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Abstract

The study of mandatory insurance systems may be carried out on two different levels. On the one hand, it is possible to analyze theoretical relations between some properties or elements belonging to that *class of systems*. On the other, given a set of relevant conditions (which determines a particular structure of transaction costs), empirical outcomes of *individual systems* can be foreseen. Theoretical relations are instrumentally useful in that process. However, although the *mandatory* purchase of liability insurance is the property or element which characterizes that kind of systems, the theoretical relations derived only from that property or element are not enough to judge the merits of each individual mandatory insurance system as a whole.

Furthermore, from a purely theoretical viewpoint, the duty of insuring brings about fewer consequences than those frequently attributed to such system's element. For example, neither a significant rise in the amount of insured cars, nor internalization of third party losses, nor lesser delay in paying victims compensations must necessarily follow from that isolated duty. Therefore, it is much more accurate to relate some of those effects to other characteristics of the systems, finer-grained than the legal obligation of contracting insurance coverage. Moreover, associating the duty of insuring with some empirical outcomes in the oversimplified way referred to above, has often been used as one of the arguments to support or reject some public policies of car accident control, which would introduce, at least, some vagueness or inaccuracy.

This work studies a few theoretical relations between some fine-grained elements of mandatory insurance systems underlying the obligation to purchase coverage, from a transaction costs perspective. We conclude that, in relation to a set of empirical conditions typically related to developing societies, it is possible to find relatively preferable an individual system including that kind of obligation. However, this statement does not mean that every individual system imposing mandatory insurance is adequate for that type of real realms, or that the duty of insuring should be discarded for societies of a different kind.

Mandatory Third Party Insurance: God, the Devil, and the details

Hugo A. Acciarri*
Andrea Castellano**

*There is one sin: to call a green leaf gray
... one thing is needful - everything
The rest is vanity of vanities.*

G.K. Chesterton - Ecclesiastes

I. - The legal requirement of contracting third party insurance for automobile accidents

Several legal systems impose the requirement of contracting third party insurance as a condition to perform some activities. Nowadays, car driving is regulated in such a way in most countries all over the world.

Northern Europe led the way. Since 1920's Finland (1925), Norway (1926) and Denmark (1927) have imposed that kind of duty. In USA, although some projects of law reform have been discussed in several states since 1925, the first jurisdiction to adopt such a requirement was Massachusetts in 1927 and, almost thirty years later, New York (1956) and North Carolina (1957). By 1970, most of the remaining states adopted that kind of institutions and by 1997 they were already forty five (COHEN & DEHEJIA, 2003). Most of the Latin-American countries (Argentina, Chile, Peru, Bolivia, Mexico, Costa Rica and Colombia) imposed that sort of obligation during the 1990s. Still more recently¹

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¹ In China, the law imposing this kind of insurance was passed at the fifth session of the 10th NPC Standing Committee in October 2003, after four rounds of deliberations. In Russia, mandatory third-party insurance kicked in on July 1, 2003, but drivers have been subject to punishment for driving without a policy only since Jan. 1, 2004.

both Russia and China have passed laws requiring third party coverage for car driving.

Nonetheless, widespread adoption of this sort of systems (hereinafter also “MTP”) neither has result in a correlative improvement in the analysis of their basis, nor has always pursued identical goals. Here, as in other fields, normative conclusions hinge clearly on the basic assumptions chosen for positive analysis. However, in studying the institution in the light of potential-Pareto criteria, it is possible to find a set of assumptions resulting in a favorable judgment, though it is equally feasible to choose another set that leads to the opposite result. In both cases the study should take into account two sets of terms; thus, the value of an individual system (one of those sets) cannot exclusively depend on the bundle of relations arising from only one of its elements -such as the duty of purchasing insurance coverage. Furthermore, problems in evaluating real MTP systems often exceed the study of theoretical relations and also involve discussing the coherence between basic assumptions and relevant existing empirical features. Hence, an individual system may be considered valuable based on the theoretical relations between its elements and a certain set of hypothetical conditions, although it could also be discussed whether or not those conditions fit a given empirical realm.

The relevant elements of an individual MTP system could be many more than those readily apparent, and also more than those commonly present in most of the systems in force. Speaking of “*mandatory*” insurance, for example, does not mean that a public officer will force citizens to sign a policy and to pay the premium. It simply denotes that the system imposes a legal consequence for that type of infringement. In economic terms that situation could be described as a chance of suffering a cost, subject to some probability. In this way, it is easy to notice the difference between a system which enforced that obligation by means of a fine of \$1, another which applied punishment of prison, and a third one which determined punishment of death to enforce the same duty. Each of them may be named “*MTP systems*”, for the legal duty, as a legal category, is independent of its enforcement. However, each of them would deserve different appreciation from an economic point of view. Then, in judging an individual system according to its effects on resource allocation, it may be useful to employ a different (a finer-grained) scale of analysis, and to distinguish smaller elements underlying the mere duty of contracting insurance.

Concerning the agents’ conditions, analyses frequently start from some kind of imperfection which poses a typical problem of resource allocation. Following this line of reasoning, the value of this type of regulations could be measured by its relative ability to deal with a single problem, along with their further implications on efficiency.

Broadly assuming the framework above, the aim of this paper is to study what features of a system of mandatory third party insurance for car accidents, in relation to what empirical conditions of a real realm, would lead to consider a single system relatively “*proper*” or “*suitable*” for a single realm, from a resource allocation perspective. For such purpose, in the second section we will overview some basic assumptions drawn up around the main critical aspects of the problem, including a summary of the simplest model of voluntary insurance against liability. In the third section we will intend to describe some particular relations that arise when the basic model terms are changed. In the fourth section we will show some traits of the joint functioning of a group of conditions (hereinafter denoted also as “*imperfections*”) generally assumed as existent in most developing societies. In the fifth section we will draw a few conclusions, summarized in the concluding remarks that compose the last section. The results suggest that, beyond the duty of insuring -the only element necessarily present in every member of the class of systems which constitutes the matter of this study- it is necessary to take particularly into account certain characteristics of the systems, finer-grained or more detailed than those usually considered in the literature. That finer scale of analysis (discriminating more detailed elements than the mere “*duty*” of contracting insurance or taking account of the mere presence of specific deterrence measures) will probably prove to be the most suitable one in judging empirical MTP systems.

Concerning emerging countries (particularly, Latin American countries) we believe that it might be possible to find some typical empirical basis which suggested that including a certain type of insurance obligation together with traditional liability would be desirable if (and possible, only if), some specific points of institutional design are taken into account.

II. - The economic analysis of liability insurance. Models, elements and basic relations

The model to represent the core-problem has usually been built by considering three types of agents: *injurers* (potentially *insured injurers* or just *insureds*), *victims* and *insurers or insurance companies*. Concerning their behavior, the main assumptions are set around some crucial issues. These include, at least, the following:²

- Agent’s information
- Agent’s risk attitude
- Agent’s assets (basically injurers’ assets)

² We intentionally left out every distinction between strict liability and negligence rules, and their implications concerning MTP systems. Variants that each of them could adopt (basically those concerning causal determinations and burden of proof) would demand a set of particularizations that exceed the purpose of this paper.

➤ Administrative costs of the system

Focusing on information, the implied situation might be modeled on the basis of different information levels for each of the players. The simplest case consists in assuming complete information on the amount and probability of losses for all the agents. However, it is also possible to assume different degrees and classes of knowledge. In any case, the theorist is able to assume different levels of information for different classes of players or to distinguish sub-classes.

A central point in this field is the ability to perceive the individual risk of the injurer *after* assured, considering that the risk corresponding to that very moment is the only one relevant from the point of view of the insurer, and also that the *individual* risk of the injurer is the only one strictly relevant to calculate the premium to cover *her* liability.

Methodological choices on the issue might usually be divided in two main groups. One of them starts from a universe comprising injurers who do not alter their prevention efforts after insuring, although their individual type of risk cannot be distinguished by the insurers at the moment of contracting. It is also assumed that insurance companies know that they are facing different kinds of customers, more and less risky, but cannot discriminate between them properly. Another group of essays assume, on the contrary, that individuals *can* change their risk by relaxing their care efforts after insured. Anyway, a core problem is common to both ways of analyzing this range of situations, and hinges on the difficulties to know the level of risk of *each* single agent *after* contracting coverage.³ Different starting points, however, allow the scholars to make up strategies to deal with the problem according to its initial conditions.

Problems related to imperfect knowledge of their own risk by the injurer have been less treated in the traditional literature, even though they are a major point in recent economic theory. Particularly interesting on this matter are the biases in the agents' information, their causes and effects.

Concerning risk attitudes, it is usual to attribute, plainly, risk aversion to the injurers and neutrality to insurance firms. However, it is also possible to vary these assumptions in order to conceive a universe consisting of injurers with different sorts of attitudes.⁴

³ In short, adverse selection models focus on problems of "*each*", whilst moral hazard models deal with problems of "*after*".

⁴ From a transaction costs viewpoint, the issue could be studied even assuming risk neutrality for every agent. That perspective focuses on the differential costs of collecting information on the risk of each activity. Such differential costs justify the existence of organizations specialized in offering insurance. See Skogh (2000).

Problems related to the amount of agents' assets constituted a specific issue in the treatment of mandatory third party insurance. Traditional economic models tend to assume that the agents' assets are not less worthy than the harm that the injurer might cause or, in other words, suppose that the agents shall be able to pay fully for the harm caused. A different assumption consists in conceiving that their assets are (at least) less valuable than the losses the injurers can cause. Several studies focus on this kind of problems, namely *judgment-proof problems*, treating it as the core of mandatory third party insurance.

Likewise, the costs of administrating a system might also be analyzed in different modes. The simplest way would be to assume zero costs. Beyond that, indeterminate variants would be considered, each of them leading to very different results.

Combining the preceding aspects, the simplest model begins by assuming just one type of risk for the injurers (associated with a unique level of losses and damages), disregards any possibility of the agents to vary their risk after contracting insurance; adopts the assumption of complete information for every agent, risk aversion for injurers and neutrality for insurance companies, zero administrative costs and assets enough to pay for the harm caused by the injurers. SHAVELL (1987), as it is well known, has shown an initial model with these features for non mandatory liability insurance. A summary overview of that model would seem useful as a benchmark to study the specific area of mandatory insurance, and as a starting point for further development and refinements.

The model focuses on determining the class of coverage which maximizes the expected utility of injurers, subject to the constraint that the premium equals the amount of expected damages. It assumes a unique level of losses l which occurs with a probability of $0 < p < 1$, and risk aversion for the injurer.

Let, W be the utility function of the injurer; w their initial wealth, being $w > 0$; π the premium for insurance, being also $\pi > 0$, and q the level of coverage, being $q > 0$.

Under such conditions, if the injurer purchases a coverage q , her level of wealth will be $w - \pi$, if she does not cause harm (to be paid as damages), and $w - \pi + q - l$ if the accident occurs. Her expected utility will then be:

$$(1 - p)W(w - \pi) + pW(w - \pi + q - l) \quad (1)$$

To maximize her expected utility to the constraint that the premium equals the insurer's expected payments, the injurer will chose q to maximize the expression (1) subject to $\pi = pq$; substituting π and differentiating with respect to q we will obtain the first-order condition:

$$W'(w - pq) = W'(w - pq + q - l)$$

Because $W'' < 0$, this implies that $q = l$, that is, the level of coverage will be full, equaling the full amount of losses.

III. - The duty of insuring, the basic model and some refinements

From the basic model shown above, results that injurers will take full insurance and this situation will be efficient in Pareto-potential terms (and also in the light of effective the Paretian criterion).⁵ According to that model, whether or not an obligation of insuring is in force, the injurers will voluntarily purchase a policy and will choose full coverage. Hence, conclusions drawn by this type of models neither constitute an obstacle to this kind of duty nor might be a solid support for obliging to contract insurance. Nevertheless, changes in the conditions of the model could lead to different results. Thus, according to the aims and procedures referred to at the beginning of this paper, we will discuss a bundle of relations resulting from those possible variations.

III.1. - Mandatory insurance and information problems

Unlike *perfect information*, *less-than-perfect information* is not just a unique possibility but a set of subjective situations, each of them projecting different outcomes.

Problems of information affecting insurance firms have been studied in the last few decades. Moral hazard issues, namely those problems associated to the decreasing of care incentives after purchasing coverage, are a good part of that area. Indeed, the risk projected by every agent's behavior could be insured -at a corresponding premium-, but the issue is, here, the presence of empirical difficulties to perceive *ex ante*, the level of care of the individual *after* insured.

⁵ If TP insurance is considered as a part of a broader field (the general field of accident control) the application of the Paretian criterion does not seem possible, provided that the problem involves an initial interaction, by linking the welfare of two or more agents. Hence, the choice on that matter will always result in winners and losers. So, there would not be another chance than selecting the losers (or the ways or amount of losses), according to some kind of criterion. In doing so, potential-Pareto criteria are usually employed. However, if a certain rule of liability is assumed as a given constraint, purely Paretian transactions, as those referred to in the previous section, are obviously possible in the insurance field.

On the other hand, ROTHSCILD & STIGLITZ (1976) studied a later famous model (hereinafter “RS”) built on the basis of two types of agents, whose risk-type cannot be individually discriminated by insurance firms, nor altered by the injurer-insured after contracting insurance. Outcomes of RS -an *adverse selection* model-, show the impossibility of any pooling equilibrium (an equilibrium in which both groups buy the same contract), and the possibility of a separating equilibrium (an equilibrium in which different types purchase different contracts), subject to a particular assembly of low-risk and high-risk agents.

RS also starts from quite an interesting assumption: injurers (potential customers of the insurance firms) know perfectly their type of risk. Does it make any sense for every real market of automobile insurance? The answer to this question is not simple.

Beyond the uniformity assumed by the model in this aspect (concerning the self-knowledge of the agents’ type of risk) it may be possible to distinguish two other types of agents. On the one hand, we can think, for example, of particular groups of firms that purchase coverage for their vehicles; on the other hand, of individual car owners or drivers who buy insurance for their automobiles. Such companies are likely to know reasonably well their own risk. Nonetheless, this kind of assumption seems very unlikely for the second case, since individuals will probably know their risk only less than perfectly. Furthermore, they will presumably have biased perceptions on the point. There might be some empirical evidence to support this guess. Experimental economics holds that agents’ perceptions on risk could be influenced by the frame of the choice, what may lead to underestimate some risks and, consequently, to alter the decision to buy an insurance policy (KAHNEMAN and TVERSKY, 2000). That psychological tendency to underestimate a certain kind of risks has also been assumed by part of the literature on economic analysis of accidents (CALABRESI, 1970; SHAVELL, 1987), for a broad range of cases and, specifically, for individual drivers.⁶

It is easy to notice the effect of this circumstance on the standard results. Considering (as in the simplest case) a market with only one type of agents who could not change their type of risk after assuring, the premium demanded by the insurance company will be (in RS conditions), as shown, a function of the probability of paying damages. More precisely, the premium will be $\pi = pl$ where p is the probability

⁶ In a recent poll carried out on 634 drivers in Buenos Aires City, 67.50 % of them consider themselves “better” or “much better” drivers than the average. In another (probable) instance of the same phenomenon, less than 21% of the drivers had seat belts on at the moment of the survey. That percentage falls down to 4% for rear seats. However, 1,000 out of about 7,000 yearly traffic deaths could have been avoided by wearing seat belts. (Source “*Luchemos por la Vida*” www.luchemos.org.ar)

that the agent has to pay damages, and l the amount of the compensation for that loss. Then, if the agent is risk averse it follows that $W(p(w-\pi)+(1-p)(w-\pi-l+q)) > pW(w-\pi)+(1-p)W(w-\pi-l+q)$, that is to say the utility of the expected value is higher than the expected utility. But this statement only assures that if the potential insured believed to be in a situation where $\pi = pl$, she would prefer to insure rather than to face probable losses without coverage. However, if the agent estimates that her risk is lower than the real one, she will make the choice believing to be in a case where the probability to cause harm is p_1 , being $p_1 < p$, and will find that $\pi_1 < \pi$, because $\pi_1 = p_1l$. Under those conditions, the injurer would prefer -by definition of her risk attitude- to purchase complete coverage at a premium π_1 , but she would not necessarily buy coverage at a premium π , since it may be perceived as too high.

Therefore, these sorts of variations in the assumptions significantly alter the initial results of RS. In the original model, a separating equilibrium can be reached by offering an incomplete insurance policy (preferred by lower risk agents). That kind of policy could not be offered at a premium lower than π , since the insurance firms would lose money otherwise. However, a fair policy would not be worth buying for optimistic low risk individuals. Hence, including optimistic agents in RS, would bring about a new result: at least many of these individuals⁷ (though risk-averse), may not be willing to purchase any fair odds policy at all.

A simple argument leads to that conclusion. The complete insurance policy premium would be perceived as unfairly high by optimistic high-risk customers, who had preferred that sort of contract in the original model. The premium of the incomplete insurance coverage, as shown, will be perceived also as too costly by optimistic low risk customers. This last type of individuals, then, would always consider fair coverage (complete or incomplete) as too expensive, and this belief would deter many of them from insuring voluntarily.

Co-existence of informed and optimistic individuals leads to interesting variants. Whereas only one sort of choices can be predicted for optimistic low-risk agents, we could distinguish several possibilities associated with optimistic high-risk individuals. If they considered their own risk as high as the real risk of low-risk agents (*high-risk slightly-optimistic customers*), then, they might purchase a fair incomplete

⁷ An especial kind of rationality could be introduced in order to justify that some agents will choose to contract *though considering the demanded premiums higher than the fair ones*. A particular preference for security over risk of paying damages would make that type of individuals to accept a contract deemed (incorrectly) unfair by them, and also to contract insurance at a premium *really* over the fair price. A large enough group of those individuals could subsidize a small and expensive market.

insurance policy, such as the initially offered to low-risk customers. Nevertheless, the premium will be, then, too low for the insurer firms, and they will lose money. If the premium of that kind of contracts rose correspondingly (to grasp the increase in the real risk introduced by this new class of customers), informed low-risk customers might not purchase a policy at such a new premium. Therefore, no low-risk agents would be left in the market. Under those conditions, insurer companies could only offer fair contracts to high-risk agents, calculated upon corresponding risk basis (high type). This possibility would grant only informed high-risk agents' acceptance, rendering a weird possibility of separating equilibrium.

On the other hand, if optimistic high-risk agents were biased enough to ponder their as risk *lower* than the low type considered in the model (*high-risk highly-optimistic agents*), they might not buy even that incomplete low-risk-contract, for (wrongly) considering that policy still as too costly. This new condition would exclude all the optimistic agents from the market, allowing a market for (only) informed agents.

In conclusion: the first scenario, including *high-risk slightly-optimistic customers*, would eliminate every low-risk agents from the market (optimistic and non-optimistic) together with the high-risk slightly-optimistic agents. The second, with *high-risk highly-optimistic agents*, would exclude only all optimistic individuals (high-risk and low-risk types). In both cases, it would result in a market smaller than its possible size with relatively high prices for most of the agents.

The preceding remarks would probably contribute to explain the instability, magnitude and prices in markets with uninformed agents. However, it is also possible to find other conditions apart from information problems which impair a voluntary TP insurance market. The judgment proof problem is, clearly, a highly relevant condition in that sense. Besides, imperfect features of voluntary insurance markets are not the only argument employed to sustain the virtues of a legal requirement of insuring. Still, the duty of insuring has been deemed useful to mitigate other kind of problems. It is commonly thought, namely, that this kind of obligation is a proper tool to deal with delays in victims' compensation payments.

In the next paragraphs we will discuss the first of those aspects -the judgment proof problem. Next, we will focus on the delay in victims' compensation payments. Then, we will study whether or not it is proper to think that imposing a duty of insuring is a good tool to deal with those problems altogether.

III.2. - Mandatory third party insurance and the judgment proof problem

Traditional liability system is based on a legal consequence (damages) of monetary nature. Therefore, individuals lacking in assets are resilient to any incentive projected by this type of sanctions: if nothing possessed, whatever the judgment obliges to pay, their real liability will be zero. In such cases, mandatory insurance used to be invoked as a legitimate tool to modify that scenario. If an insurance policy was required as a condition to start up an activity, and the premium reflected the expected value of the losses associated with that activity, then the insurance would work as an indirect mechanism to discriminate activities socially worthwhile from socially worthless ones. If so (it seems to be thought), in the real world, only when the benefits exceed its costs, will an activity be carried out.

Nonetheless, there are also several problems related to some sort of imperfect conditions of the real world. One of them is the practical difficulty of discriminating between different activities carried out by operating the same good, like e.g., a car. Even if it is theoretically possible to discriminate diverse activities and correlate each of them with a policy, that kind of discrimination does not appear to be practically feasible (Williamson et alii, 1967).⁸

Obstacles to finance some activities constitute another kind of problems. Although some activities would yield net benefits, they could probably not be performed, since the mandatory insurance premium must be paid in advance.

Focusing on drivers having insufficient (but some) assets, Shavell (1986), concludes that, if the insurer could not monitor the insured's level of care, a legal requirement of insuring would worsen the problem in terms of efficiency. Nevertheless, Polborn (1998) holds that a *certain type of mandatory insurance* would be the second best solution for this issue. His proposal considers a policy which covers only the difference between the damages to be faced by the injurer, and their assets.⁹ Then, under those conditions, the injurer will maintain their initial incentives to prevent, subject to the amount of their assets.

Both conclusions appear to be correct in their respective framework. Risks warned by Shavell arise when insurance effectively reduces injurers' incentives to take care. The implementation of Polborn's

⁸ Ordinary exclusion clauses would not strictly contribute to that aim, because the pursued goal is *effectively avoiding some activity*, rather than *leaving the agent without coverage*, if the second possibility does not imply the first. The purpose involved here is that the activity whose social cost exceeded its benefits cannot be performed without coverage; and then, if the injurer tried to contract a policy, market incentives would lead to the same effect.

⁹ Indeed Polborn's article has referred to the difference between total losses and a variable y defined as "...cash flow y , which can be distributed to the investor as dividends if there is no accident..." provided that the text deals with the case of industrial endeavors as potential sources of accidents.

insight is related to the possibility of forcing injurers to insure the very difference between the value of their goods and the damages to be faced. Possibly, that would be feasible in some activities like some industrial endeavors, but it would be less than easy in the case of car driving. In this field, it is not clear that the same difference between possessions and damages will be maintained after coverage has been contracted. Indeed, there are two ways of describing this issue. The easiest consist in assuring only a fixed sum which represents the “historical” difference (the difference at the moment of contracting); the harder one, in insuring a movable difference. Considering the variable nature of that difference over the time, the second way seems to be the only suitable possibility to achieve the aimed effect. If so, the insurer will face a new problem of moral hazard when the injurer can increase that difference by alienating or consuming her goods. That problem particularly arises when goods can be transferred at a small cost¹⁰, as it is usual in case of low-value assets.

Thus, a new conclusion could be drawn. Related to Shavell’s warning, the correct evaluation of the effect of possessing some goods on the liability incentives, must regard not only the value of present assets, but the cost of alienating, shielding or “hiding” them if the injurer has to face the payment of damages. Concerning Polborn’s proposal, since incentives of uninsured injurers are limited by the cost of subtracting their assets from paying a judgment, whenever alienating goods is almost costless, the insured amount will tend to equal the total amount of damages.

Besides, a different issue -as suggested above- is related to the effective possibility of preventing or avoiding an activity. Obviously, putting in force a legal duty does not mean eliminating forbidden acts from the real world. Though, prohibitions (such as the prohibition of driving without insuring) are just a part of a mechanism which generates expected costs to transgressors.

However, to reach the same level of costs, different kinds of transgressions demand different administrative costs. So, administrative costs for preventing an industrial endeavor seem to be very diverse than those required to monitor, detect and seize uninsured cars.¹¹ We will discuss this problem below.

¹⁰ We allude to “transfers” of goods just as a means of preventing judiciary collection. The same action could be either made just “nominally”, by apparently transferring assets that really keep on opportunistic insurer’s hands, or “really”, trading them for other assets easier to hide. The expected value of the legal sanctions for fraud must be regarded as part of the costs of alienating or hiding goods. Usually those costs are particularly low in most developing countries.

¹¹ It seems obvious that forbidding an activity does not mean that such an activity will not be performed. Less evident, however, are differential magnitudes of the costs needed to effectively avoid various types of activities, and their determinants. Nonetheless, it is well known that in several real cases, some areas of the law

III.3. - The delay in compensation payment and the insurance

Part of the literature has attributed to TP insurance swifter payment of victim's compensations than the traditional liability system applied by the courts. If an early compensation is preferable to a late one, and if insurance led to that effect, then, such circumstance would seem to pose a strong argument for imposing a legal duty of insuring.

Two points may be distinguished among those statements. The first concerns whether or not a fast payment is desirable, if aiming at a proper resource allocation; the second, if MTP is appropriate for achieving that desirable celerity.

As far as the first is concerned, it has been suggested that, for at least some kind of losses, the opportunity of the payment would not be indifferent. CALABRESI (1970) coined the term "secondary costs" to allude to the increase in the losses associated, viz. to a wrongly consolidated bone fracture affecting a victim who had not been able to afford medical treatments. If the victim had been treated on time, the cost of her losses would have been almost limited to the cost of medical practice. Though, provided that she was not properly assisted, her losses (e.g., permanent inability) will strongly exceed that sum. Money interest applied by the courts frequently does not fully compensate that difference. So, the injurer will pay a sum attached to "historical" losses plus money interests at a fixed rate, but the real losses will increase at a much higher rate. Then, at the moment of paying there must be a significant difference between the losses that the victim has suffered, and the damages that the injurer is paying. Hence, it may be seen as a particular sort of judicial error that heavily distorts the incentives of the parties. Given that scenario, although it appears clearly preferable to avoid any unjustifiable delays, the injurer will lack incentives to behave in that way.

MTP insurance, by itself, does not assure to solve that problem or even to alleviate it. Delays in paying compensations do not depend on the duty of insuring but on a collection of conditions, most of them not related with the mere existence of an insurance policy either voluntary or mandatory.

IV. - A matter of detail (and enforcement)

presented a very low rate of fulfillment. In Argentina, for example, despite MTP car insurance is in force in every jurisdiction, almost a half of the total number of cars lacks insurance. That rate has increased the last years, passing from 38 % in 1999 to 47% in 2004. Those percentages imply that nearly 3,400,000 cars jam the streets and roads of a country of less than forty million inhabitants everyday, without any coverage (Source: *Superintendencia de Seguros de la Nación* and *Registro Nacional de Propiedad del Automotor* of Argentina).

So far, the worthiness of imposing MTP insurance appears to be extremely dependant on the relations that bind the set of elements or properties of the system to the set of relevant conditions of a given field. Consequently, none of the theoretical relations arising from any isolated element of those sets may, by itself, define the value of an *individual* MTP system.

The duty of insuring is just a contingent element or property of some individual systems of traffic accident control. Although it constitutes the element or property that conceptually defines a class of systems (as MTP systems), it is also only one of those indeterminate properties or elements that could be set apart to study an individual system. So, the worthiness of each individual system, as stated above, is not exclusively dependent on that duty as a mere *legal ought* of contracting insurance, or on any other property or element of the system, considered in an isolated way. Nonetheless, the value of an individual system derives from the global appreciation of the entire cluster of relations established between a set or empirical conditions of a field, and a set of suitable conditions (elements o properties) of the system in focus.

Selecting elements or properties from a given system is, surely, an arbitrary procedure, and we are far from suggesting there is a unique or still a privileged fashion to pick out conceptual elements from MTP systems. On the contrary, the point is here just the open possibility to choose the most suitable scale of analysis according to the purpose. Preceding and later remarks, then, would suggest that an analysis scale which distinguishes the duty of contracting insurance as an “atomic” or basic element is not the most suitable to foresee some crucial empirical outcomes of a system of car accident control from an efficiency viewpoint, when transaction costs are taken into account. Besides, a finer-grained scale of analysis, distinguishing some basic (“finer”) elements underlying that legal duty, would contribute better to grasp those effects. As Calabresi has stated, good guesses are useful also for that finer scale of analysis.

Let us suppose, for instance, that a system imposing a fine as a sanction for the infringement of the duty of insuring has to be evaluated. If the predominant condition of the realm were the optimism of potential injurers, the choice of those agents would be a function of the loss of utility related to that fine, instead of the mere existence of a legal duty of insuring. The very presence of such a legal requirement, though enforced by a fine, would not grant that agents unwilling to buy insurance will change their mind and purchase a policy. The chance of having to pay that penalty will determine just a variation in the initial lottery, instead. Buying TP insurance implies a reduction of their present wealth, against the certainty that future wealth will not be diminished by any fine or damages; not buying any insurance means to

enter the uncertainty of paying damages and/or a fine in the future, each of those terms subject to a different probability. Since the only element added to the initial choice space is the fine, -put in simple words- the agent should perceive a decreasing in her utility derived from that fine *high enough so as to alter their initial choice*, to buy a policy. Nevertheless, if the only threat consisted in losing assets, a fine would never generate proper incentives to a judgment proof agent to purchase insurance. However, imposing a fine would be suitable if the only issue were a problem of optimism, suffered by agents who are wealthy enough.

Then, a group of enforcement details of the duty of contracting insurance, when in force, would determine a selection between diverse types of agents. If the field presented both agents' problems at the same time (optimism plus judgment proofs) it would be tempting to think of enforcement mechanisms suitable to deal with both flaws. Some specific deterrence measures, like punishment of prison, might be pondered to that aim.

Nonetheless, it is also easy to realize that there are strong theoretical and empirical obstacles to decide in favor of some measures of that sort. Discussing only empirical disadvantages, it is not hard to notice the low rate of effectiveness of punishment of prison in many societies that suffer also from the combination of problems previously described in the field of traffic accidents. Besides any judgment about further problems arising from that kind of punishment (as those of moral or political nature), from an economic point of view it can be observed that though punishment of prison might seem a wide ranging remedy at first glance, it sometimes poses a practical dilemma: on the one hand, it is possible to find advantages in applying that kind of specific deterrence *properly*; on the other, the *proper* functioning of a measure of that sort on the agent's incentives would require major changes in the institutions. So, given some institutional conditions, the cost of those changes would prohibitively exceed their benefits, at least, their benefits in the field of car accidents. Most of those costs would be informal (viz.: social consensus on the horrors of imprisonment or distrust, generally justified, in the fairness of the system).

Assuming those circumstances as a given constraint, other measures of specific deterrence would be examined. In that sense, advantages of fines should not be easily discarded. Quite on the contrary, it would be suitable to combine fines with a proper enforcement of their payment. Hence, two aspects can be clearly distinguished, namely the *imposition* of the fine, and its *effective payment*, each of them attaching different administrative costs. The costs of the first are focused on monitoring; in the case of the second, on the compulsion required to make agents initially unwilling to pay, do so eventually. Enforcement, in this scale of analysis, should not be seen as an atomic element of the system, but as

a set of measures. Fines are part of the enforcement of the legal duty of insuring, whilst measures to manage their payment, are part of the enforcement of the fines.

Concerning the last part of that sequence, procedures tending to collect the amount of fines are, in several countries far from effective and -what is perhaps worse- putting them in motion is a discretionary power attributed to local authorities. Then, politicians could perceive that active efforts in that sense would result in more costs (unpopularity) than benefits (an improvement in traffic safety perceivable by voters). Perhaps, that kind of reasoning may contribute to explaining the insignificant rate of payment of traffic fines in large groups of emerging societies. Thus, if those conditions were identified as present in a certain field, "automatic" mechanisms of enforcement appear to be preferable. A possible way of implementing that idea consists in seizing the uninsured car and requiring a policy in force as well as the additional payment of a fine, as conditions to recover the automobile.¹²

Obviously, that threat is far from concluding the issue. The disutility of that set of measures depends on the probability of being caught, if driving with no insurance coverage. Although that probability is clearly associated with high administrative costs, the question is whether or not other practical mechanisms are available at a relatively cheaper price. So, a conceivable strategy, previous to that comparison consists in optimizing the costs of monitoring and detection of such a contrivance. In relation to the probability of detecting uninsured drivers, for example, some aspects of the problem are apparent (e.g. the increasing in the number of traffic police agents) while others are not so evident. The minimum period of coverage allowed by law is one of those factors. If it is only of one month, a probability of 1/1 would require monitoring each car at least 12 times in a year. If the minimum were one year, to reach the same probability only once a year would be enough.¹³ Unfortunately, that kind of design details has frequently been

¹² Other measures may be considered besides impoundment and the requirement of paying fines as conditions to release the car. In that sense, banning the registration or, more generally, any acts concerning the car without having a policy in force could be pondered. Nonetheless, the latter type of measures hinges on the parties' decision of formalizing trades or other acts affecting the automobile, which is not the general case in lower social classes in emerging countries, where informality reigns.

¹³ There is an evident *trade-off* on this point: the more extended the lapse the policy is in force, the less the monitoring costs will be. Additionally, the longer was the period of coverage, the higher would be the premium's amount, which would increase the obstacles of engaging in some worthwhile activities without financing the time gap between payments and gains. In Argentina's insurance system, for example, the minimum period in coverage offered by insurer companies is usually yearly or semi-yearly, but failing in a monthly payment causes the suspension of any coverage, automatically (without any written notice before canceling the policy nor any grace period). So, it is overwhelmingly frequent to observe a typical behavior consisting in contracting an annual policy by paying only the first period, and then discontinuing the premium payments. In fact, such a system could be considered as a monthly-

disregarded when considering the optimization of actual accident systems.

Furthermore, beyond any description of the conditions required for a MTP system to generate a rise in the number of cars covered by a policy, it is fair to notice that such an increase could not imply most of the advantages usually attributed to insurance. It is also necessary to examine whether disadvantages associated with that obligation exceed its benefits or not. Then, with regard to the first issue, we will overview the relations between the increase in the number of cars covered and the delays in the payment of compensation to victims. Later on, concerning disadvantages, we will review some issues on moral hazard.

IV.1. - The delays in paying victims compensation and the duty of insuring

Just as the very legal duty of contracting a policy lacks significant influence on the number of cars insured, the mere existence of a contract of insurance in force does not guarantee a quick compensation to the victims.

The literature has often assumed a positive relation between TP insurance and faster payments. That way of reasoning would probably be founded, at least partially, on some particularly implicit bases. It is possible to think that the inclusion of insurance firms -instead of individual injurers- may shorten optimism problems in reaching an agreement. However, that effect is only empirically (and so, contingently) relatable with the presence of that kind of players. Then, it appears more accurate to discriminate between the very terms of the theoretical relation underlying the facts, and the chain of assumptions built on the empirical reality taken into account.

Along other lines, it has frequently been taken for granted that some design details, idiosyncratic to some *individual* TP insurance systems, are “natural” to the *class* of insurance systems. As it is well known, thus, in lots of states or countries insurance companies have to make a fast and automatic payment to the victim, in spite of a further trial concerning the remaining damages (when allowed). That kind of mechanisms, if reasonably well enforced, appears to shorten the delay in compensating victims. However, that effect derives from a particular cluster of contingent details of the system and not from the very duty of contracting insurance.

As a consequence, if the aim was cutting down the delay in paying damages, some “details”, other than (and possibly, additional to) the very duty of insuring, should be implemented.

minimum-period-system, in economic terms. Monitoring costs of such a system are a function, as held above, of that tiny coverage term.

IV.2. - The moral hazard

Moral hazard problems are -evidently- not exclusive of mandatory insurance, but arise all over the insurance field. Nonetheless, the argument specifically related to MTP insurance is that agents possessing limited assets, who had at least a few prevention incentives - to that extent-, would lose them after contracting coverage against liability.

A finer consideration of that problem leads to studying the translation of that theoretical relation to the real world. Authors have often remarked that injurers, even after being TP insured, would preserve incentives to take care, by pondering the effect of an accident on their own assets and body, since they are out of the boundaries of TP insurance coverage.

From an empirical perspective of research some studies intend to evaluate the presence and magnitude of moral hazard in MTP systems. Some of them found no significant evidence attached to MTP insurance (DERRING, 2001); others suggested quite the opposite. Among the latter COHEN & DEHEJIA (2003) gathered empirical evidence from 50 American states. Their paper focused particularly on the behavior of individuals who did not deem insurance to be worthwhile in the absence of regulation, but they bought it when purchasing became compulsory. They believe to have found relevant evidence of *moral hazard* -a two percent increase in fatalities for each percentage point decrease in uninsured motorists.

Nonetheless, it is always feasible to generate proper incentives by including some design particularities in the system -some of them largely studied by the literature- regarding their suitability with the respective empirical field.

In the next section we will discuss to what extent moral hazard problems are necessarily related to the mandatory requirement of insurance and overview some instruments to mitigate them.

V. - Theoretical relations, relevant empirical conditions and guidelines in designing systems for highly imperfect realms

So far, we have intended to describe some archetypical theoretical relations implied in the field of car MTP insurance. Although theoretical relations constitute a conceptual tool useful to deduce isolated results, judging a whole individual system involves also a different kind of procedures, tending to ponder the general ability of a system to deal with the full cluster of problems derived from a real field. Decisions on the scale of analysis to be employed, for example, would not be a visible

result of any deductive inference, though they have strong effects on the outcomes. So, as suggested earlier, there would be plausible reasons to think that the best scale of analysis for the proposed aims seems to be a finer one than that which discriminates the duty of insuring as an atomic term of the system. Provided that the value of an individual system is a matter of adequacy, each MTP system could be deemed to be worthwhile for a particular realm, and worthless for another when transaction costs are taken into account.

History shows these types of systems have been adopted first by developed economies and decades later by developing countries. The main features of the latter are often related to a broad range of typical imperfections in the fields of information, judgment proof agents, bureaucracy and the functioning of the court system.

The incidence of those conditions altogether appears as a constraint to consider mechanisms to handle just one kind of flaws. Given that the problem was only one of optimism, for example, an increase in the number of cars covered would be achieved by imposing a fine. Nevertheless, though that device effectively induced those drivers to take insurance, it would not improve their level of care, and still would reduce their precaution because of the moral hazard implied.

Otherwise, if only judgment proof problems were implied, the number of insured agents could be increased by enforcing the legal obligation of coverage with some consequences which generated a dose of disutility to the infringers (what should be made by means suitable to the nature of those agents, by definition, lacking assets). However, the effects of such legal devices on driver's precaution could be also indifferent or negative. Furthermore, the influence of legal duty as much as the very increase in the number of injurers covered by a policy could also be ineffective to shorten delays in the payment of compensations to victims.

That compromise between several theoretical relations present in the vast majority of real systems (arising with particular features in developing economies) would suggest taking into account some guidelines to design individual systems.

- First of all, the impossibility of adjusting empirical systems to the optimum does not mean that every empirical scheme available is equally valuable. On the contrary, it is possible to find better and worse empirical alternatives in relation to each proposed aim.
- Second, the compromise between several issues does not require finding a contrivance that solves all of them, not even a device that alleviates some problems leaving the remaining untouched. Probably, every single tool, by trying to solve a flaw, would make

another worse. If it is so -as it probably is-, the choice should ponder the net gains associable to each available set of mechanisms, in reference to the set of relevant conditions of the field.

- Third, fine-grained discrimination of conceptual elements from the normative systems and from the real fields, allows establishing a very large number of relations and combinations. The duty of insuring is not a whole system but just a contingently conceivable element of some systems. However, finer elements underlying that duty could also be distinguished.
- Therefore, in choosing the best system of car accident control, lots of feasible possibilities may include a certain type of MTP insurance together with multiple details of design. When several imperfections come together, probably the best system should include that kind of duty.

The term “plan” has been usually employed by North American literature to denote a set of rules other than the traditional liability. The different origin of both kinds of rules (liability rules, conforming Common Law, “plans”, created by parliaments) may arguably constitute the ground of that distinction, at least partially. That difference is not found in Roman Law countries, because legal rules have to be passed by parliaments in both cases. Anyway, even in those countries the term “plan” refers to a whole system, drawn up by policymakers to embrace a full area (workplace injuries, car accidents, medical malpractice). However, adopting MTP insurance does not require such an integral change.

Besides, a system does not need to be a plan to be judged in its worthiness. The notion of system has been used here as a mere conceptual category, and does not denote any set of norms thought intentionally altogether by any actual policymaker. In most developing countries integral reforms face overwhelming costs that avoid any try in that sense. Nevertheless, that circumstance does not prevent partial, successive and less ambitious changes.

In judging an individual system that includes some kind of MTP insurance -on the precedent basis-, just available alternatives should be pondered, everyone facing the same set of field conditions. If a high rate of judgment proof agents is the main problem, the only way of influencing their incentives seems to be imposing penalties other than mere monetary ones. However, “pure” specific deterrence measures usually reflect the balance between social costs and benefits of some activities just too roughly.

Moreover, most specific deterrence devices are not available at an affordable cost of implementation. In several countries, drivers (and lesser transgressors in general) are rarely condemned to effectively suffer any punishment of prison, even when that sanction was imposed by law. In spite of analyzing the causes of that state of affairs and focusing only on its effects, when it occurs so, the influence of that formal sanction on the driver's incentives will be barely null. Furthermore, a suitable functioning of that part of the system (the system composed by *penal law*¹⁴ and its organs of application), would be dependent on a general reform of the area, probably highly desirable but feasible only at unaffordable (formal and informal) costs.

Impoundment is another specific deterrence measure available to policymakers. Nonetheless, when measures of that kind are thought to be used directly to modify agents' incentives, the problem related to information that the government has to possess arises. That basic issue appears because authorities can only detect individual negligent acts (as infringing a traffic light or violating speed limits) which makes highly improbable to perceive the whole risk of the agent to compare their behavior with the optimum, taking into account social benefits of the agent's activity. Obviously, that problem tends to worsen when highly imperfect administrative systems are involved.

Then, pondering previous issues and excluding punishment of prison, there seems to be just an alternative between traditional liability, which reflects the relation between costs and benefits but is impotent to face judgment proofs, and some typical measures of specific deterrence (especially, vehicle impound), that are unable to balance costs and benefits of each activity, but may influence the judgment proof agent's behavior. However, a further possibility consists in attempting a MTP system enforced by impoundment. Though, such a system should also link the premium of the TP policy with the level of risk of the insurer. Vehicle impound, should function here just as a penalty for failure to maintain insurance, and not as a sanction for negligent driving. Although that class of sanctions is imposed by lots of legal systems, their success is not a function of the mere "legal ought" but of the decrease in their utility that the agents can perceive. Details and costs of implementation play a strong role in that outcome.

Therefore, if the previous conditions are met, drivers will face an alternative consisting in purchasing a policy or not. The second term would also imply the cost of impoundment. Provided that impoundment is subject to a probability (related to costs of detection), it should come together with a fine that compensates the difference between probability

¹⁴ "*Penal*" is used here as a broader and more embracing term than "*criminal*". In most Spanish-speaking countries only major offenses are denoted by the Spanish noun "*crimenes*" or qualified by the adjective "*criminales*".

and certitude. That fine should be paid and a proper insurance policy contracted as conditions for release.

Anyway, the problem of perceiving single risks of each agent, to calculate the premium, remains still unsolved. In spite of many usual treatments of this issue, it seems to be a technological problem rather than a theoretical one. So, to deal with this matter it would be useful to distinguish at least several dimensions of risk. One of them, for example, consists of problems related to the condition of the car; another, of those concerning the driver's behavior. The first could be verifiable by simple means and seems relatively stable, at least in the short run. The second presents different features. However, driving is usually an activity performed along extended periods of time. So, a data bank of prior relevant facts would give an approximate view of general behavior of the agent (using probabilities implies, in general, the faith that future events will reply past ones). Given the state of informatics, a system somehow based on an appropriate data bank would probably be better than other focused primarily on single-act sanctions. In that sense, a reasonable amount of information, properly individualized, to be used by insurance companies to calculate individual policies would plausibly approximate the individual type of risk of *each* agent *after* contracting coverage dealing with adverse selection (*each*) and moral hazard (*after*) problems.¹⁵

Repetitive features in the insurer-insured relation would constitute the self enforcing ingredient of the system. After the first time the insured had purchased coverage, all her behavior reflected her type of risk *after* insured. That state of affairs will not remain the same for ever though. On the contrary, that initial period of insurance will provide the basis for calculating *future* premiums. So, relaxing her precautions during the first period (if perceptible) would imply a correlative rise in her future premiums.¹⁶

With regards to the problem of agents with insufficient assets (the loss of their prior incentives if they were forced to insure) that issue could be discussed on a slightly different basis from the traditional explanation. If opportunism is admitted, incentives of that kind of agents are not exclusively limited to the magnitude of their assets but also to the cost of "hiding" those assets from Justice -just to the lower. If that line of reasoning is accepted, when the latter is small enough, the prior incentives will tend to be null. Besides, the proposal consisting in limiting MTP insurance only to the difference between the damages to

¹⁵ Intervention of insurer companies' officers in supervising public inspectors could also be explored as a mechanism to cut down corruption opportunities.

¹⁶ The trade off alluded above would take part in this issue. In properly adjusting the premium to driver's behavior, the best solution would be reducing coverage periods to the minimum possible, but to reduce monitoring costs, enlarging the minimum period of mandatory coverage would be required.

be faced and the agent's assets (Polborn, 1998) appears to be scarcely effective in this area. Considering opportunistic insurers, if that difference is a sum "moveable" throughout time (depending on the assets present at the moment of paying damages), prior behavior remarks will apply also to this mechanism. Then, when the costs of "hiding" assets are low enough, the difference between this type of MTP insurance and the classical full coverage will tend to disappear. In conclusion: on the basis shown above, although -in this area- the hopeful second best solution were not so valuable as deemed in its original version, the basic problem would not have such a magnitude as suggested by Shavell's work.

In any case, some mechanisms tending to mitigate this problem would also be put into practice. Shielding or "hiding" assets is not entirely free in any system, but it may be very cheap. Then, if it is so, a small deductible will be enough to maintain the -small- opportunistic insurer's incentives. Taking into account transaction costs, it would be preferable to include a fixed deductible, and probably, to implement it by a full payment made by the insurance company to the victim, allowing the firm to recover that deductible, then, from the injurer.¹⁷

With regard to the advantages of fastening victim compensation payments, it is always possible to include some well known details of design pointing at that aim. That sort of devices, common to most developed countries' systems, would arguably be worthwhile also for voluntary insurance in some groups of developing countries.

VI. - Concluding remarks

The literature put in doubt the consistency between real systems of traffic accident control and the economic theory. It has been remarked that still now, more than thirty five years after the *The Costs of Accidents*, "...we still know far too little about the real world consequences of liability rules to take full advantage of the intellectual legacy ..." of that work (Rabin, 2004).

That statement is possibly true, though the poor functioning of some real systems would not hinge, perhaps, on that lack of academic

¹⁷ If insureds effectively afforded their part in the total damages, there would not be any problem at all. Although, it is highly probable, at least in many cases, that that kind of deductibles were not paid because of lack or insufficiency of insured's assets. If so, victims would be forced to absorb that part of their losses. Then, taking into account transaction costs, reasons of *loss spreading* would make the proposed device plausible. For the same kind of reasons, some sort of exclusions appeared as inconvenient. Admitting the exclusion based on the injurer's gross negligence ("*culpa grave*"), when it is understood as a subjective condition too close to ordinary negligence ("*culpa*") -as that requirement is conceived by some Argentina's judges- is an example of that kind of exclusions.

knowledge. Some types of empirical constraints, other than the weakness of the research in the area, are probably more important in determining their malfunction. However, even if this is true and assuming the worst framework of institutional constraints, the present state of affairs in the area in many countries might still be improved.

Anyway, taking into account institutional constraints appears to be better than neglecting their presence in studying real systems. By reasons of division of work, academic research can arguably operate only in a definite leeway. Within such a space, one of its main contributions is, possibly, to avoid or mitigate confusions. From that point of view, clarifying the difference between theoretical relations and the very evaluation of empirical systems could be a step towards a valuable goal.

While isolating is needed to investigate theoretical relations, complexity rules in the realm of real systems. If the research in theoretical relations is an instrument to evaluate real systems, efforts to choose the best scale of analysis and rigorousness in attributing implications to the elements so discerned, appear as some of its cardinal virtues. Along those lines, some statements frequently taken as true would seem less than accurate. So, an increase in the number of insured automobiles or shorter delays in paying victims compensations do not necessarily follow from adopting a MTP insurance system. Quite on the contrary, those outcomes hinge on several conditions other and finer than the mere duty of insuring. In short, for the theoretical relations to be good tools in predicting empirical outcomes, they should be described as precisely as possible and according to the scale that best suits to the research purposes. Namely, in the field of traffic accidents, prior considerations led to employing finer distinctions than the mere duty of contracting insurance.

Although simplicity could be invoked as a justification either to leave some issues unexplained, or to argue on a rough scale, it is sometimes adopted by actual policymakers without the same kind of subtlety. Simplification might be explained as a procedure to save efforts, but it has no justification when it appears only as a result of carelessness or confusion. To accept it, as Chesterton's poem in the epigraph of this paper warns, would be, plainly, *to call a green leaf gray*, without any reason whatsoever.

On the other hand, sometimes empirical peculiarities of emerging societies are posed as foes of every theoretical analysis, because of the difference between the assumptions of some theoretical models and the real relevant elements of that kind of social systems. This way of reasoning implies that theory and models would only be possible if those particular features were neglected, which is clearly wrong. Perhaps the chief contribution of New Institutional Economics has

precisely been to extend the analyses to those (analytically) *new* types of variables, showing that theoretical relations can also be established between those new terms. That kind of approach probably leads to an awkward increasing in complexity but also to the best results.

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