Is rigorous punishment effective? A case study of lifetime license revocation in Taiwan

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Abstract

This study investigated the effectiveness of administrative lifetime driver's license revocation (ALLR) and its impact on offenders, based on a two-stage survey of 768 offenders. It was found that after ALLR had been imposed, 23.4% of these offenders were still driving almost the same as before, 59.8% drove significantly less frequently, and only 16.8% of the offenders gave up driving completely. The results of logistic regression models showed that offenders' compliance with ALLR was significantly correlated with their personal characteristics (age, income), penalty status (incarceration, duration of ALLR), and the need to drive for working, commuting and shopping. Elderly and low-income offenders were more likely to abide by the ALLR restriction. The application of the generalized estimating equations (GEE) model was used to identify the determinant factors affecting offenders' driving mileage, and to effectively estimate the driving mileage reduction as a result of the ALLR. It was found that ALLR is fairly effective in keeping offenders off the road, but that it may reduce their ability to make a living, resulting in the less fortunate becoming more helpless.

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1. Introduction

Many drivers given a sentence of license suspension/revocation (S/R) continued to drive, but at reduced levels (Hagen et al., 1980; Ross and Gonzales, 1988; Smith and Maisey, 1990). Ingraham and Waller (1971) found at least 30% of drivers given license S/R for drunk driving continued to operate a vehicle despite the licensing action. Williams et al. (1984) indicated that 65% of drivers confessed to operating a vehicle while under license S/R. Ross and Gonzales (1988) reported that 66% of suspended drivers were still driving on the road. Deyoung (1999) estimated that three-quarters of S/R drivers continued to drive, but they apparently drove less, and with more care. Malenfant et al. (2002) showed 57% of motorists were still driving while their licenses were suspended.

Although many S/R drivers continued to drive, many studies have explored the effectiveness of administrative license revocation (ALR) and supported the view that it is a positive step in reducing subsequent alcohol-involved driving by offenders (Henderson and Kedjidjian, 1992; Lund, 1993; Sweedler and Stewart, 1993). However, very few studies have explored the effectiveness of ALR over the long term (Siskind, 1996).

Some short-term license S/R offenders may be willing to follow a no-driving restriction to avoid being caught by the police during their license suspension period, in order to protect their future driving privileges. On the other hand, a long-term license S/R offender may have little motivation to adhere to such rules and continued to drive. In addition, driving while under S/R is difficult to enforce. It can only be detected when the driver of a vehicle has been stopped by the police for committing another traffic offence (Voas and DeYoung, 2002); thus, offenders are encouraged to drive by the belief that there is little danger of being caught (Knoebel and Ross, 1997). Furthermore, the punishment for driving a vehicle while under administrative lifetime license revocation (ALLR) in Taiwan is the same as driving while under S/R or while disqualified; ALLR offenders therefore have less incentive to stay off the road. Hence, we suspect that the

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percentage of ALLR offenders who continue to drive is higher than those with short-term license S/R.

Many economic and social activities, such as working, commuting, shopping, etc., rely heavily on a means of transportation. Driving a vehicle is thought to be a basic human right for people living in a modern society. Therefore, lifetime revocation of a driver's license, with no chance of rehabilitation, may be regarded as infringing on the human rights of offenders. Moreover, according to present Taiwan traffic regulations, the punishment for driving a vehicle while under ALLR is only a fine of 12,000 NTD (New Taiwan Dollars, 33 NTD = US$ 1). Apart from the fine, there is no other punishment. Thus, rich offenders may hardly notice such a penalty, choosing to continue to operate their vehicles; poor offenders, on the other hand, may be forced to abide by the ALLR no-driving restriction and give up driving. This may result in an unequal punishment, where a rigorous penalty such as ALLR, may have a greater impact on the less fortunate members of society by reducing their ability to make a living.

This study investigated the effectiveness of ALLR and its impact on offenders. A before-and-after comparison of offenders' driving habits, after ALLR had been imposed, was undertaken first, to measure the effectiveness of ALLR. The logistic regression models were then employed to show how offenders' compliance with the ALLR was associated with their characteristics, such as socio-economic factors, penalty status and the needs for transportation. Finally, a generalized estimating equations (GEE) model was employed to explore the determinant factors affecting the mileage driven by the offenders, and effectively estimate the driving mileage reduction as a result of the ALLR.

2. The ALLR policy in Taiwan

In most countries, there are two ways of revoking a driver's license. One is ALR and the other is judicial license revocation. Only the former is imposed in Taiwan. Because of the harsh need to limit traffic accidents, authorities in Taiwan have continued to believe that rigorous punishment can reduce traffic violations. Thus, sanctions have been adopted for offenders who commit hit-and-run offences, causing death/or injury or drunk driving causing death/or serious injury, which include criminal penalties, civil compensation and ALLR.

In Taiwan, a driver who commits a hit-and-run offence causing death or injury, or a drunk driving offence causing death or serious injury, will be prosecuted by a public prosecutor and awarded a criminal penalty of up to 5 years in jail. However, a hit-and-run offence not causing serious injury may not always be determined as criminal, it depends on whether or not the victim seeks court action. Similar to a criminal penalty, civil compensation varies with the consequences of the accident. The primary aim of ALLR is to revoke driving privileges and keep offenders off the road forever. In the present licensing system design they have no opportunity for rehabilitation.

In an attempt to deter the incidence of hit-and-run offences, the traffic safety authority imposed ALLR for a conviction of a hit-and-run offence causing death/or injury in 1975. For a

hit-and-run offence to be punishable by ALLR it must include: (1) hit-and-run; (2) death or injury. ALLR was implemented for drunk driving causing death/or serious injury in 1997. For a drunk driving offence to be punishable by ALLR, it must include: (1) breath alcohol content (BrAC) ≥ 0.25 mg/L; (2) death or serious injury. In cases where a breath test is not possible, blood alcohol content is tested. The police authority issues punishment administratively, rather than judicially, processing matters according to the offence committed. According to the present ALLR regulations, all privileges of operating motor vehicles, including cars, buses, trucks, motorcycles, etc. are revoked at the same time.

3. Materials and methods

3.1. Data source

The area of Taiwan is $36,000 \text{ km}^2$. In 2004, the population was approximately 22.7 million. The number of motor vehicles was 6.0 million (excluding motorcycles) with one car for every 3.8 persons. The number of driver licenses issued was approximately 10 million (excluding motorcycles), with 6% being professional licenses. Data were collected from offenders who had been punished by ALLR as a result of being involved in either a hit-and-run offence causing death/or injury, or a drunk driving offence causing death/or serious injury. From 1993 to 2002, 2554 drivers were punished by ALLR. Among these offenders, approximately 70% were hit-and-run cases and 30% were drunk-driving cases. Of these cases, 21% were drivers who held professional licenses.

3.2. Data collection

In order to get in touch with all ALLR offenders, a two-stage survey was conducted, with the assistance of all seven Departments of Motor Vehicles (DMV) in Taiwan. In the first stage, two waves of questionnaire surveys were conducted. In the first wave, questionnaires were mailed directly to the 2554 ALLR offenders in September of 2003. In the second wave, the same questionnaire was mailed to offenders who had not responded to the first wave. In order to increase the response rate we conducted a telephone follow-up, if the offender's phone number was in the DMV database. Offenders were asked to return their questionnaires and leave their current telephone numbers, if they were willing to be interviewed by a follow-up telephone contact. Specifically, the comprehensive questionnaire included questions such as: (1) basic personal characteristics at the time of survey: gender, age, marital status, income (including change in level of income), education, license category, having dependents to take care of or not, etc.; (2) penalty status: criminal penalty, civil compensation and duration of ALLR; (3) relative driving frequency under ALLR, classified into five groups, namely, same frequency, slightly less frequency, fairly less frequency, much less frequency and completely giving up driving; (4) the reasons for driving under ALLR, including job activities (e.g. working and commuting) and family activities (e.g. shopping, traveling for touring/or leisure, visiting relatives/or

friends and driving kids). Furthermore, in order to obtain an accurate estimation of the mileage driven by ALLR offenders, both before and after revocation, a telephone interview was conducted by trained personnel in the second stage of the survey. We compared the driving frequency with the mileage driven. Only consistent samples were included in the final analysis.

The percentage of questionnaires returned unclaimed by the postal service due to invalid addresses was 32%; in all 895 questionnaires were collected. When the questionnaire return rate was corrected for those returned unclaimed, the actual return rate was 52%. There were 768 offenders completed the two-stage surveys effectively, and these documents were used in the final analysis (Table 1).

Simple cross tabulations were adopted to categorize the collected and no-response offenders by jurisdiction, hit-and-run/drunk driving offences and professional/ordinary licenses. The results showed no significant difference between collected and no-response offenders by the seven jurisdictions, license category as well as hit-and-run or drunk driving participants. It is believed that no significant bias existed in either the survey areas or the participant groups.

3.3. Measures and variables

Since relative driving frequency after ALLR was collected in five groups, the focus was on exploring who had complied with the ALLR penalty and who had not. Offenders who significantly reduced their driving exposure after ALLR were represented as having complied with the penalty. Offenders who had no reduction, or had only minimally reduced their driving exposure, were categorized as not having complied with the penalty. Therefore the same driving frequency and the slightly less frequency groups were combined into the 'almost same' driving group, representing those who had not been influenced by the ALLR penalty. The less frequency and much less frequency groups were combined into the 'reduced' driving group, together with those who had completely given up driving, representing those who had been influenced by the ALLR penalty. By comparing the driving frequency and mileage driven before and after ALLR, the compliance of offenders who had received ALLR could be reasonably measured.

Apparently, compliance with the punishment of ALLR is determined by the attitude of the offenders. Moreover, some social and economic activities are necessary for living in a modern society, and driving an automobile perhaps could not be avoided for many ALLR offenders, when undertaking activities necessary for day-to-day living. To gain further insight into the relationship between compliance with ALLR and offenders' characteristics, a logistic regression model was called for, as some specific characteristics were expected to be different among the three driving groups that demonstrated quite different responses to the ALLR sentence.

Two logistic regression models were therefore hierarchically designed, to identify these influential factors. In model 1, the almost same driving offenders were compared with all other offenders in terms of their characteristics to classify which offenders had ignored the punishment. The characteristics of the

Table 1
Basic results of the sampled ALLR offenders (N = 768)

	Respondents		Non-respondents (includes invalid questionnaires)	
	n	(%)	n	(%)
Offenders' personal characteristics				
Gender				
Male	755	98.3	1762	98.7
Female	13	1.7	24	1.3
Age (years)				
≤40	538	70.1	NA	NA
>40	230	29.9	NA	NA
Married				
Yes	498	64.8	NA	NA
No	270	35.2	NA	NA
Income (NTD/month)[a]				
≤30000	537	69.9	NA	NA
>30000	231	30.1	NA	NA
Education				
No college	631	82.2	NA	NA
College and up	137	17.8	NA	NA
License category				
Professional	128	23.7	408	22.8
Ordinary	640	76.3	1378	77.2
Having dependents to take care of				
Yes	628	81.8	NA	NA
No	140	18.2	NA	NA
Penalty status				
Incarcerated				
Yes	71	9.3	NA	NA
No	697	90.7	NA	NA
Civil compensation (1000 NTD)				
<300	380	49.5	NA	NA
300–1500	200	26.0	NA	NA
>1500	188	24.5	NA	NA
Duration of ALLR (years)				
≤3	283	36.8	NA	NA
>3	485	63.2	NA	NA
Reasons for driving under ALLR[b]				
Working	390	61.1	NA	NA
Commuting	184	28.8	NA	NA
Shopping	123	19.3	NA	NA
Leisure travel	138	21.6	NA	NA
Visiting relatives/friends	142	22.3	NA	NA
Driving kids	188	29.4	NA	NA

[a] 33 NTD = US$ 1.
[b] Sample size n = 639, excluding offenders who had completely given up driving offenders 16.8%, n = 129.

no-more-driving offenders were also compared to the reduced driving offenders in model 2, in order to explore which offenders had absolutely complied with the ALLR. In this way we could differentiate between groups while using an odds ratio concept to determine those factors affecting the behavior of offenders, in response to ALLR. We expected these two logistic regression models to support our hypothesis, that some factors would influence offenders' compliance with ALLR.

The candidate explanatory variables, affecting the behavior of offenders in response to ALLR, included offenders' personal characteristics (gender, age, marital status, income, education, license category, having dependents to take care of), penalty status (incarceration, civil compensation, duration of ALLR) and reasons for driving under ALLR (working, commuting, shopping, traveling for leisure, visiting relatives/or friends, driving kids, etc.). However, the reasons for driving were not included in the second logistic model, which compared the offender group that had completely given up driving after ALLR, to the reduced driving group.

Exploring the determinant factors that forced offenders to fully comply with the ALLR and totally give up driving, to partially abide by ALLR and reduce driving, or to completely ignore the punishment and drive almost the same as before the ALLR, is not sufficient to get a whole picture of the effectiveness of ALLR. This is because all the findings are based on the phase of post-ALLR. For traffic authorities, it is valuable to comprehend the driving exposure as well as the driving pattern of those offenders who did not comply with the ALLR, both before and after ALLR. Thus, a multivariate regression model, GEE (Liang and Zeger, 1986; Hardin and Hilbe, 2003), was used to determine the association between the mileage driven by the offenders and potential explanatory factors.

The outcome variables of the GEE model included the mileage driven per year by the offenders both before and after ALLR. The candidate factors thought to influence the mileage driven by the offenders were the same as those in the logistic regression models. Moreover, an indicator variable representing the group membership (i.e. the almost same driving offenders or the reduced driving offenders) can be used in the model. Its main effect and interaction effects with other variables will indicate the difference in the driving patterns between the two groups. Finally, an indicator variable of post-ALLR in this model will reflect the mileage change after the ALLR, which can be used to measure the impact of ALLR punishment.

4. Study results

4.1. Basic results

Table 1 shows the basic characteristics of the study respondents at the time of the survey.

4.1.1. Offenders' characteristics

Among the interviewed offenders, 98.3% were male, over 70% were under 40 years of age and 64.8% were married. Apparently, most of these ALLR offenders were among the most productive members of their families. The results also showed that approximately 70% of the respondents had an average monthly income equal to or less than 30,000 NTD, over 80% were not college educated and over 80% had dependents to take care of; 23.7% held professional driver's licenses and 76.3% held ordinary driver's licenses, before the ALLR.

4.1.2. Penalty status

Among the respondents, 57.9% had been found guilty; 84.0% of those found guilty had been given probation, while 16.0% had been incarcerated from 2 to 88 months, for an average of 14.9 months. The survey results indicated that 93.3% of the interviewed offenders were responsible for civil compensation, of which 81.4% were settled through negotiation between victims and offenders and 18.6% were determined by the judgment of the court. Of the civil compensation cases, 36.3% involved causing death, and the amount levied averaged 1.5 million NTD (about US$ 45,000), which is around three times the average yearly income in Taiwan; 63.7% involved physical injury, and the amount levied averaged 300,000 NTD (about US$ 9000).

The period of time since their licenses had been revoked varied from 6 to 120 months, with an average of 53.8 months. Among the interviewed offenders, 63.2% had been deprived of the privilege to drive for more than 3 years.

4.1.3. Reasons for driving under ALLR

The reasons for driving under ALLR were classified into two categories. The first category related to job activities, including working and commuting, while the second related to family activities, such as shopping, traveling for leisure, visiting relatives or friends and driving kids. For those who still drove after the ALLR (83.2%, $n = 639$), 61.1% felt it was necessary for working, 28.8% for their daily commuting, 19.3% for shopping, 21.6% for leisure travel, 22.3% to visit relatives/or friends and 29.4% to drive their kids. A significant proportion of the interviewees drove their vehicles for more than one reason.

4.2. Driving exposure under ALLR

After being sentenced to ALLR, 12.6% of the interviewed offenders confessed that they drove with the same frequency as before, 10.8% drove slightly less frequently, 24.5% drove fairly less frequently, 35.3% drove much less frequently, while only 16.8% had given up driving completely. According to the previous classifications, these five different driving groups were combined into three groups. For those offenders who said they drove with almost the same frequency after ALLR, the average annual kilometers driven was 29,684 km before ALLR and 22,147 km after ALLR for a reduction factor of 25%. Offenders belonging to this group seemed to have high dependence on automobiles before ALLR, and continued to operate a vehicle to carry out most of their daily activities, even after ALLR.

For the group who drove with reduced frequency after ALLR, the average annual kilometers driven were sharply reduced to 3419 km after ALLR from 24,581 km before ALLR, for a reduction factor of 86.1%. The ALLR penalty apparently caused this category of offenders much concern, forcing them to significantly reduce their mileage. For the 16.8% of interviewees who said they had completely given up driving after ALLR, the average annual kilometers driven was 16,854 km before ALLR. This group of offenders had the lowest average annual mileage, before ALLR, of all driving exposure groups.

As a whole, the average annual mileage driven before ALLR was 25,495 km, which was reduced to an average of eight 750 km

after ALLR. This showed that the average annual mileage driven after ALLR was reduced to 34.3% of the average annual mileage driven before ALLR. Thus, ALLR did indeed have a significant impact on the offenders.

4.3. Logistic regression analysis for different driving frequency groups

In this section, the factors that were influential in affecting the compliance of offenders with this rigorous punishment are explored.

4.3.1. The findings from model 1—those who ignored ALLR punishment

Among the candidate variables, the results showed that the factors of age, income, penalty of incarceration, driving for work, driving for commuting and driving for shopping were significant in model 1 (Table 2). Offenders over 40 years of age were around 82% less likely (odds ratio = 0.183) to drive with almost the same frequency when compared to offenders under 40 years of age. Furthermore, offenders with a monthly income of over 30,000 NTD were approximately three times more likely (odds ratio = 2.959) to drive with almost the same frequency when compared to the offenders with a monthly income under 30,000 NTD. The study results also showed that offenders who had been incarcerated were more than 15 times as likely (odds ratio = 15.567) to drive with almost the same frequency when compared to offenders who had never been incarcerated.

For the reasons for driving, the offenders who drove for working, commuting and shopping had an odds ratio of 7.855, 3.272 and 3.011, respectively, for driving almost the same, when compared to offenders who had none of these driving reasons. It was apparent that those ALLR offenders who chose to continue operating a vehicle did so mainly to carry out their working and commuting activities, as well as family shopping.

4.3.2. The findings from model 2—those who absolutely complied with ALLR

In model 2, the study results showed that the age of the offender, incarceration status and the duration of ALLR were the three significant factors at $\alpha = 0.05$ to distinguish the no-more-driving offenders from the reduced driving offenders (Table 2). The offenders aged 40 years and older were approximately 1.88 times more likely (odds ratio = 1.879) to completely give up driving when compared to offenders under the age of 40 years. The results also indicated that offenders who had been incarcerated were about 3.6 times more likely (odds ratio = 3.571) to completely give up driving when compared to offenders who had not been incarcerated.

Finally, offenders whose licenses had been revoked for more than 3 years had around 69% less likelihood (odds ratio = 0.313) of completely giving up driving than offenders whose licenses had been revoked for less than 3 years.

4.4. GEE model analysis for mileage driven for still driving offenders

In this section, discovering the determinant factors affecting offenders' driving mileage both before and after ALLR, and estimating the mileage reduction as a result of the ALLR for

Table 2
Estimated results for the two logistic regression models

Explanatory variables	Model 1			Model 2		
	Almost same driving group vs. the others			Completely gave up driving group vs. reduced driving group		
	β	p-Value	O.R. (95% C.I.)	β	p-Value	O.R. (95% C.I.)
Offenders' personal characteristics						
Age (years)						
≤40			Reference			Reference
>40	−1.698	0.000**	0.183 (0.073–0.457)	0.632	0.032*	1.879 (1.056–3.356)
Income						
≤30000 NTD			Reference			
> 30000 NTD	1.085	0.001**	2.959 (1.528–5.729)			
Penalty status						
Incarcerated						
Yes	2.745	0.001**	15.567 (3.877–62.508)	1.271	0.023*	3.571 (1.192–10.638)
No			Reference			Reference
Duration of ALLR						
≤3 years						Reference
>3 years				−1.161	0.000**	0.313 (0.182–0.539)
Reasons for driving						
Working	2.061	0.000**	7.855 (3.650–16.908)			Not applicable
Commuting	1.185	0.001**	3.272 (1.650–6.488)			Not applicable
Shopping	1.102	0.009**	3.011 (1.314–6.900)			Not applicable
Constant	−3.211		0.040	−0.727		0.483

* Significant at $\alpha = 0.05$.
** Significant at $\alpha = 0.01$.

Table 3
Study results of the GEE parameters and standard error estimates

Parameter	Estimate	Standard error	95% Confidence		Z	Pr > |Z|
			Lower	Upper		
Intercept	3596.8	1238	1167	60262	2.02	0.04[*]
Offenders' personal characteristics						
Male	1719	4159	−6403	9845	0.42	0.68
Age (≤40 years)	1873	758	329.6	3304	2.45	0.01[*]
Married	2528	2359	−2095	7153	1.07	0.28
Average monthly income (>30000 NTD)	2115	1597	−75	4305	1.97	0.05[*]
Education (college and up)	2828	2490	−2053	7709	1.14	0.25
License category (professional)[a]	20400	6001	8637	32164	3.40	0.0007[**]
Having dependents to take care of	790	834	−845	2428	0.95	0.34
Penalty status						
Incarcerated	14609	6042	2764	26453	2.42	0.02[*]
Civil compensation (a)[b]	5182	2112	1037	9323	2.45	0.01[*]
Civil compensation (b)[c]	1650	2344	−2944	6248	0.70	0.48
Duration of ALLR >3 years	1654	1905	−2079	5389	0.87	0.38
Reasons for driving						
Working	2915	1905	−788	6681	2.38	0.02[*]
Commuting	1137	5630	33	2241	2.02	0.04[*]
Shopping	1572	2153	−2646	5794	0.73	0.46
Leisure travel	2360	1106	186	4529	2.13	0.03[*]
Visiting relatives/friends	1901	2139	−2272	6118	0.90	0.36
Driving kids	2304	1013	343	4315	2.30	0.02[*]
Group (almost same driving Group)[d]	9446	2491	4561	14331	3.79	0.0002[**]
Post-ALLR[e]	−11052	1706	−14698	−7867	−6.47	0.0001[**]
License (professional)[*] post-ALLR[f]	−20902	6647	−34148	−8089	−3.18	0.0015[**]

[a] Professional license = 1, ordinary license = 0.
[b] Civil compensation >1,500,000 NTD = 1, civil compensation <300,000 NTD = 0.
[c] Civil compensation: 300,000–1,500,000 NTD = 1, civil compensation <300,000 NTD = 0.
[d] Almost same driving Group = 1, reduced driving group = 0.
[e] Post-ALLR = 1, pre-ALLR = 0.
[f] Professional license and post-ALLR = 1, others = 0.
[*] Significant at $\alpha = 0.05$.
[**] Significant at $\alpha = 0.01$.

offenders who were still driving were explored. All of the individual candidate variables, and the possible interactions between variables (e.g. the indicator variable of the group it belongs to, together with working, commuting, etc., or an indicator variable of the post-ALLR together with working, commuting, etc.) were included in the GEE model. After several trials, the result, as shown in Table 3, was considered to be the best model in terms of explanatory ability. The study results showed that personal characteristics (age, income, license category), penalty status (incarceration, high civil compensation), driving needs (work, commuting, traveling and driving kids), indicator of group membership, indicator of post-ALLR and the interaction of license category together with post-ALLR were all significantly associated with the mileage driven.

Offenders under 40 years of age drove approximately one 873 km a year more compared to offenders over 40 years of age. Offenders with a monthly income over 30,000 NTD drove 2115 km/year more when compared to offenders with a monthly income under 30,000 NTD. Offenders who held professional licenses before the ALLR drove 20,400 km a year more compared to offenders who held ordinary licenses before the ALLR.

As to penalty status, incarceration and high civil compensation were significantly associated with the mileage driven by the offenders. Offenders who had been incarcerated drove approximately 14,609 km a year more compared to offenders who had not been incarcerated. Offenders whose civil compensation was greater than 1,500,000 NTD drove approximately 5182 km a year more compared to offenders whose civil compensation amounted to less than 300,000 NTD.

Regarding driving needs: working, commuting, leisure travel and driving kids were found to be significantly associated with the mileage driven. These driving-activities contributed 2915, 1137, 2360 and 2304 km per year, respectively, to mileage driven by offenders. Moreover, the results showed that offenders who belong to the 'almost the same' driving group drove 9446 km/year more than offenders who belong to the 'reduced' driving group.

In general, while controlling all the other explanatory factors, offenders drove 11,052 km/year less after ALLR compared to before the ALLR. The offenders with professional licenses before the ALLR were found to significantly reduce their driving mileage by 20,902 km per year after the ALLR.

5. Discussion

This study has shown that ALLR may be completely effective for only 16.8% of offenders in compelling them to completely refrain from driving. The results also indicated that ALLR was ineffective for 23.4% of the offenders whose driving habits remained almost the same as before ALLR, and fairly effective for 59.8% of offenders who drove with a significantly reduced frequency. The average annual mileage driven after ALLR decreased to 34.3% of the average mileage driven before ALLR. Overall, the 83.2% of ALLR offenders who continued to drive was higher than in previous findings based on relatively short-term license S/R. This may be explained by the facts that: first, offenders punished by the relatively short-term S/R may be willing to obey the licensing action and refrain from driving during their S/R period in order to protect their future driving privileges, while ALLR offenders do not have the same motivation. Second, ALLR offenders are in the worst situation possible, as they have no chance of rehabilitation of having their driving privileges reinstated, no matter how much they improve their attitudes and behaviors. Therefore, most ALLR offenders feel desperate and have little to lose by disregarding their sentence. The results of prior studies in which participants usually under-represented their own incidences of driving while under license S/R (e.g. Malenfant et al., 2002) may share few similarities with ALLR cases. Third, ALLR offenders were aware of the low risk of apprehension for unlicensed driving, especially after a lengthy period of revocation.

For logistic regression models, the age of the offender was found to be a significant factor affecting compliance with ALLR in both models 1 and 2. After ALLR, young offenders were more likely to ignore the penalty. This may be because young offenders are usually more aggressive, as well as needing more flexibility and mobility for driving to work, than older offenders. Offenders' incomes had significance in logistic regression model 1 but not in model 2. This implies that high-income offenders were more likely to ignore the ALLR sentence and drive almost the same as usual. In other words, ALLR might reduce the ability of low-income earners to make a living, resulting in the exacerbation of misfortune.

Incarceration was also found to be a significant factor in both logistic regression models 1 and 2, although the results of the two logistic models are quite different. In model 1 the offenders who had been incarcerated were more likely to disregard the no-driving restriction and drive the same as before. This may be explained by the followings. First, offenders who have been incarcerated may be more aggressive than their counterparts; thus, incarceration may have no effect on their driving habits. Second, about 60% of the offenders were found guilty, but only 20% of those guilty offenders were incarcerated while the other guilty offenders had confessed their guilt and sought probation. The offenders who had been incarcerated may not have felt regret, so they most likely drove the same as usual. Third, such offenders may have felt they had paid for their crimes by being incarcerated, and therefore would refuse to abide by the no-driving restriction under ALLR. However, once

they had chosen to abide by the restriction, they were more likely to completely give up driving than those who had not been incarcerated.

The duration of ALLR was found to be a significant factor in logistic regression model 2, but not in model 1. This implies that the decision to drive almost the same as before will not increase over time. However, for those offenders abiding by the punishment, the possibility of never driving significantly decreased over time. These results were similar to previous findings that driving while S/R can only be detected when the police stop the driver of a vehicle for committing another traffic offence (Voas and DeYoung, 2002), it is likely to cause the offenders to believe that there is little chance of being caught (Knoebel and Ross, 1997). In addition, complying with a short revocation of their driver license may be relatively easy for most people, while a very long suspension of their driving privileges may be too much for them to endure.

The driving purposes of working, commuting and shopping were significant in logistic regression model 1. That is, the necessity to drive for working, commuting and shopping were the significant factors to ALLR offenders' in determining whether or not to abide by the penalty.

The study results of the GEE model showed that offenders who belong to the 'almost the same' driving group drove more mileage than offenders who belong to the 'reduced' driving group. As expected, ALLR had a significant impact on the driving mileage of offenders. The still driving offenders drove 11,052 km per year less after the ALLR. Based on the significant interaction effect of license category with the indicator variable of post-ALLR, ALLR reduced the annual driving mileage of professional drivers by 20,902 km after ALLR. However, further interaction effects of post-ALLR combined with travel needs, such as working, commuting, etc., were not significant in this study. This shows that once offenders decided to continue driving for some specific activities, they would drive almost the same amount for that specific purpose. Basically, the total reduction in driving mileage should come from the mileage reductions of individual traveling activities. However, we failed to find any significant driving mileage reduction after ALLR for any of the specified traveling activities. This might be because some offenders gave up some of their traveling activities that were not observed or taken into account by the study.

In summary, many prior studies have concluded that short-term license S/R has been consistently associated with traffic safety benefits. However, even for a short-term S/R, one-fifth of the US states rejected the adoption of administrative S/R because it could lead to loss of employment, in turn impacting the offender's dependents and subsequent social welfare costs (Knoebel and Ross, 1997; Voas and DeYoung, 2002). If there is no effective means of enforcement or persuasive motivation, offenders may ignore the suspension because of their day-to-day needs. Furthermore, compliance with rigorous punishment may be correlated with an offender's social or economic conditions. This would seem to introduce one more societal inequity.

6. Conclusions

This study has provided a different view, to remind concerned authorities to balance the effectiveness of ALLR with potential problems that may ensue. Presently, the transportation authority has been requested by the Taiwan constitutional court to seriously reconsider whether ALLR offenders should be allowed to re-enter the licensing system if they can demonstrate their ability and willingness to follow the regulations of the road and society. It is our belief that the ALLR policy will be drastically modified in the near future.

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