

Deterrence and Origin of Legal System: Evidence From 1950 – 2000

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ABSTRACT

Legal systems of countries include laws, regulations and procedures that may deter acts harmful to others. Deterrence incentives created by legal systems underlie effects documented in the Law and Finance literature, which has shown that legal systems can offer protection to investors against expropriation. This protection in turn fosters the development of a country's financial markets. Incentives created by legal system can extend beyond investor protection, deterring other types of harmful acts as well. This study presents evidence on deterrence incentives in other areas, finding that fatality rates from motor vehicle accidents and from other types of accidents vary significantly across countries classified by origin of legal system. Motor vehicle accident fatality rates in countries whose legal systems are based on English Common Law generally have been lower than those in civil law countries, especially countries with legal systems based on French Civil Code or former members of the Soviet Union and Eastern Bloc countries. Fatality rates from other types of accidents are lowest in common-law countries; followed by those in French, then German, then Scandinavian Civil Code countries, with the highest fatality rates occurring in former Eastern Bloc and Soviet Union countries. The pattern of motor vehicle accident fatality rates resembles patterns of corporate control values found in the Law and Finance literature, which is evidence that aspects of a country's legal system protecting investors also deter other types of possibly harmful acts. The disparity between low motor vehicle accident fatality rates and high fatality rates from other types of accidents in Scandinavian countries is more difficult to explain. Scandinavian laws targeting motor vehicle operation, especially while under the influence of alcohol or drugs, could explain their motor vehicle accident fatality rates being among the lowest in the world, while generous social insurance programs could weaken incentives normally deterring individuals from other types of dangerous behavior. Still, the disparity between fatality rates in these two categories in Scandinavian Civil Code countries is puzzling.

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Deterrence and Origin of Legal System: Evidence From 1950 – 2000

1. Introduction, Background and Summary of Findings

A large and growing body of empirical evidence supports a belief that features of a country's culture, especially its legal system, affect the development of its financial markets. Prominent in this stream of evidence is a series of papers by Rafael La Porta, Florencio Lopez-de-Silanes, Andrei Shleifer and Robert W. Vishny (hereafter, LLSV; see LLSV 1997b, 1998, 2000), which supports a Law and Finance theory explaining why some countries' financial markets are larger than others. LLSV's papers document the effects of protection against expropriation offered to investors by a country's legal system, showing how this type of protection affects the development of financial markets.

The Law and Finance theory attributes much of the differences in investor protection to origins of countries' legal systems, classified into four legal families: French, German and Scandinavian Civil Codes; and a fourth based on English Common Law. LLSV find that common-law countries offer the strongest and the French Civil Law countries the weakest protection of shareholder and creditor rights, with the Scandinavian and German Civil Code countries falling between. LLSV find ownership of corporations to be more concentrated in countries whose legal systems offer poor investor protection, the concentrated ownership offering another mechanism for protecting owners against expropriation. As a result, the value of private corporate control rights is larger in a weak-protection environment than it would be in a legal environment offering stronger protection. LLSV also find significantly smaller debt and equity markets in countries offering poor investor protection, which is evidence that strong legal protection for investors fosters the development of financial markets.

This paper examines whether effects of a country's legal system extend beyond protection of shareholders against expropriation, possibly deterring other types of harmful acts as well. Legal scholars have argued that deterrence is a fundamental objective of tort rules and especially common-law tort systems. Speiser, Krause and Gans (1983, pp.12-13 and 108-113); Goldberg (2002), especially Sections I and IV; and Shavell (2003) summarize deterrence and other aims of tort law systems. Shavell's analysis also considers possible deterrence effects of nonmonetary sanctions such as imprisonment.

The issue of possible deterrence effects of tort liability rules arose frequently in debates on no-fault automobile injury compensation systems in the United States (e.g., see Kochanowski and Young , 1985). The enactment of no-fault systems in many states of the U.S. as well as in other countries led to empirical tests for deterrence effects under tort systems. Tests for deterrence effects based on motor vehicle accident fatality rates produced mixed results, with later studies typically finding that adoption of no-fault rules to replace common-law tort liability leads to an increase in automobile accident fatality rates (e.g., see Cummins and Weiss, 1999, Cummins, Phillips, and Weiss, 2001 and Cohen and Dehejia, 2002). Cohen and Dehejia also estimate the effect of compulsory insurance requirements which typically accompany no-fault.

The empirical tests in this paper focus on the question of whether fatality rates from motor vehicle and other types of accidents are related to countries' legal systems. The test results show that fatality rates vary significantly across countries classified by origin of legal system. These results confirm the presence of deterrence effects in tort systems noted in studies of no-fault statutes, extending this finding into an international comparison across countries classified by origin of legal system. Evidence on these deterrence effects shows that the origin of a country's legal system has effects extending beyond the development of financial markets

documented in the Law and Finance literature.

Countries whose legal systems are based on Scandinavian Civil Codes or English Common Law have motor vehicle accident fatality rates that generally have fallen below those in countries using French or German civil code systems or former members of the Soviet Union and Eastern Bloc countries. Fatality rates from other types of accidents follow a similar pattern, with the exception of Scandinavian Civil Code countries: fatality rates from other accidents are lowest in countries whose legal systems are based on English Common Law; followed by French, then German, then Scandinavian Civil Code countries, with the highest fatality rates occurring in former members of the Soviet Union and Eastern Bloc countries. The finding that Scandinavian countries have motor vehicle accident fatality rates that are among the lowest in the world but high fatality rates from other types of accidents is puzzling. A concluding section of the paper speculates about causes for this disparity.

Outline of Paper. Sections 2 through 6 offer background material to provide a context for empirical tests. Section 2 offers an overview of philosophical differences between civil-law and common-law systems. Sections 3 and 4 briefly outline evidence on the role of legal systems and other institutions in financial development. Section 3 summarizes evidence supporting the Law and Finance theory, while Section 4 summarizes evidence in support of competing theories based on factors other than the origin of a country's legal system. Section 5 outlines effects of a country's legal system on compensation for accidents. Section 6 describes data sources and methodology, with results appearing in Section 7. Section 8 concludes the paper.

2. Overview of Differences Between Civil-Law and Common-Law Systems

Under civil law systems, rules for resolving disputes between individuals are created by legislative authority and typically embodied in codes. The codes are designed to find a just solution to a dispute while maintaining or increasing the power of the State, often emphasizing collective over individual rights. The English common-law system, in contrast, has been shaped by Parliament and the aristocracy to limit the power of the sovereign, emphasizing the freedom of individuals to pursue their own ends.¹ With regard to private disputes, common-law systems emphasize the protection of individual rights, especially against government encroachment. The pattern of development in English Common Law has been gradual, evolving from decision to decision, while civil law systems rely on codification of rules.

Another difference between civil- and common-law systems appears in the standard of proof. Under common-law systems, claims in disputes between private parties must be proved by a preponderance of the evidence, while in criminal cases the defendant must be proven guilty beyond a reasonable doubt. Under civil-law systems, the standard of proof in private disputes is virtually indistinguishable from criminal cases: the judge or judges must be convinced beyond a reasonable doubt that the alleged facts are true and covered by statute. Sherwin and Clermont (2001) examine historical reasons for this different standard and offer explanations for its persistence.

¹ Mahoney (2001) elaborates on this distinction using arguments based on Friedrich Hayek's (1960) observation that common-law systems are associated with fewer restrictions on economic and political freedom. Mahoney argues that common-law systems reject an idea underlying many civil law systems that a sovereign, even if elected by popular vote, can act legitimately on behalf of the people without restraints. As a consequence, common law systems allow greater individual liberty and provide stronger enforcement of individual property and contract rights.

Civil- and common-law systems also differ as to the role of the judicial function, with the judiciary having greater independence under common-law systems.² The role of the judicial function under civil law systems traditionally has been seen as deciding cases, while under common-law systems the role is extended to include offering guidance to how similar disputes should be handled in the future. When faced with a problem, even a new and unforeseen one, lawyers under a civil law system ask what solution the rules provide, seeking concrete rules from prior decisions without necessarily considering the factual context. In comparison, common-law actions rely heavily on facts and context. Under U.S. and English common-law systems, lawyers predict how a judge would deal with a problem given the existing body of court decisions (Zweigert and Kötz, 1998, p. 69).³ Continued evolution of legal systems during the 20th century has tended to blur these distinctions, however, with courts under common-law systems increasingly relying on statutory law. Some legal scholars interpret this evolution as leading toward convergence of legal systems (see Glendon, Gordon and Osakwe 1994, pp. 242-245).

² Glaeser and Shleifer (2001) argue that during the 12th and 13th centuries judges and other law enforcers faced a greater risk of coercion by litigants in France than in relatively more peaceful England, causing France to rely on judges protected by and under the control of state while England developed trials by jury. These differences persisted for centuries while France remained less peaceful than England.

³ Mahoney (2001) observes that civil law systems typically provide judges with lower status and less independence than under common law systems. As a consequence, civil-law governments have more authority to alter property and contract rights without judicial interference. Thus judicial independence under common-law systems is an essential element for protecting economic and other types of liberty and in ensuring strong enforcement of property and contract rights, especially against government encroachment. Mahoney (pp. 513-514) also notes differences between French, German and Scandinavian civil-law systems, mostly in the level of independence for the judiciary under German as compared to French systems. Mahoney's research does not pursue this distinction in empirical tests because of the relatively few countries adopting the German and Scandinavian systems.

An important distinguishing feature of common-law systems is the jury trial. Even though jury trials occur in only a small fraction of private disputes, traditions of the jury trial are embedded in litigation under common-law systems.⁴ In a jury trial, considerable importance attaches to the preparation for trial by legal counsel, through means such as discovery. The trial is a continuous oral hearing that continues without interruption, as the members of the jury cannot be subject to repeated recalls.

In contrast, proceedings under civil-law systems often take the form of a series of step-by-step sessions where the judge learns the facts and arguments of the parties to the dispute (See Zweigert and Kötz, 1998, pp. 271-275). The judge takes an active role in questioning witnesses and in formulating issues in the case. Glendon, Gordon and Osakwe (1994, p. 167) attribute these differences to the absence of a jury of private citizens in civil law countries. A common-law jury trial requires a group of ordinary citizens to convene, to consider all of the evidence, and to apply the law. As a consequence, the trial must be continuous and uninterrupted. The absence of a jury in a civil law trial allows the proceedings to be drawn out over a longer period.⁵

⁴ In England, only criminal cases involving serious crimes where the defendant pleads “not guilty” are settled by jury trial. In the United States, not more than two or three percent of potential personal injury cases are litigated to a trial-court judgment, according to estimates cited by Speiser, Krause and Gans (1983, p. 10). That only a small fraction of injury cases are litigated presumably applies in most if not all countries, ones using civil as well as common law systems.

⁵ Djankov, La Porta, Lopez-de-Silanes and Shleifer (2002) find that dispute resolution is more formalized in civil-law (especially French civil-law) countries as compared to common-law countries and in less-developed as compared to richer countries. Within civil-law countries, they find German and Scandinavian systems to be least formalized and French systems the most formalized. Their study examines the consequences of formalism for several measures of judicial quality, finding that more formalism is associated with longer duration of the dispute resolution process; lower judicial efficiency; greater corruption; lower levels of honesty, consistency and fairness of the court system; and inferior access to justice.

In criminal trials under civil law systems, however, courts typically include lay judges who sit alongside professional judges. Even though civil law courts do not use a jury of ordinary citizens, the lay judges, who may be elected, are a functional analog of the jury in common-law criminal trials (see Glendon, Gordon and Osakwe, 1994, p. 179). Private disputes in countries using civil law systems typically are heard by only a professional judge, although parties to the dispute usually have a right to appeal the court decision.

Under any legal system that holds individuals responsible for harmful acts, the incentive to take care is due to the specter of being required to defend one's actions against a legal attack as well as contemplating the actuality of being required to pay damages. At least in the United States, the evaluation of such a defense may be performed by a jury. Bernardo, Talley and Welch (2000) develop an analytical framework for evaluating the effect of legal presumptions on incentives to shirk or engage in other forms of purely self-interested behavior. The context for their framework is common law as practiced in the United States, but their framework can be extended to consider other legal families. Their model formalizes a tradeoff implicit in legal presumptions: while litigation is an expensive mechanism for redistribution that imposes deadweight costs on both parties to a dispute, the specter of litigation serves as an ex ante deterrent for individuals contemplating self-interested behavior that imposes cost on others. Parisi (2002) models the optimal level of fact-finding under adversarial (typically, common-law) and inquisitorial (typically, civil-law) systems, examining the results for social benefits of correct adjudication and costs of litigation.

The foregoing principles determine the liability of a firm's managers, board of directors, and major shareholders to other smaller shareholders. This exposure to liability underlies findings in the Law and Finance literature on protection offered to investors by a country's legal

system. In civil-law countries, duties of managers and shareholders are specified in statutes and codes. A court will not find that a manager, board member or major shareholder has failed to meet these duties unless a judge is convinced that their actions conflict with statutes. In common-law countries, the duties of a firm's managers and board of directors to investors are created by case law as well as statutes. United States common law creates a fiduciary duty of the manager to the firm, for example, a concept that Coffee (1999, p. 698) argues is unknown under civil law.⁶ Among other obligations, this fiduciary duty precludes managers acquiring control of the firm at a price below fair market value. Additionally, rights of investors can extend beyond protection against possible expropriation. In the United States, investors can sue a firm's board of directors for negligence if the board fails to make timely disclosure of information that materially affects the price of the firm's securities. Aggrieved investors need not show that board members personally benefited by delaying the disclosure, but instead can argue that timely disclosure of material information is part of board members' fiduciary duties.

⁶ Pistor and Xu (2002) argue that socioeconomic and technological change continuously challenge the meaning and scope of law in areas such as fiduciary responsibility, making law in these areas necessarily incomplete. The problem is that lawmakers cannot anticipate future contingencies and circumstances where the law of fiduciary responsibility might apply. As a consequence, legal systems often allocate lawmaking and law enforcement powers (LMLEP) to courts or regulators. In common law systems, courts have the flexibility to interpret concepts of fiduciary responsibility as they might apply to circumstances in a particular factual situation. Courts in civil law systems typically have less flexibility, being bound by rigid statutory rules. Pistor and Xu identify three characteristics of an area of law affecting the allocation of LMLEP: the degree of incompleteness; the ability to specify harmful actions *ex ante*; and the level and scope of possible harm. They apply this framework to the area of fiduciary responsibility to conclude that courts are optimal holders of LMLEP in this area of law.

3. Legal Systems and Development of Financial Markets

LLSV (1998, 2000) document the effects of legal protection against expropriation offered to investors by a country's legal system, showing how this type of protection affects the development of financial markets. Their Law and Finance research builds on and, in many cases, reinforces an older and continuing stream of literature linking economic performance with regulation, corporate law, corporate governance systems, and the structure of financial systems. The role of banks in economic development appears as an important theme in this literature. Levine (1997) offers a review of this literature, which continues to develop through research efforts such as: Demirgüç-Kunt and Maksimovic (1998), Levine (1998), Levine and Zervos (1998), Rajan and Zingales (1998), Carlin and Mayer (2000), Levine (1999), Beck, Levine and Loayza (2000), Levine, Loayza and Beck (2000), Morck, Yeung, and Yu (2000), Wurgler (2000), and Beakaert, Harvey and Lundblad (2001).⁷

The Law and Finance theory explains the effect of a country's legal system by

⁷ A related stream of literature examines consumption of insurance and other measures of economic activity and their relationship to financial development. Much of this literature is aimed at assessing effects on economic growth. An early paper by Outreville (1990) found consumption of property-liability insurance related to a measure of financial development but did not investigate the effect of countries' legal systems. Later, Esho, Zurbrugg, Kirievsky and Ward (2001) present evidence that legal enforcement of property rights is positively associated with consumption of property-casualty insurance. They argue that enforcement of property rights creates incentives to acquire and insure property, and find that an index of property rights developed by Knack and Keefer (1995) dominates political rights and judicial efficiency in explaining levels of insurance consumption that vary across countries. Browne, Chung and Frees (2000) focus specifically on liability insurance, classifying countries' legal systems into common-law and statutory (civil) law systems. They find that the presence of a common-law system has a strong positive effect on a country's per-capita consumption of liability insurance, both motor-vehicle liability and general liability. Recent work of Keefer and Knack (2000) continues to focus on enforcement of property rights, and in particular uncertainty related to possible changes in enforcement, and consequential effects on economic growth.

recognizing that demands of investors who might invest in a firm's securities incorporate possible expropriation, hence providing rewards to firms that offer safeguards against this possibility.⁸ Such safeguards may arise from contractual promises as enforced by the country's courts, or through government regulation. Whether court enforcement of contracts or government regulation is more efficient depends on the respective costs of the mechanisms, a point recognized early in Coase's (1960) work on social costs. LLSV's (2000) empirical tests reject the hypothesis that private contracting offers sufficient guarantees in favor of an alternative where countries whose laws, regulations and court systems are protective of investors have more developed financial markets. LLSV argue that a widely-accepted distinction between bank-centered and market-centered financial systems is less useful in explaining development of

⁸ Higher security prices resulting from these safeguards have been documented in several contexts. Disclosure requirements and other legal protections against expropriation in the U.S. can induce cross-listing of securities by firms domiciled in countries whose legal systems offer weaker investor protection. Doidge, Karolyi and Stulz (2001) find that the Tobin's q ratio of foreign firms whose securities are cross-listed in the U.S. exceeds by 16.5 percent the q ratio of firms that are not listed in the U.S. When the analysis is focused on exchange-listed firms that face even more rigorous and costly disclosure requirements, the cross-listing premium increases to 37 percent. These differences are statistically significant and persist after controlling for country and firm characteristics and for possible self-selection bias. Doidge, Karolyi and Stulz attribute the cross-listing premium to U.S. constraints on controlling shareholders' ability to extract private benefits. They argue that controlling shareholders are willing to submit to greater disclosure requirements and limitations on their ability to extract private benefits if their firms have high growth opportunities that must be financed externally. In a related study, Doidge (2003) analyzes a panel data set of 745 non-U.S. firms having dual-class shares with different voting rights, finding that firms whose securities are cross-listed on U.S. exchanges on average have voting premiums that are 43 percent lower than firms that do not cross-list. The difference in voting premiums is larger for firms from countries whose investor protection is poor. Another study on the effects of governance provisions on stock returns during the 1990s by Gompers, Ishii and Metrick (2003) uses data on corporate governance provisions of individual firms published by the Investor Responsibility Research Center to construct a corporate governance index, finding that a group of firms with the strongest shareholder rights substantially outperformed another comparable group of firms having weaker shareholder rights.

financial markets than their explanation based on a country's legal system for protecting investor rights. Their argument is based partly on the observation that legal systems preceded the development of large financial institutions. They argue, for example, that some German civil law countries have well-developed bank-centered financial systems because their legal systems offer strong protection to creditors.

LLSV find that common-law systems afford the greatest protection against expropriation to small investors and also have the least concentrated ownership of major industry. One mechanism that can explain their result is the fiduciary responsibility imposed on corporate directors under common-law systems, which protects diversified investors whose stake is too small to otherwise affect the conduct of the corporation. By offering this type of protection, common-law systems foster the development of deeper financial markets.

In related research, Nenova (2000) estimates the value of corporate control rights for countries grouped by legal system, obtaining estimates for individual countries. Nenova's estimates are based on firms with dual-class shareholders, where one class of shares has superior voting rights over the other class. Nenova finds that the differences in values of these two share classes is affected by a country's legal environment and degree of law enforcement, with the largest control values occurring in French civil law countries and the smallest in common-law and Scandinavian civil law countries. After adjusting for differences in dividend rates between classes of shares, the estimated value of control rights varies widely across countries, ranging from about 46 percent of firm value in Mexico to less than one percent in Denmark. In one respect, Nenova's estimates differ from LLSV's: the estimated value of corporate control rights for Scandinavian civil law countries is lower than for other civil law systems and about as low as common-law systems, creating a "Scandinavian Puzzle" noted by Stulz and Williamson (2003).

4. Other Factors Related To Development of Financial Markets

Although a country's legal system can be an important element affecting the development of its financial markets, other aspects of a country's culture and government could, in theory, substitute for the investor protection offered by a common-law system. Since civil law systems rely heavily on codes and statutes, actual wording of statutes protecting investors could be an important issue. For example, a statute worded to prohibit a broad range of self-interested behavior by managers or controlling shareholders could offer better protection than a narrowly-worded statute. Enforcement of rules through means such as agencies and other institutions is another important aspect of this protection. These aspects of investor protection are important under common-law systems as well. In this respect, the protection afforded by a common-law system complements the protection from formal statutes and their enforcement.

Without necessarily disputing LLSV's empirical findings, a body of research in Finance and Economics argues for causes other than the origin of a country's legal system. A Politics and Finance theory is at the core of an explanation adopted in a 2000 paper by Rajan and Zingales, who stress the importance of a country's political tradition. They argue that strong centralized governments tend to be incompatible with the development of open financial markets. Rajan and Zingales also observe that a country's friendliness to the development of financial markets tends to fluctuate over time, which leads them to question whether a factor as permanent as the origins of a country's legal system explains the development of financial markets. Instead, they argue that a country's legal system is a proxy for its political tradition, which moderates the political power of interest groups. Established interest groups may oppose the development of financial markets that can become a source of funding for new entrants, so the power of interest groups and politically-imposed restraints on this power can affect financial

development. Rajan and Zingales note that financial markets were highly developed in civil law countries prior to World War I, but did not return to this state until late in the 20th Century. They present data and tests showing that countries' financial development fluctuated and even reversed during the 20th century, with common-law countries having no higher levels of financial development than countries with civil law systems early in the 20th century.

Coffee (2001) adopts a point of view similar to Rajan and Zingales by considering Nenova's (2000) estimates of the private benefits of control rights across countries. Coffee evaluates possible legal explanations including what he describes as (p. 18) "an entrepreneurial system of private law enforcement" in the U.S. (e.g., class action lawsuits and contingent legal fees), concluding that variation in the value of private corporate control rights cannot be satisfactorily explained by differences in substantive corporate law or enforcement mechanisms. He makes particular reference to Scandinavian countries, where the estimated value of private corporate control rights is nearly as low as the average among common-law countries despite their legal system having civil law origins. Coffee argues that the low value of control rights in Scandinavian countries could be a result of social norms, which he defines as informal rules of conduct that constrain self-interested behavior but are not enforced by any authoritative body that can impose sanctions. Coffee concludes that the striking variation among countries in the value of control rights remains largely unexplained. Dyck and Zingales (2002) arrive at a similar conclusion by analyzing the value of private control rights across countries, finding that these values cannot be adequately explained by the origins of a country's legal system. Instead they find that other aspects of a country's culture such as the rate of tax compliance and diffusion of press readership are at least as important as legal origin.

Possible effects of other cultural variables including religion have been studied, although

research that includes origins of a country's legal system typically finds that these cultural variables do not change the conclusion about the importance of the origins of a country's legal system. An early study of LLSV (1997a) that did not consider origins of countries' legal systems found that high levels of trust enhance a country's economic performance, with levels of trust measured using self-reported survey data. The data showed levels of trust declining with a growing percentage of population belonging to a hierarchical religion (Catholic, Eastern Orthodox, or Muslim), with correlation - 0.61. After controlling for the effect of per-capita income, their data showed dominant hierarchical religions to be associated with less efficient judiciaries, greater corruption, lower-quality bureaucracies, higher rates of tax evasion, lower rates of participation in civic and professional associations, a lower level of importance of large firms in the economy, inferior infrastructures, and higher inflation. In their survey data, the highest levels of trust and lowest percentage of population belonging to a hierarchical religion were found in a group of five countries: four Scandinavian countries plus China. In later work that considers the origins of countries' legal systems, LLSV (1999) find that the negative effect of hierarchical religion on government performance tends to disappear after controlling for per-capita income and latitude. They also find differences between Socialist law, French civil law and common-law systems that persist and remain significant across a variety of tests.

Stulz and Williamson (2003) use religion and language as proxies for a country's culture, finding that these aspects of a country's culture are significant in explaining investor protection after controlling for levels of per capita income. They find that the origin of a country's legal system is important for explaining shareholder rights while culture is important for explaining creditor rights. Regardless of legal origin, creditor rights are strongest in Protestant countries, and within civil law countries protection of creditor rights is weaker in Catholic countries. A

country's openness to international trade reduces the effect of religion on creditor rights, so enforcement of creditor rights is stronger in Catholic countries with larger international trade sectors. Within Protestant countries shareholder rights are better protected in common-law countries than in civil law countries. Stulz and Williamson conclude that cultural measures such as principal religion or language offer additional explanatory power when considered along with the country's legal system, with the additional advantage of not being subject to self-reporting problems that may occur with survey data.

Licht, Goldschmidt, and Schwartz (2001) argue that the LLSV grouping of countries by legal family offers only a partial explanation of corporate governance systems and their effectiveness. Using survey data from interviews covering over 60,000 respondents in 65 countries and a framework advocated by Licht (2001) for assessing the effects of cultural differences on corporate governance systems, they find that cultural measures such as commonly-held values offer additional explanatory power for countries' systems of corporate governance. However, their analysis reconfirms the LLSV finding that common-law legal systems in English-speaking countries offer superior protection to minority shareholders.

Other research confirms the importance of legal systems on countries' financial development. Beck, Demirgüç-Kunt and Levine (2003) show that legal system remains linked to financial development after controlling for religion and other cultural characteristics. Gugler, Mueller and Yurtoglu (2002) and Beck and Levine (2002) confirm the importance of a country's legal system on the development of its financial markets and on its economic development, adding further weight to the evidence that a country's legal system is an important if not the

dominant factor affecting development of financial markets.⁹

5. Systems for Compensating Injuries Caused by Accidents and Allocating Their Costs

In most developed countries, a special body of rules determines compensation for accidental injury, especially motor vehicle accidents. These rules may be part of a country's social insurance programs. Another possibly separate set of rules allocates the cost of injuries either to a general fund or to an individual held responsible for the accident. Because these rules affect the economic consequences of injuries, they can alter behavior that might lead to injury. On the one hand, a system of generous benefits for injury tends to undermine an individual's incentive to avoid injury. On the other, a legal mechanism that allocates the cost of these benefits to the party whose carelessness caused the accident tends to deter careless behavior. Criminal penalties and other sanctions are yet another mechanism for discouraging possibly harmful behavior. Underlying these socially-created incentives is the individual's desire to avoid self-harm. These aspects of a country's culture affect incentives to avoid injury, and they are not necessarily part of the legal system.

Even though a special body of rules determining compensation for accidental injury might have the appearance of circumventing a country's legal system, the allocation of financial

⁹ A related paper by Beck, Demirgüç-Kunt and Levine (2002) evaluates mechanisms that can explain this linkage, presenting evidence favoring an "adaptability" theory over an alternative "political channels" theory. Either theory could explain why some legal systems foster the development of financial markets; adaptability stresses a legal system's ability to evolve with changing conditions while a political channels theory stresses protection of property rights. Adaptability reduces the gap between private contracting needs and the legal system's capabilities, while weak protection of private property rights hinders development of financial markets. While the explanations are not mutually exclusive, the evidence evaluated by Beck, Demirgüç-Kunt and Levine more strongly favors adaptability over political channels as a mechanism explaining the linkage between legal systems and development of financial markets.

liability often follows principles embedded in the legal system. In the United States, for example, about one-third of the states have adopted so-called no-fault systems to reduce the number of lawsuits related to motor vehicle accidents. A no-fault system assesses the cost of injuries against the owner or insurer of the vehicle occupied by the injured person, without regard to fault. However, every no-fault statute in the U.S. has a “tort threshold”: a level of injury or damage beyond which lawsuit is allowed. A casual examination of these thresholds across states quickly reveals that they are set at levels that would have been unlikely to trigger a lawsuit even if the state had not adopted no-fault rules. Even for states retaining common-law liability, only the most serious injuries ever result in litigation, most being settled by agreement between the affected parties or their insurers. In other words, the claims that would have gone to court under common-law systems also go to court under no-fault.

Similar principles apply in the United Kingdom. Despite members of the United Kingdom having legal systems based on English Common Law, medical care and income losses caused by accidents typically are covered by a social insurance program. Thus few claims are litigated. However, the threat of litigation under common-law still looms in the background, and the rules for allocating financial liability follow principles that would apply to a settlement under common-law (i.e., fault -based) proceedings. For example, the British Health Insurance system is allowed to recoup medical costs from the insurer of the driver responsible for an accident.

A social insurance program that provides compensation for injury and a legal system based on civil law is a combination frequently found in developed Western countries. Under a system based on these foundations, costs of accidents can be assessed against private insurance or the country’s social insurance system. Campbell’s (1996) reference book on international personal injury compensation describes the systems in Germany and France, which despite their

different civil codes arrive at similar approaches to compensation for injury caused by another's actions and in particular injuries from motor vehicle operation. The German and French systems illustrate the approach that is typical in EU civil code countries.

Liability for injury is based on fault unless the injury falls into a category for which statutes create an exception, and injuries caused by or related to motor vehicles typically are an exception. For other injuries not caused by motor vehicle accidents, an injured plaintiff who has no other source can seek compensation in civil court or, if the injury is connected with a criminal offense, in penal court as a party to the criminal action. Where an injured party joins in a criminal action, the penal court sets damage awards if the defendant is convicted.

Injuries related to motor vehicles are compensated without regard to fault, either by holding the vehicle's owner or operator strictly liable or by compensating on a no-fault basis, with few exceptions such as deliberate acts. Typically, levels of compensation for damages such as medical expenses and lost earnings are generous, with possible additional benefits for pain, suffering or impaired enjoyment of life. Insurance is compulsory. If a responsible insured person cannot be identified, a national fund compensates the victim.¹⁰

¹⁰ Superficially, the principles underlying the French and German civil code systems appear to impose a common standard of care with regard to hazardous activities such as operation of motor vehicles. Under French law, for example, much of the body of tort rules (called the law of delict) rests on several well-known articles of the Code Civil, two of which are (Article 1382): "Every act whatever of man which causes damage to another obliges him by whose fault the damage occurred to repair it" and (Article 1383): "Everyone is responsible not only for the damage which he has caused by his own act but also for that which he causes by his negligence or imprudence" (Zweigert and Kötz, 1998, pp. 615-616). The principles stated in these two articles would appear to impose a standard of care indistinguishable from the standard imposed under common-law systems. However, all legal systems have other doctrines that balance the interests of parties to a dispute to decide whether compensation should be awarded. The approach under the German civil code is to identify specific personal rights that must be invaded for liability to arise with a further requirement that the

Levels of compensation for injury caused by motor vehicle accidents in EU countries typically are high enough to virtually eliminate tort actions. Except for increases in insurance premiums that may result from poor driving records, financial incentives that could deter actions leading to motor vehicle accidents are weak under EU systems of compensation. Presumably, fear of injury and the possibility of less than full compensation continue to serve as deterrents despite much of the economic disincentives being neutralized. Codes that criminalize specific types of negligent acts are another possible deterrent.

6. Data and Overview of Methodology

The hypothesis underlying tests in Section 7 is whether countries' legal systems deter acts that could lead to harm. This question is tested indirectly using cross-country data on fatality rates from motor vehicle accidents and from accidents other than motor vehicle, as in Cummins and Weiss (1999), Cummins, Phillips, and Weiss (2001), and Cohen and Dehejia's (2002) use of fatality rates to study effects of no-fault. Fatality rates are an objective gauge for assessing deterrence. With other measures such as injury rates or economic cost, the legal system could have an effect that is not necessarily related to the harm caused by the incident. Fatality rates capture a substantial element of the economic costs of accidents because death typically is associated with serious accidents, constituting a major if not the most significant aspect of the economic burden from the accident. The reported fatality rate offers an objective measure of a country's rate of serious accidents, at least a portion of which could have been avoided or reduced in severity by greater care or foresight.

defendant's behavior failed to meet the standard of a conscientious and considerate person (Zweigert and Kötz, 1998, p. 599).

Table 1 summarizes sources of information and time period covered in the data. The origin of countries' legal systems is based on LLSV (1998), Reynolds and Flores (1989), and the World Factbook.¹¹ Accident fatality rates for each of the 113 countries were calculated from World Health Organization (WHO) data for years 1950-2000 or, if fewer, for years in this interval where data were reported. These annual fatality rates were calculated by extracting data on population and number of deaths by cause from the World Health Organization (2000) statistical information system (WHOSIS). Data on motorized passenger vehicles in use for the years 1980-2000 were obtained from the CD-ROM version of the United Nations Statistical Yearbook (2001), while data for 1950-1979 were obtained from the print version of the same publication.¹²

Motor vehicle accident fatality rates were calculated per 100,000 persons and per thousand passenger vehicles. Fatality rates from accidents other than motor vehicle were calculated per 100,000 persons. Estimated means by legal system and year are graphed in Figures 1, 2 and 3. These figures provide background for the formal tests that appear in Section 7. The data graphed in Figures 2 and 3 suggest differences between legal systems that show strong persistence over time, although observed differences should be interpreted considering the

¹¹ Countries' legal systems are classified into five groups based on origin of legal system: four civil code systems based on French, German, Scandinavian and Socialist law; and a fifth based on English common law. Insufficient mortality data were available covering countries with legal systems based on Islamic law to include the group in the study. The mortality data in the World Health Organization (WHO) statistical information system covers only a single Islamic law country, for a total of nine years during the period 1973-1985. Former members of the Soviet Union and Eastern Bloc countries are classified as a single group - Socialist Civil Code - although such a grouping may mask heterogeneity within the group.

¹² Data on passenger vehicles rather than total vehicles were used because of better data availability.

small number of observations for some legal systems and some years, especially near the beginning and end of the sample period. Data graphed in Figure 1 show less persistence than in Figure 2, despite both figures being based on motor vehicle accident fatality rates. Since Figure 1 illustrates fatality rates relative to population while Figure 2 illustrates fatality rates relative to vehicle usage,¹³ differences between the two figures can be partly explained by considering patterns of vehicle usage.

Major shifts in vehicle ownership and usage occurred between 1950 and 2000, and patterns of vehicle usage differed between legal systems. Vehicle usage patterns are illustrated in Figure 4, which graphs passenger vehicles in use per thousand persons across countries classified by origin of legal system. Vehicle usage shows an upward trend in all legal systems. For example, vehicles per thousand persons in common-law countries rose to about 450 in 1998 from about 100 in 1950, approximately a 4.5-fold increase. By comparison, the increase in civil-law countries is more dramatic, as these countries began with a much smaller base. Vehicles per thousand persons in the French Civil Code countries, for example, rose to about 335 in year 1999 from about 13.7 in 1950, over a 24-fold increase.

¹³ Typically, data on motor vehicle accident rates are reported relative to population or relative to a measure of vehicle usage. Table No. 1092 of the 2001 Statistical Abstract of the United States reports motor vehicle accident death rates per 100,000 resident population, per 100,000 licensed drivers, per 100,000 registered vehicles, and per 100 million vehicle miles. Data used for tests in the following sections allow estimation of death rates relative to population and vehicles in use but not vehicle miles.

7. Results

Origin of Legal System and Country-Level Motor Vehicle Accident Fatality Rates.

Tables 2 and 3 present two-sample t-statistics for paired comparisons of annual fatality rates in countries grouped by origin of legal system. These comparisons are based directly on observed fatality rates without imposing a model on the process generating the fatalities. The comparisons in Table 2 are based on fatalities per 100,000 persons, while those in Table 3 are based on fatalities per thousand passenger vehicles. The five legal systems involved in the paired comparisons lead to a total of ten comparisons for each year where data are available. The first four columns report comparisons of common-law against the four civil code systems while the other six columns report comparisons between civil code systems.

T-tests in Tables 2 and 3 allow for unequal variances between samples, and in many comparisons the sample sizes are small (e.g., for Scandinavian and German Civil Code systems, respectively, the number of reporting countries never exceeds five or seven because relatively few countries have adopted these legal systems). Thus the power of the t-tests in rejecting the null hypothesis of no difference in fatality rates would be expected to be low. Despite the low power, the tests reported in Tables 2 and 3 show a large number of significant rejections. Table 2 reports t-statistics for a total of 474 comparisons. If differences between legal systems were purely random, an expected 23.7 comparisons would show significance at the five percent level or stronger. In Table 2, the number of significant tests for just the English/French and English/German comparisons is 33, already well above this expected value for all ten comparisons.

Further, the tests in Tables 2 and 3 confirm the persistence over time of differences between legal systems suggested by Figures 1 and 2. Table 2 shows only two instances where a

comparison that is significant at a given point in time is later significant but of opposite sign. Both instances involve Scandinavian civil code systems, one in the comparison against French (higher in 1965, later falling below) and the other against Socialist civil code systems (higher in 1964 and 1965, later falling below). In Table 3, there are no instances of such reversals. Earlier, the graphs in Figures 1 and 2 suggest a greater number of reversals, but the t-statistics in Tables 2 and 3 show that only two of these reversals involved significant differences.

The first three columns of Table 2 show fatality rates per 100,000 persons in English common-law systems falling significantly below those in French, German and Socialist civil code systems for at least 15 of the years where data allow a comparison. The comparison of English and Scandinavian systems shows fewer significant differences, with the fatality rate in English systems falling significantly below that for Scandinavian systems in only two years. Fatality rates under Scandinavian systems fall significantly below those in French and Socialist systems for at least 17 years late in the sample period, in both cases a reversal from prior experience noted above. Fatality rates under German systems fall significantly above those in French and Socialist systems early in the sample period, while later comparisons are insignificant. Table 2 also offers weak evidence of fatality rates in German systems being higher than in Scandinavian systems, with tests in five years being significant.

The first four columns of Table 3 show fatality rates per thousand vehicles in English common-law systems frequently falling significantly below French and Socialist systems but not German or Scandinavian civil code systems. In fact, all significant comparisons between English and Scandinavian systems (15) show higher fatality rates in English common-law systems. Comparisons between civil code systems (the last six columns) point toward fatality rates being lowest under Scandinavian systems and higher under German and especially French

and Socialist systems.

Changing patterns of vehicle usage across legal systems between 1950 and 2000 are helpful in interpreting these comparisons, especially those reported in Table 2. As shown earlier in Figure 4, English common-law countries began the period with, relative to population, a much larger number of passenger vehicles than civil code countries. Thus motor vehicle accident fatality rates in English common-law countries during early periods (e.g., prior to 1970) reflect a larger number of vehicles relative to population when compared to civil code countries. Fatality rates in later periods reflect vehicle usage that is more nearly equal between common-law and civil code systems. Compared to English Common-Law countries, German Civil Code countries had low rates of vehicle usage prior to the late 1960s, so tests in Table 2 showing high fatality rates in German civil code countries at this time are noteworthy. For years prior to 1970, significant comparisons appear when German systems are paired against other civil code systems as well those based on common-law. During later time periods (e.g., after 1980), fatality rates under German systems compare more favorably with other legal systems.

In some cases, whether a comparison of fatality rates shows a significant difference depends on the basis for gauging the fatality rate (population or vehicles). The comparisons of German against the French and Socialist civil code systems after 1979 illustrate this issue. None of these comparisons in Table 2 is significant, while in Table 3 half or more show lower death rates under German systems at a significance level of five percent or stronger.

Table 4 reports regression tests using a model that predicts fatality rates from data reflecting both population and vehicle usage. The dependent variable is the log of motor vehicle accident fatalities, while the explanatory variables are log passenger vehicles, log population, with legal system and years coded as dummy variables. The year fixed effects make the tests

equivalent to pooled cross-sectional tests based on each legal system's deviation from the average for that year. Because the issue being tested is cross-sectional, test statistics on the year dummy variables are not reported. The model underlying the tests in Table 4 was tested against other models identical in other respects except for omitting either the population or vehicle usage data (i.e., a model based solely on the population death rate or the death rate per vehicle). For data drawn from time intervals of twenty years and longer, the model based on both vehicle usage and population significantly outperforms either model based on more limited data.

The model also was tested using ICD coding system¹⁴ as an explanatory variable (to capture effects of changes in medical reporting conventions), alone and in combination with fixed time effects, and with legal system as the only explanatory variable other than vehicles and population. Effects on estimated legal system coefficients from these changes were minor, except for Scandinavian civil code systems during 1980-2000; the test for Scandinavian systems during this period, which is significant in Table 4, dropped out of significance in two of these three models. Estimates in Table 4, which include fixed time effects, are representative of these tests.

Each column of Table 4 shows estimated coefficients in a regression across countries classified by origin of legal system. The left-hand column reports test results on data from the entire 1950-2000 period while the next four columns report tests on data from four overlapping twenty-year sub periods. Countries' legal systems were coded as zero-one dummy variables

¹⁴ The International Classification of Diseases (ICD) system is used to code causes of death for WHO reports. During the period 1950-2000, five ICD systems were in use: ICD 6, ICD 7, ICD 8, ICD 9, and ICD 10. In general, higher-numbered systems offering finer distinctions were adopted later in the period, although points of adoption differed across countries.

with a variable for English Common Law countries and the earliest year in the period omitted. Thus the estimated intercept includes the log death rate for English Common-Law countries at the beginning of the period. Coefficients for legal system dummy variables other than common-law are estimates of the log difference between that system's fatality rate and the rate for an English Common-Law country with the same population and vehicle count. For example, the coefficient 0.49 for French Civil Code countries for the entire 1950-2000 period implies a fatality rate that is $e^{0.49} = 1.63$ times the rate in a comparable English Common-Law country.

With the exception of Scandinavian Civil Code countries, estimates in Table 4 show motor vehicle accident fatality rates in civil code countries exceeding those in common-law countries, at strong levels of significance. These differences are evident for the entire 1950-2000 interval as well as every 20-year subperiod. Point estimates for 20-year subperiods show fatality rates under all legal systems declining for 1970-1989 and 1980-2000 after reaching a peak in 1950-1969 or 1960-1979. Further, fatality rates under civil code systems during 1970-1989 and 1980-2000 decline relative to common-law systems, although those under French, German and Socialist systems remain significantly above fatality rates under common-law systems. The decline under German systems is especially dramatic.

When tested over entire 1950-2000 interval, motor vehicle accident fatality rates in Scandinavian Civil Code countries do not differ significantly from those in common-law countries. When tested over 20-year subperiods, Scandinavian fatality rates fall above common-law countries during 1950-1969, then fall below for 1980-2000. Both tests are significant at the one percent level or stronger. These tests imply that motor vehicle accident fatality rates in Scandinavian Civil Code countries during 1980-2000 were the lowest in the world, although the small sample size for this legal system (five countries) is a limitation.

With respect to the comparison of English common-law to French and German Civil Code systems, the pattern of estimates in Table 4 mirrors the pattern found by LLSV (1998) when testing the effect of legal systems on the development of financial markets.¹⁵ Further, the low fatality rates observed for 1980-2000 in Scandinavian Civil Code countries reintroduces a “Scandinavian Puzzle” connected to Nenova’s (2000) estimates of the value of corporate control rights. Despite the civil code structure and origins of Scandinavian legal systems, motor vehicle accident fatality rates and the value of private corporate control rights under Scandinavian systems tend fall below those of other civil code systems.

Origin of Legal System and Motor Vehicle Accident Fatality Rates Using Data Aggregated Across Countries Within Legal Systems. The tests reported in Tables 2 through 4 are based on country-level observations, where each observation is the reported fatality rate in a country during a year. Observations are weighted equally, so outliers from small countries could unduly influence the fatality rate being attributed to a legal system. Weighted regression offers a method for reducing the effect of outliers, one that requires resolving additional issues such as the weighting method (e.g., weighting by population or vehicles). This section uses another approach: aggregating deaths, population counts and vehicles across countries within legal systems, then testing aggregated data for differences between legal systems.

Under this approach, the unit of observation is the legal system. For example, motor vehicle deaths and passenger vehicles can be totaled across countries within legal systems for each year, with the ratio of the two totals used to calculate the fatality rate per thousand passenger vehicles for each legal system. A maximum of five observations each year are

¹⁵ LLSV’s 1998 paper did not include Socialist Civil Code countries, which are considered in a later paper on the quality of government (LLSV 1999).

possible under this approach, one for each type of legal system. These observations are graphed in Figures 5 and 6, respectively showing motor vehicle accident fatality rates per 100,000 persons and per thousand passenger vehicles.

Relative to earlier tests on country-level observations, tests on aggregated data are based on a smaller number of observations. A maximum of five observations is possible each year, but missing data reduced the total to 240 observations for the 1950 – 1999 period covered in the data. The small number of observations for each year raises the possibility of overfitting the data in statistical testing. Figure 6 suggests a log-linear time trend for each type of legal system, which is the approach used to develop the estimates summarized in Table 5. In Panel A, the dependent variable is the log motor vehicle accident fatality rate per thousand passenger vehicles, which is explained by a linear time trend (slope and intercept) for each legal system. In Panel B, the dependent variable is log number of motor vehicle accident deaths, with explanatory variables being log number of passenger vehicles, log population, and a linear time trend for each legal system (similar to the model underlying the tests in Table 4). A model allowing a separate time trend for each legal system was chosen because the data strongly reject ($p < 0.001$) the hypothesis of equal slopes across legal systems.

For the tests summarized in Table 5, countries' legal systems were coded as zero-one dummy variables with a variable for English Common-Law countries omitted. Thus estimates for legal systems other than common-law are an incremental effect relative to common-law systems, for both intercepts and slopes. The estimates include two intercepts for each legal system: one looking forward with a year 1950 origin and a second looking backward with a year 1999 origin. For civil code legal systems, these intercepts are estimates of log differences between the civil code and the common-law system, respectively at the beginning and end of the

time period.

Estimates in Panel A and Panel B are consistent in several major respects. In both panels, estimated 1950 intercepts imply that motor vehicle accident fatality rates under every civil code system at the beginning of the period exceed those in common-law systems, at very strong ($p < 0.001$) levels of significance. Estimated 1999 intercepts imply that fatality rates under French and Socialist civil code systems still continue to exceed those under common-law systems, again at very strong ($p < 0.001$) levels of significance. Both panels also show end-of-period fatality rates under German civil code systems falling below those under common-law systems, although this test is at a lower level of significance ($p < 0.05$). These tests also offer weak evidence of end-of-period fatality rates under Scandinavian civil code systems falling below those under common-law systems; this test is significant at $p < 0.05$ in Panel A but insignificant (and opposite in sign) in Panel B. In both panels, point estimates of slope coefficients imply that fatality rates under every civil code system declined more steeply than under common-law systems, although the slope estimates for French and Socialist civil code systems in Panel B are not significant.

Summary: Tests On Motor Vehicle Accident Fatality Rates. Although the testing protocol affects conclusions that can be drawn from these data about the effect of legal system on fatality rates, the test results summarized in Tables 2 through 5 offer evidence to support two conclusions:

- (1) Motor vehicle accident fatality rates in common-law countries generally have fallen below those in other legal systems, especially French and Socialist civil code systems. These differences have been strong and persistent. A claim that common-law systems have the lowest motor vehicle accident fatality rates is supported by some of the tests. A claim that Scandinavian or German civil code

systems have the lowest motor vehicle accident fatality rates is supported by other tests. None of the tests support a claim that common-law systems have the highest vehicle accident fatality rates.

- (2) During 1950-1999, motor vehicle accident fatality rates under German and Scandinavian civil code systems declined at a steeper rate than under common-law systems. Consequently, the data offer weak evidence of motor vehicle accident fatality rates under these systems declining below those under common-law systems by 1999.

Origin of Legal System and Country-Level Fatality Rates From Accidents Other than Motor Vehicle. Tests on fatality rates from accidents other than motor vehicle are patterned after the foregoing tests on motor vehicle accident fatalities. Table 6 uses a format similar to Tables 2 and 3 to present two-sample t-statistics for paired comparisons of annual fatality rates in countries grouped by origin of legal system. These comparisons are based directly on observed fatality rates without imposing a model on the process generating the fatalities. The tests allow for unequal variances between samples. Ten comparisons are possible for each year where data are available. The first four columns report comparisons of common-law against the four civil code systems while the other six columns report comparisons between civil code systems.

For the tests in Table 6, a description of the pattern of significance is straightforward. Especially after 1975, fatality rates in common-law systems frequently fall significantly below those in civil law systems. The tests for each year do not all cross a threshold for significance, but the large number of significant tests despite the low power of the testing approach is strong

evidence. Some of the comparisons between civil code systems are significant as well. One-half of the tests comparing French and Socialist systems show a significantly lower fatality rate under the French system. Of the tests comparing French and Scandinavian systems, 12.5 percent show significantly lower fatality rates under the French system.

Table 7 offers additional evidence of differences between legal systems. The tests in Table 7 follow a format similar to the one used in Table 4 on motor vehicle accident fatalities. The dependent variable in Table 7 is the fatality rate per 100,000 persons, with explanatory variables being legal system and years, both coded as dummy variables. The year fixed effects make the tests equivalent to pooled cross-sectional tests based on each legal system's deviation from the average for that year. Because the issue being tested is cross-sectional, test statistics on the year dummy variables are not reported.¹⁶ The left-hand column reports test results on data from the entire 1950-2000 period while the next four columns report tests on data from four overlapping twenty-year sub periods. Countries' legal systems were coded as zero-one dummy variables with a variable for English Common-Law countries and the earliest year in the period omitted. Thus the estimated intercept includes the fatality rate for English common-law countries at the beginning of the period. Coefficients for legal system dummy variables other than common-law are estimates of the difference between that system's fatality rate and the rate for an English Common-Law country. For example, the point estimate of the fatality rate for German civil code countries at the beginning of the 1950-2000 period is $29.35 + 10.45 = 39.80$

¹⁶ The model also was tested using ICD coding system as an explanatory variable (to capture effects of changes in medical reporting conventions), alone and in combination with fixed time effects, and with legal system as the only explanatory variable other than vehicles and population. None of these changes affected the level of significance or the sign of estimated legal system coefficients appearing in Table 7.

fatalities per 100,000 persons.

Every test in Table 7 shows a higher fatality rate in civil code as compared to common-law countries, at strong ($p < 0.001$) levels of significance. Tests on overlapping 20-year intervals reveal a growing disparity between civil code and common-law systems, both in the magnitude of the difference and the level of its significance. Visual evidence on this issue appeared earlier in Figure 3, the graphs of average fatality rates by legal system and year.

Origin of Legal System and Fatality Rates From Accidents Other than Motor Vehicle, Data Aggregated Across Countries Within Legal Systems. The growing disparity between fatality rates also is evident in data aggregated across countries within legal system groupings. The tests summarized in Table 8 and the observations graphed in Figure 7 are based on the legal system as the unit of observation. The same procedure was used earlier for the graphs in Figures 5 and 6 and the tests in Table 5. Population count and deaths from accidents other than motor vehicle were totaled across countries within legal system groups, and the resulting totals used to calculate a fatality rate for each legal system.

Figure 7 shows fatality rates for the latest three years (1998-2000) deviating markedly from long-term trends for all but Socialist civil code systems. These departures from long-term trends could reflect changes within legal systems, although volatility resulting from a declining number of reporting countries after 1997 offers a more likely explanation. These fewer observations may be a result of the time required for countries to analyze death reports and assemble summary documents for submission to WHO. Because these late-term deviations from long-term trends are unlikely to be rooted in changes in underlying legal systems, results

reported in Table 8 do not consider 1998-2000 data¹⁷.

In Table 8, estimated 1950 intercepts imply that every type of civil code system began the period with a fatality rate lower than in common-law systems, at five percent or stronger level of significance. By 1997, the situation reversed. Estimated 1997 intercepts imply that by the end of the period, fatality rates under civil code systems exceeded those in common-law systems, at very strong ($p < 0.001$) levels of significance. This outcome is not necessarily a result of fatality rates in civil code countries increasing, but instead failing to decline at as rapid a rate as in common-law countries. This mechanism is evident from the graphs in Figure 7 and confirmed by the significant positive forward time-slope coefficients for civil code systems in Table 8.

The comparison of common-law against Socialist and Scandinavian civil code systems is especially striking. Point estimates of 1997 intercepts imply fatality rates under Socialist and Scandinavian systems more than double those of common-law systems. While fatality rates under French, German and common-law systems appear to decline from 1950 to 1997, those under Socialist and Scandinavian systems do not. This result is especially puzzling for Scandinavian systems when contrasted against earlier results for motor vehicle accident fatalities, adding yet another dimension to the “Scandinavian puzzle”.

Summary: Tests on Fatality Rates from Accidents other than Motor Vehicle.

Although specific tests may support additional conclusions, the test results summarized in Tables 6 through 8 offer evidence to support the following general conclusion:

¹⁷ Another set of regression tests including 1998-2000 data showed minimal effects. None of the estimates changed sign, and the only estimates to change level of significance were the 1950 intercepts for French, German and Socialist civil code systems and the time-slope coefficient for German systems. The 1950 intercept for French and German systems strengthened one level of significance (to $p < 0.01$) while the one for Socialist systems declined one level (to $p < 0.05$). The time-slope coefficient for German systems strengthened one level of significance (to $p < 0.001$).

Since 1950, fatality rates from accidents other than motor vehicle have fallen faster in common-law than in civil code systems, leading to a growing disparity between legal systems. Estimated 1997 intercepts show fatality rates under common-law systems being lower than those under every type of civil code system, with the comparisons against Socialist and Scandinavian civil code systems especially striking.

8. Conclusion

This paper presents evidence that fatalities from causes whose likelihood of occurrence is affected by the degree of care vary significantly between countries classified by origin of legal system. The tests are patterned after the Law and Finance literature, and the results to a large extent mirror and reinforce the growing acceptance of legal systems being an important factor affecting incentives against behavior that might lead to harm. Particularly with respect to accidents not related to motor vehicles, the finding that common-law countries have low fatality rates may be evidence on the adaptability of common-law systems to novel circumstances. The adaptability could create incentives for care under circumstances where a civil code system would require additional rules.¹⁸

Although findings in this paper apply across legal systems generally, a more complete

¹⁸ Observations of Pistor and Xu (2002) on incomplete law are helpful in explaining this result. The problem is that lawmakers cannot anticipate all future contingencies and circumstances where care would decrease the likelihood of harm. Thus codes in a civil law system are unlikely to encompass harmful acts unless the linkage between the act and the harm is well known when the code is enacted. Motor vehicle operation offers an example of an area that could be codified, as motor vehicles have been in existence for more than a century and principles of safe motor vehicle operation are generally understood.

understanding of differences between legal systems may require a broader study including other aspects of culture including the system of criminal codes, law enforcement, social insurance systems, religious beliefs and other behavioral norms.¹⁹ For example, well-developed social insurance systems and generous levels of compensation for injury in Scandinavian countries²⁰ would be expected to diminish financial incentives for individuals to avoid behavior that might lead to accidents. High fatality rates from accidents other than motor vehicle in Scandinavian Civil Code countries would be consistent with these financial incentives being reduced. Yet Scandinavian countries have motor vehicle accident fatality rates that are among the lowest in the world.

Language in a translation of the Swedish Penal Code offers clues as to possible reasons while raising other issues. The uniformity of legal codes among Scandinavian countries allows the Swedish code to serve as a model.²¹ Carelessness leading to death or serious injury is considered a crime, with criminal penalties increased if the crime is gross. In determining whether the crime is gross, special consideration is given to whether the person being sentenced was under the influence of alcohol or another substance if the act was committed by driving a motor vehicle. The code is silent on whether the influence of alcohol or other substances is

¹⁹ Coffee (2001), Dyck and Zingales (2002), Licht, Goldschmidt, and Schwartz (2001), Rajan and Zingales (2000) and Stulz and Williamson (2001) are examples.

²⁰ Bengtsson, et. al. (1994) offer an overview of compensation levels for accidents in Sweden as well as other aspects of Swedish law.

²¹ Green-Gonas (1989) offers an overview of Scandinavian legal systems with the purposes of comparing them with other civil code systems and explaining the uniformity of these systems among Nordic countries. Zweigert and Kötz (1998, ch. 19) describe the forces and events leading to the close interrelationship between Nordic legal systems.

considered when injury or death is not caused by motor vehicle operation. These provisions would be expected to reduce fatalities resulting from the operation of motor vehicles while under the influence of alcohol or drugs without necessarily affecting fatalities caused by other types of motor vehicle accidents or other types of hazardous behavior.

Criminalization of negligence leading to injury or death is not unique to Scandinavian codes,²² but the scope of circumstances covered by language in the Swedish codes appears broad when compared to other codes. Under the Swedish criminal code, for example, gross carelessness that only exposes another to possible serious harm can be considered a crime. Other codes may require actual harm. These differences are illustrated by excerpts from translations of the Swedish Penal Code and French Penal Code of 1994 appearing in Table 9. These excerpts are taken from code sections applying to death or injury caused by negligence or misconduct. The reference to operation of motor vehicles while under the influence of alcohol or other substances in the Swedish code is explicit, although the only effect is in determining whether the crime is gross and thus subject to a harsher penalty.

In areas other than operation of motor vehicles while under the influence of alcohol or other substances, the French code appears narrower and more specific than the Swedish code, thus leaving more gaps allowing possibly harmful behavior. Sections of the Swedish code on negligence leading to injury, for example, impose criminal penalties for “carelessness” causing another to suffer “bodily injury or illness not of a petty nature”, while corresponding sections of the French code require that the negligence cause “a total incapacity to work” (the length of the

²² Mattiacci’s (2003) survey of literature on economic incentives created by tort law and systems for allocating liability argues that civil law systems impose criminal sanctions or administrative penalties if their tort rules allow persons to less than fully internalize expected injury costs when contemplating actions that might harm others. Mattiacci states that punitive damages serve a similar purpose under the U.S. legal system.

incapacity and whether the act causing injury was deliberate affect the harshness of the penalty). Taken literally, the wording of the Swedish code could invoke criminal penalties for injuries caused by negligent acts that would escape penalties under the French code. Despite the apparent broader scope of Scandinavian codes on negligence leading to injury, fatality rates from other accidents under Scandinavian systems are higher than under French systems, an outcome that further research may be able to explain. Readers should bear in mind that these excerpts are translations (not by the same translator) and do not reflect issues such as enforcement.

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Table 1

Sources of Information, Time Period, and Number of Countries Covered by Data

<u>Nature of Data</u>	<u>Sources of Information</u>	<u>Years Covered</u>	<u>Number of Countries</u>
Classification of Countries' Legal Systems	LLSV (1998), Reynolds and Flores (1989), <u>World Factbook</u> .	—	113
Accident Fatality Rates	World Health Organization (2000) Statistical Information System (WHOSIS)	1950-2000	Varies by Year
Motor Vehicles in Use	United Nations <u>Statistical Yearbook</u>	1950-2000	Varies by Year

Table 2

Motor Vehicle Accident Fatality Rates Per 100,000 Persons, Two-Sample T-Statistics For Paired-Comparison Tests Between Legal Systems in Each Year. Column Headings Indicate the Two Legal Systems Being Compared, with Rate Under Second System Subtracted from the First. Tests Allow for Unequal Variances Between Legal Systems.

Year	English/ French	English/ German	English/ Socialist	English/ Scandinavian	French/ German	French/ Socialist	French/ Scandinavian	German/ Socialist	German/ Scandinavian	Socialist/ Scandinavian
1950	1.67	---	---	---	---	---	---	---	---	---
1951	1.48	0.60	---	1.37	-0.30	---	-0.25	---	0.22	---
1952	1.28	0.27	---	1.40	-0.87	---	0.05	---	0.94	---
1953	1.26	0.08	---	1.41	-0.84	---	-0.07	---	0.87	---
1954	0.62	-0.17	---	1.15	-0.60	---	0.53	---	0.94	---
1955	0.09	-0.82	1.38	-0.07	-0.96	1.68	-0.22	1.85	0.86	-1.93
1956	0.13	-1.54	0.79	-0.10	-1.79	0.87	-0.32	2.33	1.71	-1.48
1957	0.05	-1.87	0.85	-0.09	-2.07	1.09	-0.20	2.60	2.04	-1.46
1958	0.63	-1.88	1.38	0.05	-2.49	1.05	-0.84	2.90*	2.13	-1.67
1959	1.01	-2.15	1.17	-0.06	-2.98*	0.50	-1.20	2.87*	2.18	-1.28
1960	0.23	-3.23*	1.47	-0.51	-3.77*	1.46	-0.81	4.12**	2.71*	-1.85
1961	-0.17	-3.90**	0.45	-1.44	-4.35**	0.68	-1.53	4.14*	2.62*	-1.82
1962	-0.20	-3.30*	0.62	-1.22	-3.50*	0.92	-1.21	3.92*	2.23	-1.88
1963	0.70	-3.26**	0.93	-1.12	-4.76**	0.44	-2.17	4.30**	2.28	-2.13
1964	-0.16	-4.02**	0.40	-1.97	-4.58**	0.64	-2.23	4.43**	2.24	-2.39*
1965	-0.03	-3.30**	0.53	-1.91	-4.21**	0.75	-2.41*	4.35**	1.44	-2.75*
1966	-0.14	-3.25**	0.10	-1.69	-4.16**	0.35	-2.09	4.16**	1.71	-2.22
1967	-0.11	-3.49*	0.08	-1.71	-3.72*	0.22	-1.84	3.69*	2.04	-1.88
1968	0.01	-2.96*	-0.14	-0.60	-3.33*	-0.19	-0.67	3.04*	1.95	-0.52
1969	-0.34	-3.59**	-0.69	-1.24	-3.94**	-0.47	-1.13	3.30*	1.97	-0.74
1970	-0.93	-3.94**	-0.79	-1.91	-3.73*	0.18	-1.31	3.85*	2.52*	-1.46
1971	-1.21	-3.93**	-1.12	-1.64	-3.41*	0.05	-0.78	3.35*	2.35	-0.78
1972	-1.79	-3.47*	-1.55	-1.45	-2.45	0.36	0.02	2.70	2.22	-0.25
1973	-1.01	-2.45*	-0.62	-1.02	-1.90	0.55	-0.14	2.28	1.68	-0.60
1974	-1.98	-2.50	-1.32	-1.00	-1.33	0.81	1.31	1.79	2.07	0.46
1975	-2.35*	-2.32	-2.13*	-2.35*	-0.96	0.62	0.55	1.32	1.28	-0.16
1976	-2.26*	-2.41	-2.26*	-1.35	-1.00	0.22	1.06	1.17	1.66	0.95
1977	-3.23**	-2.67*	-3.24**	-2.40*	-0.82	0.43	1.42	1.07	1.55	1.19
1978	-2.63*	-2.37	-2.98*	-1.39	-0.79	-0.64	1.94	0.34	1.83	2.38
1979	-2.49*	-1.79	-1.69	-0.44	-0.18	-0.78	3.92***	-0.62	1.85	1.62
1980	-3.29**	-2.32	-2.59*	-0.58	-0.16	0.10	3.73***	0.22	2.23	2.62*
1981	-2.56*	-2.19	-2.41*	-0.44	-0.45	0.30	2.90**	0.66	2.18	2.81*
1982	-2.45*	-2.13	-2.05*	-0.29	-0.46	0.60	3.15**	0.85	2.26	2.75*
1983	-2.37*	-2.45	-2.58*	-0.60	-0.88	-0.46	2.32*	0.52	2.32	2.51*
1984	-1.78	-2.07	-2.40*	-0.41	-0.99	-0.90	1.98	0.33	2.06	2.61*
1985	-2.39*	-0.32	-1.63	-0.08	1.19	1.03	2.87**	-0.66	0.29	1.98
1986	-1.47	-0.59	-0.86	0.43	0.87	0.98	2.58*	-0.15	1.22	2.12
1987	-1.35	-0.76	-1.08	0.86	0.47	0.51	2.87**	-0.10	1.78	2.99**
1988	-2.91**	-1.26	-2.98**	0.15	1.46	0.24	3.48**	-1.37	1.54	3.71**
1989	-2.13*	-1.18	-3.35**	0.63	0.54	-1.29	3.20**	-1.55	1.81	4.64***
1990	-2.53*	-1.62	-5.00***	0.47	-0.07	-2.66*	3.60**	-1.57	1.99	6.46***
1991	-3.50**	-1.79	-4.31***	0.53	0.13	-1.54	4.08***	-1.16	2.05	4.75***
1992	-4.90***	-2.28	-4.33***	0.66	0.50	-0.01	5.97***	-0.48	2.69*	5.18***
1993	-4.89***	-1.88	-3.29**	1.65	0.66	0.53	7.00***	-0.28	2.72*	4.71***
1994	-4.29***	-1.39	-1.90	2.01	0.38	0.89	5.97***	0.16	2.31	3.26**
1995	-2.53*	-0.23	-1.49	1.17	1.92	0.84	3.90**	-1.07	1.18	2.64*
1996	-1.34	-0.31	-1.93	1.31	0.98	-0.07	2.38*	-1.34	1.45	3.51**
1997	-1.22	-0.20	-1.24	1.61	0.81	0.29	2.34*	-0.68	1.24	2.84*
1998	-2.02	-0.08	-1.34	0.69	1.66	0.77	3.35**	-1.06	0.67	2.53*
1999	-1.60	-1.58	-3.10**	---	0.36	-0.54	---	-1.15	---	---
2000	---	---	---	---	0.54	0.38	---	-0.31	---	---

Notes:

T-Tests allow for unequal variances in samples. Critical values for significance tests vary with sample degrees of freedom.

Levels of Significance: * - $p < 0.05$; ** - $p < 0.01$; *** - $p < 0.001$

Table 3

Motor Vehicle Accident Fatality Rates Per Thousand Passenger Vehicles, Two-Sample T-Statistics For Paired-Comparison Tests Between Legal Systems in Each Year. Column Headings Indicate the Two Legal Systems Being Compared, with Rate Under Second System Subtracted from the First. Tests Allow for Unequal Variances Between Legal Systems.

Year	English/ French	English/ German	English/ Socialist	English/ Scandinavian	French/ German	French/ Socialist	French/ Scandinavian	German/ Socialist	German/ Scandinavian	Socialist/ Scandinavian
1950	- 2.76	---	---	---	---	---	---	---	---	---
1951	- 2.71	- 1.08	---	- 0.78	- 0.90	---	2.49	---	1.06	---
1952	- 3.55*	- 1.27	---	- 1.34	- 0.84	---	2.51*	---	1.17	---
1953	- 2.57*	- 1.30	---	- 1.09	- 0.72	---	2.16	---	1.22	---
1954	- 3.16*	- 1.28	---	- 1.42	- 0.76	---	2.48*	---	1.18	---
1955	- 2.90*	- 1.30	---	- 0.34	- 0.85	---	2.58*	---	1.26	---
1956	- 2.97**	- 1.41	---	- 0.26	- 0.89	---	2.76*	---	1.39	---
1957	- 3.55**	- 1.44	---	- 0.26	- 0.89	---	3.23**	---	1.41	---
1958	- 4.46***	- 1.28	---	0.30	- 0.65	---	4.55***	---	1.30	---
1959	- 4.28***	- 1.24	- 2.36	0.30	- 0.73	- 1.84	4.21***	- 0.79	1.26	2.38
1960	- 4.10***	- 1.22	- 1.45	0.24	- 0.61	- 0.78	3.85**	- 0.08	1.24	1.47
1961	- 4.09***	- 1.22	- 3.50	- 0.18	0.02	- 1.43	3.92***	- 0.86	1.20	3.45
1962	- 4.63***	- 1.11	- 3.32	0.73	0.35	- 1.44	5.06***	- 1.25	1.24	3.48
1963	- 3.86***	- 1.27	- 3.53	0.00	1.05	- 0.55	3.82***	- 1.39	1.26	3.51
1964	- 3.85***	- 1.34	- 4.55*	0.11	1.10	- 1.10	3.87***	- 1.94	1.37	4.57*
1965	- 4.31***	- 1.17	- 4.39*	0.50	1.82	- 0.86	4.51***	- 2.38	1.32	4.54*
1966	- 4.19***	- 1.32	- 4.24*	0.31	2.03	- 0.75	4.29***	- 2.52	1.42	4.33*
1967	- 3.89***	- 1.27	- 4.29*	1.27	2.63*	- 0.50	4.25***	- 3.08*	1.82	4.63*
1968	- 4.26***	- 1.28	- 5.85**	1.08	3.41**	- 0.41	4.59***	- 4.63**	1.98	6.28**
1969	- 3.86***	- 1.46	- 4.29*	0.86	3.20**	0.23	4.04***	- 3.45*	1.93	4.49**
1970	- 3.64**	- 1.04	- 2.80	1.23	3.31**	0.50	4.00***	- 2.49	2.40	3.13
1971	- 3.94***	- 1.27	- 2.78	1.15	3.59**	0.58	4.26***	- 2.46	2.51*	3.06
1972	- 3.00**	- 0.60	- 1.81	1.34	2.86**	0.92	3.42**	- 1.66	2.44*	2.23
1973	- 3.07**	0.33	- 1.74	1.78	3.18**	1.82	3.51**	- 1.93	1.87	2.50
1974	- 2.67*	- 0.17	- 1.86	1.61	2.66*	1.58	3.03**	- 1.88	2.99*	2.64
1975	- 3.38**	0.55	- 1.74	1.94	3.53**	2.28*	3.81***	- 2.05	1.60	2.64
1976	- 3.90***	0.96	- 1.89	2.25*	4.54***	2.30*	5.11***	- 2.75	1.97	3.60
1977	- 3.39**	1.03	- 1.68	2.22*	3.72***	2.47*	4.00***	- 2.44	2.04	3.12
1978	- 2.64**	0.61	- 3.07	2.16*	2.77*	1.44	3.01**	- 3.53	2.11	4.31*
1979	- 2.46*	1.22	- 1.73	2.19*	2.80*	1.75	3.01**	- 2.87	1.97	3.56
1980	- 1.69	1.88	- 1.34	2.51*	2.36*	0.78	2.55*	- 2.55*	2.50	2.89**
1981	- 2.50*	1.62	- 3.02**	2.19*	3.50**	0.05	3.77***	- 4.50***	2.18	4.86***
1982	- 2.70*	0.94	- 4.35***	2.11	3.01**	- 0.17	3.30**	- 4.97***	2.24	5.45***
1983	- 2.08*	1.44	- 1.44	2.03	3.19**	0.61	3.53**	- 2.56*	2.18	2.92*
1984	- 2.28*	1.69	- 1.44	2.28*	3.36**	0.93	3.65**	- 2.72*	1.99	3.08*
1985	- 2.36*	- 0.55	- 2.77**	3.26**	0.28	0.75	3.90***	- 0.02	1.01	6.50***
1986	- 1.62	- 0.47	- 2.13*	2.80*	0.16	0.15	3.62**	- 0.11	1.07	6.40***
1987	- 2.21*	- 0.60	- 1.11	3.18**	0.16	- 0.99	3.87***	- 1.00	1.08	1.19
1988	- 2.72*	- 0.65	- 1.23	2.41*	0.96	- 0.93	3.53**	- 1.11	1.10	1.31
1989	- 2.49*	- 0.46	- 1.22	2.61*	0.91	- 1.01	3.85***	- 1.15	1.11	1.31
1990	- 2.51*	- 0.55	- 4.83***	2.85**	1.40	0.55	3.12**	- 1.31	1.13	7.06***
1991	- 2.16*	- 0.26	- 3.11**	2.08	1.69	0.83	2.86**	- 1.54	1.18	6.02***
1992	- 3.08**	- 0.57	- 4.23***	2.71*	2.32*	1.22	3.68**	- 1.94	1.46	6.14***
1993	- 1.72	0.70	- 1.23	1.92	2.41*	0.97	3.41**	- 2.40*	1.49	5.05***
1994	- 1.26	0.73	- 0.83	1.99	2.11*	0.79	3.57**	- 2.06	1.46	6.01***
1995	0.23	1.34	0.57	1.46	2.49*	0.75	2.78*	- 4.90***	1.47	6.29***
1996	- 1.35	1.07	- 1.43	1.52	2.41*	0.48	2.75*	- 4.71***	1.44	5.97***
1997	- 2.01	0.31	- 4.28***	2.47*	2.07	- 0.82	2.86*	- 4.11***	1.38	5.77***
1998	- 1.44	- 0.05	- 5.08***	1.34	1.30	- 2.04	1.98	- 4.39***	0.90	6.10***
1999	- 0.54	0.34	- 2.33	---	0.69	- 0.40	---	- 3.43**	---	---
2000	---	---	---	---	---	---	---	---	---	---

Notes:

T-Tests allow for unequal variances in samples. Critical values for significance tests vary with sample degrees of freedom.

Levels of Significance: * - $p < 0.05$; ** - $p < 0.01$; *** - $p < 0.001$

Table 4

Motor Vehicle Accident Fatalities, Number of Passenger Vehicles, and Population; Year Fixed Effects

Each column of this table shows estimated coefficients in a regression across countries classified by origin of legal system. The dependent variable is log number of motor vehicle accident fatalities. The explanatory variables are log number of passenger vehicles (in thousands), log population (in hundreds), with legal systems and year effects coded as dummy variables. The left-hand column reports test results on data from the entire 1950-2000 period while the next four columns report tests on data from four overlapping twenty-year sub periods. Countries' legal systems were coded as zero-one dummy variables with a variable for English Common-Law countries omitted. Thus the coefficients for legal system dummy variables other than common law are estimates of the log difference between that system's fatality rate and the rate for English Common-Law countries. Years were coded as zero-one dummy variable to take into account year-to-year variation as fixed effects. Tests on these year dummies are not reported. Heteroscedasticity consistent t-statistics are reported in parentheses.

	<u>Full Period</u> <u>1950 - 2000</u>	<u>20-Year Subperiods</u>			
		<u>1950 - 1969</u>	<u>1960 - 1979</u>	<u>1970 - 1989</u>	<u>1980 - 2000</u>
Number of Countries	102	59	72	96	95
Number of Observations	2413	759	1003	1136	1140
Intercept - Common Law	- 3.13 *** (- 17.93)	- 2.79 *** (- 10.61)	- 2.65 *** (- 14.12)	- 3.02 *** (- 18.64)	- 4.02 *** (- 24.52)
French Civil Code Dummy	0.49 *** (13.93)	0.59 *** (9.03)	0.64 *** (12.69)	0.53 *** (11.89)	0.40 *** (7.31)
German Civil Code Dummy	0.42 *** (10.65)	0.84 *** (13.83)	0.60 *** (11.96)	0.29 *** (4.84)	0.18 ** (3.07)
Socialist Civil Code Dummy	0.74 *** (19.28)	0.81 *** (9.09)	0.74 *** (12.73)	0.68 *** (13.98)	0.60 *** (12.74)
Scand. Civil Code Dummy	0.01 (0.35)	0.23 *** (4.49)	0.11 * (2.17)	- 0.06 (- 1.33)	- 0.13 ** (- 3.14)
Log Passenger Vehicles (000)	0.35 *** (25.38)	0.46 *** (20.24)	0.44 *** (22.91)	0.34 *** (17.35)	0.21 *** (9.64)
Log Population (00)	0.68 *** (39.09)	0.59 *** (18.51)	0.58 *** (23.22)	0.68 *** (29.93)	0.83 *** (32.23)
Other Fixed Effects	Year	Year	Year	Year	Year
R ²	0.93	0.95	0.94	0.94	0.92

Levels of Significance: * - $p < 0.05$; ** - $p < 0.01$; *** - $p < 0.001$

Table 5 – Panel A

Motor Vehicle Accident Fatalities - Data Aggregated Across Countries Within Legal Systems

Tests On Fatality Rate Per Thousand Passenger Vehicles

Both Panels of this table show estimated coefficients in regressions using data on population, fatalities and vehicles aggregated across countries within legal systems. In Panel A, the dependent variable is log motor vehicle accident fatality rate per thousand passenger vehicles. The explanatory variables are legal system and a linear time trend for each legal system. Countries' legal systems were coded as zero-one dummy variables with a variable for English Common-Law countries omitted. Thus estimates for legal systems other than common law are an incremental effect relative to common-law systems. Two sets of intercepts were estimated: one looking forward with a year 1950 origin and a second looking backward with a year 1999 origin. For other than common-law countries, 1950 and 1999 intercepts are estimates of log differences relative to common-law systems, respectively at the beginning and end of the time period. T-statistics are reported in parentheses.

Dependent Variable: Log Motor Vehicle Fatality Rate Per Thousand Passenger Vehicles

Explanatory Variables: Legal System, Time Trend

	<u>Incremental Effect Relative to Common-Law Systems</u>				
	<u>English Common Law</u>	<u>French Civil Code</u>	<u>German Civil Code</u>	<u>Socialist Civil Code</u>	<u>Scandinavian Civil Code</u>
Intercept (1950)	0.126 (1.68)	1.504*** (14.17)	2.448*** (23.07)	2.430*** (18.12)	0.916*** (8.46)
Forward Time- Slope Coefficient	- 0.035*** (- 13.85)	- 0.014*** (- 3.88)	- 0.053*** (- 14.70)	- 0.013** (- 3.12)	- 0.023*** (- 6.19)
Intercept (1999)	- 1.68*** (- 22.43)	0.788*** (7.43)	- 0.266* (- 2.51)	1.748*** (15.61)	- 0.245* (- 2.30)

Number of Observations: 240

$R^2 = 0.94$

Levels of Significance: * - $p < 0.05$; ** - $p < 0.01$; *** - $p < 0.001$

Table 5 – Panel B

Motor Vehicle Accident Fatalities - Data Aggregated Across Countries Within Legal Systems

Motor Vehicle Accident Fatalities, Number of Passenger Vehicles, and Population

In Panel B, the dependent variable is log number of motor vehicle accident fatalities. The explanatory variables are log number of passenger vehicles (in thousands), log population (in hundreds), legal system, and a linear time trend for each legal system. Countries' legal systems were coded as zero-one dummy variables with a variable for English Common-Law countries omitted. Thus estimates for legal systems other than common law are an incremental effect relative to common-law systems. Two sets of intercepts were estimated: one looking forward with a year 1950 origin and a second looking backward with a year 1999 origin. For other than common-law countries, 1950 and 1999 intercepts are estimates of log differences relative to common-law systems, respectively at the beginning and end of the time period. T-statistics are reported in parentheses.

Dependent Variable: Log Number of Motor Vehicle Fatalities

Explanatory Variables: Log Passenger Vehicles, Log Population, Legal System, and Time Trend

Log Passenger Vehicles (000)	0.510*** (24.10)
Log Population (00)	0.631*** (21.43)

Incremental Effect Relative to Common-Law Systems .

	<u>English Common Law</u>	<u>French Civil Code</u>	<u>German Civil Code</u>	<u>Socialist Civil Code</u>	<u>Scandinavian Civil Code .</u>
Intercept (1950)	- 3.89*** (- 13.08)	0.524*** (7.14)	1.168*** (13.90)	1.085*** (9.66)	0.692*** (8.69)
Forward Time-Slope Coefficient	- 0.023*** (- 15.58)	- 0.002 (- 0.75)	- 0.026*** (- 10.84)	- 0.0002 (- 0.06)	- 0.012*** (- 6.07)
Intercept (1999)	- 5.06*** (- 17.67)	0.444*** (7.49)	- 0.135* (- 2.35)	1.076*** (16.14)	0.062 (0.83)

Number of Observations: 240

R² = 0.98

Levels of Significance: * - p < 0.05; ** - p < 0.01; *** - p < 0.001

Table 6

Fatality Rates Per 100,000 Persons from Accidents Other than Motor Vehicle, Two-Sample T-Statistics For Paired-Comparison Tests Between Legal Systems in Each Year. Column Headings Indicate the Two Legal Systems Being Compared, with Rate Under Second System Subtracted from the First. Tests Allow for Unequal Variances Between Legal Systems.

Year	English/ French	English/ German	English/ Socialist	English/ Scandinavian	French/ German	French/ Socialist	French/ Scandinavian	German/ Socialist	German/ Scandinavian	Socialist/ Scandinavian
1950	-0.12	---	---	---	---	---	---	---	---	---
1951	0.91	-1.32	---	-1.25	-1.67	---	-1.63	---	-0.28	---
1952	0.66	-1.08	---	-1.12	-1.25	---	-1.28	---	-0.03	---
1953	-0.26	-2.18	---	-1.78	-0.64	---	-0.72	---	-0.25	---
1954	0.54	-1.42	---	-0.74	-1.36	---	-0.99	---	0.44	---
1955	-1.03	-1.77	-0.94	-1.24	-0.89	0.11	0.07	1.00	1.07	-0.07
1956	-1.25	-2.06	-1.22	-1.45	-1.02	-0.15	-0.20	0.74	0.86	-0.02
1957	-0.63	-2.13	-1.31	-1.44	-1.72	-0.83	-0.94	0.77	0.78	-0.04
1958	-0.57	-1.93	-0.78	-1.44	-1.64	-0.37	-1.04	0.97	0.85	-0.37
1959	-0.51	-2.04	-0.89	-1.52	-2.00	-0.50	-1.33	1.66	-0.26	-1.12
1960	-0.96	-1.89	-1.63	-1.70	-1.20	-0.99	-0.77	0.02	0.78	0.61
1961	-1.16	-2.64*	-1.99	-2.86*	-1.81	-0.88	-1.86	1.15	0.34	-1.03
1962	-0.71	-2.17	-1.72	-2.85*	-1.58	-0.90	-1.86	0.96	0.36	-0.96
1963	-0.98	-2.12	-3.15**	-2.43*	-1.36	-1.97	-1.66	0.09	-0.22	-0.39
1964	-2.41*	-2.78*	-3.32**	-3.93**	-1.04	-0.46	-1.37	0.79	0.05	-1.08
1965	-1.68	-2.41	-3.24**	-2.94*	-1.19	-0.99	-1.34	0.65	0.12	-0.68
1966	-1.51	-2.35	-2.44*	-2.86*	-1.38	-1.07	-1.64	0.73	0.29	-0.68
1967	-2.62*	-3.06*	-3.75**	-3.34*	-1.06	-0.87	-0.74	0.40	0.46	0.09
1968	-1.26	-2.02	-2.72*	-2.40*	-1.39	-1.83	-1.67	0.28	0.01	-0.31
1969	-2.24*	-2.66	-4.60***	-3.45**	-1.49	-2.77*	-1.82	-0.20	0.18	0.53
1970	0.40	-0.34	-0.73	-0.34	-1.14	-2.61*	-1.25	-0.49	0.01	0.55
1971	-1.19	-1.93	-4.65***	-2.24	-1.20	-3.12**	-1.55	-0.55	-0.34	0.08
1972	-0.09	-1.29	-3.05**	-1.90	-1.35	-3.74**	-2.14	-0.74	-0.17	0.76
1973	-0.65	-1.60	-3.25*	-2.29	-1.32	-3.09*	-2.05	-0.65	-0.61	-0.10
1974	-1.60	-1.68	-3.71*	-2.89*	-0.89	-2.61*	-1.99	-0.77	-0.65	0.06
1975	-1.53	-1.66	-4.13**	-3.01*	-0.88	-3.29*	-2.08	-1.30	-0.55	0.94
1976	-2.75**	-1.93	-5.24**	-4.00**	-0.74	-3.27*	-1.86	-1.36	-0.39	1.39
1977	-1.08	-0.95	-4.65**	-2.88*	-0.44	-4.01*	-2.16	-2.14	-0.90	1.66
1978	-0.53	-0.97	-2.66*	-2.78*	-0.70	-2.49	-2.64*	-1.34	-0.98	0.63
1979	-0.85	-1.23	-2.53	-3.32**	-0.83	-2.22	-3.03*	-1.17	-0.66	0.87
1980	-0.92	-0.78	-1.20	-2.57*	-0.21	-0.80	-1.93	-0.56	-1.11	-0.20
1981	-0.72	-1.06	-2.26	-2.59*	-0.63	-1.90	-1.93	-1.14	-0.55	0.91
1982	-2.36*	-1.66	-2.76*	-3.22**	-0.16	-1.45	-1.02	-1.08	-0.50	0.84
1983	-2.59*	-2.09	-3.76**	-6.04***	-0.94	-2.51*	-2.92**	-1.10	-0.35	1.16
1984	-2.20*	-1.68	-3.40*	-3.90**	-0.68	-2.45*	-2.07	-1.42	-0.51	1.27
1985	-2.34*	-2.60*	-4.66**	-2.58*	-1.56	-3.52*	-1.35	-1.21	0.35	1.71
1986	-1.98	-2.18	-3.86**	-3.42**	-1.29	-2.95*	-2.05	-1.11	0.10	1.53
1987	-2.64*	-2.88*	-2.91*	-4.39**	-1.59	-1.75	-2.44*	-0.24	-0.12	0.18
1988	-3.52**	-2.96*	-2.96*	-3.59*	-1.38	-1.56	-1.91	-0.26	-0.31	-0.03
1989	-2.89**	-2.63*	-4.07**	-4.32**	-1.40	-2.77*	-2.77*	-0.97	-0.73	0.33
1990	-2.56*	-2.47	-5.11**	-4.11*	-1.47	-3.91**	-2.72*	-1.63	-0.54	1.30
1991	-2.58*	-3.00*	-4.60**	-3.25*	-1.54	-2.92*	-1.70	-0.98	-0.06	0.94
1992	-3.66**	-4.07**	-3.90**	-3.61*	-1.89	-2.12	-1.61	-0.45	0.13	0.55
1993	-3.59**	-4.07**	-4.68***	-3.64*	-1.66	-3.01*	-1.67	-1.62	-0.22	1.32
1994	-3.17**	-3.90**	-3.48**	-4.59**	-1.66	-2.65*	-2.11	-1.87	-0.28	1.75
1995	-3.27**	-3.06*	-3.91**	-4.90**	-1.48	-2.66*	-2.01	-1.23	0.19	1.58
1996	-2.24*	-3.08*	-5.18***	-3.30*	-1.36	-3.11**	-0.91	-1.44	0.62	2.32*
1997	-2.08	-2.79*	-5.10***	-4.58*	-0.98	-2.88**	-1.68	-1.69	-0.40	1.56
1998	-1.87	-2.61*	-4.15**	-3.61*	-0.57	-2.24*	-1.46	-1.76	-0.91	0.93
1999	-1.45	-2.67*	-4.19***	---	-0.67	-2.38*	---	-2.04	---	---
2000	---	---	---	---	0.81	0.07	---	-0.78	---	---

Notes:

T-Tests allow for unequal variances in samples. Critical values for significance tests vary with sample degrees of freedom.

Levels of Significance: * - $p < 0.05$; ** - $p < 0.01$; *** - $p < 0.001$

Table 7

Fatality Rates Per 100,000 Persons, Accidents Other Than Motor Vehicle

Each column of this table shows estimated coefficients in a regression across countries classified by origin of legal system. The dependent variable is the fatality rate per 100,000 persons from accidents other than motor vehicle. The explanatory variables are legal system and year effects, both coded as dummy variables. The left-hand column reports test results on data from the entire 1950-2000 period while the next four columns report tests on data from four overlapping twenty-year sub periods. Countries' legal systems were coded as zero-one dummy variables with a variable for English Common-Law countries omitted. Thus the intercept is the estimated fatality rate for English Common-Law countries and coefficients for other legal system dummy variables are estimates of the difference between that system's fatality rate and the rate for English Common-Law countries. Years were coded as zero-one dummy variable to take into account year-to-year variation as fixed effects, but tests on these year dummies are not reported. Heteroscedasticity consistent t-statistics are reported in parentheses.

	<u>Full Period</u>	<u>20-Year Subperiods</u>			
	<u>1950 - 2000</u>	<u>1950 - 1969</u>	<u>1960 - 1979</u>	<u>1970 - 1989</u>	<u>1980 - 2000</u>
Number of Countries	105	63	83	95	98
Number of Obs.	2513	816	1145	1208	1073
Intercept - Common Law	29.35 *** (13.35)	29.58 *** (13.55)	25.07 *** (15.71)	25.55 *** (9.42)	19.32 *** (12.22)
French Civil Code Dummy	4.54 *** (9.22)	3.80 *** (4.53)	3.54 *** (4.67)	3.90 *** (5.39)	6.57 *** (9.87)
German Civil Code Dummy	10.45 *** (14.57)	9.62 *** (10.16)	9.08 *** (8.44)	9.37 *** (7.91)	13.02 *** (11.71)
Socialist Civil Code Dummy	17.23 *** (17.54)	7.78 *** (8.84)	11.41 *** (11.97)	15.62 *** (13.22)	22.67 *** (15.62)
Scand. Civil Code Dummy	11.19 *** (18.70)	8.34 *** (9.36)	10.16 *** (11.15)	11.67 *** (12.53)	14.47 *** (16.31)
Other Fixed Effects	Year	Year	Year	Year	Year
R ²	0.24	0.14	0.15	0.20	0.33

Levels of Significance: * - $p < 0.05$; ** - $p < 0.01$; *** - $p < 0.001$

Table 8

Fatality Rates From Accidents Other Than Motor Vehicle

Tests Using Data Aggregated Across Countries Within Legal Systems

This table shows estimated coefficients in regressions using data on fatalities and population aggregated across countries within legal systems. The dependent variable is the fatality rate per 100,000 persons from accidents other than motor vehicle. The explanatory variables are legal system and a linear time trend for each legal system. Countries' legal systems were coded as zero-one dummy variables with a variable for English Common-Law countries omitted. Thus estimates for legal systems other than common law are an incremental effect relative to common-law systems. Two sets of intercepts were estimated: one looking forward with a year 1950 origin and a second looking backward with a year 1997 origin (Data for years after 1997 were not used). For other than common-law countries, 1950 and 1997 intercepts are estimates of differences relative to common-law systems, respectively at the beginning and end of the time period. T-statistics are reported in parentheses.

Dependent Variable: Fatality Rate Per 100,000 Persons From Accidents Other Than Motor Vehicle

Explanatory Variables: Legal System, Time Trend

	<u>Incremental Effect Relative to Common-Law Systems .</u>				
	<u>English Common Law</u>	<u>French Civil Code</u>	<u>German Civil Code</u>	<u>Socialist Civil Code</u>	<u>Scandinavian Civil Code .</u>
Intercept (1950)	35.07 *** (52.39)	- 2.07 * (- 2.19)	- 2.00 * (- 2.11)	- 3.14 ** (- 3.09)	- 3.19 ** (- 3.29)
Forward Time- Slope Coefficient	- 0.405 *** (- 17.02)	0.173 *** (5.15)	0.111 ** (3.31)	0.550 *** (15.55)	0.384 *** (11.23)
Intercept (1997)	15.23 *** (22.76)	6.41 *** (6.77)	3.47 *** (3.66)	23.82 *** (24.74)	15.63 *** (16.42)

Number of Observations: 236

$R^2 = 0.84$

Levels of Significance: * - $p < 0.05$; ** - $p < 0.01$; *** - $p < 0.001$

Table 9

French and Swedish Penal Code Sections on Negligence Leading to Death or Injury

<p>Sections 7 - 9 of Chapter 3, <u>The Swedish Penal Code</u>.</p>	<p>Articles 221-6, 222-19, 222-20 and 223-1, <u>The French Penal Code</u>.</p>
<p>A person who through carelessness causes the death of another shall be sentenced for <i>causing another's death</i> to imprisonment for at most two years or, if the crime is petty, to a fine.</p> <p>If the crime is gross, imprisonment shall be imposed for at least six months and at most six years. If the act was committed by driving a motor vehicle, special consideration shall be given, in determining whether the crime is gross, to whether the sentenced person was under the influence of alcohol or other substance.</p>	<p>Causing the death of another, by carelessness, imprudence, inattention, negligence, or the non-observance of an obligation of safety or prudence imposed by law or regulation, is an unintentional homicide punishable by three years of misdemeanor imprisonment and by a fine of 300,000 francs.</p> <p>In the case of the deliberate non-observance of an obligation of safety or prudence imposed by law or regulation, the penalties incurred are raised to five years of misdemeanor imprisonment and to a fine of 500,000 francs.</p>
<p>A person who through carelessness causes another to suffer bodily injury or illness not of a petty nature shall be sentenced for <i>causing bodily injury or illness</i> to a fine or imprisonment for at most six months.</p> <p>If the crime is gross, imprisonment for at most four years shall be imposed. If the act was committed by driving a motor vehicle, special consideration shall be given, in determining whether the crime is gross, to whether the sentenced person was under the influence of alcohol or other substance.</p>	<p>Causing another, by carelessness, imprudence, inattention, negligence, or the non-observance of an obligation of safety or prudence imposed by law or regulation, a total incapacity to work for more than three months is punishable by two years of misdemeanor imprisonment and by a fine of 200,000 francs.</p> <p>In the case of the deliberate non-observance of an obligation of safety or prudence imposed by law or regulation, the penalties incurred are raised to three years of misdemeanor imprisonment and to a fine of 300,000 francs.</p>
<p>A person who through gross carelessness exposes another to mortal danger or danger of severe bodily injury or serious illness shall be sentenced for <i>creating danger to another</i> to a fine or imprisonment for at most two years.</p>	<p>Causing another, by the deliberate non-observance of an obligation of safety or prudence imposed by law or regulation, a total incapacity to work for a period less than or equal to three months, is punishable by one year of misdemeanor imprisonment and by a fine of 100,000 francs.</p> <p>Directly exposing another to a risk of immediate death or of wounds likely to result in mutilation or permanent infirmity, by the manifestly deliberate violation of a special obligation of safety or prudence imposed by law or regulation, is punishable by one year of misdemeanor imprisonment and by a fine of 100,000 francs.</p>

Figure 1

Motor Vehicle Accident Deaths Per 100,000 Persons
(Means Across Countries Within Legal Systems)

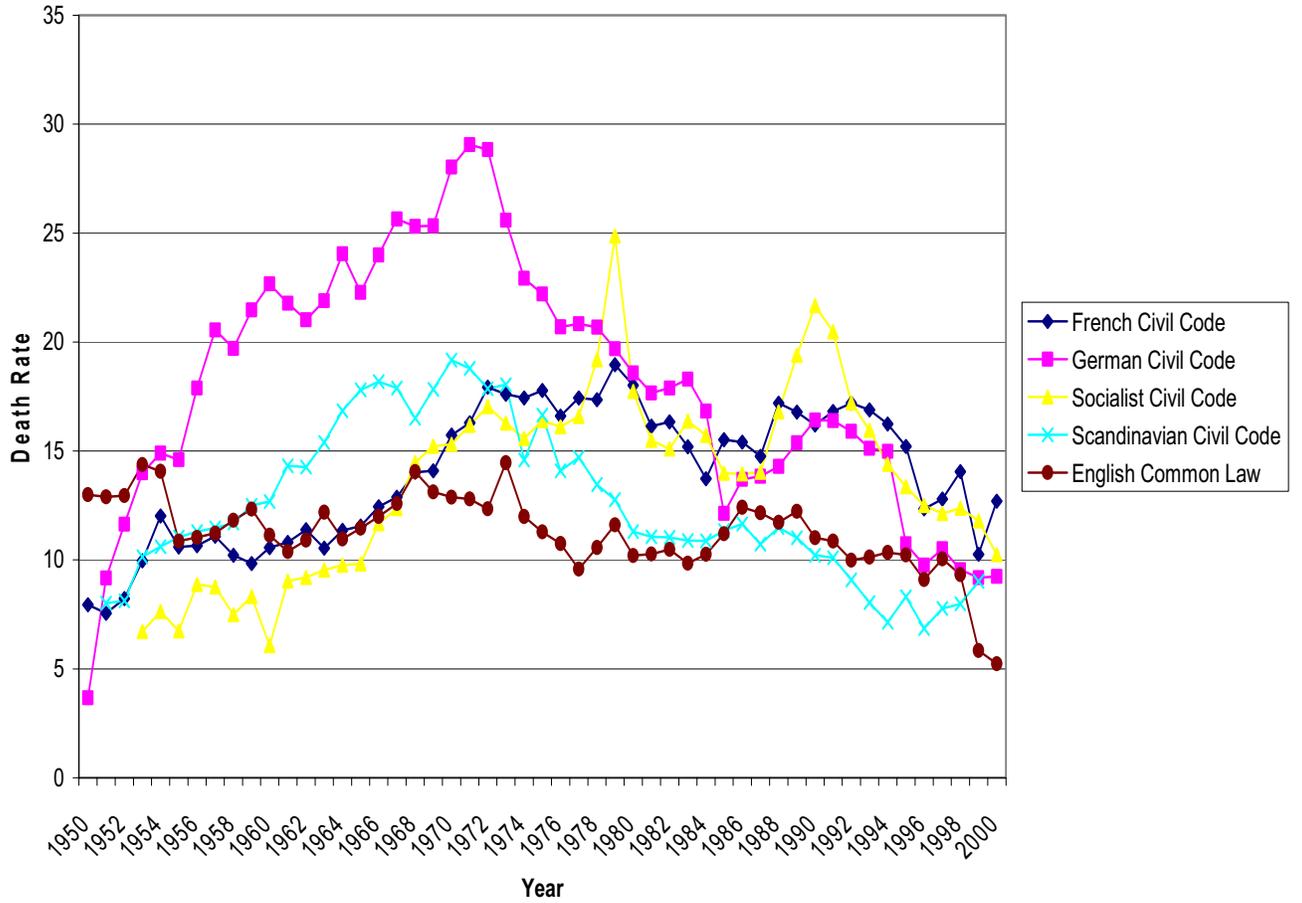


Figure 2

Motor Vehicle Accident Deaths Per Thousand Passenger Vehicles
(Means Across Countries Within Legal Systems)

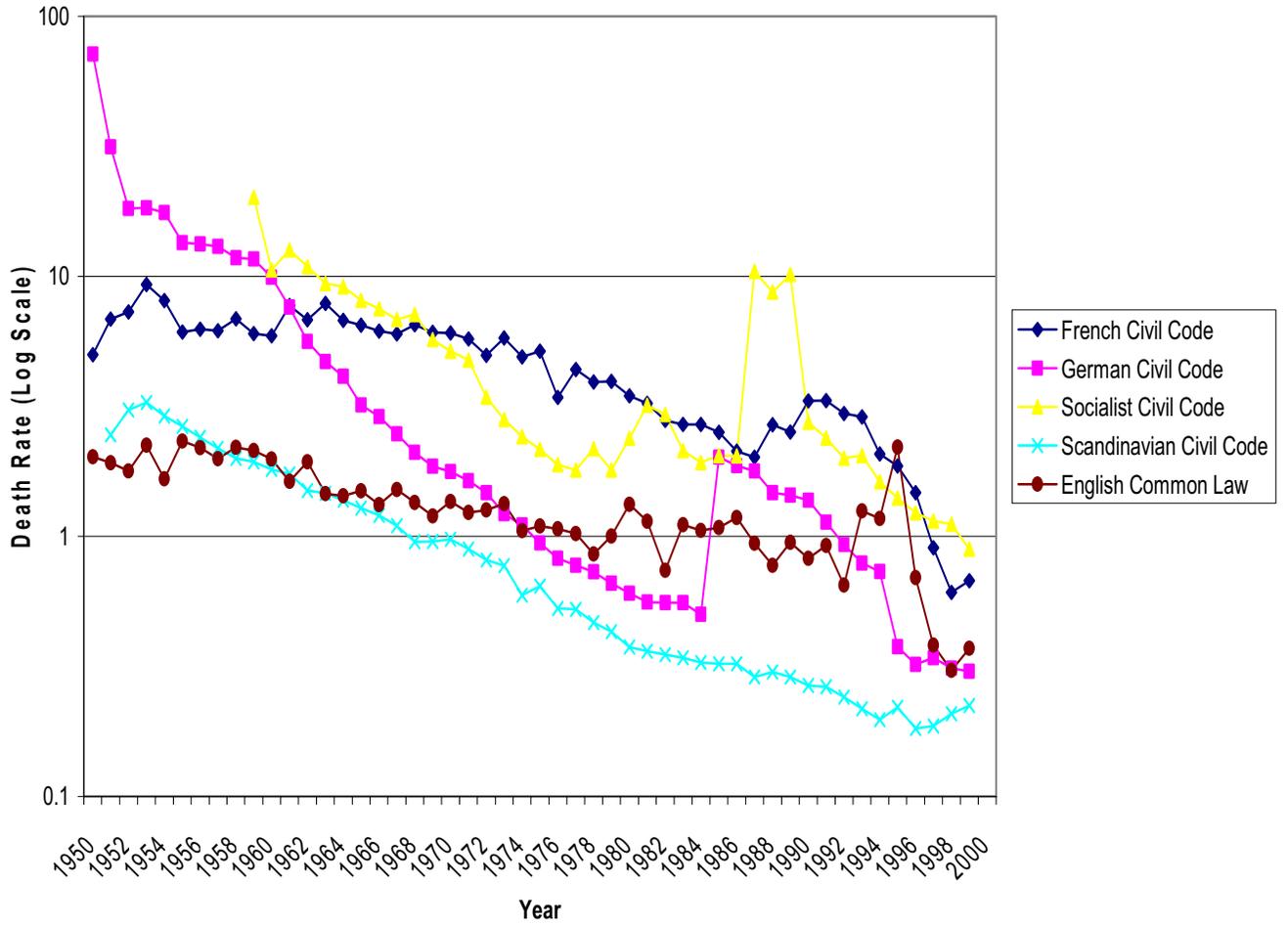


Figure 3

Deaths Per 100,000 Persons From Accidents Other Than Motor Vehicle
(Means Across Countries Within Legal Systems)

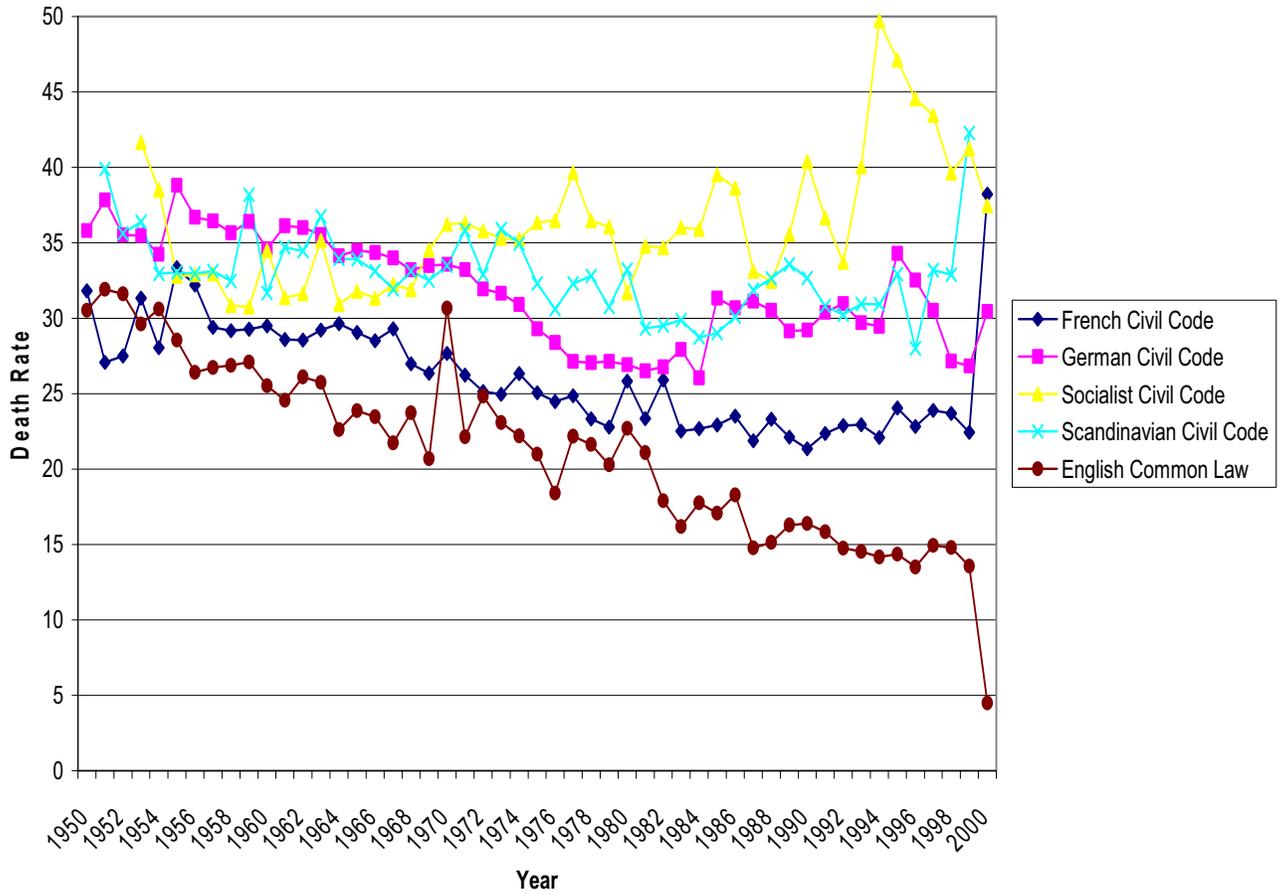


Figure 4

Passenger Vehicles Per Thousand Persons In Countries and Years Where Data Allows
Calculation of A Death Rate Per Thousand Passenger Vehicles
(Means Across Countries Within Legal Systems)

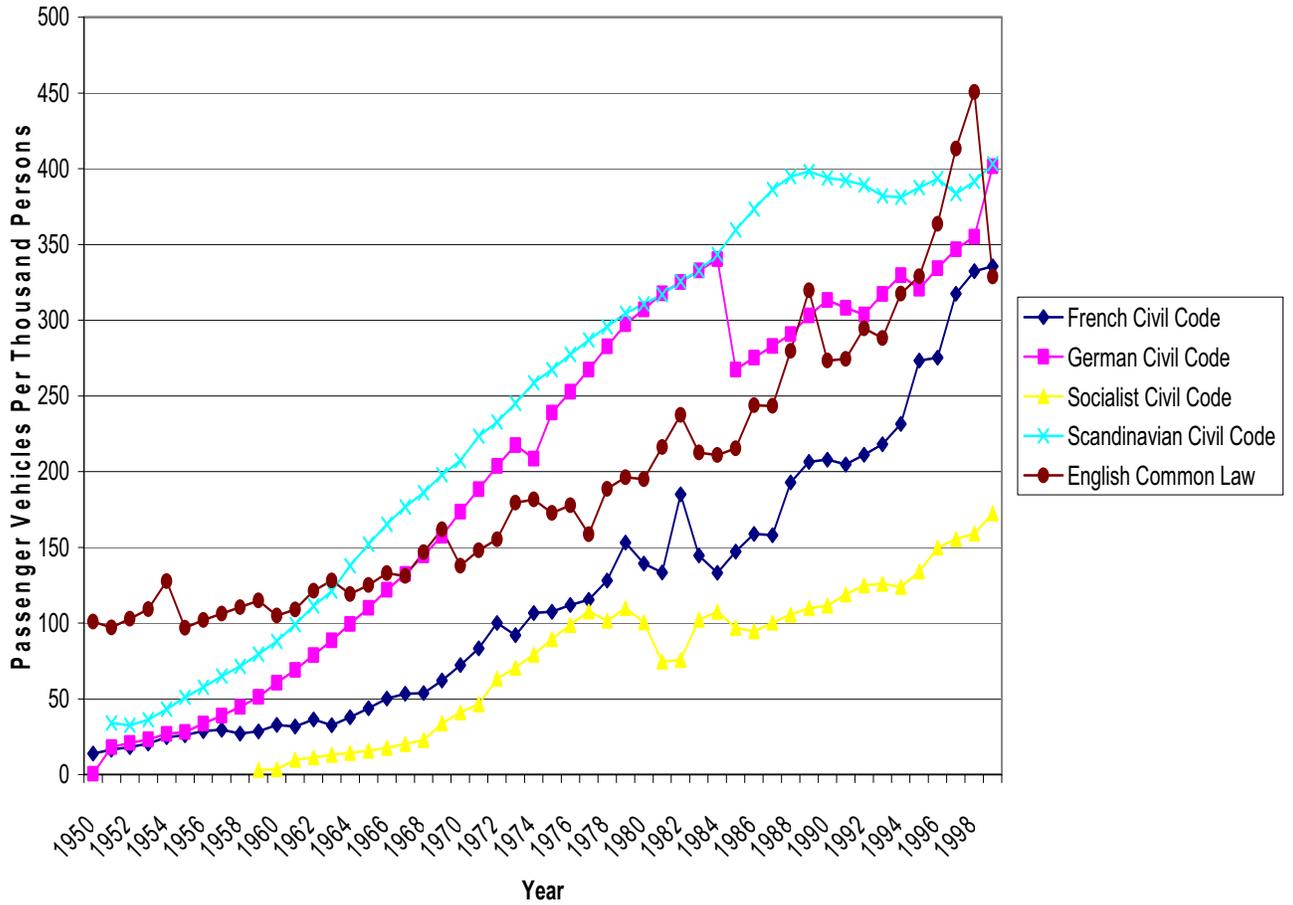


Figure 5

Motor Vehicle Accident Deaths Per 100,000 Population,
Data Aggregated Across Countries Within Legal Systems

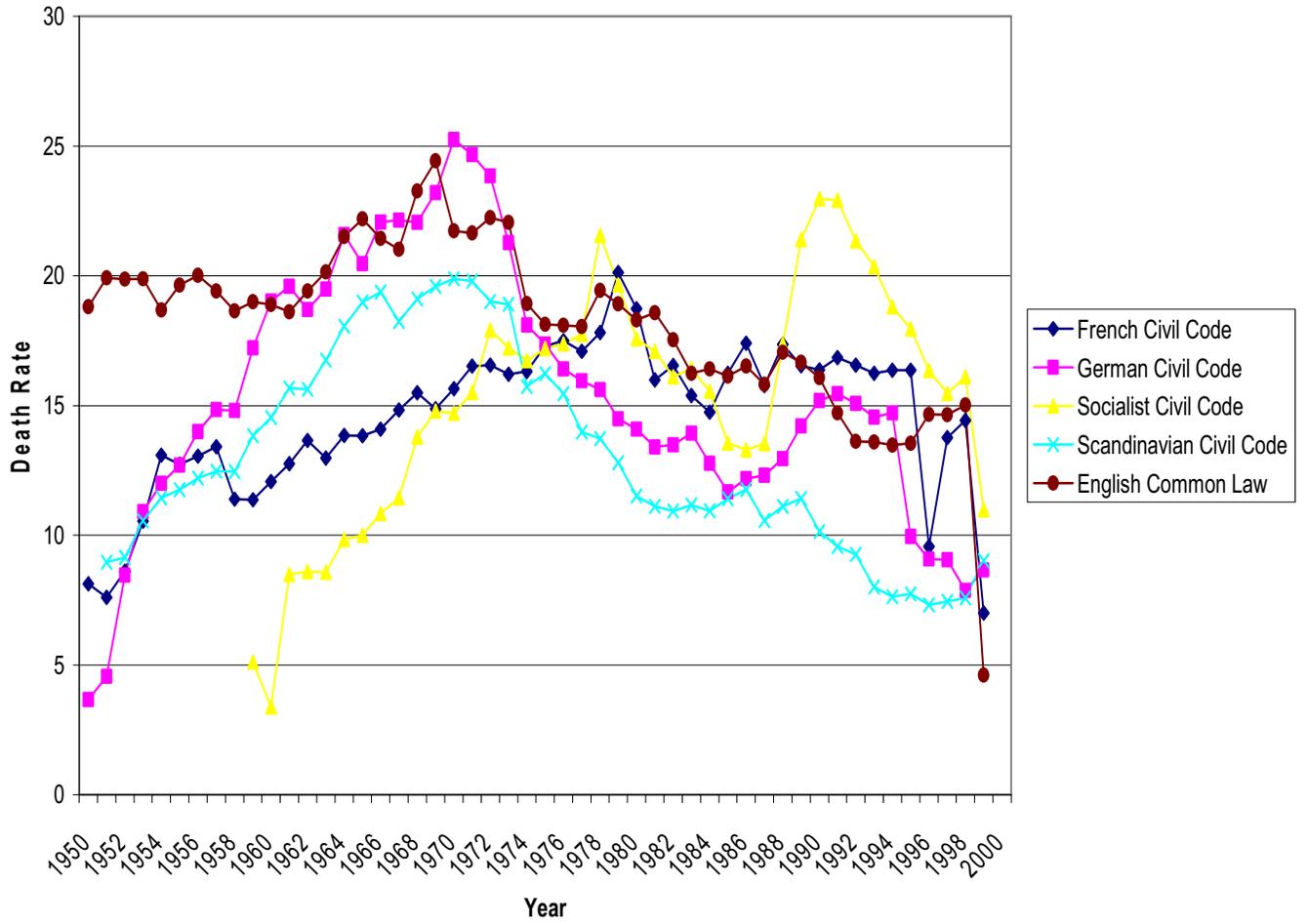


Figure 6

Motor Vehicle Accident Deaths Per Thousand Passenger Vehicles,
Data Aggregated Across Countries Within Legal Systems

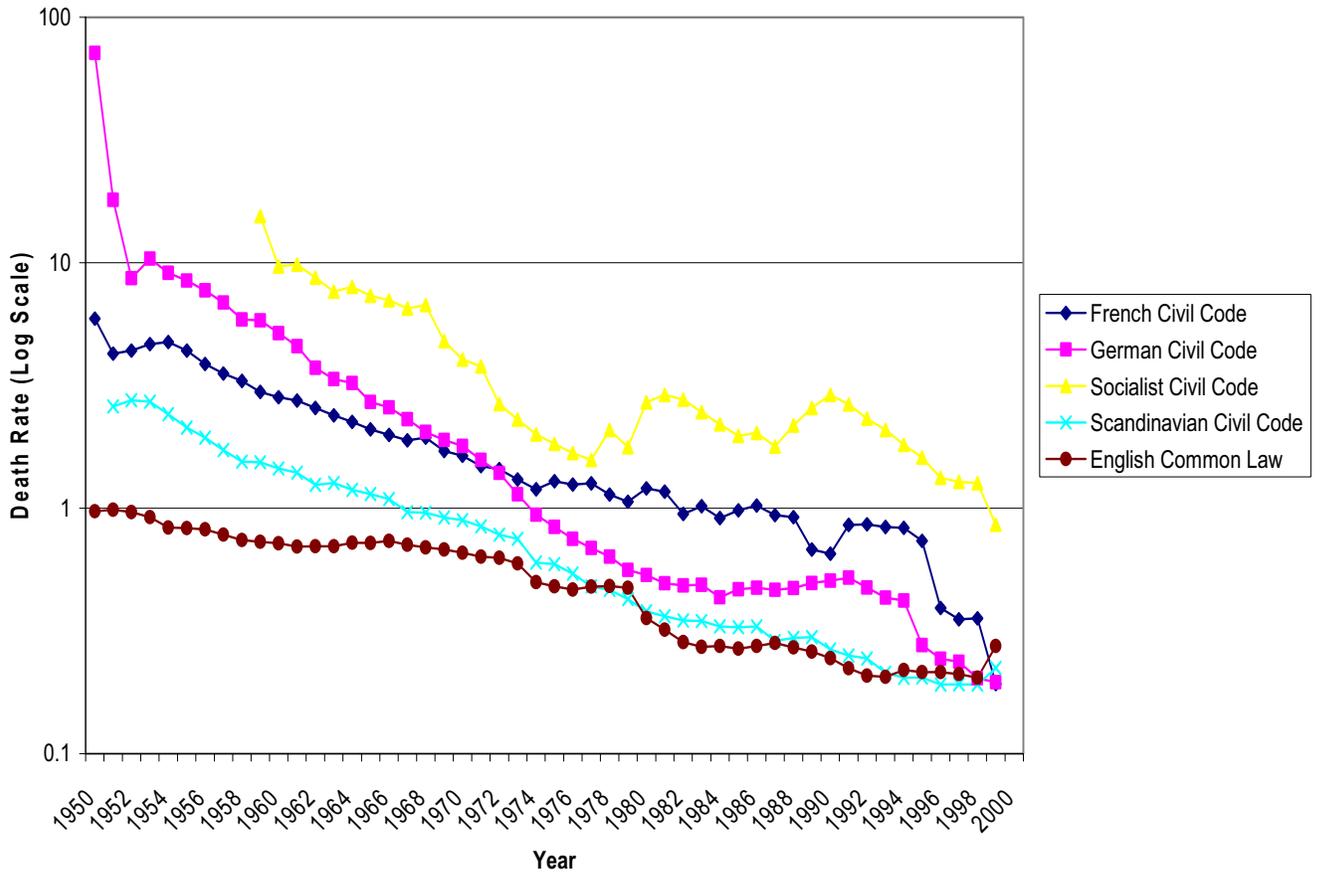


Figure 7

Deaths Per 100,000 Persons From Accidents Other Than Motor Vehicle,
Data Aggregated Across Countries Within Legal Systems

