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Article abstract

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The Relationship between Automobile Liability Costs and Government Social Spending

by Anne E. Kleffner, Patricia Born and David Chan

ABSTRACT

Liability insurance is one of the primary mechanisms for compensating individuals who are injured in auto accidents. An injured individual's propensity to seek compensation through the legal system depends on his or her expected payoff and access to other sources of compensation. A justification for social insurance programs that provide compensation to injured parties is the potential for such compensation to reduce the need for victims to seek compensation through the legal system. If such programs serve as substitutes for the legal system as sources of compensation, then we expect that as spending on these programs decreases, liability costs will increase, and vice-versa. Using State-level data for the U.S., and provincial-level data for Canada, we evaluate the relationship between government health/welfare spending and automobile liability insurance costs. Our results suggest a small but significant substitute relationship in both countries. Information that substantiates a connection between these sources will be useful in public assistance decision-making.

Keywords: Automobile liability insurance, social insurance programs, substitution effect.

RÉSUMÉ

L'assurance responsabilité est le plus important mécanisme de compensation pour les victimes d'accidents de la route. La probabilité que ces victimes entament des poursuites judiciaires dépend à la fois des profits espérés par une telle démarche

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et de leur accès à d'autres sources de compensation. Le bien-fondé des programmes sociaux d'assurance repose sur le principe qu'en compensant les victimes d'accident, on réduit la probabilité qu'elles passent par un système légal pour demander une compensation. Si de tels programmes se substituent au système légal en tant que sources des compensations, on peut supposer que les dépenses dans ces programmes sont inversement corrélées aux coûts de responsabilité (liability cost). En utilisant des données au niveau provincial pour le Canada et au niveau des États pour les États-Unis, nous avons évalué la relation existant entre les dépenses gouvernementales en santé et en aide sociale, et les coûts d'assurance responsabilité automobile. Nos résultats suggèrent la présence, dans les deux pays étudiés, d'une relation mince mais substantielle entre ces variables. L'information qui explique la relation découverte sera particulièrement utile lors de l'élaboration des programmes gouvernementaux d'aide.

Mots clés : Assurance responsabilité automobile, programmes sociaux d'assurance, effet de substitution.

1. INTRODUCTION

Liability insurance is one of the primary mechanisms for compensating individuals who are injured in auto accidents. An injured individual's propensity to seek compensation through the legal system depends on his or her expected payoff and access to other sources of compensation. Large non-economic losses and high probabilities of success increase the expected pay-off and increase the likelihood of filing a liability claim following an automobile accident. But, to the extent that first party benefits, such as health and disability insurance, are available and sufficient to cover economic losses, we expect the frequency of liability claims to be reduced.

One potentially important factor in the equation is the existing social safety net. One justification for social programs that provide for compensation of injured parties is the potential for such compensation to reduce the need for victims to seek compensation through the legal system. The argument assumes that liability insurance, in general, is not an efficient way of providing compensation to injured parties due to delays and high legal costs. A study by Tillinghast-Towers Perrin (2003) indicates that only 22 cents of every U.S. liability premium dollar is paid to victims to compensate for economic loss. Other studies have cited distributional inequities of the tort system, such as the tendency for only a small proportion of victims to obtain access to the legal system.[1] On the other hand, social programs are not provided without substantial administrative costs and may induce moral hazard, resulting in over-spending on medical services. Moreover, social programs, by design, may have built-in

distributional goals which can create inequities in their costs and benefits.

Regardless of whether particular social programs or liability insurance are more likely to provide an "optimal" system of compensation for victims, the coexistence of these compensation mechanisms suggests that policy changes could lead to shifts from one form to another. That is, if government social programs serve as substitutes for the legal system as sources of compensation for accident victims, then we would expect that as public spending on social programs decreases, liability costs will increase, and vice-versa. Intuitively, persons injured in auto accidents will be more likely to make a liability claim and incur the potentially high costs of litigation if there are not other sources of compensation available. Kerr, Ma and Schmit (2009) examined this issue using country-level data for 24 countries and found a strong negative relationship between expenditures on government social programs and national liability insurance premiums. "As government payments rise, injured parties will see less value in undertaking the costly process of litigation." (Kerr, *et al.*, 2009).

In this study, we examine the relationship between compensation from government health/welfare programs and the tort liability system. We take the demand for auto liability insurance as given, since it is generally required, and focus on the injured person's decision to claim. If first-party benefits are available and adequate we expect that this will reduce injured parties' incentive to seek compensation through the tort system, thereby reducing automobile liability costs. We test whether there is a substitution effect between auto liability costs (incurred losses per vehicle) and per capita spending on public and private health care and public welfare programs. Using State-level data for the U.S., and provincial-level data for Canada, we seek to document whether these forms of compensation are substitutes, by exploring the variations in government expenditures over time as well as across States/provinces, and measuring the relationships between these variations and incurred losses in the auto liability line. While it is beyond the scope of this research to determine the optimal approach for providing compensation to injured victims, information that substantiates a connection between these sources will be useful in public assistance decision-making. Our results show that there is a negative relationship, suggesting that as social spending increases (decreases), auto liability costs decrease (increase).

We discuss important background information in the next section. This is followed by a discussion of relevant theories from which we develop our hypothesis and important differences between the

U.S. and Canada. A description of the Canadian and U.S. data employed in the analysis, our empirical approach, and results of the analysis follow, along with our discussion and conclusions.

2. BACKGROUND

The relationship between government health/welfare spending and liability costs has been examined in a number of different studies. We are primarily interested in measuring whether there is a substitution relationship between automobile liability costs and government health/welfare spending in the U.S. and Canada. We do not evaluate the cost or efficiency of either option, but rather focus on the potential for large shifts which, if unanticipated, could exacerbate the current problems with either source of compensation. Also, substantial research has addressed the costs and efficiency of the tort liability system and various public programs, but a comparison does not seem appropriate since their basic objectives are quite different. That is, the tort system is designed to provide compensation to victims and to deter negligent behavior, while public health and welfare programs may be designed to improve the health or economic status of a target population, and compensating victims of accidents is only incidental to the existence of the program. Thus, we emphasize that the substitution from one form of compensation to another may have wide-ranging consequences for both systems, and we attempt to provide a better understanding of the nature of the substitution between them. First, however, we note some trends in health care and liability costs that motivate this goal.

2.1 Health Care Systems

The approach toward health care financing is different in the Canada and the U.S. Canada has a universal health care system that provides access to "necessary" care to all residents, and additional government sponsored support is available to low income individuals. In the U.S. private health insurance, predominantly provided through employers, is used to pay for health care for those who are insured, and government-sponsored support programs provide health care services for those who cannot afford it. One example of such a program in the U.S. is Medicaid. In 2004, State-run Medicaid programs, which are jointly funded by the federal and State governments, spent $263 billion providing health services to over 58 million Medicaid enrollees.[2]

While the financing mechanisms differ, in both countries, the cost of providing medical care continues to rise. In 2009, the share of the U.S. gross domestic product (GDP) spent on health care is expected to have increased 1.1 percentage points to 17.3 percent, which is the largest single-year increase since 1960 (Truffner *et al,* 2010). Similarly, the proportion of Canada's GDP spent on health care in 2009 hit an all-time high of 11.9 percent; in total, Canada is expected to spend about $183.1 billion on health care in 2009, an increase of $9.5 billion from 2008 (Collier, 2010). Further, an increase in the number of uninsured in the U.S. has motivated policymakers to consider drastic changes in public health programs, such as moving enrollees into managed care or offering subsidies to businesses to encourage them to provide health insurance to their employees.

2.2 Legal Systems

In examining the U.S. and Canadian legal systems it is clear that they are more alike than dissimilar. As previously noted, the primary goals of the tort liability system are deterrence and compensation, but critics cite long delays and complexities that result in suboptimal efforts to avoid liability[3] and inadequate compensation to victims. Access to, and success within, the legal system is not guaranteed. According to Shuck (2002):

"The typical accident victim must follow a tortuous path. First she must find a lawyer who sees a profit in taking her case. Then she will embark on a long adversarial process in the courts, where she must prove, among other things, precisely who caused her loss and that the wrongdoer was negligent… If she does prove this, and obtains a judgment, she must then try to collect it - and a third of that recovery will typically go to her lawyer. If she fails to prove her case, of course, she receives nothing. No wonder that only one injured accident victim in 10 attempts to collect compensation. (This proportion rises to about five in 10 for those injured in auto accidents.)"

Nevertheless, the costs of the tort system continue to increase in both the U.S. and Canada.[4] In particular, we note that only a small share of liability premium dollars is paid to victims to compensate for economic loss. Tillinghast estimates for 2001 indicate that only 46 percent of the total direct costs of the U.S. tort system go to victims in the form of economic (22 percent) and noneconomic (24 percent) damages; 54 percent go to transaction costs (Tillinghast-Towers Perrin, 2003). Furthermore, these costs represent a large share of gross domestic product when compared to other industrialized coun-

tries. In 2003, for example, tort costs equaled 2.2 percent of gross domestic product in the United States, compared with 1.7 percent in Italy and 1.1 percent in Germany—the next two closest countries (Tillinghast-Towers Perrin, 2006). In contrast, Canadian tort costs are less than 0.6 percent of gross domestic product.

Efforts to control the rising costs of tort liability include a variety of State level legal reform measures in the U.S., and in Canada, several provinces have also implemented caps on pain and suffering for minor automobile injuries in order to combat increasing auto liability costs.[5] As we explore how liability costs are related to government spending for social programs, we must account for the cross-State and cross-province variations in the legal environments. This is especially important if the measures are designed to reduce the amount recoverable in the legal system.[6]

We are primarily concerned with *whether* and *to what extent* changes in government social policies, in particular health and welfare spending decisions, will result in more/less automobile accident victims choosing the liability system as their source of recovery. Despite the documented increase in total liability costs, it is not obvious that liability costs would necessarily increase if an increasing number of victims were to choose compensation in this manner. We might anticipate longer delays, but an increase in tort claims could also deter more negligent behavior over time. More important is whether the current tort system is prepared for an increasing number of claimants, should changes in government programs drive a larger number of victims its way. Likewise, should there be a shift of claimants toward public health programs – perhaps because reforms make filing a tort claim more onerous – then we might anticipate far reaching consequences, such as an increase in the magnitude of the tax burden and a moral hazard affect leading to overutilization of medical services.[7] Thus, to the extent there exists a substitution effect between spending on government health and welfare programs and liability costs, the magnitude of this substitution is important as it indicates, for example, the change in the size of the population that must be accommodated through the alternative form of compensation.

In our empirical analysis, we recognize that every victim of an automobile accident does not face the same alternative choices for compensation. Some victims are not eligible for compensation under public programs which generally target lower-income populations. Victims with private health insurance may choose to file a claim with their own insurer, or perhaps pay out-of-pocket for medical expenses. Employees injured in work-related automobile accidents can file workers' compensation claims. These facts are considered in more detail in the development of our theoretical model.

3. THEORETICAL FRAMEWORK

The potential for a substitution effect between different sources of compensation has been examined by a number of researchers. Reasons for the existence of a substitution effect relate to the generosity of different forms of compensation and ease of receiving payment. Theoretically, if there are constraints on accessing the resources from the three sources available (private insurance, public programs, the legal system), such that one is either ineligible, or cannot claim adequate monetary compensation from one source, we would expect attempts to obtain compensation from one of the alternatives if income is held constant. Similarly, we expect that a source that increases in generosity will attract claimants from the alternatives. This hypothesis stems from a class economic concept of a substitution effect, often presented via a two goods–two prices model. In particular, the substitution effect refers to the change in the quantity of a good consumed when the price of that good changes relative to the price of another good. Substitutability has been analyzed in many industries, and not only with respect to products, but with respect to labor,[8] investment,[9] and leisure activities.[10] Here, we note that several studies have found evidence of a substitution between some of the more common forms of compensation: public programs, the legal system, and private insurance. Generally, substitution is expected when relative prices – here, perhaps the cost of accessing the source or the generosity of the compensation – change among alternative "products", i.e., sources of compensation.

3.1 Substitutions between public program, (first-party) private insurance and the legal system

There is substantial evidence regarding the substitution between alternative public programs, where substitution results from a change in one program's parameters, such as the eligibility requirements. For example, Campolieti and Krashinsky (2003) document a significant substitution between social programs in Canada that support disabled persons. They find that increases in per capita workers' compensation benefit expenditures were associated with significant reductions in the number of Canada/Quebec Pension Plan disability beneficiaries. In a study using data from the U.S. Current Population Survey, Ziliak (2004) finds strong evidence of substitution across wage, welfare and disability income sources. For example, an increase in the generosity of Social Security Income (SSI) relative to Aid to Families with Dependent Children (AFDC) accounts for about 40 percent of the increase in the growth of SSI from 1979-1999.

More relevant to our research question is the potential substitution effect between public or private insurance programs and the legal system. A report by the International Academy of Comparative Law notes, "when other benefits are available, the incentive to litigate is far less" (Reimann, 2003). For example, Cummins and Tennyson (1996) find that other sources of recovery reduced third-party auto bodily claim filings. A study by Viscusi (1989) analyzes data on product liability claims for job-related injuries. He finds that the existence of privately provided compensation for injuries that were both product-related and work-related increased the likelihood that a product liability claim would be dropped (and also decreases both the settlement and litigation rates), but that government benefits did not have a significant effect. While workers' compensation is a more prominent remedy, workers have increasing incentives to pursue a third-party lawsuit as the potential award increases. His results suggest that workers' compensation and tort liability have overlapping responsibilities and effects, and thus coordination problems are fundamental.

Biddle and Roberts (2003) examine whether other income replacements benefits and sources of medical insurance are viewed as substitutes for workers' compensation benefits in the U.S. Evidence suggests that availability of potential substitute benefits is a factor in the claim filing decision. Over a quarter of all non-filers reported access to other wage replacement benefits as a reason for not filing, and over a third said that one reason for not filing was the availability of other health insurance coverage. In another workers' compensation claims study, Lakdawalla *et al.* (2007) evaluate the extent to which private health insurance coverage may discourage insured workers from filing workers' compensation claims. Interestingly, they find that workers in firms that offer health insurance are more likely to file claims, suggesting that firm characteristics are more important than insurance status.

The medical malpractice area also provides some examples of the potential for substitution between private insurance and the legal system as sources of compensation. For example, in a study of medical malpractice cases filed in Florida, Sloan and Hsieh (1995) find that claims for birth-related injuries were less likely to result when a family had health insurance.

The above cited studies all deal with the decision to file a claim, as opposed to the decision to purchase insurance. There is also a rich literature that describes how public efforts to expand coverage to underserved populations have often been criticized for their potential

for disrupting individual and employer incentives to purchase private insurance coverage. There is substantial evidence of such "crowding out" of private insurance by public programs. See for example Dubay and Kenney (2004), Blumberg *et al.* (2000), Brown *et al.* (2006), Browne and Hoyt (2000) and Kunreuther and Michel-Kerjan (2004). These studies all find some level of displacement of private insurance by public insurance programs.

Kerr, Ma and Schmit (2009) use an insurance demand approach to examine the relationship between compulsory government programs and liability insurance demanded. The existence of generous social programs is expected to reduce individuals' demand for liability insurance. Using country-level data for 24 countries, they find a strong negative relationship between government social program spending and the size of liability costs, as measured by insurance premiums. Their results show that higher government social expenditures are associated with lower private liability costs.

We take a different approach in our analysis, and examine the impact of changes in social spending on the costs of auto liability *losses*. Our justification for this approach is that automobile insurance is largely mandatory and compensation to victims comes through third-party liability coverage. We do not expect that demand for automobile insurance coverage is very responsive to changes in potential liability; rather changes in premiums will follow changes in losses, which will reflect changes over time in the use of third party automobile liability as a source of compensation.[11]

Thus, our focus is on the injured person's decision to claim. Injured parties are less likely to seek compensation through the tort system if other first-party benefits are available and adequate. We therefore focus on auto liability costs (incurred losses per vehicle) as our dependent variable and are interested in the relationship between these costs (one source of compensation) and per capita spending on public and private health care and public welfare programs (an alternative source of compensation). Our arguments above suggest that individuals may view the liability system and social spending as substitute sources of compensation; thus, we expect individuals might switch between these sources if the availability, generosity, or ease of access to compensation through one source changes relative to another. Thus, we propose the following hypothesis:

H1: There is an inverse relationship between government expenditures on health/welfare programs per capita and automobile liability insurance losses per vehicle.

The hypothesis suggests that State/provincial variations in *ex post* losses incurred on liability coverage will reflect the variations in use of private insurance, public programs, or both in obtaining compensation for injuries. We expect an inverse relationship because we consider the two sources to be substitutes. We focus on automobile liability because it represents the majority of liability exposure in North America on a premium basis.

Many other factors influence liability costs and government spending levels, such as the characteristics of the legal environment and demographics, including the average income in the State/province. We control for these factors, discussed further below, in order to quantify the monetary trade-off between social spending and liability costs. The results will provide evidence of the responsiveness of changes in liability costs to changes in social spending, i.e., does a dollar reduction in government spending result in an increase in liability costs by *more than or less than a dollar*.

4. SOCIAL, ECONOMIC AND DEMOGRAPHIC CONSIDERATIONS: UNITED STATES VERSUS CANADA

It is generally believed that the U.S. tort system is expensive and inefficient. In comparison to other countries, the U.S. relies more on private mechanisms to protect against health expenses and lost income, whereas other countries place greater emphasis on government social programs (Kerr, Ma, and Schmit, 2009). In comparing the U.S. to Canada, this is also an important difference, although not as obvious as it may be in comparing the U.S. to other countries, since Canada's legal liability system is indeed very similar. Still, there are distinct differences that we anticipate could result in different results for the States compared to the provinces.

A main difference is the universal health care system in Canada. When persons are injured, they access care that is covered by provincial health plans. All "medically necessary" care is covered. For persons injured in auto accidents, treatment for soft tissue injuries (e.g. physical therapy and chiropractic care) often is not covered, or only minimally covered, and therefore people require an alternative to pay for this care. First-party accident benefits provided in the auto policy[12] provide a second line of defense, and only if the two of these together are inadequate would an injured party make a liability claim for compensation for economic loss. However, even for minor injuries that are 100 percent covered by provincial health plans and/or

first-party accident benefits, injured persons may still bring a liability claim for non-economic loss. The incentive to file a suit increases as the pay-off increases.[13]

In the U.S., persons injured in an auto accident access care that is then paid for out-of-pocket, by their own private insurance, by first-party medical pay in their auto policy (if available), by government insurance (if lower income or over 65), or by bringing a liability claim against the other party. Due to the absence of universal health care, private health insurance is arguably more important. States that have a higher percentage of the population with private insurance may experience lower liability costs.

A second important difference between Canada and the U.S. is lower awards for non-economic damages in Canada. Awards for pain and suffering in Canada are, in essence, capped as they are guided by precedent and do not exhibit the variability or the size potential of U.S. awards. This is due in part to judge decided awards in Canada, compared to jury decided awards in the U.S.[14]

We note also that cultural factors may affect the propensity for citizens in each country to seek compensation through the legal system. Using the results of two large scale phone surveys, Kritzer *et al.* (1991) find that compared to U.S. residents, residents of Ontario are less likely to file a claim but more likely to seek legal advice. Their research, which draws on a theory of legal mobilization, confirms that injured victims are more likely to pursue a claim than are citizens in Ontario, Canada. Interestingly, they also find that some cultural factors, such as religion and type of residence, influence filing behavior in Canada, but the same factors have little effect in the U.S.

Given these factors, and the Canadian focus on maintaining a strong safety net (a more socialist approach), we expect that a one dollar change in per capita health/welfare spending will lead to a larger change in auto liability costs per vehicle in the U.S. compared to in Canada.[15]

5. DATA AND METHODOLOGY

Our analysis involves the use of two separate data sets, one for Canada and one for the U.S. In order to facilitate comparison, each dataset contains roughly the same variables, to the extent that comparable elements were available for each country.[16] Table 1 provides the summary statistics for each country (the sources for the data are noted in the Appendix). The Canadian dataset contains 102 observa-

TABLE 1 – SUMMARY STATISTICS

	Canada (1989-2005, N=102)			United States (1997-2003, N=348)		
Variable	**Mean**	**St. Dev**	**Min/Max**	**Mean**	**St. Dev**	**Min/Max**
Incurred Losses TPL/ Registered Vehicles				416.37	147.80	181.72/1569.39
Incurred Losses TPL/Earned Vehicles	376.44	89.20	219.32/625.87			
Real public health & welfare per capita (CIHI)	3182.09	430.95	2496/4266	1063.58	314.89	461.70/2393.97
Real public health & welfare per capita (CANSIM)	2815.89	350.37	2169/3745			
GDP per capita	30246.9	8821.99	19300/61650.8	33706.07	2405.67	29890/37123
Population Density*	11.16	7.51	1.27/24.42	179.75	246.19	1.06/1163.83
Unemployment	11.39	4.16	3.9/20.4	4.62	1.18	2.2/7.8
Percent female	50.47	0.505	49.44/51.35	50.82	0.01	0.48/0.52
Percent over age 65	12.03	1.47	8.65/14.30	12.12	0.02	0.05/0.18
Welfare income as percent of poverty line	63.5	8.37	48/81			

	Canada (1989-2005, N=102)			United States (1997-2003, N=348)		
Variable	**Mean**	**St. Dev**	**Min/Max**	**Mean**	**St. Dev**	**Min/Max**
Percent below poverty				11.82	3.02	5.6/19.3
Disposable Income per capita*	40756.14	4844.45	34970/53154	29847.24	4793.22	21266/46606
Private health expenditure per capita	1737.2	2317.4	76.6/8190	4449.67	605.58	3076.69/6319.97
Percentage with Private Health Insurance				86.06	3.99	74.20/93.60
PD losses per vehicle				270.86	72.87	144.34/736.58
Incurred losses per claim (First party)	7018.69	5900.8	1630/26877			
Number of BI claims/ Number of PD claims (TPL)	0.23	0.11	0.018/0.401			
Tort Reform	0.115	0.321	0/1	0.79	0.41	0/1

* Population density in Canada is measured as population/km^2 and in United States as population/mile^2.

tions for the period 1989-2005. The data includes only provinces with private auto insurance and excludes the four provinces with government auto insurance. The U.S dataset contains 348 observations covering the period 1997-2003.[17]

As shown in Table 1, average auto liability incurred losses are lower in Canada, $376 compared to $416 in the U.S., and average government spending is higher, $2,815 compared to $1,063. This negative relationship is consistent with the notion that the two may be substitutes. Other differences include higher GDP per capita in the U.S. and higher income per capita in Canada. There are also noticeably lower private health expenditures per capita in Canada, $1,737 compared to $4,449 in the U.S., which is expected given the universal health care in Canada. Other demographic factors that are noticeably different are the higher unemployment rate in the U.S. and the much higher population density. It is important to note, however, that direct comparisons between these variables cannot be made since the time periods examined are not the same.

For our assessment of a substitution effect, our dependent variable is the annual automobile liability losses incurred per vehicle,[18] by State/province, as reported by all auto liability insurers in each State/province. Liability insurance losses are determined by the frequency and severity of liability insurance claims. We hypothesize that the frequency and severity of automobile liability insurance claims are related to the availability of other sources of compensation, most likely through the influence that other sources may have on claim filing behavior. As other sources of compensation become more generous, we expect liability losses per vehicle to fall.

We apply multivariate regression analysis to empirically examine the relationship between automobile liability losses per vehicle and per capita government expenditures on social programs. Specifically, we estimate the following equation for each country:

$$AutoLiabLosses_{st} = \alpha + \beta_1 PCGovSpend_{st} + X_{st}\gamma_k + Y_t\eta_p + S_s\varphi_q$$

Where:

$AutoLiabLosses_{st}$ = auto liability losses per vehicle, respectively for State/province, *s,* at time *t*.

$PCGovSpend_{st}$ = per capita expenditures on health and welfare for State/province, *s,* at time *t*.

X_{st} = a 1 x *k* vector of control variables including State/province measures of real per capita income, per capita private health care spending, auto insurance coverage rate, unemployment rate, percent of female population, percent of population over 65, and tort reform.

Y_t = a 1 x p vector of State/province invariant variables that vary only over time

S_s = a 1 x q vector of time-invariant variables that vary only over State/province

ε_{st} = error term

We are primarily interested in the estimated effect, β_1, of the per capita government spending variable on auto liability losses. Our State/provincial government spending measures are combinations of the per capita spending on health care and per capita spending on welfare compensation. We hypothesize that higher funding of these programs will be associated with lower liability losses, all else equal. We recognize that spending in these programs is not limited to compensation for injuries in automobile accidents. Nevertheless, we suspect that higher spending on public programs reflects higher State/province involvement, e.g., via the investment in clinics and hiring of support personnel, which consequently reflects greater opportunities for those injured in auto accidents to obtain services and greater benefits available.

Our theory suggests that reductions in government spending will increase the likelihood that people will access the liability system following an automobile accident, and hence increase liability costs, but it is possible that changes in liability costs likewise impact government spending. That is, if people find it easier to obtain compensation from the legal system, pressure for social programs to provide services is reduced. If the two sources are substitutes, then the amount spent on government programs is negatively correlated with the random error term in the loss equation, and ordinary least squares regression will yield a coefficient on government spending that is biased downward. Thus, we use an instrumental variables approach, whereby we first estimate government spending on public health and welfare as a function of State/province demographic measures. Our goal is to characterize the variations across States and provinces in the generosity of the "social safety net," which depends not only on the spending levels, but on other characteristics of the population eligible for this source of compensation. Our assessment of instruments is driven by studies of changes in health care spending, which suggest that health expenditures are largely driven by inflation, changes in population demography (e.g., longevity), and changes in technology (Dao, 1995; Levit *et al.*, 1998). Since macroeconomic variables and changes in technology do not differ across States or provinces, we follow Dao (1995) and Kerr *et al.* (2009) and explore the variations in demographic characteristics.

Specifically, in our first stage regression we obtain an instrument for per capita government health and welfare spending by regressing this measure on GDP per capita, population density, percent unemployed, percent female, percent over 65, and percent below the poverty level (for the U.S.) or welfare income as a percent of the poverty line (for Canada).[19] We then include in our second stage the estimated value of per capita government health and welfare spending to replace the endogenous measure in equation (1).

Variables in the second stage of analysis that may be correlated with liability costs and/or the substitutability of auto liability for government compensation include private health care expenditures, factors that affect claim filing behavior and demographic factors. First, we include a measure of per capita private health care spending. We expect that private health care expenditures are negatively related to liability costs. While spending on government programs is our primary focus, we expect that private spending on health care the private insurance coverage measures proxy for jurisdictional differences in the need for these forms of public assistance.

Next, we include factors previously shown to influence the frequency and severity of liability claims.[20] For the U.S., a proxy for accident frequency is created by dividing auto property damage losses by the number of vehicles because accident statistics are not readily available at the State level.[21]

For Canada we use the number of bodily injury claims relative to the number of property damage claims, which proxies for the opportunity for fraud (Cummins and Tennyson, 1996), and we also include the average first-party accident benefit claim, expecting that higher first party benefits will be associated with lower liability costs. We include a set of State/provincial demographic variables that have been shown in other studies to be related to claim filing behavior or claim severity in auto insurance: per capita income and the rate of uninsured motorists (in the U.S.).[22]

Automobile liability costs may also depend on characteristics of the legal environment, which vary across States and provinces in two key ways. First, some States and provinces have no-fault rules for automobile accidents, whereby insureds are indemnified for their losses by their own insurer regardless of fault. No-fault States are expected to have fewer lawsuits filed than traditional tort liability States and higher average damage awards at trial. In 23 States (and the District of Columbia and Puerto Rico), the ability or incentive to file an automobile-related tort liability case is restricted by some variation of no-fault rules. A no-fault system, in which drivers are required to carry first-party insurance that compensates them for certain losses

regardless of fault, is intended to take small claims out of the courts. Only under certain conditions can drivers in no-fault States sue for severe injuries. Of the 25 jurisdictions with no-fault rules, only 14 have mandatory no-fault systems. In contrast, three States give drivers a choice of selecting a no-fault insurance policy. Ten other States and the District of Columbia let drivers carry first-party insurance but do not restrict those drivers in filing a lawsuit (III, 2003). During the period analyzed using both U.S. and Canadian data, there were no changes in no-fault statutes. Thus, the role of this statute, as it affects liability losses and premiums, is captured through our fixed State effects in the pooled regressions.

States also differ in the extent to which they have enacted various reforms intended to reduce the frequency and/or severity of tort claims. In particular, many States have enacted caps on noneconomic damages, modifications to the joint and several liability rule, and collateral sources rules. A recent study of commercial auto liability insurance losses indicates that these three reforms are associated with reduced liability losses (Hoyt *et al.*, 2007). During 2003-2005 provinces with private insurance enacted caps on pain and suffering awards for "minor" injuries. Since some States/provinces modified their tort environments during our sample period, we include a dummy variable that is equal to one if the State/province enacted one of these key reforms, zero otherwise.

A variety of State- or province-specific factors are likely omitted in our analysis. Hence, we include in our model fixed effects for each State or province, along with year effects to capture a possible time trend.

6. RESULTS

Tables 2 and 3 present the results of estimating equation (1) using a panel data instrumental variables approach.[23] The two tables report the estimates for the separate regressions using the U.S. and Canadian data, respectively. Our results indicate a negative relationship between auto liability costs and government spending on health and welfare in both Canada and the U.S., thus providing evidence of a substitution relationship between auto liability costs and government social spending. In the U.S., a $1 reduction in health/welfare spending translates into a $0.32 increase in liability costs. In Canada, the substitution effect is much smaller, and is only $0.11. The greater sensitivity of liability costs to changes in government social spending in the U.S. is not surprising, given a tendency toward greater emphasis on private liability and less reliance on the social safety net.

TABLE 2
INSTRUMENTAL VARIABLES REGRESSION RESULTS: UNITED STATES (N=348), 1997-2003
SECOND STAGE, DEPENDENT VARIABLE = AUTO LIABILITY LOSSES PER VEHICLE

	Estimated Coefficient (Standard Error)
Intercept	192.615 (217.100)
Per capita government spending on health & welfare†	-0.320** (0.141)
Per capita disposable income	0.003 (0.007)
Uninsured motorists rate	-123.488 (234.127)
Property Losses Incurred per vehicle	1.297*** (0.098)
Tort Reform	-26.092 (40.291)
N	348
Overall R-squared	0.094
F-Test for fixed effects F(49, 286)	12.27***

†Note: The first State regressions include demographic controls (GDP per capita, population density, percent female, percent over 65, and percent under the poverty level) and all covariates from the second stage. Results of first stage are available from authors upon request.
*, **, and *** denote significance at the 99%, 95% and 90% level, two tailed test.

In terms of other factors that affect auto liability costs per vehicle, average disposable income is positively related to average losses for the U.S., but is insignificant in Canada. This is consistent with the idea that higher incomes would necessarily result in higher awards due to income replacement benefits. As expected, property losses incurred per vehicle (in the U.S.), a proxy for accident rate, are also positively related to average loss costs. The other covariates for the U.S. data are not significant. For Canada, higher per capita private health care spending is associated with lower liability costs, as

TABLE 3
INSTRUMENTAL VARIABLES REGRESSION RESULTS: CANADA (N=102) 1989-2005
SECOND STAGE, DEPENDENT VARIABLE = AUTO LIABILITY LOSSES PER VEHICLE

	Estimated Coefficient (Standard Error)
Intercept	500.56** (222.55)
Per capita government spending on health & welfare†	-.11 (.0305)*
Median income per capita (CN)	-.0022 (.0037)
Personal health care spending per capita	-.042 (.0136)
No. of BI Claims/No. of PD Claims	789.05* (106.10)
Average claim for first party accident benefits	-.0001 (.0027)
Tort Reform	-65.69 (32.93)**
N	102
Overall R-squared	.59
F-Test for fixed effects F(5,69)	9.67*

†Note: The first State regressions include demographic controls (GDP per capita, population density, percent female, percent over 65, and percent under the poverty level) and all covariates from the second stage. Results of first stage are available from authors upon request.
*, **, and *** denote significance at the 99%, 95% and 90% level, two tailed test.

expected, and the higher the proportion of bodily injury claims to property damage claims the higher average loss costs are. This is consistent with other studies (Cummins and Tennyson, 1996) that find that average loss costs increase with relatively more bodily injury claims. As well, the tort reform variable is significant, indicating that the cap on pain and suffering awards for minor auto injuries has been successful in reducing liability costs.

Although the covariates we include in our analysis are more disaggregated and substantially different, the main result of our study is consistent with the international comparison presented by Kerr *et al.* (2009): increased (decreased) spending on government programs reduces (increases) liability costs. An important difference between the two studies is the dependent variable. Whereas Kerr *et al.* (2009) use insurance premiums, we use incurred losses. Given that changes in social spending will affect insurance claiming behavior in the same period, while premiums will adjust with some delay, we think the use of incurred losses provides a more direct measure of the substitution effect. That is, as government social spending increases, individuals who are injured in an automobile accident will have less incentive to seek compensation through the liability system, thereby reducing insurers' automobile liability costs. Similarly, cuts to government social programs are expected to increase the attractiveness of compensation through the legal system and shift costs to private insurance.

7. CONCLUSION AND DISCUSSION

This study provides an examination of the relationship between sources of support for automobile accident victims, with an emphasis on whether these sources serve as substitutes. From a policy perspective, we are especially interested in whether changes in the level of government support are associated with changes in the use of the legal system as a source of compensation. The direction and magnitude of any such trade-off has important implications for future policy that affects individuals' access to these sources. We do not address whether one source is more efficient or appropriate; the legal route may be a less efficient source due to delays in obtaining judgments and a large share of awards going to lawyers, but we cannot attest to the efficiency of government programs either. Nonetheless, whether either avenue has the capacity to absorb additional claimants if significant substitution occurs should be considered.

We note substantial variation across States and provinces in liability losses, as well as in the amount spent on health and welfare, and exploit this feature to measure the possible substitution by individuals seeking compensation for injuries. Our analysis confirms the existence of a substitution effect, and this effect is greater in the U.S. than in Canada: for every $1 increase in per capita government spending, we estimate a $0.32 reduction in liability losses in the U.S. and a $0.11 reduction in Canada. This result is important to public policy makers and we suggest that they use caution when adjusting public health and welfare spending, as the transfer of claimants

between public programs and the legal system has indirect consequences that may be problematic. At this point, however, we suspect the costs of filing claims in the legal system will continue to discourage a large shift to that form of recovery.

Our paper makes three important contributions. First, using incurred losses per vehicle for automobile third party liability, we are able to measure the direct relationship between government health/welfare spending and auto liability costs. Given the mandatory nature of automobile liability coverage, we take coverage as given and examine how changes in government social welfare spending impact claiming behavior for automobile accidents. This is a more direct way to measure the substitution effect rather than relying on premiums, since premiums adjust only with a lag and premiums are affected by other factors. Second, by conducting the analysis at the State/provincial level, we are able to explore a wide range of influential factors that differ across jurisdictions in each country and are able to examine whether inter-country differences in the social safety net impact liability costs across jurisdictions. Finally, our results provide further evidence that a key factor that impacts liability costs is the level of government social spending; thus, the ability for these countries to control liability costs may require a reevaluation of the role of the social safety net.

APPENDIX – TABLE OF COMPARABLE DATA DESCRIPTIONS AND SOURCES*

Canada, 1989-2005	**United States, 1997-2003**
Real Provincial Total Auto Liability Losses Incurred Source: IBC	State Total Auto Liability Losses Incurred Source: NAIC
Per capita Provincial Expenditures on Health and Welfare Source: CIHI and HRSDC	Per capita State Expenditures on Health and Welfare Source: US Department of Commerce, Bureau of the Census
Per capita Provincial Government Health Expenditures Source: CIHI	Per capita Total State Government Health Expenditures Source: Milbank Memorial
Per capita spending on welfare Source: HRSDC	Per Capita Total State Government Welfare Expenditures Source: U.S. Department of Health & Human Services
Provincial Private Health Care Expenditures Source: CIHI	Per Capita State Total Personal Health Care Expenditures Source: US Department of Health & Human Services

Canada, 1989-2005	United States, 1997-2003
	Real State Total Auto Property Damage Losses Incurred Source: NAIC
Welfare income as a percent of the poverty line Source: National Council of Welfare	Percent below the poverty level Source:US Census Bureau, Small Area Income and Poverty Estimates
Earned Vehicles (by province) Third Party Liability Source: Insurance Bureau of Canada	State Total Personal and Commercial Automobiles Source: Federal Highway Administration, Office of Highway Policy Information
Per Capita Median Income Source: Statistics Canada	Per Capita Personal Income Source: U.S. Department of Commerce, Bureau of Economic Analysis, Survey of Current Business
Population per square kilometer Source: Statistics Canada,	State Population per square mile Source: US Census Bureau
Percent Unemployed in Province Source: Statistics Canada	Percent Unemployed in State Source: Bureau of Labor Statistics
Percent Female in Province Source: Statistics Canada	Percent Female in State Source: US Census Bureau, Intercensal State and County Characteristics
Percent of Population Over 65 Years of Age Source: Statistics Canada	Percent of Population Over 65 Years of Age Source: US Census Bureau, Intercensal State and County Characteristics
Dummy variable which equals 1 if province adopted a cap on pain and suffering awards for minor injuries, 0 otherwise Source: IBC	Dummy variable which equals 1 if State has reformed Joint & Several Liability, Collateral Sources Rule, or Noneconomic Damages Cap, 0 otherwise Source: ATRA and State statutes
Provincial GDP per capita Source: Statistics Canada	State GDP per capita Source: US Bureau of Economic Analysis
Number of TPL BI Claims/Number of TPL PD Claims Source: IBC	
Average First-party Accident Benefit Claim Source: IBC	

* All amounts were converted to 2004 dollars.

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Notes

1. See, for example, Localio (1991).

2. See National Association of State Budget Officers (2004) and Centers for Medicare and Medicaid Services, (2007).

3. Effort to avoid liability involves the allocation of resources to reduce the probability of accidents. Excessive liability may result in over-deterrence, which is inefficient (Porat, 2007).

4. According to Tillinghast-Towers Perrin (2007), "Since 1950, growth in tort costs has exceeded growth in GDP by an average of slightly more than two percentage points." In 2006 the U.S. tort system cost $247 billion, or roughly $825 per person. Although the 2006 figures suggest a 5.5 percent reduction from 2005, the average annual increase in tort costs since 1951 is 9.2 percent.

5. In addition, in 2005 the B.C. Supreme Court implemented Rule 68, a pilot project in four registries, to fast-track litigation. The rule limited the evidence allowed to be called to the trial for claim amounts of less than Cdn$100,000.

6. Danzon (1986) notes that a monetary cap on the award of noneconomic damages, in particular, has a significant effect on lowering the number of medical malpractice claims filed.

7. Interestingly, in a recent study Eisenhauer (2007) suggests that the expansion of public health insurance to those currently without coverage may be substantially less inefficient than previous models suggest. He notes that while some of the extra medical treatment would be undervalued, the rest would be valued above market cost by patients. Thus, the net result may be an overall efficiency improvement.

8. New and Zimmerman (1994) evaluate the effect of immigrants on native labor supply, noting the concern that immigrants induce declining wages.

9. Apergis (2002) tests whether there is a positive or negative relationship between government spending and private investment in Greece. The results suggest that increases in the public share in the total investment process crowded out private investments, thus jeopardizing economic growth.

10. Standen (2009) discusses a substitution effect between professional sports and other recreational pursuits.

11. However, for our purposes, we take insurance as given and examine the impact of changes in social spending on the costs of auto liability losses. Our justification for this approach is that automobile insurance is largely mandatory and compensation to victims comes through third-party liability coverage. We do not expect that demand for automobile insurance is very responsive to changes in potential liability; rather changes in premiums will follow changes in losses, which will reflect changes over time in the use of liability as a source of compensation.

12. These are mandatory in private provinces with private automobile insurance except Newfoundland.

13. In 2004 most provinces with private auto insurance instituted a cap on pain and suffering awards for minor injuries because the aggregate cost of these claims was having a significant impact on premiums.

14. Within each country, there is additional variation across States and provinces in the legal systems that may distort the relationship between automobile liability losses and social spending. However, the environments have been relatively unchanged for our sample period, with one exception: some States and provinces have enacted reforms in the tort liability environment, such as a cap on noneconomic damages awards. We include in our analysis a variable to capture whether the State/province has enacted any tort reforms and note that other omitted State/province differences are captured in our fixed effects variables. A control variable for "no fault" coverage is not included because it does not vary during the sample period.

15. We recognize that other variables, including the State and province price and form regulations, are not completely accounted for. The effects of these omitted features are captured in the State fixed effects.

16. Variables are the closest match available based on the fact that some data is measured in slightly different ways.

17. Two years of data for Florida are missing from the analysis because State expenditures on health and welfare were not reported.

18. For the U.S we use Registered Vehicles and for Canada we use Earned Vehicles.

19. All covariates from the second stage are included in the first stage as well.

20. In another model, we include the number of property damage accidents per 1000 population for Canada. But this is not available for the entire period 1989-2005 and was not significant when included so was excluded from the final model.

21. This proxy for accident rates follows the formula used by the Insurance Research Council (2004).

22. See for example Cummins and Tennyson (1996) and Browne and Schmit (2004).

23. We use STATA's xtivreg procedure with fixed effects.