

Asymmetric Information in the Unmediated Market: Theory and Evidence from the Used Car Market

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Abstract

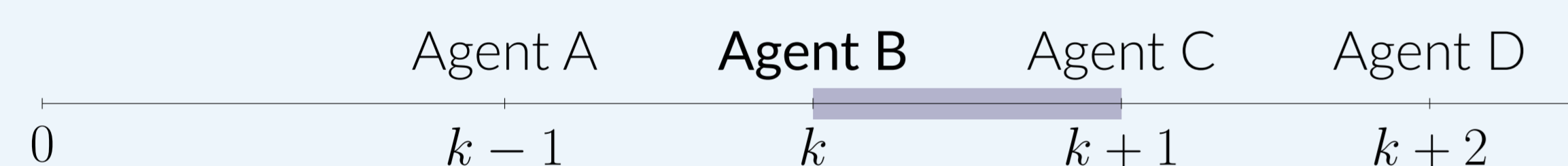
This study investigates the unmediated used car market, examining factors influencing individual seller's hidden behavior which determines vehicle quality in the absence of dealerships as intermediaries. This paper explores the sale of lemons in unmediated transactions and whether unobservable lemon sales are influenced by regional factors along with cost-benefit considerations. While unmediated transactions involve varying degrees of screening and signaling, full information disclosure remains uncertain. Concealing a lemon as a high-quality vehicle is costly but still happens, with these vehicles frequently sold directly without intermediaries. I document evidence of an aggregated quality premium and price premium in unmediated transactions in specific areas with higher opportunity costs of hidden action, highlighting the role of geographic factors. This research underscores the driving forces behind information opacity in the unmediated used car market, offering valuable information for buyers, sellers, and other market participants.

Data

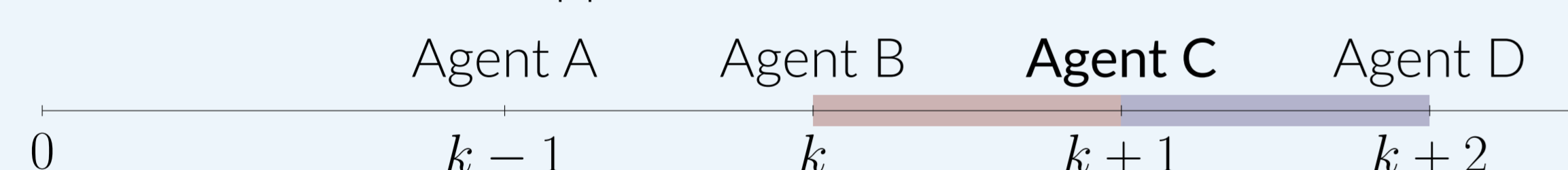
The main data source of this paper is the time-series transaction data from Pennsylvania Department of Motor Vehicles between January 2014 and July 2016.

My variable of interest is the quality of the used car, which will be measured by lemon indicator depends on the resale rate within six months:

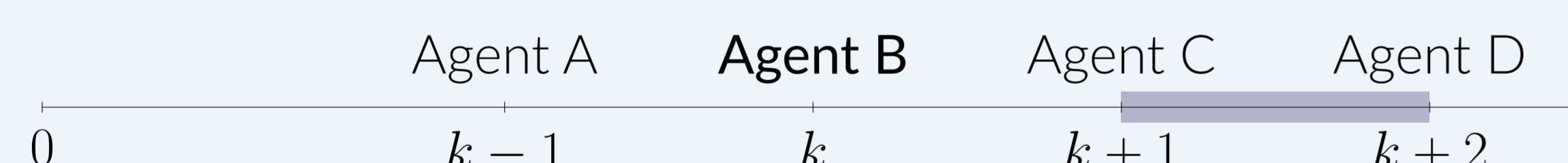
Broad definition



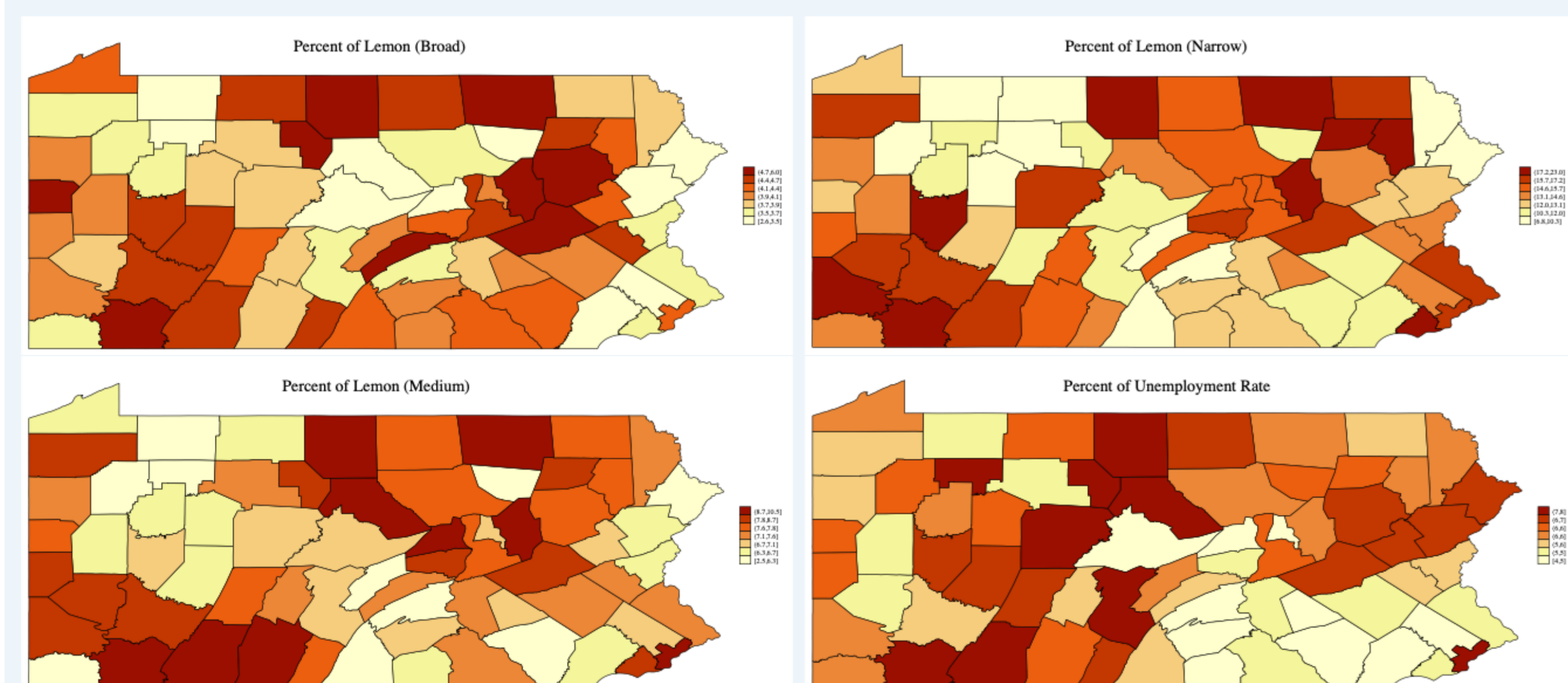
Narrow definition (backward approach)



Medium definition (forward approach)



Controlled variables include vehicle characteristics—make, model, age, annual mileage, and price—and geographic demographics—percentage of population under 18, African American, Hispanic, household income, unemployment rate, motor vehicle death rates, and population density. The unemployment rate is used as a proxy for the opportunity cost of hidden actions.



Theoretical Framework

V_H represents High quality vehicles and V_L represents Lemon. Because of the existence of lemon holders engaging in hidden action, buyer's willingness to pay depends on the observable characteristics. P represents transaction price, so $P = [V | \text{No Evidence of Lemon}]$, this will be abbreviated $[V_m]$.

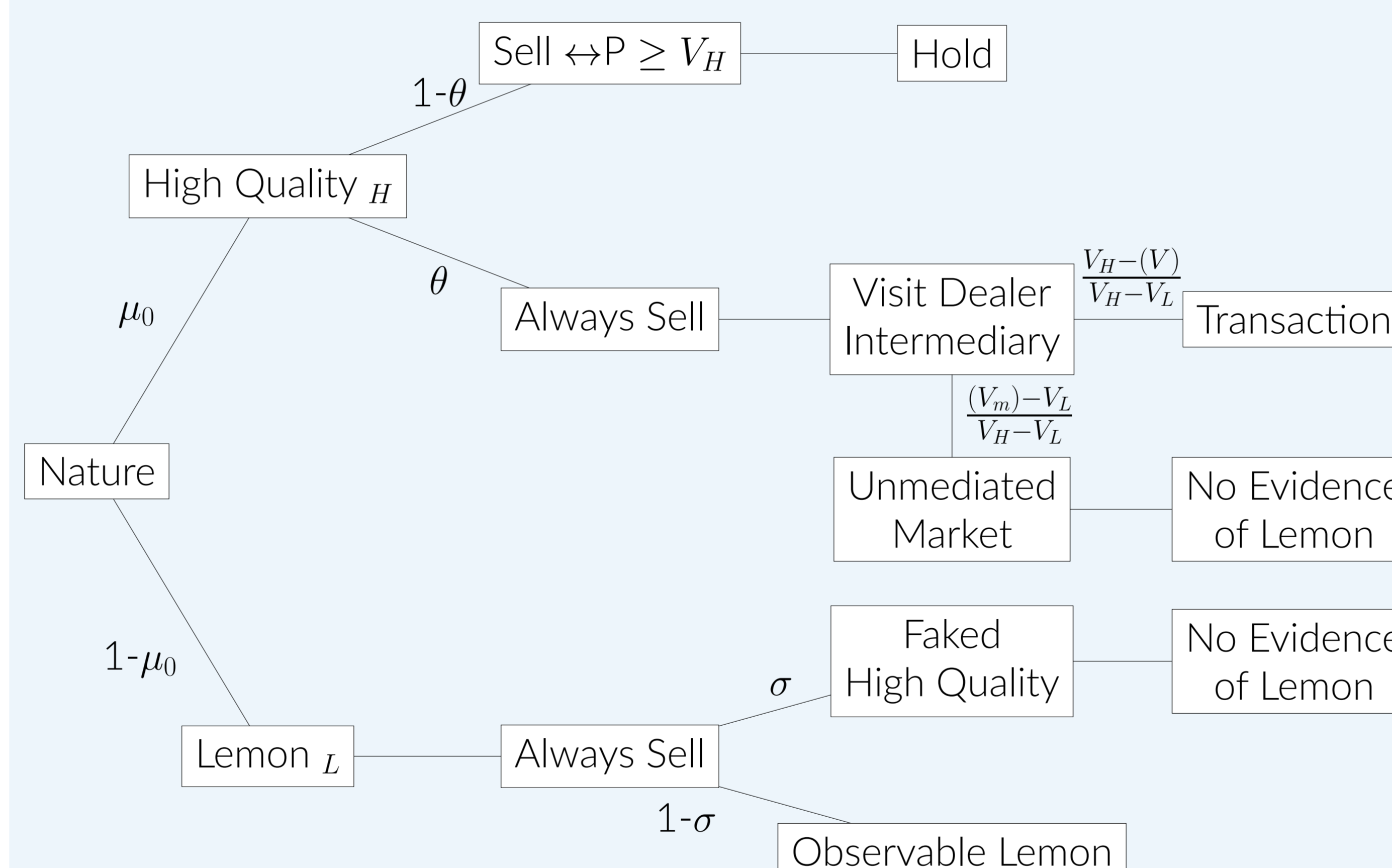
Nash Bargaining There exists an equilibrium in the mediated market where the dealer only purchases a high-quality vehicle at price G and sells it at price V_H . The payoff matrix is:

	Dealer	Seller
Trade	$V_H - G$	G
No trade	0	$[V_m]$

Δ represents the net benefit from the trade, where $\Delta(\epsilon) = \max\{V_H - [V_m] + \epsilon, 0\}$, where $\epsilon \sim \text{UNIF}(V_L - V_H, 0)$, which represents the idiosyncratic shock associated with the trade. Then, let $\alpha \in [0,1]$ represent the share of the net benefit of the trade $\Delta(\epsilon)$ that is gained by the dealer. Under Nash Bargaining:

$$V_H - G = \alpha * \Delta(\epsilon)$$

$$G = (1 - \alpha) * \Delta(\epsilon) + [V_m]$$



Proposition In a perfectly competitive market equilibrium without the existence of intermediaries, ceteris paribus, an increase in the opportunity cost of hidden action (C) results in:

- (1) Decrease in information asymmetry (σ).
- (2) Increase in transaction price (P).

Evidence of Quality Difference

$$Pr(y_{it} = 1 | x_g) = \beta_0 + \beta_1 * Z_{vt} + \beta_2 * W_{gt} + \lambda_t + \epsilon_{it}$$

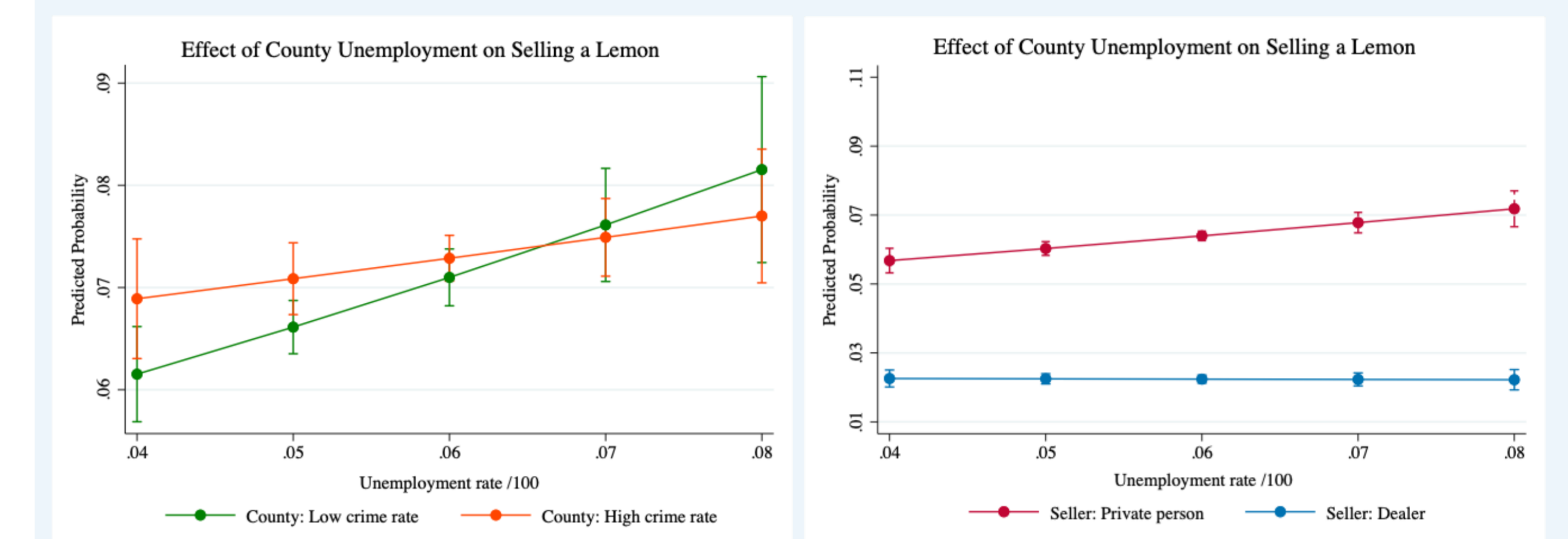
At Unemployment Rate	Lemon (Broad)	Lemon (Narrow)	Lemon (Medium)
0.04	0.033*** (0.000)	0.082*** (0.004)	0.064*** (0.002)
0.05	0.034*** (0.000)	0.093*** (0.001)	0.068*** (0.001)
0.06	0.035*** (0.000)	0.105*** (0.002)	0.071*** (0.001)
0.07	0.036*** (0.000)	0.119*** (0.005)	0.075*** (0.002)
0.08	0.037*** (0.001)	0.133*** (0.008)	0.079*** (0.003)

Evidence of Quality Difference Cont.

$$Pr(y_{it} = 1 | x_g) = \beta_0 + \beta_1 * Z_{vt} + \beta_2 * W_{gt} + \beta_3 * CR * x_g + \lambda_t + \epsilon_{it}$$

$$Pr(y_{it} = 1 | x_g) = \beta_0 + \beta_1 * Z_{vt} + \beta_2 * W_{gt} + \beta_3 * D * x_g + \lambda_t + \epsilon_{it}$$

where, CR represents an indicator variable for counties with high crime rates, and D represents the dealer indicator.



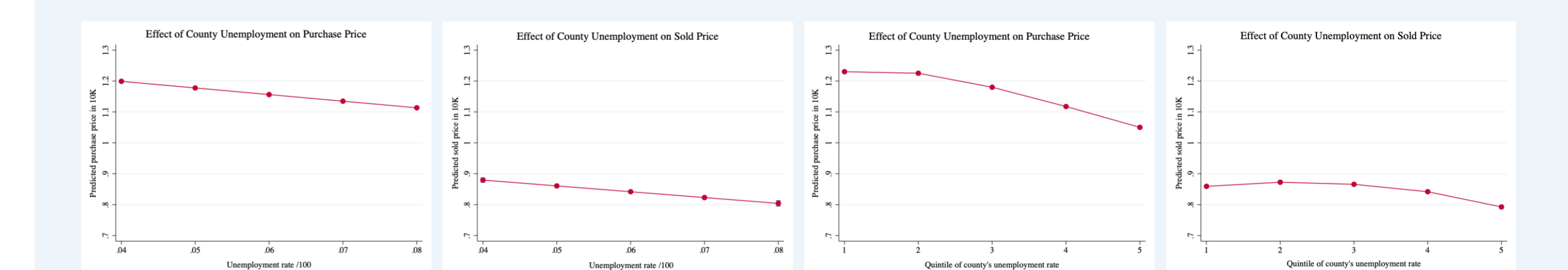
Across all models, there is a clear tendency for the probability of lemon sales to increase with decreasing opportunity costs. Low crime rate counties have more high-quality vehicles in the market to start with. Thus, the probability of selling a lemon is more responsive to the unemployment rate change. As the opportunity cost diminishes, unmediated transactions exhibit a heightened propensity for lemon sales. However, the relationship between intermediaries and the opportunity cost of hidden action remains less clear.

Evidence of Price Difference

$$P_{it} = \beta_0 + \beta_1 * Z_{vt} + \beta_2 * W_{gt} + \lambda_t + \epsilon_{it}$$

where, P_{it} is transaction price, it can be either purchase price or sold price.

VARIABLES	Purchase Price in 10K	Sold Price in 10K
Annual miles per year in 100K	-1.860*** (0.013)	-1.902*** (0.056)
Under the age of 18, share	0.233*** (0.030)	0.222** (0.087)
African American, share	0.260*** (0.007)	0.150*** (0.021)
Hispanic, share	-0.026*** (0.009)	-0.078*** (0.028)
Log of household median income	0.077*** (0.003)	0.033*** (0.010)
Unemployment rate /100	-2.140*** (0.065)	-1.886*** (0.190)
Motor vehicle deaths, %	-0.040** (0.018)	-0.008 (0.051)
Population density	-1.148*** (0.023)	-1.115*** (0.066)
Constant	1.972*** (0.016)	1.972*** (0.048)
Observations	2,565,435	263,106
R-squared	0.661	0.624



Conclusion

In the unmediated market with uncertain information disclosure, with the existence of imperfect screening and signaling, there exist a quality premium and price premium in regions with a higher opportunity cost of hidden action.