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Estimating the Effect of a Change in Insurance Pricing Regime on Accidents with Endogenous Mobility

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Abstract. In this paper, we estimate the impact of introducing a bonus-malus system on the probability of having automobile accidents, taking into account contract duration or the client mobility between insurers. We show that the new incentive scheme reduces accident rates of all policyholders when contract duration is taken into account, but does not affect accident rates of movers that shirk the imposed incentive effects of the new insurance pricing scheme.

Keywords. Bonus-malus, contract duration, automobile accident, Poisson distribution, right- and left-censoring, exponential distribution.

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1 Introduction

In 1992, the Tunisian government put in place a bonus-malus scheme for automobile insurance rating in order to increase road safety. The bonus-malus scheme links insurance premiums to past reported accidents at fault. Usually, such a system can have two effects when the insurance industry is committed to its application (Dionne and Vanasse (1990); Abbring, Chiappori, and Pinquet (2003); Dionne, Pinquet, Maurice, and Vanasse (2007)):

1. It can motivate drivers to be more prudent because past claims are associated with an increased insurance premium in the future (moral hazard); (Shavell (1979)).

2. It can improve risk-classification by allowing insurance companies to make bad risk pay more and good risk pay less (risk classification); (Crocker and Snow (1986)).

In this article, we are more concerned with the incentive effect of the bonus-malus. The main objective is to evaluate whether the Tunisian reform was successful in decreasing the number of automobile accidents. There are reasons to believe that the reform was not entirely successful. This is because the reform has a flaw. The bonus-malus system implemented by the Tunisian government ranks drivers on a scale from 1 to 17 according to the number of accidents they had, 17 being the worst score. However, the new law indicates that if an individual changes insurance company, he must have a written proof of his previous score if he wants to keep it. Without such a proof, he is awarded score 14. This gives an incentive to bad risks or to individuals with score 15 or higher to switch insurance company in order to bring back their bonus-malus score to 14. Thus the reform might encourage mobility between insurance companies or reduce insurance contract duration. If this effect is important, it is then likely that the reform will be less effective on road safety than expected.

Dionne and Ghali (2005) show that the reform has no effect on accidents but they have not taken into account contract duration. They take into account any potential selectivity bias by estimating selection equations. They show that the reform had a positive effect on the Exit decision and no effect on the Entry decision. For technical reasons, they did not estimate jointly the three decisions (Accident, Entry, and Exit) and limited their simultaneous analysis to reported accidents and exit decisions. They choose to model the exit decision because the reform seems to have had no effect on entry decisions (Verbeek and Nijman (1992); Dionne, Gagné, and Vanasse (1998)). However, their model of exit decisions does not take into account the fact that the data on contract duration is right-censored. Moreover, times and states before the contract period is not taken into account (left-censoring). This methodology choice may have effects on the estimation results.

In this paper, we estimate the joint distribution of accident rates and contract duration. Analyzing contract duration instead of entry and exit decisions simplifies the estimation of the model (two equations instead of three) and permits to take explicitly into account censoring. Moreover, our model allows us to explicitly test whether individuals whose propensity to have accidents is higher also have higher mobility. This is done by exploiting the longitudinal structure of the data.

The article is organized as follows. Section 2 presents the data and Section 3 describes the statistical model by focussing on contract duration. The empirical results are presented in Section 4 and a short conclusion follows.

2 Data

To evaluate the impact of the reform, we have at our disposal a random sample from the portfolio of a private insurer covering five years from 1990 to 1994. This data come from Dionne and Ghali (2005). This private insurer has a 7% market share in the Tunisian domestic insurance market. The sample comprises $46,337$ observations on $25,366$ individuals. Hence, individuals are observed over 2.7 records on average but almost two thousand individuals are observed for the whole five years.

We note that those who stay had on average less accidents than people observed less than five years (6.3% versus 7.3%). The variables available in the data set are the exact same ones available to the insurer : sex of the insuree, type of automobile, geographic location, and type of insurance coverage. We know the exact date of all accidents. We also know the exact dates for entries and exits if an individual purchased an insurance contract after 1990 or exited its contract before 1994. For people present in 1990, we do not know if they were with the same insurer previously, a situation known as left-censoring. Similarly, for people with a contract in 1994, we do not know whether they will continue their insurance contract with the insurer, a situation known as right-censoring.

(Table 1 here)

Table 1 describes the variables of the study while Table 2 presents their summary statistics over the five years. From Table 2, we observe that more than 80% of insureds are male. The horsepower of the car does not represent any unusual property nor the country origin of the car where more than 60% come from France and 28% from Germany. The insurance coverage variables need to be discussed. We observe that more than 80% of drivers buy the fire and the theft protections while only 2% hold the damage coverage. We must emphasize that liability insurance is compulsory for all automobile owners. It seems that damage insurance is very expensive and not felt as necessary by the insureds. The bonus-malus scheme is based on reported accidents at fault and information from other accident types does not affect the insurance premiums.

(Table 2 here)

Table 3 describes the accident distribution over the five years of the study. The new bonus-malus scheme was introduced on January 1, 1992. Before that date, the insurance premium was not a function of past accidents. The first changes in premium based on past experience occurred after January 1, 1993, when the contracts come up for renewal. So we consider that the incentive scheme becomes effective by January 1, 1992 since the rational insureds start anticipating its effects on the premiums at this date.

With the new bonus-malus scheme, the third-party insurance premium is adjusted by a multiplicative factor increasing or decreasing according to the past experience. The premium is decreased by 5% if the policy holder has reported no accident at fault during the last year. The policyholder's premium is raised by 10% for one reported accident, 30% for two reported accidents, and 100% for more accidents reported (see Dionne and Ghali (2005), for more details). So we must observe, after 1992, more incentive for road safety with the new pricing scheme.

Indeed, the data in Table 3 seems to support a decrease in accident rates over time, more particularly after 1991. Since only at fault accidents involving another party are included, the under reporting of accidents should be not important because the other party has advantage to obtain compensation. But the bad risks (those with a bonus-malus score higher than 14) may have an incentive to change insurer or reduce their contract length in order to maintain their premium as low as possible. Unfortunately, we do not have information on bonus-malus scores.

(Table 3 here)

3 Statistical model

In order to evaluate the impact of the Tunisian reform, we estimate a simultaneous model of contract length and accidents. It is necessary to take into account insuree's mobility because is it possible that the reform had an effect on both at fault claims and entries and exits. Indeed, as already discussed, the number of reported accidents at fault seems to decrease over time. Moreover, the average presence of a policyholder over the 5-year period is 2.73 years: 43 percent of policyholders entered the insurer portfolio over the 5-year period while 40 percent choose to exit. These exits and entries are more accentuated after 1992. For example, in 1991, 32 percent of subjects were new clients while 37 percent left at the end of the contract year. In 1993, the corresponding numbers were 49 percent and 43 percent, respectively.

We use a Poisson distribution with random effects to model the number of reported accidents at fault by the insured person and an exponential distribution for the length of the relationship between the insured person and the insurer. We refer to the duration of the relationship as contract duration even though the decision to continue the contract is theoretically made on a yearly basis. We discuss the specifics of each equation next.

3.1 Accidents

The Poisson model applies to processes for which the outcomes are counts. Our dependent variable is the cumulative number of accidents per period.

Typically, a contract between an insurer and an insuree lasts a year but many contracts have duration less than one year for unexplained reasons.[1] It is necessary to use a count model instead of a dichotomous variable model because the reform is anticipated to have a bigger impact on bad risks, i.e. people more likely to have more than one accident. Let this number of accidents for person i at period p be y_{ip}, then the conditional probability distribution is written as

$$\Pr(Y_{ip} = y_{ip}|x_{ip}) = \frac{e^{-\lambda_{ip}}\lambda_{ip}^{y_{ip}}}{y_{ip}!},\ i = 1, ..., N;\ p = 1, ..., 5 \tag{1}$$

with the parameterization

$$\lambda_{ip} = \exp(\beta' x_{ip}) \tag{2}$$

where x_{ip} is a vector of explanatory variables for period p (Hausman, Hall, and Griliches (1984); Gouriéroux, Monfort, and Trognon (1984)). In the model with unobserved heterogeneity, we let λ_{ip} depends on an individual specific effect θ_i that does not vary over time as follows

$$\lambda_{ip} = \exp(\beta' x_{ip} + \theta_i) \tag{3}$$

where θ_i is assumed to be a normally distributed random effect with variance σ_θ orthogonal to covariates x_{ip}. We can identify σ_θ because of multiple

[1] We use the correct reparametrization of λ to take into account such contracts.

observations on the number of accidents for the same individual.

3.2 Contract duration

Some insurance contract spells were in progress when the observation period began and we do not know their starting dates, a situation we refer to as left-censoring. It is common practice to drop those observations as it is perceived that they do not contain much information that can be exploited in empirical studies. Given that the proportion of left-censored spells is relatively large in our sample and our observation period is short, this solution is not very attractive in our case. Moreover, given the sampling process, it is clear that spells with longer than average full lengths are more likely to be in progress at the survey date, a phenomenon known as length-biased sampling (D'Addio and Rosholm (2002)). Note that the incorporation of those spells in the analysis is typically a very complex issue because of the fact that the entry rate into the initial state is unknown. However, in the special case of exponentially distributed duration, the density of left-censored corresponds to the density of non-censored spells. We therefore maintain this assumption for the rest of the paper.

More specifically, we assume contract duration t has density

$$f(t_i) = \gamma_{ip} e^{-\gamma_{ip} t_i} \tag{4}$$

We note that t_i refers to the whole duration of the relationship between the insurer and the insuree. The corresponding survivor function is

$$S(t_i) = e^{-\gamma_{it} t_i} \tag{5}$$

and the hazard rate takes the simple form

$$h(t_i) = \gamma_{ip} \tag{6}$$

In our application, the hazard rate is the conditional probability of moving given the past length of the contract. We model parameter γ_{ip} as

$$\gamma_{ip} = \exp(\alpha y_{ip} + \delta' x_{ip}) \tag{7}$$

where y_{ip} is the dependent variable in the accident equation (the number of reported accidents at fault for individual i in period p.)

3.3 Estimation

Simultaneity between the two equations is introduced through a load factor κ on θ_i and with the number of accidents from the Poisson regression appearing as a time-varying explanatory variables through α on the probability of contract termination :

$$\gamma_{ip} = \exp(\alpha y_{ip} + \delta' x_{ip} + \kappa\theta_i) \tag{8}$$

Note that we can test whether contract duration is exogenous in the accident equation by testing that the load factor κ equals zero. Moreover, the coefficient estimates for κ indicates whether individuals who are more accident-prone (for unobserved reasons: $\theta_i > 0$) are more likely to switch insurer (if $\kappa > 0$) or more likely to stay with their current insurer (if $\kappa < 0$).

Given the nested structure of the problem, we can derive the likelihood function at the individual level and, assuming independence, take the product to get the sample likelihood. The full joint marginal likelihood for the ith person is given by:

$$\mathcal{L}_i = \int_\theta \prod_{p=1}^{P_i} \frac{e^{-\lambda_{ip}} \lambda_{ip}^{y_{ip}}}{y_{ip}!} h(t_i)^{D_i} S(t_i) d\theta \tag{9}$$

where $D_i = 1$ if we observe the complete contract duration and 0 otherwise and P_i equals the number of periods insured i is observed. The full likelihood function is then simply the product over all individuals. Estimation is done by maximizing the marginal likelihood and integrating out the heterogeneity components θ_i:

$$\mathcal{L} = \prod_{i=1}^{N} \mathcal{L}_i$$

Since a closed form solution to the integral does not exist, we use Gauss-Hermite Quadrature to approximate the normal integral.

4 Results

The main results are presented in Tables 4 and 5 for parameter estimates on both accidents model and contract duration. Table 4 is divided into four columns. Each column presents parameter estimates from the estimation of equation (1) with the parametrization in equation (2). When we limit the number of observations to those who stayed in the portfolio of the insurer over the 5-year period (Stayers), it is interesting to observe that the reform (introduction of the bonus-malus scheme in 1992) has a negative and significant effect on the number of reported accidents at fault. This suggests that the new pricing scheme has an incentive effect on accidents for these clients. When we consider all the 46,337 observations (all; with left and right censoring), the reform effect is no more significant. The result is about the same with the estimation of the Poisson distribution with no left censoring (NLC spells, 25,229 observations) and with movers (35,542 observations). So the desired reform effect may have been eliminated by policyholders who switch companies in order to skirt the improved incentive effects of the new insurance policy.

In order to test that interpretation, we present, in Table 5, the results of two models where reported at fault accidents distribution and contract duration are estimated simultaneously. We observe that the reform has now a negative and significant effect on all clients and still no effect on movers. The main difference between the results in the two tables resides in the introduction of the duration equations. It is interesting to observe that the κ parameter is statistically significant in the specification of the duration equations which indicates that the contract duration decision is endogenous. Since the estimated κ is positive, we conclude that more risky individuals also have higher mobility. We also observe that the κ parameter is lower for the subcategory of movers. One interpretation is that there is more unobservable heterogeneity in the overall population of clients than in the population of movers (this can be seen from comparing the estimates for σ_θ from Table 4). But it is also expected that since movers are more accident prone, variation in θ_i in this subgroup will have a lower impact on mobility decisions.

The control variables do not show surprising results. Male drivers are more risky and more mobile than female drivers; owners of cars with more horse power (8HP) are more risky and more mobile; those who buy damage insurance are also more risky and more mobile while those who buy theft coverage are more risky but less mobile.

(Table 4 here)

5 Conclusion

The object of this paper was to analyze how the introduction of a bonus-malus scheme in automobile insurance pricing affects incentives for road safety. Under moral hazard and full commitment of the insurance industry, pricing insurance on past accidents experience should reduce accidents.

The bonus-malus studied has a flaw in the sense that bad risks (movers) escape higher premiums simply by changing insurer. Indeed we obtain that this bonus-malus scheme has no effect on accidents for movers although it reduces the number of accidents for all clients in the portfolio. We should emphasize that movers represent more than 75% of the insurer portfolio.

References

Abbring, J., P. Chiappori, and J. Pinquet (2003). Moral hazard and dynamic insurance data. *Journal of the European Economic Association 1*(4), 767–820.

Crocker, K. and A. Snow (1986). The efficiency effets of categorical discrimination in the insurance industry. *Journal of Political Economy 94*(2), 321–344.

D'Addio, A. and M. Rosholm (2002). Left-censoring in duration data: Theory and applications. Technical Report 2002-05, Department of Economics, University of Aarhus.

Dionne, G., R. Gagné, and C. Vanasse (1998). Inferring technological parameters from incomplete data. *Journal of Econometrics 87*(2), 303–327.

Dionne, G. and O. Ghali (2005). The (1992) bonus-malus system in tunisia: An empirical evaluation. *Journal of Risk and Insurance 72*(4), 609–633.

Dionne, G., J. Pinquet, M. Maurice, and C. Vanasse (2007). Point-record incentives, asymmetric information and dynamic data. Technical report, HEC Montréal and École Polytechnique.

Dionne, G. and C. Vanasse (1990). A generalization of automobile insurance rating models: The negative binomial distribution with a regression compononent. *Astin Bulletin 19*(2), 199–212.

Gouriéroux, C., A. Monfort, and A. Trognon (1984). Pseudo maximum likelihood functions: Applications to Poisson models. *Econometrica 52*(3), 701–720.

Hausman, J., B. Hall, and Z. Griliches (1984). Econometric models for count data with an application to the patents-r&d relationship. *Econometrica 52*, 909–938.

Shavell, S. (1979). On moral hazard and insurance. *Quartely Journal of Economics 93*(4), 541–562.

Verbeek, M. and T. Nijman (1992). Testing for selectivity bias in panel data models. *International Economic Review 33*(3), 681–703.

Table 1: Variable description

Variable	Description
Male	Dummy variable : 1 if individual is male (reference group)
Female	Dummy variable : 1 if individual is female
4 HP	Dummy variable : 1 if vehicule has 4 horspower (reference group)
5 HP	Dummy variable : 1 if vehicule has 5 horsepower
6 HP	Dummy variable : 1 if vehicule has 6 horsepower
7 HP	Dummy variable : 1 if vehicule has 7 horsepower
8 HP	Dummy variable : 1 if vehicule has 8 horsepower
9 HP	Dummy variable : 1 if vehicule has 9 horsepower
10+ HP	Dummy variable : 1 if vehicule has 10 or more horsepower
Fire	Dummy varibale : 1 if contract includes protection against fire
Damage	Dummy variable : 1 if contract includes protection against damage
Theft	Dummy variable : 1 if contracts includes protection agains theft
France	Dummy variable : 1 if vehicule's made is French (reference group)
Italy	Dummy variable : 1 if vehicule's made is Italian
Germany	Dummy variable : 1 if vehicule's made is German
England	Dummy variable : 1 if vehicule's made is English
Asia	Dummy varibale : 1 if vehicule's made is Asian
Eastern Europe	Dummy variable : 1 if vehicule's made if Eastern European
Other	Dummy varibale : 1 if vehicule's made is from an other country

Table 2: Summary Statistics per Year

	1990	1991	1992	1993	1994	Total
Gender						
Male	0.83	0.81	0.82	0.81	0.81	0.82
Female	0.17	0.19	0.18	0.19	0.19	0.18
Horsepower						
4 HP	0.19	0.21	0.21	0.21	0.20	0.20
5 HP	0.29	0.30	0.29	0.28	0.27	0.29
6 HP	0.11	0.12	0.12	0.13	0.14	0.13
7 HP	0.18	0.17	0.17	0.17	0.17	0.17
8 HP	0.12	0.10	0.11	0.11	0.12	0.11
9 HP	0.07	0.06	0.06	0.06	0.06	0.06
10+ HP	0.04	0.04	0.04	0.04	0.04	0.04
Coverage						
Fire	0.89	0.91	0.82	0.87	0.90	0.88
Damage	0.02	0.02	0.02	0.02	0.02	0.02
Theft	0.83	0.86	0.76	0.79	0.77	0.80
Origin						
France	0.64	0.61	0.63	0.62	0.59	0.61
Italy	0.07	0.07	0.07	0.07	0.07	0.07
Germany	0.25	0.28	0.27	0.28	0.30	0.28
England	0.01	0.01	0.01	0.01	0.01	0.01
Asia	0.01	0.01	0.01	0.01	0.02	0.02
Eastern Europe	0.01	0.01	0.00	0.00	0.00	0.00
Other	0.01	0.01	0.01	0.01	0.01	0.01
N	7549	7482	9641	10218	11447	46337

Table 3: Number of Reported Accidents at Fault per Year

Number accidents	1990	1991	1992	1993	1994
0	92.25	92.38	93.33	93.17	93.29
1	7.17	7.03	6.30	6.31	6.20
2	0.50	0.55	0.34	0.47	0.45
3	0.08	0.03	0.03	0.04	0.05
4	0.00	0.01	0.00	0.01	0.01
>0	7.75	7.62	6.67	6.83	6.71
Total	100%	100%	100%	100%	100%

Table 4: Parameter Estimates - Poisson Model

	All	Stayers	Movers	NLC Spells
Female	-0.064	0.103	-0.111 **	-0.165 ***
	(0.048)	(0.099)	(0.053)	(0.064)
5 HP	0.046	0.044	0.037	-0.021
	(0.057)	(0.115)	(0.061)	(0.073)
6 HP	0.165 **	-0.113	0.207 ***	0.122
	(0.069)	(0.162)	(0.072)	(0.083)
7 HP	0.194 ***	0.260 *	0.170 **	0.096
	(0.064)	(0.140)	(0.070)	(0.084)
8 HP	0.362 ***	0.107	0.411 ***	0.342 ***
	(0.072)	(0.182)	(0.077)	(0.092)
9 HP	0.198 **	0.000	0.226 **	0.154
	(0.087)	(0.206)	(0.095)	(0.118)
10+ HP	0.295 ***	-0.069	0.347 ***	0.232 *
	(0.096)	(0.223)	(0.107)	(0.128)
Fire	-0.014	0.262	-0.081	-0.091
	(0.080)	(0.264)	(0.082)	(0.091)
Damage	0.972 ***	-0.290	1.025 ***	1.180 ***
	(0.082)	(0.413)	(0.091)	(0.106)
Theft	0.182 **	0.282	0.171 **	0.183 **
	(0.079)	(0.255)	(0.076)	(0.088)
Italy	-0.028	-0.067	-0.026	-0.024
	(0.077)	(0.163)	(0.081)	(0.101)
Germany	0.047	0.189 *	0.026	0.008
	(0.042)	(0.101)	(0.048)	(0.057)
England	0.042	-0.121	0.080	0.040
	(0.206)	(0.363)	(0.183)	(0.223)
Asia	0.122	0.308	0.070	0.098
	(0.131)	(0.376)	(0.151)	(0.170)
Eastern Europe	0.242	0.489	0.187	0.150
	(0.240)	(0.351)	(0.282)	(0.353)
Other	0.117		0.197	0.406 **
	(0.174)		(0.186)	(0.199)

Table 4: cont'd

	All	Stayers	Movers	NLC Spells
Trend	-0.003	0.079	-0.024	-0.019
	(0.024)	(0.054)	(0.026)	(0.030)
Reform	-0.106	-0.450 ***	-0.027	0.002
	(0.072)	(0.150)	(0.078)	(0.101)
Constant	-2.722 ***	-3.177 ***	-2.585 ***	-2.601 ***
	(0.090)	(0.214)	(0.100)	(0.141)
σ_θ	0.723 ***	0.738 ***	0.687 ***	0.710 ***
	(0.037)	(0.065)	(0.043)	(0.053)
Number of obs.	46337	10795	35542	25229
ln-L	-12311.78	-2582.79	-9687.01	-6733.82

Includes controls for region of residence
Statistical significance: *=10%; **=5%; ***=1%.

Table 5: Parameter Estimates - Simultaneous Model

	Simultaneous model with Exponential duration			
	All		Movers	
	Poisson	Hazard	Poisson	Hazard
Female	-0.073 *	-0.165 ***	-0.113 **	-0.126 ***
	(0.042)	(0.032)	(0.053)	(0.026)
5 HP	0.046	0.067 **	0.038	0.036
	(0.050)	(0.033)	(0.063)	(0.027)
6 HP	0.158 ***	0.191 ***	0.206 ***	0.134 ***
	(0.061)	(0.041)	(0.075)	(0.033)
7 HP	0.195 ***	0.177 ***	0.172 **	0.113 ***
	(0.056)	(0.037)	(0.071)	(0.029)
8 HP	0.361 ***	0.166 ***	0.408 ***	0.141 ***
	(0.062)	(0.041)	(0.080)	(0.032)
9 HP	0.202 ***	0.210 ***	0.224 **	0.106 ***
	(0.076)	(0.050)	(0.094)	(0.038)
10+ HP	0.286 ***	0.171 ***	0.345 ***	0.118 **
	(0.083)	(0.063)	(0.103)	(0.051)
Fire	-0.060	-0.404 ***	-0.095	-0.299 ***
	(0.073)	(0.039)	(0.087)	(0.028)
Damage	0.961 ***	0.532 ***	1.017 ***	0.282 ***
	(0.063)	(0.090)	(0.083)	(0.066)
Theft	0.183 **	-0.332 ***	0.170 **	-0.248 ***
	(0.073)	(0.037)	(0.086)	(0.028)
Italy	-0.043	-0.030	-0.028	-0.036
	(0.070)	(0.045)	(0.084)	(0.036)
Germany	0.034	-0.236 ***	0.021	-0.156 ***
	(0.037)	(0.027)	(0.048)	(0.022)
England	0.026	-0.124	0.076	-0.046
	(0.184)	(0.120)	(0.221)	(0.104)
Asia	0.080	-0.008	0.067	-0.063
	(0.115)	(0.099)	(0.135)	(0.078)
Eastern Europe	0.228	-0.514 ***	0.181	-0.280 **
	(0.201)	(0.164)	(0.281)	(0.138)
Other	0.083	0.115	0.200	-0.015
	(0.153)	(0.130)	(0.179)	(0.095)

Table 5: cont'd

	Simultaneous model with Exponential duration			
	All		Movers	
	Poisson	Hazard	Poisson	Hazard
Trend	0.029		-0.015	
	(0.024)		(0.027)	
Reform	-0.184 ***		-0.052	
	(0.071)		(0.082)	
Constant	-2.428 ***	-4.132 ***	-2.569 ***	-3.849 ***
	(0.077)	(0.040)	(0.102)	(0.030)
κ		3.029 ***		0.132 ***
		(0.303)		(0.049)
σ_θ	0.293 ***		0.690 ***	
	(0.028)		(0.046)	
Number of obs.	46337		35542	
ln-L	-122540.93		-114834.54	

Includes controls for region of residence
Statistical significance: *=10%; **=5%; ***=1%.