CENTRE DE RECHERCHE
SUR LES STRATÉGIES ÉCONOMIQUES

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January 2013

Working paper No. 2013 – 01

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The impact of the number of courts on the demand for trials*

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January 17, 2013

Abstract

The recent reforms of the "judicial map" in Europe have drastically reduced the number of courts, raising fears of a decline in access to justice. This paper addresses this issue through a litigation model within a Salop (1979) model. We assume that victims of accidents differ both in terms of compensatory damages expected and in terms of distance from court. Due to distance costs, it might be too expensive to file cases for some victims with low expected awards. Therefore, the demand for trials is reduced by a decrease in the number of courts when the probability of an accident is exogenous. However, the link between the number of courts and the demand for trials is not clear cut when the probability of an accident occurring is determined by

*The authors would like to thank the participants in the Annual Meeting of the European Association of Law and Economics at Stockholm University, the participants in the Annual Meeting of the French Economic Association in Paris 2 University, Nuno Garoupa and Sebastien Rouillon for their insightful comments.

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the defendant through his level of care. Furthermore, we determine the optimal number of courts.

JEL classification: K41, H40

keywords: litigation, number of courts, distance costs, access to justice

1 Introduction

For decades, the geographical distribution of courts in Europe (*i.e.* the number and the location of courts) remained the same, following "traditions, cultures and historical reasons" (Chemla, Hess and Lindgren [2003]). However, due to public debt concerns and the rise in efficiency issues, the revision of the judicial map has become an issue for of several European countries.[1]

In France, the revision was initiated in 2007 and ended in December 2010 with the closure of 21 *Tribunaux de Grande Instance* and 178 *Tribunaux d'Instance*[2]. The total number of courts and tribunals was reduced from 1206 to 819. In the Netherlands, municipal courts were merged with district courts (Mak [2008]), and –at a later stage- the number of district courts has been reduced from 19 to 10, and the number of district for courts of appeal from 5 to 4.

Proponents of these reforms highlight the more efficient use of resources brought about by a reduction in the number of courts, due to judges' specialization and economies of scales. Among other things, the concentration of courts is viewed as enhancing specialization of judges. The belief is that specialization of courts would reduce delays. Furthermore, the aim of the reforms is to attain the optimum size, which would allow the aim of an efficient public management to be pursued (Ficet [2011]), or the "optimal scale of judicial decision-making" (Mak [2008]). In France for example, courts with less than 1500 civil cases addressed each year threshold have been closed. Also, the overall displacement times and the existence of economic activities areas have been considered. [3]

[1]Especially in countries with civil law tradition, such as Belgium, France, Germany, The Netherlands, Norway, Portugal, Sweden. See Gomes [2007], Ficet [2011]. Note that in Germany, the drawing of the judicial map is decided by each Land.

[2]In addition, *62 Conseils de prud'hommes* and 55 *Tribunaux de commerce* have been closed.

[3]The number of new civil cases per district court in France in 2008 varied from 507 (Millau) to 48166 (Paris). Source: French Ministry of Justice, Annuaire statistique de la Justice 2008. The statistics for 2011 year are not publicly available yet.

Critics have focused on the risk of diminishing access to justice.[4] More distance between victims and the court might negatively affect their decision to sue. According to Mak [2008], the former approach to judicial organization used to be based on the territorial standard. The prevailing standard nowadays in the functionality standard, based on efficiency. The territorial standard encompasses both the notion of the geographical location of courts and the issues of timeliness, accessibility, comprehensibility, and visibility towards society. Decreasing the number of courts might not only increase the distance costs, but might more generally affect the feeling of "proximity" of users to judicial services (Lhuillier *et al.* [2010]). Even if new ways of organizing the judicial system emerge (such as itinerant judges, or the development of new technologies of communication), the symbolic aspect of access to justice is undermined by the reduction of the distribution of courts.

Hence, the optimal number of courts has become a matter of growing concern in Europe. In this paper we address the issue of access to justice by analyzing changes in defendants' incentives to take care and in victims' incentives to sue caused by the change in the number of courts. This issue is particularly significant in the French legal system. Indeed, reform of the judicial map mainly concerned the "tribunaux d'instance" ("court of first instance of limited jurisdiction"). These courts handle most small claims (up to 10000 euros): debt, divorce, unpaid rent, neighbourhood conflict... The functioning of these courts requires the parties to appear in person before the judge and possibly several times. The assistance of a lawyer is never mandatory before the "tribunaux d'instance"[5]. For this reason the issue of access to justice appears to be highly relevant regarding claims before the "tribunaux d'instance". Since there is no lawyer and the parties are

[4]This view defines access to justice as the demand for trials. It is the definition of access to justice that we use in this paper, although it is a narrow view. Most disputes are resolved without resorting to formal legal institutions.

[5]The French judicial system is based on an inquisitorial system in which the parties and their lawyer (if they have one) are less present during the procedure than in adversarial systems.

compelled to move in person, distance to court matters for a person subject to legal proceedings before a "tribunal d'instance"[6]. The only statistical study available[7] indicates that distance to court has sometimes risen from 50 km to more than 100 km and that the reform has created "judicial deserts"[8]. The report also mentions the implementation by some cities of assistance devices to enable mobility for individuals in financial difficulty to go to court.

To our knowledge, little academic work has been done on this subject, specifically in the law and economics literature. This paper tries to fill this gap by proposing a theoretical analysis of two questions: Does the reduction of the number of courts lead to reduced access to justice? What are the determinants of the optimal number of courts?

To that end, a model of litigation is developed within a Salop [1979] model. The paper borrows elements from two areas of distinct literature: litigation and spatial competition. Our litigation model is a two-stage game: the occurrence of an accident (initially exogenous and subsequently endogenous) and the decision whether to sue. This framework incorporating tort liability and litigation is quite similar to that of Polinsky and Rubinfeld [1988], Gravelle [1990]. We combine this framework with models of spatial competition (Salop [1979]). Nevertheless, our approach is somewhat different since there is no competition between courts.[9] Victims go to the nearest court. Victims differ in terms of (geographical) location, that is, their dis-

[6]Waiting costs and lawyers fees are generally considered as having an impact on the decision whether to sue or not. Since counsel is not compulsory, we focus on the impact of distance costs particularly when the expected compensatory damages are low. Furthermore, the use of new technologies of communication, often seen as a solution to avoid the negative effects of closing courts, is not yet entirely satisfactory. Indeed, these new technologies often do not bring the level of service quality and efficiency gains expected. For further details, see Velicogna [2008] and Velicogna, Errera, Derlange [2011].

[7]Rapport du Sénat sur la réforme de la carte judiciaire, 662, juillet 2012

[8]The expression judicial deserts is used when over 100km an area is deprived of any legal jurisdiction. For example, in Corsica, Brittany and Auvergne

[9]We do not consider the possibility of forum shopping, since we assume that the judges award the same level of damages in any court for a given case. That is, location has no impact on the level of damages.

tance from court varies. We assume that there are two types of victims who differ in damages ("high" and "low").

This paper highlights three main results. First of all, if the probability of accident is exogenous, reducing the number of courts decreases the demand for trials. Secondly, if the probability of accident is endogenous (the probability of accident depends on the level of care chosen by the defendant), the impact of reducing the number of courts on the demand for trials is ambiguous. Reducing the number of courts might either enhance or diminish the demand for trials, depending on the transport cost per unit distance. Thirdly, the optimal number of courts depends on the level of damages, the filing fees, the distance costs and the court production costs.

This paper is organized as follows. Section 2 introduces the general framework of the following game: first of all, the policy maker chooses the number of courts, secondly an accident occurs and thirdly the victim decides whether to sue or not. Section 3 presents the results with an exogenous probability of accident. Section 4 considers the case in which the probability of an accident is endogenously determined. Section 5 concludes.

2 The general framework

Using Salop's model [1979], we consider a circular country of length 1[10]. M identical courts (indicated $j = 1, ..M$) are uniformly distributed around the circle: therefore the distance between courts is equal to $\frac{1}{M}$.

We have two main assumptions regarding the victims:

(i) Victims differ in their compensatory damages to be awarded if they file a suit.[11] More specifically, we assume there are two types of victims: l-type victims who have suffered a monetary equivalent loss of l and L-type victims who have suffered a larger loss L, with $L > l$. We further assume

[10] We assume that the courts and the plaintiffs are distributed around a circle to avoid boundary problems found in line models.

[11] We assume that a victim filing a case is completely compensated for the harm he or she has suffered, whatever the defendant's care (strict liability).

that the proportion of L-type victims is given by λ, with $0 \leqslant \lambda \leqslant 1$, and the proportion of l-type by $1 - \lambda$.

(ii) Victims differ in their distance x to the closest court. The victim transport cost per unit distance is denoted t_V. Hence, victims face distance costs $t_V x$ in addition to the usual litigation fees f. Distance costs do not need to be exclusively physical; they might more generally reflect the justice proximity, which goes with timeliness, accessibility, comprehensibility, and visibility of the judicial system. Both types of victims are uniformly distributed around the circle.

The utility of suing for a L-type victim is given by

$$U_V^L(x) = L - f - t_V x \tag{1}$$

Equivalently, the utility of a l-type victim is given by

$$U_V^l(x) = l - f - t_V x \tag{2}$$

where $l - f > 0$.

We concentrate on cases where the L-segment is always covered, while the l-segment is only partially covered.[12] That is, some l-type victims will not sue in equilibrium.

The M courts have identical cost functions. The total cost of a court[13] j is $\Gamma_j = z\pi D_j + Z$, where Z is a fixed cost, D_j the quantity of cases treated by the court j, π the probability of accident and z is marginal variable cost.

The timing of the game is the following.

1. The policy maker chooses the number of courts to minimize social costs of accidents.

[12] See Brekke *et al.* [2010] for a similar framework in the context of hospital competition. They assume that there are two types of patients who differ in expected benefits from hospital treatment. Hospitals compete on the segment of demand with high benefits, while they are local monopolists on the demand segment with low benefits.

[13] The cost function expressed here follows the general structure found in the spatial economics literature.

2. An accident occurs with probability π. Initially we assume π is exogenous, then we propose an extension in which π results from the defendant's decision to take care (see section 4).

3. The victim decides whether to sue or not. If the victim drops the case, then the game ends. If the victim decides to file a suit, trial occurs.

A L-type victim located at a distance x will sue if $U_V^L > 0$. Knowing that the country is of length 1, the maximum distance a victim has to travel is $\frac{1}{2}$, when there is only one court.

Assumption 1 *The expected compensatory damages L of the L-type victim are high enough so that the L victim always sues:*

$$L > \frac{t_V}{2} + f$$

Since the distance between courts is equal to $\frac{1}{M}$, the total demand for court j from the L-type victim is given by $D_j^L = \frac{1}{M}$. An increase in the number of courts decreases the demand from the L-type victim ($\frac{\partial D^L}{\partial M} = -\frac{1}{M^2}$). For the M courts, the global demand is given by $D^L = 1$.

A l-type victim located at a distance x will sue if $U_V^l > 0$. That is if

$$\frac{l - f}{t_V} > x \tag{3}$$

We note $\hat{x}$ the distance at which a l-type victim would be indifferent between filing a suit and dropping the case:

$$\hat{x} = \frac{l - f}{t_V} \tag{4}$$

The maximum distance a l-type victim may be from court is $\frac{1}{2M}$.[14] If the threshold distance is larger than the maximum distance, that is if $\hat{x} \geq \frac{1}{2M}$, all the victims go to trial.[15] If, however the threshold distance is shorter than

[14]Since we assumed that M courts are evenly distributed around a circle of circumference 1.

[15]This case is referred to as the competition case in the spatial competition literature. See Salop [1979]

the maximum distance, that is, $\hat{x} < \frac{1}{2M}$, then some victims, those who live farther away, will not go to court. They will find it more expensive to go to court than to suffer from non compensated harm.[16]

Assumption 2 *We consider cases in which some victims, those who live farther away, will not go to court $\hat{x} < \frac{1}{2M}$, which is the case if and only if $t_V > (l-f)2M$.In other words, the number of courts Mmust not be too large.*

We will later derive the conditions for this assumption to hold in equilibrium. It must be noted that even when the litigation fees f and unit distance cost t_V remain constant, the proportion of l-type victims filing suits increases as the number of courts increases, since the distance between any two providers is reduced. Accordingly, the l-type victim's demand for court services is a function of three variables: the fee charged, the costs of distance and the number of courts.

Total demand facing court j from the l-type victims is given by $D_j^l = 2\hat{x}$. The total demand for the M courts is given by $D^l = 2M\hat{x}$. Total demand facing court j from both segments is thus given by

$$D_j = \lambda D_j^L + (1-\lambda)D_j^l = \lambda\frac{1}{M} + (1-\lambda)2\hat{x} \tag{5}$$

where $\lambda \in [0,1]$ and $D_j \in [2\hat{x}, \frac{1}{M}]$. The total demand (all courts) from the victims is given by $D = \sum_{j=1}^{M} D_j \in [2M\hat{x}, 1]$, with

$$D = \lambda + (1-\lambda)2M\hat{x} \tag{6}$$

and

$$\frac{\partial D}{\partial M} = (1-\lambda)2\hat{x} > 0$$

The total demand from the victims increases with the number of courts.

3 Exogenous probability of accident

Here, we analyze the demand for trials and derive the optimal number of courts when the probability of accident is exogenous.

[16]This case is called the monopoly case in the spatial competition literature.

3.1 The demand for trials

There is a trial only if there is an accident, which occurs with the exogenous probability π and the victim of that accident files suit D, so that the demand for trials is $T(M) = \pi D(M)$. Differentiating Eq. (6) with respect to M yields

$$\frac{\partial T}{\partial M} = \pi(1-\lambda)2\hat{x} > 0 \tag{7}$$

Lemma 1 *When the probability of accident is exogenous, the demand for trials is reduced by a decrease in the number of courts, as the demand from the l-type victims decreases.*

The influence of the number of courts on the demand for trials goes through the demand of the low damages victims.

Note that only the total demand from the l-type victims depends on the number of courts, since an increase in the number of courts reduces the distance between two courts. Note that the total demand increases in the proportion of L-type victims λ.

The demand responsiveness to changes in the number of courts decreases with the distance cost as $\hat{x} = \frac{l-f}{t_V}$. Indeed, lower distance costs make it less costly for victims to sue. Lower filing fees have the same impact. Higher awards increase the demand responsiveness to changes in the number of courts. However, since the increased demand due to the increased number of courts is larger in the l-segment, a larger L-segment (i.e., an increase in λ) will reduce the demand responsiveness to changes in the number of courts.

3.2 The optimal number of courts

The policy maker chooses the number of courts which minimizes the social cost of accidents.

The defendants are assumed to be uniformly distributed around the circle; they differ in their distance y to the closest court. The defendant's transport cost per unit distance is denoted t_D and the defendant's litigation fees are denoted c. The social cost is given by (1) the litigation fees f and c respectively incurred by the victims who sue and by the defendant $D\pi(f+c)$, (2) the defendant's distance costs and the distance costs beared by the L-type victims and the l-type victims who sue, (3) the total cost of courts $z\pi D+ZM$ and (4) the loss suffered by the excluded victims $(1-D)$.

$$\begin{aligned}\min_M SC &= \pi D(f+c) && (8)\\ &+\pi D\int_0^{\frac{1}{2M}} yt_D dy \\ &+\pi 2M\left[\lambda\int_0^{\frac{1}{2M}} xt_V dx+(1-\lambda)\int_0^{\hat{x}} xt_V dx\right] \\ &+[\pi Dz+ZM]+\pi l[1-D] && (9)\end{aligned}$$

The total distance costs of the defendant is given by $\int_0^{\frac{1}{2M}} ydx$, that is $\frac{1}{8M^2}$. The total transport cost of the L-type victim is given by $\int_0^{\frac{1}{2M}} xdx$, that is $\frac{1}{8M^2}$. The maximum a l-type victim will have to travel to go to a court is $\hat{x}$. The average distance for the l-type victim who files a case is $\frac{\hat{x}^2}{2}$. Total distance costs are $t[\lambda\frac{1}{4M}+(1-\lambda)\hat{x}^2M]$. An increase in the number of courts M has two opposite effects on the distance costs : (1) lower distance costs for plaintiffs, and (2) increase in distance costs for l-types as more l-types go to court. We can easily show that they are increasing in the proportion of L-type victims if $\frac{1}{2M}>\hat{x}$ which is the case we consider.

The optimal number of courts is obtained by minimizing social costs with respect to number of courts, yielding the following first-order condition [17]

$$\frac{\partial SC}{\partial M}=\frac{\partial D}{\partial M}\pi(f+c+z-l)+\frac{\pi t_D}{4M^2}\left(\frac{\partial D}{\partial M}\frac{1}{2}-\frac{D}{M}\right)-\frac{\pi\lambda t_V}{4M^2}+\pi(1-\lambda)\hat{x}^2t_V+Z=0 \tag{10}$$

The first term, $\frac{\partial D}{\partial M}\pi(f+c+z-l)$, represents the marginal increases in net costs due to the induced marginal increase in demand: additional fees,

[17] The second-order condition is given by $\frac{\partial^2 SC}{\partial M^2}=-[\frac{-\pi\lambda t_D 12M^2}{16M^9}+\frac{-\pi 8M}{16M^4}]>0$.

$f+c$, additional marginal cost, z and additional compensatory damages l (more suits, hence less excluded victims). The second term, $\frac{\pi t_D}{4M^2}\left(\frac{\partial D}{\partial M}\frac{1}{2}-\frac{D}{M}\right)$, is negative and represents the decrease in defendant distance costs. More courts means more defendants sued but less distance costs. Defendants pay less more often. In our setting, the global impact is negative, an increase in the number of courts induces a decrease in the defendant distance costs. The third term, $\frac{\pi\lambda t_V}{4M^2}+\pi(1-\lambda)\hat{x}^2 t_V$, is the impact on the victims distance costs, L-type victims and l-type victims. An increase in the number of courts induces a decrease in the plaintiff distance costs. The last term, Z, represents the increase in the fixed cost due to an additional court.

In a nutshell, the number of courts is optimized at a level so that the benefit from a marginal increase in the number of courts (reduction of the number of excluded victims and reduction of the distance costs for the defendants and the victims) is equal to the corresponding marginal increase of total trial costs.

Proposition 1. *There exists a socially optimal number of courts M^*, defined by Eq.(10), which is strictly positive and involves a partially covered segment (l-type victims) if $f+c+z>l>f$ or if $f+c+z<l$ and $Z+\pi(1-\lambda)\hat{x}^2 t_V > (1-\lambda)2\hat{x}\pi(f+c+z-l)$.*

All proofs are given in the Appendix.

Several effects may be identified by using comparative statics (see Appendix).

First of all, there are direct and intuitive effects. An increase in the marginal cost z and the fixed cost Z of production have similar effects. They increase the direct costs without altering the demand. Therefore an increase in these parameters induces a decrease in the numbers of courts. On the contrary, an increase in the defendant distance costs induces an increase in the number of courts.

Secondly, there are indirect effects through a change in the marginal plaintiff, $\hat{x}$ (that is the number of suits). An increase in litigation fees (f) leads to a decrease in the demand from l-type victims (reducing the value of $\hat{x}$), hence to a decrease in the total litigation fees (less plaintiffs pay higher litigation fees) and to a decrease in distance costs (less plaintiffs). Finally, an increase in litigation fees leads to an increase in the number of excluded victims and the associated loss l. The global effect is thus ambiguous depending on which effect prevails.

An increase in victim's transport cost per unit distance (t_V) leads to a decrease in the demand from l-type victims (reducing the value of $\hat{x}$), that is to a decrease in litigation fees but to a increase in distance costs. In other words, victims pay more less often. The third effect is an increase in the number of excluded victims.

An increase in the level of loss/damages l leads to an increase in the demand from l-type victims (increases the value of $\hat{x}$) and consequently to an increase in litigation fees and distance costs. Furthermore, by altering the value of $\hat{x}$ these changes reduce the number of excluded victims. The global effect is thus ambiguous depending on which effect prevails.

4 Endogenous probability of accident

The analysis of the decision to sue or not is similar to the previous section.

4.1 The defendant chooses the level of care

Let us assume now that the defendant can reduce the probability of accident by increasing his/her level of care χ with $\pi'(\chi) < 0$ and $\pi''(\chi) \geqslant 0$.[18] The defendant chooses his/her level of care χ to minimize the sum of his/her care costs and his/her expected accident costs: $\chi + \pi(\chi)H$, where H is given by:

$$H = \lambda D^L (L + c + t_D \int_0^{\frac{1}{2M}} y f(y) dy) + (1 - \lambda) D^l (l + c + t_D \int_0^{\frac{1}{2M}} y f(y) dy) \quad (11)$$

[18] We assume that increasing the level of care has an impact on the probability of accident, but does not affect the level of damages.

with $D^L = 1$ and $D^l = 2M\hat{x}$.

The optimal level χ^* satisfies:

$$1 + \pi'(\chi^*)H^* = 0$$

As is well known from the literature (Shavell, 1984), at the first best level the marginal cost of care equals the marginal benefits. The optimal level of care is increasing in H.

$$\chi^* = g(M) \tag{12}$$

The defendant's care and the probability of accidents depend on the litigant's distance costs, and the litigation fees. In order to assess the effects of M on the incentive for care, we compute $\frac{\partial H}{\partial M}$.

$$\frac{\partial H}{\partial M} = (1-\lambda)\frac{\partial D^l}{\partial M}(l+c) - [\frac{\lambda}{M} + (1-\lambda)\hat{x}]\frac{t_D}{4M^2} \tag{13}$$

Proposition 2. *If t_D is sufficiently high ($t_D > \frac{(1-\lambda)(l+c)4M^2}{\lambda/M+(1-\lambda)\hat{x}}$), then decreasing the number of courts increases the defendant's expected cost of accident and his/her optimal level of care and thus decreases the probability of accident, $\frac{\partial H}{\partial M} < 0$. If, t_D is small ($t_D < \frac{(1-\lambda)(l+c)4M^2}{\lambda/M+(1-\lambda)\hat{x}}$), then decreasing the number of courts decreases the defendant's expected cost of accident, his/her optimal level of care and thus increases the probability of accident, $\frac{\partial H}{\partial M} > 0$.*

Two countervailing effects explains the sign of $\frac{\partial H}{\partial M}$:

On the one hand, decreasing the number of courts induces a decrease in the demand for trials from l-type victims that decreases the expected trial payment. On the other hand, decreasing the number of courts increases the defendant's distance costs. When the defendants' distance costs are high enough, the second effect (the distance cost effect) is larger than the first effect (the demand effect). The global impact is negative: $\frac{\partial H}{\partial M} < 0$. When the defendants' distance costs are low enough, the second effect (the distance cost effect) is smaller than the first effect (the demand effect). The global impact is positive: $\frac{\partial H}{\partial M} > 0$.

4.2 The demand for trials

There is a trial only if there is an accident, which occurs with the probability $\pi(\chi^*(M))$ and the victim filing suit D. The demand for trials is defined by: $T(M) = \pi(\chi^*(M))D(M)$

$$\frac{\partial T}{\partial M} = \pi(\chi(M))\frac{\partial D}{\partial M} + \frac{\partial \pi}{\partial \chi}\frac{\partial \chi}{\partial H}\frac{\partial H}{\partial M}D(M) \lesseqgtr 0 \tag{14}$$

since $\frac{\partial \pi}{\partial \chi} < 0$, $\frac{\partial \chi}{\partial H} > 0$, and $\frac{\partial D}{\partial M} > 0$, the sign of $\frac{\partial T}{\partial M}$ depends on the sign of $\frac{\partial H}{\partial M}$.

When the defendant's unit distance cost is high ($t_D > \frac{(1-\lambda)(l+c)4M^2}{\lambda/M+(1-\lambda)\hat{x}}$), decreasing the number of courts increases his/her expected accident cost H, as the distance cost effect is larger than the demand effect. The defendant is encouraged to increase his/her level of care, and therefore the probability of accident decreases. Furthermore, a smaller number of courts encourages victims to file fewer suits (since distance costs are greater). Thus, if the defendant's distance costs are high, both effects go in the direction of reducing the number of trials: $\frac{\partial T}{\partial M} < 0$.

When the defendant unit cost is low ($t_D < \frac{(1-\lambda)(l+c)4M^2}{\lambda/M+(1-\lambda)\hat{x}}$), reducing the number of courts decreases his/her expected accident cost H. The defendant is encouraged to decrease his/her level of care, and therefore the probability of accident goes up. Still, a smaller number of courts encourages victims to file fewer suits. Thus, if the defendant's distance costs are low, effects on the victim and on the defendant side go in opposite directions: less suits and less care (more accidents). The sign of $\frac{\partial T}{\partial M}$ is ambiguous. If the impact on the victim (number of suits) outweighs the impact on the defendant (number of accidents), then decreasing the number of courts will reduce the number of trials. Otherwise decreasing the number of courts will increase the number of trials.

Proposition 3. *When a defendant's costs are high, decreasing the number of courts reduces the number of trials. When a defendant's costs are low, decreasing the number of courts has an ambiguous impact on the number of* *trials.*

4.3 The optimal number of courts

The policy maker's objective is to minimize social costs, which can be written as:

$$\begin{aligned}
\min_M SC &= \chi^*(M) + T(c+f) + T\int_0^{\frac{1}{2M}} y t_D dy \\
&+ \pi(\chi^*(M))(2M)\left[\lambda \int_0^{\frac{1}{2M}} x t_V dx + (1-\lambda)\int_0^{\hat{x}} x t_V dx\right] \\
& +zT + ZM + (1-\lambda)\pi(\chi^*(M))l[1-D(M)] \qquad (15)
\end{aligned}$$

By comparison with (8), the defendant level of care cost is added and the demand πD is replaced by T. The optimal number of courts is obtained by minimizing social costs with respect to the number of courts, yielding the following first-order condition [19]

$$\begin{aligned}
& \frac{\partial \chi}{\partial H}\frac{\partial H}{\partial M} + \left[\frac{\partial T}{\partial M}\frac{t_D}{8M^2} - t_D T\frac{1}{4M^3}\right] + \frac{\partial T}{\partial M}(c+f+z) + Z \\
+ \; & \frac{\partial \pi}{\partial \chi}\frac{\partial \chi}{\partial H}\frac{\partial H}{\partial M} t_V[\lambda\frac{1}{4M} + (1-\lambda)[\hat{x}M(\hat{x} - l2) + l] \\
+ \; & \pi(\chi^*(M))[\lambda t\frac{-1}{4M^2} + (1-\lambda)t_V\hat{x}^2 - (1-\lambda)l2\hat{x}] = 0 \qquad (16)
\end{aligned}$$

The first term is either the decrease or the increase in the defendant care costs. The second and third terms are the impact on the defendant distance costs. The fourth term is either the decrease in trial costs (fees plus marginal cost) if a higher number of courts pushes the demand for trials down ($\frac{\partial T}{\partial M} < 0$) or the increase in trial fees if a higher number of courts pushes the demand for trial up ($\frac{\partial T}{\partial M} > 0$). The fifth term is simply the fixed cost from an additional court. The sixth term is the decrease in the distance costs of both victim

[19] The second-order condition is given by $\frac{\partial^2 SC}{\partial M^2} = \chi''(M) + \pi'' D(c+f) + \pi' D'(c+f) + t_D\pi'' D\frac{1}{8M^2} + t_D\pi' D(-\frac{1}{2M^3}) + t_D\pi D\frac{3}{4M^4} + t_D\pi D'(-\frac{1}{4M^3}) + \pi'' t_V[-\frac{\lambda}{4M^2} + (1-\lambda)\hat{x}^2] + \pi t_V[-\frac{\lambda}{2M^3}] + (1-\lambda)\pi'' l(1-D) + (1-\lambda)\pi l(-D') > 0$

segments due to the lower probability of accidents. The seventh term is the decrease in distance costs due to an additional court and the reduction in the number of excluded victims. The optimal number of courts is the number for which the marginal benefit is equal to the marginal cost.

When the probability of accidents is endogenous, the policy maker has to take into account the impact of the number of courts on the probability of accidents through the expected cost of trial via the change in the marginal l-type victim.

5 Concluding remarks

In Europe, the debates regarding the "judicial map" reforms focus on the consequences of reducing the number of courts. This paper shows that a decrease in the number of courts does not necessarily reduce the demand for trials, when the incentives of the defendant are taken into account.

At first sight, reducing the number of courts might reduce the volume of litigation. Some low damages plaintiffs might decide not to sue. Intuitively, the impact of a decrease in the number of courts is weaker when the proportion of large damages cases is higher, and when distance costs and fees are lower.

However, this assertion has to be mitigated when the defendant's incentives are taken into account. It is unclear whether decreasing the number of courts reduces or increases resort to trial. To clarify this point, it is necessary to underline a joint result: diminishing the number of courts might increase the probability of accident. This result depends on the level of the defendant's distance costs. If the country is characterized by a high distance cost due to geographical reasons (mountains) or a lack of public transport, a decrease in the number of courts will increase the defendant's distance costs significantly, and this effect might overcome the reduction of demand from victims.

Furthermore, we have shown that there exists a strictly positive socially optimal number of courts, which involves a partially covered segment (victims expecting small awards), if the level of damages is low enough. This number decreases with the defendant's distance to court, the trial fees, and the fixed and marginal cost of production.

Finally, our results call for careful implementation of such reforms, accompanied with case by case studies. First of all, policy makers have to consider the existence of victims expecting small damages who could be excluded from trial. Secondly, the negative impact on incentives to take care might *in fine* increase social costs, and in some cases, the judicial system organization cost, if the demand for trials increases. Thirdly, we have shown that a reduction in the number of courts has a different impact depending on the transport costs. The report of the Sénat mentions the appearance of judicial deserts. For example, these situations appears in Brittany, in Corsica and in Auvergne. As these regions are often associated with high transport costs (mountainous region, some rail transit and little transportation by road off season), this finding is consistent with our results. When transportation costs are high the impact of a reduction in the number of courts is clearly a reduction in access to justice. In contrast, when transport costs are low the impact of reducing the number of courts is more ambiguous.

As mentioned above, waiting costs and lawyers' fees could be considered since they both impact the behavior of the parties. These extensions have to be made in future works. Indeed the number of courts might have an impact on congestion, and therefore on waiting costs. Fewer courts means fewer claims from victims. The decrease in the demand of justice might in turn have an impact on the level of congestion. Introducing lawyers might be another interesting extension[20] and might better reflect the adversarial system. In particular fewer courts might have an impact on the decision of lawyers to accept or drop cases. Furthermore additional costs caused by distance might be passed on to clients by higher lawyers' fees.

[20] We are indebted to Nuno Garoupa for this suggestion

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6 Appendix

Proof of Proposition 1. The first order condition can be written:

$$\frac{\partial SC}{\partial M} = -\frac{\lambda\pi t_D}{4M^3} - \frac{\pi}{4M^2}\left[t_D(1-\lambda)\hat{x} + \lambda t_V\right] + \pi(f+c+z-l)(1-\lambda)\hat{x}^2 t_V + Z + \pi(1-\lambda)\hat{x}^2 t_V = 0 \tag{17}$$

that is

$$\frac{\partial SC}{\partial M} = A\frac{1}{M^3} + B\frac{1}{M^2} + C = 0 \tag{18}$$

with $C = (1-\lambda)2\hat{x}\pi(f+c+z-l) + \pi(1-\lambda)\hat{x}^2 t_V + Z$; $A = -\frac{\pi t_D \lambda}{4}$ and $B = -\frac{\pi}{4}\left((1-\lambda)\hat{x}t_D + \lambda t_V\right)$ An interior solution exists with a positive number if $C > 0$, that is if $f+c+z > l > f$ or if $f+c+z < l$ and $Z + \pi(1-\lambda)\hat{x}^2 t_V > (1-\lambda)2\hat{x}\pi(f+c+z-l)$.

Proof of Proposition 2.

Comparative statics

We have

$$\frac{\partial^2 SC}{\partial M^2} = -\left[\frac{-\pi\lambda t_D 12M^2}{16M^9} - \frac{-\pi 8M}{16M^4}\right] > 0 \tag{19}$$

Comparative static on z

$$\frac{dM^*}{dz} = -\frac{\frac{\partial^2 SC}{\partial M \partial z}}{\frac{\partial^2 SC}{\partial M^2}} \tag{20}$$

With

$$\frac{\partial^2 SC}{\partial M \partial z} = \pi(1-\lambda)2\hat{x} > 0 \tag{21}$$

Since $\frac{\partial^2 SC}{\partial M^2} > 0$

$$\frac{dM^*}{dz} < 0 \tag{22}$$

Comparative static on Z

$$\frac{dM^*}{dZ} = -\frac{\frac{\partial^2 SC}{\partial M \partial Z}}{\frac{\partial^2 SC}{\partial M^2}} \tag{23}$$

With

$$\frac{\partial SC}{\partial M \partial Z} = 1 \tag{24}$$

Hence

$$\frac{dM^*}{dZ} < 0 \tag{25}$$

Comparative static on λ

$$\frac{\partial M^*}{\partial \lambda} = -\frac{\frac{\partial^2 SC}{\partial M \partial \lambda}}{\frac{\partial^2 SC}{\partial M^2}} \tag{26}$$

With

$$\frac{\partial^2 SC}{\partial M \partial \lambda} = \frac{\pi t_D}{4M^2}\left(\hat{x} - \frac{1}{M}\right) - \frac{\pi t_V}{4M^2} - \hat{x}^2 \pi t_R - \pi 2\hat{x}\left(f + c + z - l\right) \langle 0 \tag{27}$$

Hence

$$\frac{dM^*}{d\lambda} > 0 \tag{28}$$

Comparative static on π

$$\frac{dM^*}{d\pi} = \frac{\frac{\partial^2 SC}{\partial M \partial \pi}}{\frac{\partial^2 SC}{\partial M^2}} \tag{29}$$

With

$$\frac{\partial^2 SC}{\partial M \partial \pi} = -\frac{\lambda t_D}{4M^3} - \frac{1}{4M^2}[(1-\lambda)\hat{x}t_D + \lambda t_V] + (1-\lambda)2\hat{x}\left(f + c + z - l\right) + (1-\lambda)\hat{x}^2 t_V \lesseqgtr 0 \tag{30}$$

Hence

$$\frac{dM^*}{d\pi} \lesseqgtr 0 \tag{31}$$

Comparative static on t_D

$$\frac{dM^*}{dt_D} = -\frac{\frac{\partial^2 SC}{\partial M \partial t_D}}{\frac{\partial^2 SC}{\partial M^2}} \tag{32}$$

With

$$\frac{\partial^2 SC}{\partial M \partial t_D} = -\frac{\pi}{4M^2}[(1-\lambda)\,\hat{x} + \frac{\lambda}{M}] < 0 \tag{33}$$

Hence

$$\frac{dM^*}{dt_D} > 0 \tag{34}$$

Comparative static on t_V

$$\frac{dM^*}{dt_V} = -\frac{\frac{\partial^2 SC}{\partial M \partial t_V}}{\frac{\partial^2 SC}{\partial M^2}} \tag{35}$$

With

$$\frac{\partial^2 SC}{\partial M \partial t_V} = -\frac{\pi}{4M^2}(1-\lambda)\frac{\partial \hat{x}}{\partial t_V}t_D - \frac{\pi}{4M^2}\lambda + \pi(1-\lambda)2\frac{\partial \hat{x}}{\partial t_V}\,(f+c+z-l) + \pi(1-\lambda)\hat{x}^2 + \pi(1-\lambda)\frac{\partial \hat{x}}{t_V}t_V\hat{x} \lesseqgtr \tag{36}$$

Hence

$$\frac{dM^*}{dt_V} \lesseqgtr 0 \tag{37}$$

Comparative static on f

$$\frac{dM^*}{df} = -\frac{\frac{\partial^2 SC}{\partial M \partial f}}{\frac{\partial^2 SC}{\partial M^2}} \tag{38}$$

With

$$\frac{\partial^2 SC}{\partial M \partial f} = -\frac{\pi}{4M^2}(1-\lambda)\frac{\partial \hat{x}}{\partial f}t_D + \pi(1-\lambda)2\hat{x} + \pi(1-\lambda)2\frac{\partial \hat{x}}{\partial f}\,(f+c+z-l) + \pi(1-\lambda)2\frac{\partial \hat{x}}{\partial f}\hat{x}t_V \lesseqgtr 0 \tag{39}$$

Hence

$$\frac{dM^*}{df} \lesseqgtr 0 \tag{40}$$

Comparative static on l

$$\frac{dM^*}{dl} = -\frac{\frac{\partial^2 SC}{\partial M \partial l}}{\frac{\partial^2 SC}{\partial M^2}} \tag{41}$$

With

$$\frac{\partial^2 SC}{\partial M \partial l} = -\pi(1-\lambda)2\hat{x} + \pi(1-\lambda)2\frac{\partial \hat{x}}{\partial l}(f+c+z-l) + \pi(1-\lambda)2\frac{\partial \hat{x}}{\partial l}\hat{x}t_V - \frac{\pi}{4M^2}(1-\lambda)\frac{\partial \hat{x}}{\partial l}t_D \lesseqgtr 0 \tag{42}$$

Hence

$$\frac{dM^*}{dl} \lesseqgtr 0 \tag{43}$$