markets (Bradshaw et al., 2017). However, it is common that different analysts hold different opinions over one target firm, and this disagreement across analysts may create excess volatility to capital markets (Lundholm and Rogo, 2016) and lead to price inefficiency (Rees and Thomas, 2010; Lee, 2016). One important question is why analysts disagree with each other, and our study tries to answer this question from the perspective of analyst's information acquisition role and integration role. We use different opinions, disagreement, divergence, and dispersion interchangeably in this paper.

To answer the question why analysts disagree with each other, we review previous literature. We find that most scholars previously attributed analysts' disagreement to firm's characteristics such as fundamentals (Johnson, 2004) and information environments (Lang and Lundholm, 1996; Ali et al., 2019). These studies argue that prospects of target firms with high idiosyncratic risk and high information asymmetry are difficult to predict, and consequently analysts have different opinions on these target firms. However, these studies treat analysts' decision-making processes as "black-box" and overweight the influence of firm's characteristics in analysts' opinions. Diether et al. (2002) find that analysts' different opinions are unexplained by firm's characteristics, but they do not point out the specific source of dispersion.

Based on the evidence that analysts' decision-making processes involve interaction between firms and analysts themselves, we argue that these previous studies fail to consider analyst's characteristics. Li and Natarajan's research (2012) is the closest to our study in the sense that they examine the effect analysts' strategic behavior on analysts' disagreement. They construct firm-level proxies for analysts' herding and self-selection behavior and argue that these behaviors add downward bias to analysts' disagreement. Compared with Li and Natarajan's research (2012), our study uses analyst-level data and focuses on analyst's information acquisition role and integration role. We measure the dispersion between analysts by their differences in earnings forecasts and stock recommendations. Then, we employ our measures to test for associations between the disagreement and analysts' characteristics.

Our hypotheses are based on Brown et al. (2015) and Blankespoor et al. (2020)'s frameworks. According to their frameworks, we argue that analysts perform information acquisition and integration roles when make decisions. For one given firm, it is likely that analysts with same level of cost acquire and integrate this firm's information in similar way, and thus they share similar opinions. We assume that analysts from brokerage with similar size face close level of information acquisition cost because their information sources are similar. For example, analysts from large brokerage may get access to firm's private information and they thus make decisions based on the private information, whereas it is costly for analyst from small brokerage to obtain firm's private information and they only use public information to form their belief. We also assume that equally experienced analysts bear close level of information integration cost because they are both well acquainted with industry knowledge. For example, it is comparatively easy for experienced analysts to assess and interpret firm's hard and soft information, and they use firm' information in ways

different from young analysts. As a result, we hypothesize that analysts with similar acquisition and integration cost share similar opinions.

As a first step toward understanding the causes of forecasts dispersion, we run regressions contain pure analyst's characteristic. We find that pure analyst's characteristics have significant and positive effect on forecasts dispersion. This means that analysts with different working experience, analysis experience and come from different size of broker firms will have different EPS forecast. In the second step, we run regressions contain pure target firm's characteristic and combined it with analyst's characteristic. We find that adding analyst's characteristic will increase the explain ability of our model. In the last step, we add the interaction term between firm's and analyst's characteristic. Their coefficients have the same sign with the pure characteristic. This result contributes to the fact that these intersection terms amplify the effect of analyst difference. We conclude that the analyst's information acquisition role and integration ability contribute to different EPS forecast. Our empirical results are consistent with our hypothesis and fill the gap with previous research that only consider firm's characteristic difference or pure analyst's characteristic.

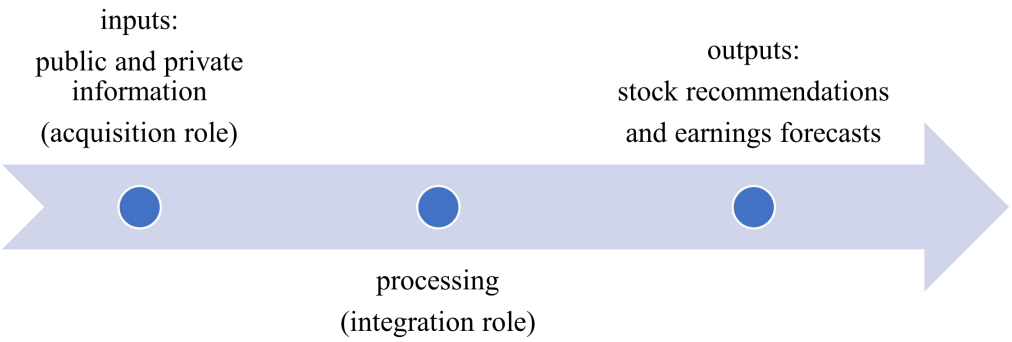
Besides EPS forecast, we also explore the difference on recommendation code with the similar econometric method, but the effect is not consistent. In some case, the coefficients are not significant. Thus, we put all the results in the appendix.

Section 2 provides our framework and develop hypotheses for empirical tests. Section 3 discusses data and research design. We discuss the empirical results in section 4, and we provide summary and conclusion in section 5.

2. Hypotheses Development

Analysts are important information intermediary in capital markets, and they play central roles to the flow of information from firms to investors. However, analysts have been widely criticized for providing biased forecast (McNichols and O'Brien, 1997) and thus their decision-making processes is of significant interest to researchers in finance and accounting area and practitioners. Understanding why analysts disagree with each other and how analysts' characteristics affect analysts' disagreement is important because it can shed light on the "black box" of analysts' decision-making processes (Brown et al., 2015).

We try to penetrate the "black box" of analysts' decision-making processes and separate these processes into three parts: inputs, processing, and outputs. The inputs of the "black box" comprise both private and public information, and analysts play information acquisition role in accessing information sources and extracting information available for decision. Next, analysts play information integration role in the core process of decision-making. They select the specific pieces of information and certain types of valuation model to use. As a result, analysts who obtain different information acquisition and integration skill produce different opinions as outputs. The outputs of analysts' decision-making are their reports where stock recommendations and earnings forecasts are most value-relevant to information users.



We investigate analysts' decision-making processes starting from analysts' information sources and first focus on private information. We assume that analysts' information acquisition skill plays significant part in gathering and acquiring private information. This assumption is supported by evidence that analysts may get access to firm's private information by directly communicating with management teams. For example, it is common that analysts attend communication events such as earnings conference calls and investors days, some analysts even have private phone call directly with CEOs, CFOs, or investor relationship offices of firms. A survey research finds that analysts rank private communication with management as the most useful input to earnings forecast and stock recommendation (Brown et al., 2015). While private communication with management is beneficial, it is also costly for analysts to take time and effort to acquire such information. We argue that while some analysts in large brokerage enjoy access to firm's private information, analysts in small brokerage may not. Since analysts in small brokerage firm may not have enough money and labor resource for firm coverage, they may not fully access firm's private information and thus make decisions on stock recommendations and earnings forecasts without using firm's private information. Consequently, analysts from

brokerages with different size are more likely to make decisions based on different information sets and believes, and thus they hold different opinions on one firm.

H1: The disagreement between analysts from brokerages with different size is large.

Public information is another type of information as analysts' inputs into decision-making processes. For public information, an analyst gathers and extracts information available from a firm's stock price and financial reports. For example, researchers documented evidence that analysts consider past stock returns when determine stock recommendations and earnings forecasts based on the assumption that past stock returns indicate future earnings (Lys and Sohn, 1990; Abarbanell, 1991). In addition to stock returns, information from financial reports such as recent 10-K and 10-Q are another key input for analysts' stock recommendations and earnings forecasts (Bradshaw et al., 2001). These financial reports provide analysts with not only hard information such as earnings and its different components but also soft information such as management earnings forecasts and discussion of firms' strategies which are indicative of firms' fundamentals and useful for analysts' predication of firms' future profitability (Williams, 1996; Barron et al., 1999).

Even though public information is available for every analyst on capital markets, it is still possible that one analyst holds opinions different with the other analyst because of analysts' different interpretations of the information. For example, analysts use different valuation models such as price/earnings model, discounted cash flow model, and residual income model to support their decision in earnings forecasts and stock recommendations. They can choose appropriate models based on their experience or industry specialty. In addition to valuation models, analysts choose specific information and its weights to put into valuation model according to their

work experience and industry knowledge. For hard information available to public, earnings and its components are accessible to each analyst, but may be used in different way by experienced analysts and young analysts. For instance, an experienced analyst chooses to exclude nonrecurring items in earnings rather than use earnings directly (Bradshaw et al., 2002). For soft information available to public, management discussion and analysis sections in financial reports provide a rich amount of information to public, but they cannot be easily comprehended and interpreted without industry knowledge. For instance, an experienced analyst who follows bank industry for several years may successfully forecast bankruptcy during financial crisis (The Wall Street Journal, 2015). Consequently, we assume that analysts play information integration role when analyze public information, and we hypothesize that similarly experienced analysts are more likely to hold similar opinions on one firm, and the opinion dispersion is smaller when analysts get access to the same public information source.

H2: The disagreement between equally experienced analysts is small.

H3: The disagreement between equally experienced analysts is smaller when they get access to the same public information source.

3. Data and Research Design

We start with the full Institutional Broker Estimate System (I/B/E/S) database. We use the I/B/E/S Unadjusted Detail Earnings Estimate History File to obtain analysts' quarterly earnings forecasts. We use I/B/E/S Recommendation File to obtain analysts' characteristics and IBES recommendation code (where 1 means strong buy and 5 means strong sell). Applying Compustat North America Fundamentals dataset

and CRSP dataset, the quarterly firms' basic accounting information and stock price information data are obtained.

Raw Data Definitions		
Name	Definition	Data Source
EPS	Earnings per share forecast	I/B/E/S
Recommendation	Indicator variables.	I/B/E/S
Working_Experience	The number of years since the analyst appears in IBES recommendation file	I/B/E/S
Analyze_Experience	The number of years since the analyst provided his/her first recommendation for the given company.	I/B/E/S
Brokerage_Size	Brokerage firm size. It is the number of analysts providing forecast for the given company in a given year.	I/B/E/S
Stock price		CRSP
Firm_Size	Natural log of market value	Compustat
Book/Market ratio		Compustat
Debt/Equity Ratio		Compustat
Sales/Total asset		Compustat

Variables Definitions		
Name	Definition	Data Source
	Panel A: Dispersion Variables	
ΔEPS	Difference between two analysts' earnings per share forecast	I/B/E/S
Bold	Bold is the absolute difference between the analyst's recommendation and the average recommendation of all other analysts covering the same company.	I/B/E/S
	Panel B: Independent Variables	
IWork	The difference between two analysts' working experience	I/B/E/S
IAnalyze	The difference between two analysts analyze experience	I/B/E/S
ISize	The difference between two analysts' brokerage firm size.	I/B/E/S

Our sample period is from 2010 to 2019. We avoid the years of 2008 and 2020 because important financial recessions may affect our result. We clean the raw data and generate variables in the following ways: For each target firm j and quarter t, we obtain several analysts' earnings forecasts and stock recommendations, and then we generate analyst i's dispersion by calculating the difference of his (her) opinion with the other analyst's opinion. We obtain the other variables in the similar way.

Our research question seeks to understand the sources of analysts' forecast dispersion. We address this question by regressing the analysts' forecast dispersion on their characteristics including the difference their broker firm's size, the difference of

their working experience, the difference between their analyst experience, and some firm specific controlled variables. In the main analysis, we are going to estimate the following equation using OLS model and panel data. We predict the coefficient of *ICompany* to be positive based on our first hypothesis (H1) that divergence between analysts' opinions is large when these analysts work in brokerage firms with different size. We also predict the coefficients of *IWorking* and *IAnalyst* to be positive based on our second hypothesis (H2) that divergence between analysts' opinions is large when these analysts do not have similar level of experience.

$$Dispersion_{i,j,t} = ISize_{i,j,t} + IWorking_{i,j,t} + IAnalyst_{i,j,t} + Controlled_{j,t} + Fixed\ effects + \varepsilon$$

In additional analysis, we use fundamental controlled variables as proxies for firm's public information to test our third hypothesis (H3). We hypothesize that analysts play stronger information integration role when control for public information, and thus the coefficients of *IWorking*Controlled* and *IAnalyst*Controlled* are predicted be positive when the coefficients of controlled variables are positive, and the coefficients of *IWorking*Controlled* and *IAnalyst*Controlled* are predicted to be negative when the coefficients of controlled variables are negative.

$$Dispersion_{i,j,t} = ISize_{i,j,t} + IWorking * Controlled_{i,j,t} + IAnalyst * Controlled_{i,j,t} + Controlled_{j,t} + Fixed\ effects + \varepsilon$$

4. Empirical Result

Table 1 Summary statistics

This table reports the number of our observations, cross-sectional mean and standard deviation for analyst earning per share forecast, analyst's characteristics and firms' financial characteristics. Our sample period is 2010-2019 and it has quarterly frequency. Hence, working experience equals to 18 means 4.5 years .

	Obs	Mean	Std. Dev.	Min	Max
Dependent Variables					
EPS Forecast	761368	2.655	2.506	-.91	8.809
Independent Variables					
Working Experience	761368	18.288	11.593	0	39
Analyze Experience	761368	30.223	10.77	0	39
Brokerage Size	761368	23.288	11.317	1	45
Controlled Variables					
Stock price	758348	46.939	32.496	.118	106.735
Firm Size	756118	8.32	1.598	.398	11.135
Book/Market ratio	590383	.567	.322	0	5.367
Debt/Equity Ratio	513617	2078.74	12157.178	0	2663032.5
Sales/Total asset	754851	.185	.171	0	21.847

Table 2 Broker firm size

	(1)	(2)	(3)
	Dispersion_EPS	Dispersion_EPS	Dispersion_EPS
ISize	.0503***		.0571***
	(.0041)		(.0059)
Book/Market ratio		-2.4401***	-2.3671***
		(.4401)	(.4401)
Stock price		.0107**	.0105**
		(.0047)	(.0047)
Sales/Total asset		5.4527***	5.4195***
		(.8608)	(.8607)
Debt/Equity Ratio		-.0003	-.0003
		(.0005)	(.0005)
Firmsize		-.4904***	-.4388**
		(.1823)	(.1824)
_cons	.3258***	4.0487***	3.5991**
	(.0283)	(1.5274)	(1.5279)
Observations	761367	433972	433972
R-squared	.0002	.0003	.0005

Table 3 Working experience

	(1)	(2)	(3)	(4)
	Dispersion_EPS	Dispersion_EPS	Dispersion_EPS	Dispersion_EPS
IWorking	.0416***		.048***	.2075***
	(.0038)		(.0054)	(.0369)
Book/Market ratio		-2.4547***	-2.3755***	-2.4267***
		(.4398)	(.4399)	(.4423)
Stock price		.0113**	.0118**	.015***
		(.0047)	(.0047)	(.0047)
Sales/Total asset		5.3745***	5.2953***	5.3011***
		(.8603)	(.8602)	(.8607)
Debt/Equity Ratio		-.0003	-.0003	-.0003
		(.0005)	(.0005)	(.0005)
Firmsize		-.5081***	-.4764***	-.5427***
		(.1822)	(.1822)	(.1825)
IWorking * B/M				-.0251
				(.0172)
IWorking * Stock price				.001***
				(.0002)
IWorking* Sales/Total asset				.0518
				(.0329)
IWorking* Debt/Equity				.0001**
				(0)
IWorking * Firmsize				-.0248***
				(.0044)
_cons	.3271***	4.1857***	3.8785**	4.2919***
	(.0283)	(1.5264)	(1.5267)	(1.5287)
Observations	761367	433972	433972	433972
R-squared	.0002	.0003	.0005	.0006

Standard errors are in parentheses

**** p<.01, ** p<.05, * p<.1*

Table 4 Analyst experience

	(1)	(2)	(3)	(4)
	Dispersion_EPS	Dispersion_EPS	Dispersion_EPS	Dispersion_EPS
IAnalyst	.0093**		.0176***	-.0016
	(.0038)		(.0054)	(.006)
Book/Market ratio		-2.4401***	-2.4342***	-2.3211***
		(.4401)	(.4401)	(.4422)
Stock price		.0107**	.0106**	.0135***
		(.0047)	(.0047)	(.0047)
Sales/Total asset		5.4527***	5.4488***	5.5277***
		(.8608)	(.8608)	(.8607)
Debt/Equity Ratio		-.0003	-.0003	-.0002
		(.0005)	(.0005)	(.0005)
Firmsize		-.4904***	-.4907***	-.4924***
		(.1823)	(.1823)	(.1825)
IAnalyst * B/M				.0098
				(.0161)
IAnalyst * Stock price				.0006***
				(.0002)
IAnalyst * Sales/Total asset				.1287***
				(.03)
IAnalyst * Debt/Equity				.0001
				(0)
IAnalyst * Firmsize				-.0023
				(.0021)
_cons	.3272***	4.0487***	4.0523***	3.8475**
	(.0283)	(1.5274)	(1.5274)	(1.528)
Observations	761367	433972	433972	433972
R-squared	0	.0003	.0003	.0005

Standard errors are in parentheses

**** p<.01, ** p<.05, * p<.1*

In table 2, we explore the effect of broker firm size on analyst forecast dispersion and test for H1. We start our analysist by running univariate regression. We find that the Isize term has positive and significant coefficient in regression 1, and this result testify H1 that analyst from different size of broker firms will have different forecast. The intuition underlying this empirical finding is that the large broker firms can access to richer amount of private information compared with small broker firms, and analysts in large broker firms play stronger information acquisition role.

Next, we run multivariate regression in regression 2 and 3. We regress earnings forecasts dispersion on firm's characteristics in regression 2, and coefficients for book to market ratio, stock price, sales/assets ratio and firm size are all significant. The signs of these firm variables coincide with signs in previous findings that traditionally attribute analysts' dispersion to firm' characteristics. We then add analyst' characteristic and run regression 3. The coefficient of Isize term in regression 3 is positive and significant, and the coefficients of firm variables in regression 3 decrease compared with the coefficients of firm variables in regression 2. This result indicates that, apart from firm's characteristics, divergence in brokerage size has a negligible effect on analysts' dispersion as well.

Table 3 explores another analyst characteristic, working experience, that might affect the dispersion between two analysts. We first run regression on analyst' s working experience and firm's characteristics separately in regression 1 and 2. We next add the analyst's working experience in regression 3 as an additional independent variable compared to regression 2. Results in regression 3 show that working experience divergence bring positive and significant effect to EPS forecast dispersion. This result is consistent with our H2: The disagreement between equally experienced analysts is small. Moreover, adding working experience decrease the

magnitude of firms' own characteristic coefficients and R-squared increased. This result also proves that divergence in working experience can explain part of the dispersion.

In regression 4, we add the interaction terms between working experience and firm characteristics such as book to market ratio, stock price, debt/asset ratio, sales/assets ratio, and firm size. These interaction terms have the same sign with the firm's financial terms. This result shows that working experience amplify the effect of these firm's financial terms. For example, the negative sign of firm size presents that analysts are possible have the same opinion on the large cap companies. This interpretation makes sense because there is more public information released on the large cap companies. The interaction terms reflect the different information integration ability between two analysts on a transparent and information-tensed company, and this difference in information integration is larger when financial information is publicly disclosed. In conclusion, we find that, as the analysts become more experienced and professional, they will build their own information process system. Hence, they are more likely to have different opinion on the target firm.

In table 4, we explore the effect of difference analyst experience on analyst forecast dispersion. From regression 1 to regression 3, the results are similar to previous effect of working experience and broker firm size. The coefficient of analyst experience is significant and positive. High analyst experience means that this analyst follows and study the target firm for a long time period. He should be more familiar with the financial information on this company. Compared with a new analyst who study the target firm for a short period, there exists the dispersion on target firms.

However, in regression 4, we consider the intersection between analyst experience and then the coefficient of analyst experience becomes negative and

insignificant. In this regression, the intersection terms [Analyst experience* stock price] and [Analyst experience* sales/total assets] are positive and significant. One possible explanation is that the understanding the information contained in stock price and sales are importance source of forecast dispersion. Analyst working experience is not the key source of forecast dispersion in this situation.

5. Concluding Remarks

Several scholars have studied the sources of analysts' different opinions, but previous research focused on target firm' characteristics and treated analysts' decision-making processes as "black-box". We try to penetrate the "black-box" by investigating analyst's characteristics as a source of analysts' different opinions. Exploring the richness of analyst-level data, we construct analysts' different opinions as the difference between an analyst's earnings forecasts and another analyst's earnings forecasts over the same target firm at the same time, and we find that analyst' s characteristics such as divergence in size of analysts' brokerage firms and divergence in analysts' experience help explain analysts' different opinions after controlling for firm characteristics.

Based on framework of analyst's information processing cost, we use divergence in size of analysts' brokerage firms and divergence in analysts' experience as proxies for analyst's information acquisition role and integration role. We show significant roles analysts play in acquiring and integrating information on capital markets as main result. In further analysis, we try to figure out the specific channel in which analysts participate, and we find that analysts play stronger information integration roles when they receive firm's public information. In conclusion, our

study help explain analysts' dispersion using analyst's characteristics and demonstrate analyst's information acquisition role and integration role on capital markets.

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Appendix

Table 5 Broker firm size

	(1) Dispersion_ Recommendation	(2) Dispersion_ Recommendation	(3) Dispersion_ Recommendation
ISize	0		0
	(0)		(0)
Book/Market ratio		.0591	.0574
		(.0992)	(.0992)
Stock price		.0014	.0015
		(.0012)	(.0012)
Sales/Total asset		.2728	.2751
		(.1895)	(.1894)
Debt/Equity Ratio		.0003*	.0003*
		(.0001)	(.0001)
Firmsize		-.0214	-.0222
		(.045)	(.045)
Observations	151499	68920	68920
Pseudo R^2	0	.0002	.0002

Standard errors are in parentheses

**** p<.01, ** p<.05, * p<.1*

Table 6 Working experience

	(1) Dispersion_ Recommendation	(2) Dispersion_ Recommendation	(3) Dispersion_ Recommendation	(4) Dispersion_ Recommendation
IWorking	-.0054***		-.0049**	-.0141
	(.0016)		(.0024)	(.0167)
Book/Market ratio		.0591	.0617	.0728
		(.0992)	(.0992)	(.0996)
Stock price		.0014	.0015	.0015
		(.0012)	(.0012)	(.0012)
Sales/Total asset		.2728	.2773	.2788
		(.1895)	(.1895)	(.1906)
Debt/Equity Ratio		.0003*	.0003*	.0003*
		(.0001)	(.0001)	(.0001)
Firmsize		-.0214	-.0212	-.0205
		(.045)	(.045)	(.0451)
IWorking * B/M				.0098
				(.0081)
IWorking * Stock price				0
				(.0001)
IWorking* Sales/Total asset				.0017
				(.0152)
IWorking* Debt/Equity				0
				(0)
IWorking* Firmsize				.0005
				(.0021)
Observations	151499	68920	68920	68920
Pseudo R^2	.0001	.0002	.0003	.0004

Standard errors are in parentheses

**** p<.01, ** p<.05, * p<.1*

Table 7 Analyst experience

	(1) Dispersion_ Recommendation	(2) Dispersion_ Recommendation	(3) Dispersion_ Recommendation	(4) Dispersion_ Recommendation
IAnalyst	-.0006		-.0015	-.0007
	(.0009)		(.0012)	(.0013)
Book/Market ratio		.0591	.059	.0691
		(.0992)	(.0992)	(.0996)
Stock price		.0014	.0014	.0015
		(.0012)	(.0012)	(.0012)
Sales/Total asset		.2728	.2743	.2731
		(.1895)	(.1895)	(.1904)
Debt/Equity Ratio		.0003*	.0003*	.0003*
		(.0001)	(.0001)	(.0001)
Firmsize		-.0214	-.0213	-.0227
		(.045)	(.045)	(.045)
IAnalyst * B/M				.0078
				(.0078)
IAnalyst*Stock price				0
				(.0001)
IAnalyst* Sales/Total asset				-.003
				(.014)
IAnalyst* Debt/Equity				0
				(0)
IAnalyst * Firmsize				-.001
				(.001)
Observations	151499	68920	68920	68920
Pseudo R^2	.0001	.0002	.0002	.0004

Standard errors are in parentheses

**** p<.01, ** p<.05, * p<.1*