The Market for Lawyers: the Value of Information on the Quality of Legal Services.*

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2 November 2007

Abstract

We study the value of information on the quality of legal services by analyzing the incentives of litigants to hire high-quality lawyers, the incentives of lawyers to invest in quality-enhancing activities and the effect of legal representation on the decision-making behaviour of adjudicators.

In a setting where adjudicators have reputational concerns, we show that better information over the quality of legal representation generates a trade-off. On the one hand, it allows for a better match between the value of a legal dispute and the quality of the legal representation. This also has the effect of increasing the incentives of lawyers to invest in quality-enhancing training. On the other hand, better information over the quality of legal representation may induce adjudicators to bias their decisions in favour of the litigant with the highest-quality lawyer and this generates allocative inefficiency. We discuss the implications of these effects on the desirability of quality certification system (such as the Queen's Counselor system) in the market for the legal professions.

*For helpful comments we wish to thank Julian Greenhill, Paul Grout, Ian Jewitt , Neil Rickman, and seminars participants at Brunel University, Birkbeck College, University of Essex and at the CMPO Workshop on the Economics of Legal Services and Justice (Bristol).

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1 Introduction

Efficient legal systems are key for the legal enforcement of contractual relationships and thus for the development of market transactions. This paper analyzes the functioning of the market for lawyers, focusing on how information over the quality of legal services impacts on the efficiency of the legal system.

Legal services are credence goods. Due to the sheer complexity of the law, litigants in a dispute are generally unable to gauge the quality of the legal service they receive even if they can observe the legal strategy undertaken by their legal counsels. Gauging the quality of legal services requires knowledge of principles of law and educated reasoning, for which specific training is necessary.

Information over the quality of legal services can however be affected by legal market regulation. For example, restrictions on entry conditions in the legal profession, in the form of minimum qualifications and experience, can contribute to ensure that a minimum quality standard prevails in the market. Quality considerations are in fact at the heart of the justification provided by legal associations and regulatory bodies for restricting access to the profession (see OFT, 2001).[1]

Also, distinctive layers of quality may exist within the legal profession. In England and Wales, for example, the lawyers who appear in court to argue a case before an adjudicator or tribunal are divided into juniors and Queen's Counsels (QCs). Appointment as QC is a mark of quality and brings a number of formal privileges.[2] In court, QCs wear a distinctive uniform: a short wig, wing collar and bands and silk gown over a special court coat. Furthermore, QCs tend to focus on more complex cases and usually benefit from an increased fee rate per case. Schemes equivalent to the QC system exists e.g. also in Scotland, Northern Ireland, Canada, New Zealand and South Australia.

[1] Shaked and Sutton (1981) explicitly analyze the rationale for self-regulation and on whether the profession should, or should not, be allowed to retain monopolistic powers for quality purposes. They show that self-regulating profession that maximizes either the relative or the absolute incomes of its members will choose a size which is socially sub-optimal.

[2] Currently, following consultation with the judiciary and the profession, the Lord Chancellor recommends for appointment those practitioners whom have marked themselves out as leaders of the profession. QCs are then appointed annually by the Queen.

In other countries the legal profession has no mark of distinction or quality comparable to the QC mark, yet quality layers can still be identifiable. As described for example by Rosen (1992) for the US, one can often distinguish between two categories of lawyers. The first category comprises lawyers who graduated from elite institutions, who are well-connected and influential in the profession. These lawyers tend to serve business clients, charge high fees and earn high incomes. The second category serves more individual clients and comprises lawyers who graduated from lower-tier schools, charge lower fees and provide largely routine, non-contested legal services. Depending on the category, lawyers are then employed in different law companies, with most reputable companies employing the most talented and well trained lawyers.

In this paper we study the value of public information on the quality of legal services and thus the desirability of regulation that provides for quality certification. We consider the interaction between three groups of agents: the litigants, their lawyers and the adjudicator in charge of resolving the dispute.

A lawyer's quality is a multidimensional concept that encompasses knowledge of the principles of law and their interpretation, quality to identify aspects of the law useful to make the case in court and advocacy skills. In any systems of law committed to precedent, such as the common law system, the art of legal reasoning is also the art of drawing out distinctions and similarities between cases; in adversarial systems it is also the art of fact finding and evidence gathering. We focus on the quality dimension that is related to the ability to identify the underlying 'state of the world' (i.e., the 'correct decision', which can also be viewed as the decision that an appeals court would take). We abstract from other quality dimensions in order to highlight the role played by knowledge of the underlying state. Thus a high-quality lawyer in our model is neither a better advocate nor is he able to substantiate his knowledge with production of verifiable evidence. If quality matters, this is only because of the way information about the quality of legal representation affects the interaction between the parties in a dispute, the litigants, the lawyers and the adjudicators.

We consider how public information affects the interaction between all the parties in a dispute. We focus on the incentives of litigants to hire high-quality lawyers, on the incentives of lawyers to invest in training so as to increase their quality and on how the decision making behaviour of adjudicators is affected by the quality of lawyers in courts.

An important element in our analysis is that adjudicators have reputational concerns and wish to appear able to identify the correct decision. When making their decisions, careerist adjudicators take into account how their decision affects the behaviour of the parties to seek an appeal and how the appeal outcome in turn affects the inference on their ability. Contrary to standard settings in the career concerns literature, in the judicial system it may never be found out whether an adjudicator's decision is correct or not. However, when the information held by the parties is reflected in their appeals strategy and when higher courts are more competent than lower courts, in expectations, appellate reviews are likely to be informative as to the competence of lower court adjudicators (see for example Shavell, 2004, for an in depth discussion of the role of appeals as monitoring mechanism of adjudicators).

The idea that adjudicators may have reputational concerns is now well received in the law and economics literature (see related literature below). Adjudicators may care about how others perceive their quality either because of a general concern for prestige or influence or because their reputation can directly influence their career and future income. Empirical evidence indeed shows that the perceived quality of judges plays an important role in their promotion to higher courts (see Levy 2005 and references therein). Also, reputable judges often take prestigious and well paid positions upon retirement from the judicials. It is not unusual for example for retired judges to become arbitrators in commercial disputes or international transactions.

To study the value of public information over lawyers' quality, we build a stylized model where a lawyer's quality is constituted by the precision of his signal about the state of the world. Signals are soft information and cannot be credibly transmitted. Lawyers can choose to invest in trainings activities that increase their quality. Successful training results in the reception of a quality mark or certification (as QC for example), that is publicly observable. More able lawyers are more likely to succeed in training. Parties to a dispute then choose whether to hire a certified or an uncertified lawyer. A dispute is resolved through an initial stage where a lower-court adjudicator makes an initial decision, and, if the losing litigant appeals, an appeals stage where the appeals court makes a final decision. We focus on the reputational concerns and the behaviour of the lower court; the appeals court is assumed to comprise only competent adjudicators who take the correct decision.

In this setting, we show that better information over the quality of legal representation generates four effects. First there is a *matching effect*: better information allows for a better match between the value of a legal dispute and the quality of the legal representation. Low-quality lawyers will be hired by litigants with low-value cases and will be paid a basic wage. Higher quality lawyers instead will be hired by litigants with high-value cases and be paid higher salaries. In equilibrium high-valued disputes will receive higher quality representation and obtain better legal outcomes, in the sense that the correct decision will be reached more often.

A second effect is the *investment effect.* As lawyers anticipate that quality certification brings higher income, they will have incentives to make investments that enhance their legal abilities. Note that since investment (or equivalently certification) is costly, only the most capable lawyers will obtain certification and enjoy indeed higher equilibrium salaries.

The gain for the litigants from hiring a certified lawyer stems from two more effects: the *appeals effect* and the *decision bias effect.* The former arises because a certified lawyer brings the benefit of more efficient appeals: he discovers and appeals incorrect decisions more often than an uncertified lawyer. This in turn leads to a greater probability of the correct decision being taken.

The *decision bias effect* instead highlights a potentially inefficient consequence of public information over the quality of legal services. This effect is related to the possibility that information induces less competent adjudicators to bias their decisions in favour of the litigant with the highest-quality lawyer. It is a consequence of the reputational concerns of adjudicators. It arises because high-quality lawyers hold more precise signals over the state of the world than lower-quality lawyers and this better information translates into a more informed appeals strategy. This in turn improves the inference that can be made over the competency of lower-court adjudicators from the decision of litigants to appeal an unfavourable decision. Less competent adjudicators have therefore more to fear from high-ability lawyers. This bias may be the source of excessive fees for lawyers and it induces a misallocation of lawyers among cases.

This decision bias effect rationalizes the perception described by respondents to a consultation paper issued by the Department of Constitutional Affair (DCA) in the UK investigating the desirability of QC systems or in general of marks of quality. As reported by the DCA (DCA, 2003, p.23)

> "There was a perception that QCs were now instructed in circumstances where their particular skills where not really needed: for example because it might be thought that judges would pay more attention to a QC's argument, or because a simple equality of arms was needed -just because the other side had already instructed a QC"

The bias effect thus rationalizes the incentives to "pay more attention" to a QC's argument as one of reputational concerns and suggests that it will be less competent adjudicators who are more likely to favour litigants with a QC.

An implication of our results is that knowledge of lawyers quality is not necessarily welfare improving. When all the effects are put together we find that better information over the quality of legal representation has ambiguous effects on welfare. Due to the potential advantage that the appointment of a high-quality lawyer generates through the bias effect, a market equilibrium may be reached where there is over-demand of quality. Litigants can end up spending excessive resources on legal representation exacerbating the prisoner's dilemma problem of any legal process.[3] Furthermore, at

[3] The presence of a prisoner's dilemma in litigation has been first pointed out by Ashenfelter and Bloom (1993).

the market equilibrium there is misallocation of lawyers: cases inefficiently arise where litigants' behaviour is asymmetric, with one litigant hiring a certified lawyer and the other one hiring an uncertified lawyer. An increase in the quality of certified lawyers then increases the likelihood that the correct decision is taken but it generates the negative effect of raising the misallocation of lawyers.

The paper is organized as follows. In Section 2 we review the related literature. Section 3 presents the basic model; section 4 and 5 discuss the decision-making behaviour of the adjudicator and the outcome of the decision process. Section 6 considers the incentives of the parties in the dispute to hire a certified lawyer and the equilibrium in the market for lawyers. The private and social value of certification is then analyzed in section 7. Section 8 discusses some extensions whilst section 9 concludes. All proofs missing from the text are in the Appendix.

2 Related literature

The legal literature has long debated the impact of lawyers' capabilities in adjudication (see for example Galenter, 1974). Consensus and evidence has been gathered on how legal representation makes for a significant difference both in likelihood of recovery and in amount recovered (e.g. Ross, 1970). A number of empirical papers have then analyzed the dynamics of the market for lawyers and quantified the rewards from training and specialization (see for example Sauer 1998, Rosen, 1992, and Pashigian, 1977).

The theoretical literature on the value and quality of legal representation however remains slim (see Cooter and Rubinfeld, 1989, Spier, 2005 and Shavell, 2006 for a general discussion on the economics of litigation). Lawyers can affect the probability of winning through their (trial) effort (see Hirshleifer and Osborne, 2001) or through their information gathering (see Dewatripont and Tirole, 1999). They may then efficiently inform the court (see e.g. Bundy and Elhauge, 1993 and more recently Che and Severinov, 2006), or mislead it (see Kaplow and Shavell, 1989). We are not aware of any study that looks at how knowledge over the quality of legal representation affects the functioning of the market for lawyers. To the extent of our knowledge, our paper is also the first paper to derive the value of quality of legal representation endogeneously, from the interaction between career concerns of adjudicators and a lawyer knowledge of the underlying state.[4]

Our paper is also related to literature on careerist decision makers, such as regulators, managers or experts who try to prove their ability to make the correct decision. For example, in Levy (2005) careerist adjudicators contradict precedents too often in order to signal their ability, whilst in Iossa (2007) arbitrators with career concerns bias their decision in favour of long-term players. Career concerns may also induce less able bureaucrats to use soft policies so as to keep interests groups quiet and mistakes out of public eyes, (Leaver, 2004). See also Bourjade and Jullien (2005), and Ottaviani and Soerensen (2006) for recent studies on bias in experts' advice.[5]

3 The model

The general setting

We consider a setting where lawyers make an initial investment to increase their ability to understand legal issues. The most able lawyers can then acquire a costly qualification to certify that their quality is above a certain threshold. When there is a dispute, litigants choose whether to hire a certified lawyer or not. A dispute is resolved through an initial stage where a lower-court adjudicator makes an initial decision, and, if the losing litigant appeals, an appeals stage where the appeals court makes a final decision.

For simplicity, we treat the occurrence of a dispute as an exogenous event and we

[4]There is of course an extensive literature on the role of information and certification for consumption goods and services. References include, among others, Shapiro (1986), Biglaiser (1993) and Lizzeri (1999). These papers focus on incentives and asymmetric information issues. We abstract from these issues and focus on the interaction between the parties on a case and the behaviour of the adjudicator.

[5]The paper is in general related to the carrier concerns literature, although in most of this literature, and contrary to our approach, the quality of the decision is verifiable ex post.

model a dispute as disagreement between two parties, $P1$ and $P2$ over the realization of a state of the world θ. There are two states, 1 and 2, and it is common knowledge that $\Pr(\theta = 1) = 1/2$. We denote by d the decision of the lower-court adjudicator and by D the one of the appeals court. We assume that there are only two possible decisions, $d, D \in \{1, 2\}$. A decision $d = 1$ (or equivalently $D = 1$) favours $P1$ and it is the most appropriate in state $\theta = 1$, whilst a decision $d = 2$ favours $P2$ and it is the most appropriate in state $\theta = 2$. We refer to $d = \theta$ as the correct decision and we interpret the correct decision as the decision that the appeals court would choose. Thus we assume that following an appeal, the appeals court always chooses $D = \theta$. We assume that θ is independent across disputes.

The lawyers

There is a large mass of lawyers who may work for litigants on a dispute or on some alternative activities leading to an expected utility normalized to zero. Lawyers may be of two types "certified" or not. Certified lawyers have quality r, whilst uncertified lawyers have quality equal to zero.[6] We denote by S the mass of certified lawyers. On average in a dispute a certified lawyer observes a perfectly informative and unverifiable signal of the state of the world θ with probability r. With probability $(1 - r)$ he observes nothing.

We denote by w_0 the salary of an uncertified lawyer and by w the salary of a certified lawyer. w_0 is exogenously given by the productivity on the outside option. For simplicity we set $w_0 = 0$.

Remark 1 *Notice that given our interpretation of θ as the would-be decision of the appeals court, the concept of competent lawyer refers to the ability to predict accurately the behavior of the appeals court.*

This market configuration stems from a training stage where lawyers choose whether to train in order to raise their individual quality and from a test certifying that quality

[6] The analysis would be similar for a positive expected quality of uncertified lawyers, provided that this is smaller than the one of certified lawyers.

is above a threshold r. Untrained lawyers have quality $\rho = 0$. Raising quality from zero to some positive level $\rho \in (0, 1]$ is costly. The cost of training for a lawyer is given by c, a random variable with a smooth distribution. We denote by $S(c; \rho)$ the mass of lawyers with cost of training to level ρ smaller than c. We assume that the distribution of c has full support on the real line and that it is increasing in ρ according to first order stochastic dominance.

Lawyers maximize their expected salary net of training cost. In our setup this implies that a lawyer will either train to raise his quality to $\rho = r$ and be certified or he will not train at all in which case his quality will be zero.

The adjudicator and the appeals court

There are two types of lower-court adjudicators: the competent (C) and the incompetent (I). Type C privately observes the state of the world θ with probability 1, type I observes nothing. Types are private information and we let γ denote the proportion of competent adjudicators. The model can be generalized to continuous types.

The adjudicator has reputational concerns in the sense that he wishes to appear competent to an evaluator E, his payoff being equal to the posterior belief held by E about the competency of the adjudicator. The assumption that the the appeals court chooses $D = \theta$ allows us to focus our attention on the lower-court adjudicator (hereafter simply referred to as the 'adjudicator') and the interplay between adjudicators' competency and lawyers.

The litigants

The litigants in the dispute (also referred to as 'parties'), $P1$ and $P2$, value a favourable decision at $V(1 + \delta)$ if it is correct, V if it is incorrect, and an unfavourable decision at zero; the value V varies across disputes and has a distribution with continuous positive density on the real line.[7] The litigants sequentially choose whether to

[7]The parameter δ can capture for example the sense of justice of the parties or (in a reduced form) the value for contractual parties of better enforcement of contractual terms (see Anderlini, Felli and Postelwaite, 2007) for a discussion of the role of court decisions on ex ante incentives). Ex ante (i.e. before a dispute arises) better enforcement can help to ensure better incentives for relationship-specific investments and thus increases the surplus from the contractual relationship.

hire a certified lawyer at salary w or a uncertified lawyer at salary w_0.[8] In order to focus on the value of information on the quality of the legal representation, we assume away agency problems between lawyers and their clients and assume throughout that the hired lawyer acts in the best interest of his client and this is public information.

Remark 2 *An alternative interpretation of the model is a situation of self-litigation versus professional litigation. In this interpretation certification is the minimal quality requirement to be a member of the legal profession. Then agents choose to be represented by a lawyer or not (self-litigation).*

Upon observing the adjudicator's decision d, the party who loses the dispute can choose to appeal the decision. This party then incurs costs AV for the appeal, where A is a random variable that is realized after a decision d is made and before an appeal is demanded. For simplicity we assume that A can take two values, $A = 0$ or $A = \bar{A}$ with respective probabilities q and $1 - q$.[9] Moreover we assume that $1 + \delta > \bar{A} > \frac{1-\gamma}{2-\gamma}(1 + \delta)$, which is sufficient to ensure that faced with a high appeals cost $\bar{A}$, an uninformed party never appeals, and an informed party appeals only if the decision is not correct.

We also assume that the private value of the correct decision is not too large, namely $\delta < \bar{A}$. We relax this assumption in section 8. To simplify the exposition, we also rule out the possibility that the certified lawyer appeals an unfavorable decision when appeals cost is low, $A = 0$, and he is informed that the decision is correct.

The evaluator

An evaluator (E) observes the decisions d and D, whether the lawyers of the parties in the dispute are certified or not and whether they appeal. Using this information, the evaluator E updates his beliefs about the competency of the adjudicator rationally.

Timing

[8] This is innocuous and avoids mirror equilibria. Further, in practice the game is indeed sequential with the plaintiff initiating the case.

[9] The extension to a general distribution does not add much to the main argument.

· Each lawyer decides whether to spend c to increase his quality and request certification.

· Disputes arise and states of the world θ are realized. The litigants sequentially choose whether to hire a certified lawyer at salary w or a uncertified lawyer at salary w_0. $P1$ chooses first, then $P2$ chooses.

· A lawyer with quality ρ observes a perfectly informative signal with probability ρ and nothing otherwise. The lower-court adjudicator observes θ if he is type C and nothing otherwise. Then the adjudicator makes decision d.

· Appeals cost A are privately realized. Observing d and A the losing party decides whether to appeal. In the event of an appeal, the appeals court observes θ and chooses $D = \theta$.

· The evaluator forms her beliefs based on d, whether an appeal occurs or not, and the outcome of the appeal.

Equilibrium Concept

We use the concept of Sequential Equilibrium to solve the model. Beliefs are derived from players' equilibrium strategies and the strategies are rational given those beliefs.

4 The judicial game

In this section we study the behaviour of the adjudicator, given the choice of the parties as to whether to hire a certified lawyer and given the choice of lawyers as to whether to train and obtain certification. To this purpose we consider a dispute where party $P1$ hires a lawyer with quality r_1, and the other party, $P2$, hires a lawyer with quality r_2. In the game of course r_i $(i = 1, 2)$ will take value r or 0, depending on whether the lawyer is certified or not.

In this setting, consider the following strategies for the adjudicator: C chooses $d = \theta$, whilst I randomizes between $d = 1$ and $d = 2$, choosing $d = i$ with probability z_i. We now show when these strategies constitute an equilibrium. To simplify notation, let $\pi(d, D)$ denote the posterior belief of E following a decision d of the adjudicator, an appeal and a decision D of the appeals court. When there is no appeal, instead, let $\pi(d, 0)$ denote the posterior belief of E following a decision d.

Notice first that following an appeal, if reversal occurs, $E's$ posterior belief is $\pi(1,2) = \pi(2,1) = 0$, since under our candidate equilibrium only type I in equilibrium takes incorrect decisions.

- **Behavior of** I

Consider now the behavior of an adjudicator of type I. Since I is uninformed and he wishes to appear competent, he will attempt to minimize the chance of his decision being reversed in appeal, taking into account the incentives of the litigants to appeal. The appeals strategies of the two lawyers thus play an important role in determining the incentives of I.

Consider the expected payoff of I when he chooses $d = i$. With probability r_j the lawyer of Pj is informed and if he observes $\theta = j$, he successfully appeals the unfavourable decision $d = i$ for all realizations of A. If instead the lawyer observes an unfavourable state $\theta = i$, he does not appeal. With complementary probability, $1 - r_j$, the lawyer of Pj is uninformed. In this case, he appeals the unfavourable decision only if the appeals cost is low, which occurs with probability q.

In light of these appeals strategies, consider $E's$ posterior beliefs for each possible outcome. Following a confirmation of the decision $d = i$ in appeal, $E's$ belief is given by

$$\pi(i,i) = \Pr(C \mid d = i, \theta = i) = \frac{\gamma}{\gamma + (1-\gamma)z_i}$$

since conditional on $\theta = i$, a correct decision $d = i$ is taken by C with probability 1 and by I with probability z_i.

Suppose that $z_i < 1$. Following no appeal when $d = i$, E can infer that either the lawyer of the losing party is informed that the decision is correct or that appeals costs A is high and the lawyer is uninformed. In particular, conditional on A being low, $E's$ belief is the same as when there is a confirmation in appeal, $\pi(i,i)$, as only an informed lawyer who observes $d=\theta$ does not appeal. Conditional on A being high, E does not know whether the lack of an appeal is due to appeals cost being high and the lawyer being uninformed or instead it is due to the lawyer being informed and having observed $d=\theta$. The posterior belief of E in this latter case is given by

$$\Pr\left(C \mid d=i, D=0, A=\bar{A}\right)=\frac{\gamma}{\gamma+(1-\gamma)\, z_i\,(2-r_j)}$$

and we note that the higher the probability r_j that the lawyer of $P1$ is informed the more no appeal signals competency.

Overall we see that when there is no appeal, the posterior is

$$\pi(i,0)=\frac{q\frac{1}{2}r_j\pi(i,i)+(1-q)\left(1-r_j+\frac{1}{2}r_j\right)\Pr\left(C \mid d=i, D=0, A=\bar{A}\right)}{\frac{1}{2}r_j+(1-r_j)(1-q)}$$

and the expected payoff of I when he chooses $d=i$ is given by

$$\begin{aligned} v(d &= i)=\frac{1}{2}q(1-r_j)\pi(i,i)+\left(\frac{1}{2}r_j+(1-r_j)(1-q)\right)\pi(i,0) \\ &= \frac{1}{2}q\pi(i,i)+(1-q)\frac{1}{2}\frac{\gamma(2-r_j)}{\gamma+(1-\gamma)\,z_i\,(2-r_j)} \end{aligned}$$

Let us now consider the case where $z_i=1$. In this case a decision $d=j$ reveals that the adjudicator is competent so that $\pi(j,0)=1$. In this case Pi is indifferent between appealing or not if the appeals cost is $A=0$, and can appeal $d=j$ with some probability if not informed that the decision is correct.

- **Behaviour of C.**

Consider the expected payoff of C when he observes $\theta=i$ and takes the correct decision $d=i$. With probability $(1-r_j)$ the lawyer of losing party Pj is uninformed and appeals when the appeals cost is low. The adjudicator's decision is then confirmed in appeal. In all other cases there is no appeal. It follows that C obtains

$$v(d=i|\,\theta=i)=q(1-r_j)\pi(i,i)+(1-q(1-r_j))\pi(i,0)$$

If instead C takes the incorrect decision $d = j$, then with probability r_i the lawyer of Pi is informed and always appeals the decision taken by C. With probability $1 - r_i$ the lawyer of Pi is uninformed and appeals the decision only when appeals cost is low. Thus, by taking the incorrect decision, C obtains

$$v\left(d = j \middle| \theta = i\right) = (1 - q)\,(1 - r_i)\,\pi(j, 0)$$

5 The equilibrium strategies

5.1 Asymmetric case

In this section we consider the case where one party, say $P1$, hires a certified lawyers whist the other party, $P2$, hires an uncertified lawyer. We then have: $r_1 = r$ and $r_2 = 0$, and in light of the analysis in the previous section we obtain the following proposition.

Proposition 1 *When party $P1$ hires a certified lawyer and $P2$ does not, (i) in equilibrium the competent adjudicator chooses $d = \theta$, whilst the incompetent adjudicator chooses $d = 1$ with probability $z_1^{hl} \in (\frac{1}{2}, 1]$ and $d = 2$ with probability z_2^{hl}.*

Proof. See the Appendix ■

The proposition above highlights the presence of a '*decision bias effect*' that arises from the interaction between career concerns of adjudicators and a lawyer knowledge of the underlying state. Whilst the competent adjudicator always takes the correct decision, the incompetent adjudicator biases his decision in favour of the party with the certified lawyer. Intuition follows from the fact that the appeal strategy of a certified and informed lawyer depends on the underlying state of the world θ and it is therefore more informative about the underlying state than the appeal strategy of the uninformed lawyer. Since the decision strategy of C is correlated with the underlying state, the appeals strategy of the certified and informed lawyer reveals information about the type of the adjudicator that the appeals strategy of the uninformed lawyer does not. I has then more to fear from appeals by a certified lawyer than by an uncertified lawyer, which yields the decision bias of Proposition 1.

There are two types of equilibrium that arise and lead to the decision bias, depending on parameters value. The first one is a mixed strategy equilibrium where the incompetent adjudicator chooses $d = 1$ with probability $z_1^{hl} \in (\frac{1}{2}, 1)$. The second one is a pure strategy equilibrium where $z_1^{hl} = 1$. Intuitively, when $z_1^{hl} = 1$ a decision $d = 2$ perfectly signals the competency of the adjudicator. However, when an incompetent adjudicator deviates and announces $d = 2$, there is the possibility that the certified lawyer learns that $\theta = 1$. In this case there is a conflict in beliefs and Bayes rule doesn't apply. As we focus on a sequential equilibrium, the litigant decides to appeal when informed that $\theta = 1$, in which case the decision is reversed. For some parameters, this effect limits the incentives to deviate to $d = 2$, and yields a pure strategy equilibrium rather than a mixed strategy one.

The corollary below highlights the implication of an increase in the probability r that a certified lawyer is informed, that is in an increase in the quality of certified lawyers.

Corollary 1 *When party $P1$ hires a certified lawyer and $P2$ does not, the decision bias in favour of the party with the certified lawyer is non-decreasing in the probability r that a certified lawyer is informed.*

Since the difference between a certified and an uncertified lawyer rests with r, the probability that the certified lawyer is informed, then as r increases so does the difference in appeals probability between the two types of lawyers. Other things being equal, this increases the risk for the incompetent adjudicator of facing a reputational loss through reversal in appeal when he takes a decision unfavourable to the party with the certified lawyer. To reestablish indifference in the mixed strategy equilibrium, the decision bias in favour of that party must increase.

To further highlight the role of appeals, consider now what happens to the decision bias when the cost of appeals decreases.

Corollary 2 *When party $P1$ hires a certified lawyer and $P2$ does not, the decision bias in favour of the party with the certified lawyer is non-increasing in the probability q of low appeals cost.*

As q increases, appeals when $d = 1$ and when $d = 2$ become more likely (for a given z_1^{hl}). However, other things being equal, the probability of an appeal increases more when the decision is unfavourable to the party with the uncertified lawyer than to the one with the certified lawyer. This is because q does not affect the appeals strategy of a certified and informed lawyer who always and only appeals incorrect decisions; q only affects the appeals from an uninformed (certified or not) lawyer. Thus as q increases, the incentives of the incompetent adjudicator to make a decision in favour of the party with the certified lawyer decrease. To reestablish indifference in the mixed strategy equilibrium, the decision bias in favour of that party must decrease.

Before concluding this section we note that the decision bias here discussed is given by a combination of reputational concerns for the adjudicator and his knowledge of lawyers' quality. Lawyers' quality per se does not lead to bias.

Corollary 3 *When the adjudicator has symmetrical belief about the quality of the lawyers, at the equilibrium there is no decision bias.*

Corollary 3 then identifies the source of bias in the public nature of the quality mark. Were the adjudicator not to have any information over the quality of the lawyers representing the litigants in the dispute, no decision bias would arise in equilibrium. It is the knowledge about the lawyers's quality, rather than their quality per se, that matters. It also follows immediately from the above corollary that the less precise is the information of the adjudicator as to the lawyers' quality the lower the decision bias. Intermediate cases can be viewed as representative of situations where the system of certification is imprecise.

5.2 Symmetric cases

Suppose now that both parties hire a certified lawyer and thus $r_1 = r_2 = r$. In this case, with probability r the certified lawyer is informed and an incorrect decision is always reversed in appeal. With probability $1 - r$ the certified lawyer is uninformed and an incorrect decision is reversed only if the appeals cost is low. Since the typology of lawyers for each side in the dispute is the same so is their appeals strategy and there is no incentive for I to bias his decision in favour of one party. Moreover, a decision bias in favour of Pi would generate countervailing incentives to I because a decision favourable to Pi would then signal incompetency.

The same conclusion holds also when both parties hire an uncertified lawyer and thus $r_1 = r_2 = 0$.

Proposition 2 *When both parties hire a certified lawyer or when both parties hire an uncertified lawyer, at the equilibrium there is no decision bias*: $z_1^{hh} = z_1^{ll} = \frac{1}{2}$.

6 The market for lawyers

6.1 The demand of lawyers

In this section we derive the demand for certified lawyers. To this purpose we calculate the payoffs of the parties when they choose a certified lawyer and study the incentives of litigants to hire certified lawyers. We denote by l a low quality, uncertified lawyer, and by h a high quality, certified lawyer.

- **Case ll**

If both $P1$ and $P2$ choose l, we know from Proposition 2 that $z_1^{ll} = \frac{1}{2}$ and the behaviour of the parties is symmetrical. Since $\Pr(D = j \mid d = i) = \frac{1}{2}(1-\gamma) < \frac{\overline{A}}{(1+\delta)}$, the losing party appeals only if A is low; $(1-\gamma)\frac{1}{2}(1-q)$ is therefore the probability that the final decision is not correct and it follows that the expected payoff of a party in case ll is given by (normalized by V)

$$u^{ll} = \frac{1}{2} + \left(1 - (1-\gamma)\frac{1}{2}(1-q)\right)\frac{\delta}{2}. \tag{1}$$

- **Case hh**

If both $P1$ and $P2$ choose h, the behaviour of the parties is also symmetrical and $z_1^{hh} = \frac{1}{2}$ (Proposition 2). An uninformed lawyer appeals an unfavourable decision (which is taken with probability $\frac{1}{2}$) whenever A is low. An informed lawyer always and only appeals an unfavourable and incorrect decision. $(1-\gamma)\frac{1}{2}(1-q)(1-r)$ is therefore the probability that the final decision is not correct whilst $r\frac{1}{4}(1-\gamma)(1-q)\bar{A}$ is the expected appeals cost. The expected payoff of a party in case hh is therefore given by

$$u^{hh} = \frac{1}{2} + \left(1 - (1-\gamma)\frac{1}{2}(1-q)(1-r)\right)\frac{\delta}{2} - r\frac{1}{4}(1-\gamma)(1-q)\bar{A} \tag{2}$$

- **Case hl and lh**

If $P1$ chooses h and $P2$ chooses l, we know from Proposition 1 that $z_1^{hl} > 1/2$. Then, conditional on $\theta = 1$, $P1$ always wins unless the adjudicator is incompetent, chooses $d = 2$, the appeals cost is high and the lawyer is uninformed. Thus, $1 - (1-\gamma)z_2^{hl}(1-q)(1-r)$ is the probability that $P1$ wins when $\theta = 1$.

Conditional on $\theta = 2$, $P1$ wins only if the adjudicator is incompetent, chooses $d = 1$ and the appeals cost is high. Thus, $(1-\gamma)z_1^{hl}(1-q)$ is the probability that $P1$ wins when $\theta = 2$.

Overall, $P1$ wins with probability

$$\frac{1}{2} + (1-\gamma)(1-q)\left(z_1^{hl} - \frac{1}{2} + \frac{r}{2}z_2^{hl}\right)$$

Hiring a certified lawyer yields two benefits. With probability $1-\gamma$, it raises the chance of obtaining a favourable decision from 1/2 to z_1^{hl} which is valuable only if the other party doesn't appeal, hence the term $(1-\gamma)(1-q)\left(z_1^{hl} - \frac{1}{2}\right)$. Second in the event that the decision is unfavourable and the appeals cost is high, the certified lawyer may discover that the decision is incorrect and appeals, while there would be no appeal otherwise. This raises the wining probability by $(1-\gamma)(1-q)\frac{r}{2}z_2^{hl}$.

Hiring a certified lawyer however raises the expected appeals cost by $(1-q)\bar{A}$ in the event that the decision is not favourable and the certified lawyer discovers it to be incorrect.

We then obtain

$$\begin{aligned} u^{hl} &= \frac{1}{2}+(1-\gamma)(1-q)\left(z_1^{hl}-\frac{1}{2}+\frac{r}{2}z_2^{hl}\right) \\ &\quad +\left(1-(1-\gamma)z_2^{hl}(1-q)(1-r)\right)\frac{\delta}{2}-(1-\gamma)z_2^{hl}\frac{r}{2}(1-q)\bar{A} \end{aligned}$$

Similarly the probability that $d=\theta=2$ is $\frac{1}{2}\left(1-(1-\gamma)z_1^{hl}(1-q)\right)$ where $(1-\gamma)z_2^{hl}(1-q)$ is the probability that an incorrect decision $d=1$ is not appealed by the uncertified lawyer. Thus

$$u^{lh}=\frac{1}{2}-(1-\gamma)(1-q)\left(z_1^{hl}-\frac{1}{2}+\frac{r}{2}z_2^{hl}\right)+\left(1-(1-\gamma)z_1^{hl}(1-q)\right)\frac{\delta}{2}$$

We define

$$\underline{u}=u^{hh}-u^{lh} \text{ and } \overline{u}=u^{hl}-u^{ll},$$

and we are now in a position to characterize the demand for certified lawyers.

Lemma 1 *For $r>0$, $\overline{u}>\underline{u}>0$ and, for a given salary w, the demand for certified lawyers is characterized as follows.*
(i) If $V\geq\frac{w}{\underline{u}}$, both sides hire a certified lawyer;
(ii) If $\frac{w}{\underline{u}}>V\geq\frac{w}{\overline{u}}$, only one side hires a certified lawyer;
(ii) If $\frac{w}{\overline{u}}>V$, no side hires a certified lawyer.

Lemma 1 stems from the fact that, net of salary cost, a party always gains from hiring a certified lawyer. By hiring a certified lawyer when the opponent does not, the party ensures a decision bias in her favour (Proposition 1); by hiring a certified lawyer when the other party also has a certified lawyer the party ensures that no decision bias against her will arise. This is the *decision bias effect.* A certified lawyer also brings the benefit of more efficient appeals, due to his discovering and appealing incorrect decisions more often than an uncertified lawyer. This is the *appeals effect.*

The gain from a certified lawyer however is greater when the other party does not have a certified lawyer than when she does (i.e., $\overline{u} > \underline{u}$). The reason is that the increase in the probability of winning is the same regardless of whether the hiring of the certified lawyer ensures a decision bias or eliminates it. Instead, the cost of appeal has to be paid less often when favoured by the bias than when on equal foot with the competitor.

It follows that if the cost w of a certified lawyer is sufficiently low relatively to the value of the dispute, both parties will hire a certified lawyer. If however the cost w of a certified lawyer is sufficiently high, both parties will hire the uncertified lawyer. For intermediate values of w, $P1$ who moves first hires a certified lawyer whilst $P2$ who moves second prefers not to. This result suggests that public information over the quality of legal service generates a '*matching effect*'. Litigants to a dispute form different pools based on the amounts at stake. Those with high-value cases then hire high-quality lawyers and pay a higher salary. Litigants with lower-valued cases will instead hire lower quality lawyers and pay lower salaries.

We then obtain the total demand for certified lawyers, as given by

$$D\left(\frac{w}{\underline{u}}\right) + D\left(\frac{w}{\overline{u}}\right) \tag{3}$$

where $D(v)$ is the mass of cases with a gain $V > v$ (the decumulative).

Corollary 4 *For r below some threshold $\bar{r}$, the demand for certified lawyers is increasing with r.*

For r not too high, the gain for a party from hiring a certified lawyer is increasing in the quality of the lawyer both when the other party's lawyer is certified and when he is not (i.e., $\overline{u}, \underline{u}$ are both increasing in r). The condition on r is then explained as follows. When there is only one certified lawyer and r is sufficiently high that $z_1^{hl} = 1$, the certified lawyer never intervenes since he faces always a favourable decision by the adjudicator. Thus the parties' utility levels, u^{hl} and u^{lh}, are independent of r, implying that the value $\overline{u}$ of hiring a certified lawyer when the opponent's lawyer is not certified is independent of r. Moreover, when there are two certified lawyers, from equation (2), the marginal effect of r on u^{hh} is $(1-\gamma)\frac{1}{4}(1-q)\left(\delta-\bar{A}\right) < 0$. The utility of both parties decreases with the quality of certified lawyers because the winning probability is unchanged but the probability of appeal increases. Therefore, in this case the value $\underline{u}$ of hiring a certified lawyer when the other party has hired a certified lawyer decreases with r. As a result demand decreases (weakly) with r.

6.2 The equilibrium in the market for lawyers

Consider now the supply of certified lawyers by looking at the incentives of lawyers to train and obtain certification. In our simplified model, training brings benefits to a lawyer only insofar as he obtains certification, which raises the salary from 0 to w. Thus, a system of certification generates an *investment effect* by creating incentives to train. In particular, a lawyer chooses to train if $w-c \geq 0$ and the total number of certified lawyers in the market is $S(w;r)$. The supply is increasing in salary w and decreasing in the certification threshold r. A greater r corresponds to a tougher certification test and thus to an increase in the cost of training.

In light of Corollary 4 and of the fact that $S(w;r)$ increases in r we can now in a position to characterize the equilibrium configuration, which defines a unique salary for every given test for certification.

Proposition 3 *The equilibrium salary $w(r)$ exists and is positive. Further, $w(r)$ is unique and increases with r for $r < \bar{r}$.*

7 The value of certification

7.1 The value of certification for the private parties

In the previous section we have discussed the gain for a litigant from hiring a certified lawyer, given the choice of the other litigant. In the corollary below we find however when the value of certification is calculated at the equilibrium, the private value of certification is negative.

Corollary 5 *(i) For $V \geq \frac{w}{\underline{u}}$ both sides obtain $u^{hh}V - w < u^{ll}V$. (ii) For $V \in [\frac{w}{\bar{u}}, \frac{w}{\underline{u}})$ one side gets $u^{hl}V - w > u^{ll}V$ and the other side obtains $u^{lh}V < u^{ll}V$, and $u^{hl}V - w + u^{lh}V < 2u^{ll}V$. (iii) For $\frac{w}{\bar{u}} > V$, both sides obtain $u^{ll}V$.*

In our model there is a prisoners' dilemma problem: the litigants would be better off in the absence of certification. Intuitively, consider case hh. Here each party has an incentives to pay a higher salary w to hire a certified lawyer in order to obtain a decision bias in her favour. In equilibrium both parties hire a certified lawyer, pay the additional cost w but obtain no decision bias. The effects of hiring a certified lawyer are then reduced to an increase in the probability that the correct decision is reached (due to more informed appeals) and to an increase in the appeals cost (due to certified lawyers appealing also when A is high). With δ sufficiently low, as due to the assumption $\delta < \bar{A}$, the cost of additional appeals dominates the benefit from a better decision and the private value of certification is negative.

7.2 The social value of certification

Let us define the normalized social value from the judicial procedure net of training cost as $\omega = \Pr(D = \theta)\lambda - A$, where, with a slight abuse of notation, $\Pr(D = \theta)$ is the probability that the final decision is correct, and where λ is the external value of a correct decision. In this function we ignore the utility of the adjudicator and more generally the social value of the information generated on the adjudicator.[10]

We then have that the level of welfare achieved by the equilibrium allocation is

$$\Omega = \int_0^{\frac{w}{\bar{u}}} \omega^{ll} V f(V)\, dV + \int_{\frac{w}{\bar{u}}}^{\frac{w}{\underline{u}}} \omega^{hl} V dF(V) + \int_{\frac{w}{\underline{u}}}^{\bar{V}} \omega^{hh} V f(V)\, dV - \int_0^w c dS(c, r),$$

where $\int_0^w c dS(c,r)$ is the the total training cost and ω^{ll} denotes the value of ω for cases where both litigants hire uncertified lawyers, and so on.

[10]Notice that in our model the adjudicator's preferences are linear in posterior beliefs on his ability so that his ex-ante expected utility is independent of the equilibrium and equal to γ.

A value of the information on judge could be accounted for by incorporating a componant $\varkappa(\pi)$ convex in π.

Proposition 4 *When $\lambda < \bar{A}$, the system of certification reduces total welfare.*

In the absence of a system of certification neither the parties nor the adjudicator can distinguish between a high quality lawyer and a low quality one and in equilibrium there is no incentive to train: $r = 0$. A system of certification then brings about higher quality of legal services, which from a social perspective generates one benefit and two costs. The benefit is given by the increase in the probability of a correct decision that more informed appeals generate. The costs are the increase in the cost of appeals, as certified lawyers appeal also when A is high, and the cost of training. When the social value of a correct decision is small ($\lambda < \bar{A}$), for society as a whole the value of the increase in the likelihood of a correct decision does not justify the higher appeals and training costs. As a consequence, the system of certification reduces total welfare.

In the rest of the paper we assume that $\lambda > \bar{A}$, which for moderate training cost suffices to ensure that certified lawyers are socially valuable. To discuss the property of the equilibrium in this case we proceed in two steps. First, we study the efficiency of the equilibrium allocation for a fixed supply of certified lawyers and in particular how welfare changes as quality r increases. For this purpose we assume that the public decision maker is able to control the supply S (for example through a tax on certified lawyers), and we analyze the effect of r, given S. We then show how efficiency is affected by reducing the supply S of certified lawyers.

Consider step one and fix supply S.

Proposition 5 *Assume that $\lambda > \bar{A}$. For any given r and for a fixed supply of certified lawyers, the equilibrium allocation involves too many cases with only one certified lawyer and too few cases with two certified lawyers.*

Consider two cases with value $V' > V$ each with one certified lawyer. The welfare is $\omega^{hl}V + \omega^{hl}V'$. Suppose we allocate the two certified lawyers to the case V' so as to obtain $V\omega^{ll} + V'\omega^{hh}$.We prove in appendix that $V'\left(\omega^{hh} - \omega^{hl}\right) > V\left(\omega^{hl} - \omega^{ll}\right) > 0$ which implies that the welfare is higher when both lawyers are on the same case. This reflects two considerations. First it is more valuable to allocate lawyers on the highest value case. Second, the decision bias reduces the value of having only one certified lawyer since it reduces the likelihood that the lawyer expertise will be used by raising the probability of a favourable decision. The consequence is that from a social point of view the marginal value of having a certified lawyer is higher when the other party also has a certified lawyer than when she does not. This is in contrast with what we have seen for the private value of certification to a litigant, where the gain from a certified lawyer is greater when the other party does not have a certified lawyer than when she does (from Lemma 1). It stems in part from the value of a correct decision being smaller for private parties than for society as a whole ($\delta < \bar{A}$ but $\lambda > \bar{A}$). It stems also from the fact that the society internalizes the fact that hiring a second certified lawyer raises the value of the first certified lawyer by eliminating the bias.

Proposition 5 implies that the decision bias that arises under a system of certification of lawyers' quality creates a social cost that is given by the misallocation of lawyers that the decision bias generates.

Consider now the effect on social welfare of a change in r, the quality of certified lawyers, whilst still keeping S constant.

Proposition 6 *For a fixed supply of certified lawyers, raising the quality of certified lawyers has three effects:*
i) it raises the social value of each certified lawyer (at least for r not too high);
ii) it raises the training cost of lawyers;
iii) it raises the misallocation of lawyers by increasing the mass of cases with only one certified lawyer.

When $\lambda > \bar{A}$, an increase in the quality of certified lawyers r has a positive impact on social welfare, given the supply of lawyers. This is because the social value of a correct decision brought about an increase in r more than compensates the increase in the appeals cost. Raising r however brings also the additional cost that it raises the cost of training. Finally, for a fixed supply, increasing r has a cost in terms of (mis)allocation of lawyers as it raises the mass of cases with one certified lawyers and reduces the mass of cases with two certified lawyers. This stems from the fact that raising r has a greater impact on the value of the first certified lawyer on the case than on the value of the second certified lawyer. The equilibrium salary has then to increase in such a way to discourage some parties to drop a certified lawyer.

We now proceed to step two and analyze the effect of changing the supply of certified lawyers for any given r. The effect is shown in appendix to be

$$\begin{aligned}\frac{\partial \Omega}{\partial S} &= x_1 \left(\omega^{hh} - \omega^{ll}\right) z_2^{hl} V_1 + x_2 \left(\omega^{hh} - \omega^{ll}\right) z_1^{hl} V_2 - W\left(S; r\right) \\ x_1 &= 1 - x_2 = \frac{f\left(V_1\right) \underline{u}}{f\left(V_1\right) \underline{u} + f\left(V_2\right) \overline{u}}\end{aligned} \tag{4}$$

To understand the above expression notice that additional lawyers will be randomly allocated between the two types of cases, those with no certified lawyer and those with only one certified lawyer. Then the increase in the mass of cases with one lawyer bring a value $\left(\omega^{hl} - \omega^{ll}\right) V_1 = \left(\omega^{hh} - \omega^{ll}\right) z_2^{hl} V_1$, whilst the increase in the mass of cases with two lawyers bring a value $\left(\omega^{hh} - \omega^{hl}\right) V_2 = \left(\omega^{hh} - \omega^{ll}\right) z_1^{hl} V_2$. The increase of supply S is then transferred to the two margins with proportion x_1 and x_2. The first term in expression (4) is thus the expected social benefit from an increase in S. The second term is the expected social cost from the increase in the cost of training.

Proposition 7 *When $1 + \delta > \lambda$, in equilibrium there is an excessive supply of certified lawyers.*

Thus, for a given certification standard, whenever the social benefits from correct decisions is larger than the appeals cost but only to a limited extent, the number of lawyers who choose to invest in training so as to obtain certification is excessive compared to the social optimum. This occurs in particular when the individual value from the favourable correct decision, $1+\delta$, is greater the value of a correct decision to society, $1+\delta-\overline{A} > \lambda-\overline{A} > 0$. In this case the private benefit from reversing an incorrect and unfavourable decision in appeal is larger than the social benefit. Private parties have here excessive incentives to win, hence an excessive incentives to hire certified lawyers.

8 Extensions

- **Legal associations**

On the lawyers' side, consider the choice of r by a legal association that maximizes the total wages of its members net of certification costs, taking into account the equilibrium condition in the market for lawyers. Thus, we have

$$\begin{aligned}
\max_r \Pi &= w(r) S(w(r), r) - \int_0^{w(r)} c dS(c, r) \\
s.t. w(r) \text{ solving } &: D\left(\frac{w}{\underline{u}}\right) + D\left(\frac{w}{\overline{u}}\right) = S(w, r)
\end{aligned}$$

Training incentives and the equilibrium salary depend on $\overline{u}$ and $\underline{u}$, where $\overline{u}$ and $\underline{u}$ are increasing in r and $S(w; r)$ is decreasing. Using integration by part, the level of r chosen by the association solves

$$\max_r \int_0^{w(r)} S(c, r) dc$$

which leads to

$$w'(r) S(w(r), r) + \int_0^{w(r)} \frac{\partial S(c, r)}{\partial r} dc = 0$$

At the equilibrium the certification threshold chosen by the legal association equates the marginal benefit coming from a higher wage being benefited by certified lawyers with the higher marginal cost due to an increase in the cost of training to obtain certification. As the payoff of the legal association is independent of λ, there is no reason to suppose that the choice of the association will be socially optimal.

- **Case where $\delta > \overline{\mathbf{A}}$**

We have assumed throughout the paper that the value of a correct decision is lower than the appeals cost. When this assumption is relaxed, most of our qualitative results continue to hold albeit there are some differences, which we highlight in the proposition below.

Proposition 8 *When $\delta > \overline{\mathbf{A}}$: (i) $u^{hh} - u^{ll} < \overline{u} = u^{hl} - u^{ll} < \underline{u} = u^{hh} - u^{lh}$; (ii) for $V > \frac{w}{\overline{u}}$, the equilibrium is hh, whilst for $V < \frac{w}{\overline{u}}$, the equilibrium is ll; (iii) both sides obtain $u^{hh}V - w < u^{ll}V$ for $V \in (\frac{w}{\overline{u}}, \frac{w}{u^{hh}-u^{ll}})$.*

At the equilibrium there are now either cases with no certified lawyers or cases with two certified lawyers. The asymmetric equilibrium, where only one party hires a certified lawyer, ceases to exist. The reason is that a certified lawyer is now more valuable if the other party has a certified lawyer than if the other party's lawyer is not certified. Furthermore, the prisoner dilemma problem always arises but only for some intermediate values of V. Provided that the value V is large compared to the salary w, the parties are now better off from both hiring a certified lawyer than not, as the gain from better quality decisions is now greater than the appeals cost. Indeed the probability of winning is 1/2 in both cases, but with certified lawyers, parties benefits from winning the "right" case more often. However, for intermediate values of V, they end-up hiring certified lawyers at salaries higher than their values, due to competition to create or correct the decision bias.

For this reason, it remains the case that for λ not too large $(1 + \delta > \lambda)$ the number of lawyers who choose to invest in training so as to obtain certification is excessive compared to the social optimum (see the Appendix). However, since no decision bias arises in equilibrium there is no longer misallocation of lawyers.

9 Conclusions

We have studied the value of information on the quality of legal services by analyzing how quality certification affects the incentives of litigants to hire high-quality lawyers, the incentives of lawyers to invest in training and the decision-making behaviour of adjudicators. We have shown that quality certification is more likely to be beneficial when the social value of a correct decision is high or when training costs are low or when appeals cost is low.

To the extent that the social value of a correct decision is higher in systems based on precedent, such as the common law system, our results suggest that a QC system is more likely to be beneficial in a common law system than in a civil law system. This is in line with casual observation that quality certification in the form of a QC system is prevalent in countries with common law tradition rather than in counties with civil law tradition of codified law.

We have modelled quality of lawyers as the precision of the signal over the state of the world. It would be interesting to extend our analysis to settings where lawyers are also in charge of information gathering, as in adversarial systems, and higher-quality lawyers are also more likely to find hard evidence about the correct decision. Being partisans, lawyers have incentives to disclose only evidence that is favourable to their case. Negative inference can then be drawn from a certified lawyer not disclosing any hard evidence in favour of his case. In this respect, the reputational concerns of the adjudicator and thus his desire to minimize reversal in appeal would result in a bias against the party with the certified lawyer, conditional on no evidence being disclosed. How this effect would interact with the effects described in the paper could constitute an interesting topic for future research.

We have assumed throughout that the lower court comprises only one adjudicator who may be more or less competent. It would be interesting to extend the analysis to account for the possibility that the lower court comprises a panel of judges (or that there is a jury) and then study whether cases with certified lawyers are better adjudicated by a single judge as opposed to a panel (or a jury). Two contrasting effects would play a role here. On the one hand, assigning panels to cases with one certified lawyers is beneficial because it reduces the incidence of the bias effect. On the other hand, panels are more valuable when incorrect decisions are *a priori* more likely, that is when there are no certified lawyers on the case.

Finally, we have considered a setting where, absent certification, information is symmetric. It would be interesting to extend the results to setting where absence certification, asymmetry of information exists between lawyers.

10 Appendix

Proof of Proposition 1. Consider the case of a mixed strategy equilibrium where $0 < z_1 < 1$. This requires that

$$v\left(d=1\right)=v(d=2)$$

or

$$q\frac{1}{2}\pi(1,1)+(1-q)\pi(1,0)=\frac{1}{2}q\left(1-r\right)\pi\left(2,2\right)+\left(\frac{1}{2}r+\left(1-r\right)\left(1-q\right)\right)\pi\left(2,0\right)$$

where the RHS decreases with z_1 and the LHS increases with z_1.

For $z_1 = 1/2$ we have

$$v(d=1)=q\frac{\gamma}{1+\gamma}+\left(1-q\right)>v(d=2)=q\frac{\gamma}{1+\gamma}+\left(1-q\right)\frac{\gamma\left(2-r\right)}{2\gamma+\left(1-\gamma\right)\left(2-r\right)}$$

since $\frac{\gamma(2-r)}{2\gamma+(1-\gamma)(2-r)} < 1$.

Thus an equilibrium with mixed strategy exists if at $z_1 = 1$, we have

$$q\frac{1}{2}\gamma+(1-q)\frac{\gamma}{2-\gamma}<\frac{1}{2}r+\left(1-r\right)\left(1-\frac{q}{2}\right)=1-\frac{r}{2}-\left(1-r\right)\frac{q}{2}$$

where $1-\frac{r}{2}-\left(1-r\right)\frac{q}{2} < 1-\frac{r}{2}$.

Consider now an equilibrium with $z_1 = 0$, then $\pi\left(1,0\right)=\pi\left(1,1\right)=1$ and there can only be appeal with some probability x after $d=1$ if the cost is zero:

$$v\left(d=1\right)\geq q\frac{1}{2}x+q\left(1-x\right)+1-q\geq 1-\frac{q}{2}$$

but

$$v(d=2)=\frac{1}{2}q\gamma+\left(1-q\right)\left(1-\frac{1}{2}r\right)\frac{\gamma}{\gamma+\left(1-\gamma\right)\left(2-r\right)}<1-\frac{q}{2}.$$

Thus this cannot be an equilibrium.

Suppose that in equilibrium the competent adjudicator chooses $d = \theta$ and consider the payoff of the incompetent one if he chooses $z_1 = 1$ in equilibrium; we have

$$v(d = 2, z_1 = 1) = 1 - \frac{r}{2} + \frac{r}{2}\pi\left(2, 1\right)$$

where $\pi\left(2, 1\right)$ is arbitrary.

There is an equilibrium with $z_1 = 1$ if $v\left(d = 1, z_1 = 1\right) = q\frac{1}{2}\gamma + \left(1 - q\right)\frac{\gamma}{2-\gamma} \geq v(d = 2, z_1 = 1)$, for some $\pi\left(2, 1\right)$, thus if

$$q\frac{1}{2}\gamma + \left(1 - q\right)\frac{\gamma}{2 - \gamma} \geq 1 - \frac{r}{2}$$

which is obtained for $\pi\left(2, 1\right) = 0$.

Now suppose that $1 - \frac{r}{2} > q\frac{1}{2}\gamma + (1 - q)\frac{\gamma}{2-\gamma} > 1 - \frac{r}{2} - \left(1 - r\right)\frac{q}{2}$. Then it must be the case that the equilibrium has $z_1 = 1$ and the uncertified lawyer appeals when $d = 2$ with some probability $x > 0$ when the cost is $A = 0$. We then have

$$\begin{aligned} v(d = 2, z_1 = 1, x) &= 1 - \frac{r}{2} - \left(1 - r\right)\frac{qx}{2} \\ v\left(d = 1, z_1 = 1\right) &= q\frac{1}{2}\gamma + \left(1 - q\right)\frac{\gamma}{2 - \gamma} \end{aligned}$$

and the equilibrium involves

$$q\frac{1}{2}\gamma + \left(1 - q\right)\frac{\gamma}{2 - \gamma} = 1 - \frac{r}{2} - \left(1 - r\right)\frac{qx}{2},$$

which concludes the proof. ■

Proof of Corollary 1. First notice that $z_1^{hl} = 1$ for $q\frac{1}{2}\gamma + (1 - q)\frac{\gamma}{2-\gamma} > 1 - \frac{r}{2} - \frac{q}{2} + r\frac{q}{2}$;which writes:

$$r > \frac{2 - q - q\gamma - (1 - q)\frac{2\gamma}{2-\gamma}}{1 - q} = 1 + \frac{1 - \left(2 - \gamma q\right)\frac{\gamma}{2-\gamma}}{1 - q}.$$

The RHS is bigger than 1 if $1 > \left(2 - \gamma q\right)\frac{\gamma}{2-\gamma}$. Thus for $1 > \left(2 - \gamma q\right)\frac{\gamma}{2-\gamma}$ which holds if $\gamma < \frac{2}{3}$ or q is large, there is always an equilibrium with $z_1^{hl} < 1$.

On the range $z_1^{hl} < 1$ we have

$$\frac{1}{2}q\pi(1,1) + (1-q)\pi(1,0) = \frac{1}{2}q\pi(2,2) + (1-q)\frac{1}{2}\frac{\gamma(2-r)}{\gamma + (1-\gamma)z_2^{hl}(2-r)}$$

where the π are independent of r. Then the term $\frac{\gamma(2-r)}{\gamma+(1-\gamma)z_2^{hl}(2-r)}$ is decreasing in r which implies that $z_1^{hl}$is increasing with r. ■

Proof of Corollary 2. On the range $z_1^{hl} < 1$ we have

$$q\left(\frac{1}{2}\pi(1,1) - \pi(1,0) - \frac{1}{2}\pi(2,2) + \frac{1}{2}\frac{\gamma(2-r)}{\gamma+(1-\gamma)z_2^{hl}(2-r)}\right) = \frac{1}{2}\frac{\gamma(2-r)}{\gamma+(1-\gamma)z_2^{hl}(2-r)} - \pi(1,0)$$

where the π are independent of q.

Thus z_1^{hl} decreases with q if the LHS is negative

$$\begin{aligned} \frac{1}{2}\frac{\gamma(2-r)}{\gamma+(1-\gamma)z_2^{hl}(2-r)} - \frac{1}{2}\frac{\gamma}{\frac{\gamma}{2}+(1-\gamma)z_1^{hl}} &< 0 \\ \frac{\gamma}{2}\left(\frac{2(2-r)(1-\gamma)\left(2z_1^{hl}-1\right) - r\gamma}{\left(\gamma+(1-\gamma)z_2^{hl}(2-r)\right)\left(\gamma+(1-\gamma)2z_1^{hl}\right)}\right) &< 0 \end{aligned}$$

So z_1^{hl} decreases with q if

$$z_1^{hl} < \frac{1}{2} + \frac{\gamma r}{4(2-r)(1-\gamma)}.$$

which holds for $z_1^{hl} = \frac{1}{2}$. For q close to 1 we have

$$\frac{1}{2}\pi(1,1) \simeq \frac{1}{2}\pi(2,2)$$

which implies that z_1^{hl} is close to $1/2$. This along with the fact that z_1^{hl} increases if it is above some threshold implies that z_1^{hl} decreases with q. ■

Proof of Corollary 3 and Proposition 2. In a symmetric case the incompetent judge chooses the action that yields the highest probability π of being competent in case of no appeal. If one decision is more likely to be chosen by the incompetent, it will yields the lowest π which would yield a contradiction. Thus both decisions are chosen with the same probability. ■

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Proof of Lemma 1.

Straightforward computations yield

$$\begin{aligned}\underline{u} &= (1-\gamma)(1-q)\frac{1}{2}\left(\left(2z_1^{hl}-1+rz_2^{hl}\right)+\left(z_1^{hl}-\frac{1}{2}(1-r)\right)\delta-r\frac{1}{2}\bar{A}\right)\\ &> (1-\gamma)(1-q)\frac{r}{4}\left(1+\delta-\bar{A}\right)>0\end{aligned}$$

and

$$\begin{aligned}\overline{u} &= (1-\gamma)(1-q)\frac{1}{2}\left(\left(2z_1^{hl}-1+rz_2^{hl}\right)+\left(\frac{1}{2}-z_2^{hl}(1-r)\right)\delta-z_2^{hl}r\bar{A}\right)\\ &> (1-\gamma)(1-q)\frac{r}{4}\left(1+\delta-\bar{A}\right)>0.\end{aligned}$$

Thus

$$\overline{u}-\underline{u}=(1-\gamma)(1-q)\frac{1}{2}\left(z_1^{hl}-\frac{1}{2}\right)r\left(\bar{A}-\delta\right)$$

Suppose $w<Vu^{hh}-Vu^{lh}\equiv V\underline{u}$. Then the second mover always chooses h. The first mover chooses h since it prefers to pay w to induce (h,h).

Suppose $w>Vu^{hl}-Vu^{ll}\equiv V\overline{u}$, then the second mover always chooses l. The first mover then prefers l since $Vu^{ll}>Vu^{hl}-w$.

Suppose now that $Vu^{hl}-Vu^{ll}>w>Vu^{hh}-Vu^{lh}$. The second mover chooses h if the first mover chooses l and h otherwise. The first mover chooses between $Vu^{hl}-w$ and Vu^{lh}. But $Vu^{hl}-Vu^{lh}>Vu^{hl}-Vu^{ll}>w$ (because $u^{lh}<u^{ll}$) so she prefers (h,l). ■

Proof of Corollary 4.

Since D is non-increasing it suffices to show that $\underline{u}$ and $\overline{u}$ are non-decreasing with r.

$$\frac{\partial\overline{u}}{\partial r}=(1-\gamma)(1-q)\frac{1}{2}\left[(2-r)\ \frac{\partial z_1^{hl}}{\partial r}+(1-r)\delta z'(r)+r\bar{A}\frac{\partial z_1^{hl}}{\partial r}+z_2^{hl}\left(1+\delta-\bar{A}\right)\right]$$

is positive since $\frac{\partial z_1^{hl}}{\partial r}\geq 0$.

$$\frac{\partial\underline{u}}{\partial r}=(1-\gamma)(1-q)\frac{1}{2}\left[(2-r)\frac{\partial z_1^{hl}}{\partial r}+\frac{\partial z_1^{hl}}{\partial r}\delta+1-z_1^{hl}+\frac{1}{2}\left(\delta-\bar{A}\right)\right]$$

is positive if $z_1^{hl} < 1 + \frac{1}{2}\left(\delta - \bar{A}\right)$. Since $z_1^{hl}(r)$ is non-decreasing and $z_1(0) = 1/2$ and $1 - \frac{1}{2} + \frac{\delta}{2} - \frac{1}{2}\bar{A} > 0$, there exists $\bar{r}$ such that $\frac{\partial u}{\partial r} \geq 0$ if $r \leq \bar{r}$. ■

Proof of Proposition 3. An equilibrium verifies $S(w, r) = D\left(\frac{w}{\underline{u}}\right) + D\left(\frac{w}{\overline{u}}\right)$ and exists at a positive salary since $S(0, r) = 0 < 2D(0)$ and $D\left(\frac{w}{\underline{u}}\right) + D\left(\frac{w}{\overline{u}}\right)$ converges to 0 when w goes to infinity. On the range where $r \leq \bar{r}$, $S(w, r)$ decreases with r while $D\left(\frac{w}{\underline{u}}\right) + D\left(\frac{w}{\overline{u}}\right)$ is non-decreasing with r. Thus the equilibrium salary increases with r. ■

Proof of Corollary 5.

$$u^{hh} = u^{ll} + (1-\gamma)\frac{1}{4}(1-q)\,r\left(\delta - \bar{A}\right) < u^{ll}$$

On the range $V \in \left[\frac{w}{\overline{u}}, \frac{w}{\underline{u}}\right]$ we have $u^{hl}V - w > u^{ll}$. Moreover

$$u^{lh} = u^{ll} - (1-\gamma)(1-q)\left(z_1^{hl} - \frac{1}{2} + \frac{r}{2}z_2\right) - (1-\gamma)(1-q)\left(z_1^{hl} - \frac{1}{2}\right)\frac{\delta}{2} < u^{ll}$$

and

$$u^{hl} + u^{lh} = 2u^{ll} + (1-\gamma)\,z_2^{hl}(1-q)\frac{r}{2}\left(\delta - \bar{A}\right) < 2u^{ll},$$

which give the results. ■

Proof of Proposition 4.

First note that in the absence of certification, welfare is ω^{ll} since quality is unobservable and lawyers have no incentives to train. Then note

$$\omega^{ll} = \left(1 - (1-\gamma)\frac{1}{2}(1-q)\right)\lambda$$

$$\begin{aligned}
\omega^{hh} &= \left(1 - (1-\gamma)\frac{1}{2}(1-q)(1-r)\right)\lambda - r\frac{1}{2}(1-\gamma)(1-q)\,\bar{A} \\
&= \omega^{ll} + \frac{r}{2}(1-\gamma)(1-q)\left(\lambda - \bar{A}\right)
\end{aligned}$$

$$\begin{aligned}
\omega^{hl} &= \left(1-(1-\gamma)\,z_2^{hl}\,(1-q)\,(1-r)\right)\frac{\lambda}{2}+\left(1-(1-\gamma)\,z_1^{hl}\,(1-q)\right)\frac{\lambda}{2}-(1-\gamma)\,z_2^{hl}\frac{r}{2}\,(1-q)\,\bar{A} \\
&= \left(1-(1-\gamma)\,z_2^{hl}\,(1-q)\right)\frac{\lambda}{2}+\left(1-(1-\gamma)\,z_1^{hl}\,(1-q)\right)\frac{\lambda}{2}+(1-\gamma)\,z_2^{hl}\,(1-q)\,\frac{r}{2}\left(\lambda-\bar{A}\right) \\
&= \omega^{ll}+z_2^{hl}\frac{r}{2}\,(1-\gamma)\,(1-q)\left(\lambda-\bar{A}\right)
\end{aligned}$$

with

$$2\omega^{hl}-\omega^{hh}-\omega^{ll}=\left(1-2z_1^{hl}\right)\frac{r}{2}\,(1-\gamma)\,(1-q)\left(\lambda-\bar{A}\right)$$

And if $\lambda<\bar{A}:\omega^{hh}<\omega^{hl}<\omega^{ll}$ and $2\omega^{hl}>\omega^{hh}+\omega^{ll}$. For $\lambda<\bar{A}$ we then have

$$\int_0^{\frac{w}{\overline{\overline{u}}}}\omega^{ll}Vf(V)\,dV+\int_{\frac{w}{\overline{\overline{u}}}}^{\frac{w}{\underline{u}}}\omega^{hl}V\,dF(V)+\int_{\frac{w}{\underline{u}}}^{\overline{V}}\omega^{hh}Vf(V)\,dV-\int_0^{w\Psi(r)}cg(c)dc<\int_0^{\overline{V}}\omega^{ll}Vf(V)\,dV$$

since $\int_0^{\frac{w}{\overline{\overline{u}}}}\omega^{ll}Vf(V)\,dV+\int_{\frac{w}{\overline{\overline{u}}}}^{\frac{w}{\underline{u}}}\omega^{hl}V\,dF(V)+\int_{\frac{w}{\underline{u}}}^{\overline{V}}\omega^{hh}Vf(V)\,dV<\int_0^{\bar{V}}\omega^{ll}Vf(V)\,dV$. ■

Proof of Proposition 5. Define $W(S;r)$ as the level of $w-\tau$ solving $S(w-\tau;r)=S$. Given S, let $V_1=\frac{w}{\overline{u}}$ and $V_2=\frac{w}{\underline{u}}$ denote the cutoff values. They are solutions of

$$\int_{V_1}^{\overline{V}}f(V)\,dV+\int_{V_2}^{\overline{V}}f(V)\,dV=S \tag{5}$$

$$V_1\overline{u}=V_2\underline{u}\quad\left(=W(S;r)+\tau\right) \tag{6}$$

and we can define the level of welfare achieved by the equilibrium allocation as

$$\Omega=\int_0^{V_1}\omega^{ll}Vf(V)\,dV+\int_{V_1}^{V_2}\omega^{hl}Vf(V)\,dV+\int_{V_2}^{\overline{V}}\omega^{hh}Vf(V)\,dV-\int_0^{W(S;r)}c\,dS(c,r). \tag{7}$$

Note that for $\lambda>\bar{A}:\omega^{hh}>\omega^{hl}>\omega^{ll}$ and $2\omega^{hl}<\omega^{hh}+\omega^{ll}$. Consider an allocation in the thresholds V_1 and V_2, where cases with value $V\in[V_1,V_2]$ have one certified lawyer and cases with value $V>V_2$ have two certified lawyers. The allocation must satisfy $S=D(V_1)+D(V_2)$. Suppose we change V_1 and adjust V_2 to maintain the supply, then $\frac{\partial V_2}{\partial V_1}=-\frac{f(V_1)}{f(V_2)}$ and

$$\begin{aligned}
\left.\frac{\partial\Omega}{\partial V_1}\right|_{S=cst} &= \left(\omega^{ll}-\omega^{hl}\right)V_1f(V_1)+\left(\omega^{hl}-\omega^{hh}\right)V_2f(V_2)\left(-\frac{f(V_1)}{f(V_2)}\right) \\
&= \left(-\left(\omega^{hl}-\omega^{ll}\right)V_1+\left(\omega^{hh}-\omega^{hl}\right)V_2\right)f(V_1)
\end{aligned}$$

Evaluated at the equilibrium we obtain

$$\left.\frac{\partial\Omega}{\partial V_1}\right|_{S=cst} = \left(-\left(\frac{\omega^{hl}-\omega^{ll}}{\overline{u}}\right)+\left(\frac{\omega^{hh}-\omega^{hl}}{\underline{u}}\right)\right) f\left(\frac{w}{\overline{u}}\right) w > 0,$$

thus increasing V_1 would raise welfare. ■

Proof of Proposition 6.

Differentiating (7) with respect to r, and using

$$\int_0^{W(S,r)} c\frac{\partial S(c,r)}{\partial c} dc = W(S,r)\,S - \int_0^{W(S,r)} S(c,r)\,dc,$$

we have

$$\begin{aligned}\frac{\partial\Omega}{\partial r} &= \left(\omega^{ll}-\omega^{hl}\right)V_1 f(V_1)\frac{\partial V_1}{\partial r} + \left(\omega^{hl}-\omega^{hh}\right)V_2 f(V_2)\frac{\partial V_2}{\partial r} + \int_0^{W(S;r)}\frac{\partial S(c,r)}{\partial r}dc \\ &\quad + \int_{V_1}^{V_2}\frac{\partial\omega^{hl}}{\partial r}Vf(V)\,dV + \int_{V_2}^{\overline{V}}\frac{\partial\omega^{hh}}{\partial r}Vf(V)\,dV\end{aligned}$$

Using

$$\frac{\partial\omega^{hh}}{\partial r} = \frac{\omega^{hh}-\omega^{ll}}{r} = \frac{1}{2}(1-\gamma)(1-q)\left(\lambda-\bar{A}\right)$$

and

$$\begin{aligned}\frac{\partial\omega^{hl}}{\partial r} &= \frac{\omega^{hl}-\omega^{ll}}{r} - \frac{\omega^{hl}-\omega^{ll}}{z_2^{hl}}\frac{\partial z_1^{hl}}{\partial r} \\ &= \left(z_2^{hl} - r\frac{\partial z_1^{hl}}{\partial r}\right)\frac{1}{2}(1-\gamma)(1-q)\left(\lambda-\bar{A}\right) = \left(z_2^{hl}-r\frac{\partial z_1^{hl}}{\partial r}\right)\frac{\omega^{hh}-\omega^{ll}}{r}\end{aligned}$$

we obtain

$$\begin{aligned}\frac{\partial\Omega}{\partial r} &= \left(\omega^{ll}-\omega^{hl}\right)V_1 f(V_1)\frac{\partial V_1}{\partial r} + \left(\omega^{hl}-\omega^{hh}\right)V_2 f(V_2)\frac{\partial V_2}{\partial r} + \int_0^{W(S;r)}\frac{\partial S(c,r)}{\partial r}dc \\ &\quad + \left(\frac{\omega^{hh}-\omega^{ll}}{r}\right)\left(\left(z_2^{hl}-r\frac{\partial z_1^{hl}}{\partial r}\right)\int_{V_1}^{V_2}Vf(V)\,dV + \int_{V_2}^{\overline{V}}Vf(V)\,dV\right)\end{aligned}$$

Using

$$\omega^{hh}-\omega^{ll} = \frac{r}{2}(1-\gamma)(1-q)\left(\lambda-\bar{A}\right)$$

$$\omega^{hl} - \omega^{ll} = z_2^{hl}\frac{r}{2}(1-\gamma)(1-q)\left(\lambda - \bar{A}\right) = z_2^{hl}\left(\omega^{hh} - \omega^{ll}\right) \tag{8}$$

$$\omega^{hh} - \omega^{hl} = z_1^{hl}\left(\omega^{hh} - \omega^{ll}\right) \tag{9}$$

we obtain the effect on welfare of an increase in r

$$\begin{aligned}\frac{\partial \Omega}{\partial r} &= -\left(\omega^{hh} - \omega^{ll}\right)\left(z_2^{hl}V_1 f(V_1)\frac{\partial V_1}{\partial r} + z_1^{hl}V_2 f(V_2)\frac{\partial V_2}{\partial r}\right) + \int_0^{W(S;r)}\frac{\partial S(c,r)}{\partial r}dc \\ &+ \left(\frac{\omega^{hh} - \omega^{ll}}{r}\right)\left(\left(z_2^{hl} - r\frac{\partial z_1^{hl}}{\partial r}\right)\int_{V_1}^{V_2} Vf(V)\,dV + \int_{V_2}^{\overline{V}} Vf(V)\,dV\right)\end{aligned}$$

The last term measures the impact of increasing the quality r for a given allocation of lawyers, and it is positive if z_1^{hl} is not too large. The second term is negative and it captures the fact that increasing r for a given supply requires that more lawyers train and thus increases the cost. The first term is the impact of the reallocation of lawyers between cases for a given supply. Using $V_1 f(V_1)\frac{\partial V_1}{\partial r} = -V_2 f(V_2)\frac{\partial V_2}{\partial r}$, this first effect is

$$-\left(\omega^{hh} - \omega^{ll}\right)\left(z_2^{hl}V_1 f(V_1)\frac{\partial V_1}{\partial r} + z_1^{hl}V_2 f(V_2)\frac{\partial V_2}{\partial r}\right) = \left(\omega^{hh} - \omega^{ll}\right)\left(2z_1^{hl} - 1\right)V_1 f(V_1)\frac{\partial V_1}{\partial r}$$

which has the same sign as $\frac{\partial V_1}{\partial r}$. The following lemma then establishes this sign. ■

Lemma 2 *For a fixed supply, increasing the quality of certified lawyers raises the mass of cases with one certified lawyers and reduces the mass of cases with two certified lawyers:* $\left.\frac{\partial V_1}{\partial r}\right|_S < 0 < \left.\frac{\partial V_2}{\partial r}\right|_S$.

Proof of Lemma 2.

Since $V_1\overline{u} = V_2\underline{u}$

$$\frac{1}{V_1}\frac{\partial V_1}{\partial r} - \frac{1}{V_2}\frac{\partial V_2}{\partial r} = \frac{1}{\underline{u}}\frac{\partial \underline{u}}{\partial r} - \frac{1}{\overline{u}}\frac{\partial \overline{u}}{\partial r}$$

Since $\frac{\partial V_1}{\partial r}$ and $\frac{\partial V_2}{\partial r}$ have opposite signs, $\frac{\partial V_1}{\partial r} < 0$ if the RHS is negative which is equivalent to $\frac{\partial}{\partial r}\left(\frac{\overline{u}}{\underline{u}}\right) > 0$. Now $\frac{\overline{u}}{\underline{u}} = 1 + \frac{r\left(z_1^{hl} - \frac{1}{2}\right)\left(\bar{A} - \delta\right)}{\left(z_1^{hl} - \frac{1}{2}\right)(2+\delta-r) + \frac{r}{2}\left(1+\delta-\bar{A}\right)}$, so that

$$\frac{\partial}{\partial r}\left(\frac{\overline{u}}{\underline{u}}\right) = \frac{\partial}{\partial r}\left(\frac{\bar{A} - \delta}{\left(\frac{2+\delta-r}{r}\right) + \left(\frac{1+\delta-\bar{A}}{2z_1^{hl}-1}\right)}\right) > 0$$

Hence the result. ■

Derivation of expression 4. To analyze the effect of a change in S whilst keeping r constant suppose there is a tax τ on certified lawyers that is paid upon successful certification. Then, defining $V_1 = \frac{w}{\overline{u}}$ and $V_2 = \frac{w}{\underline{u}}$, the equilibrium conditions are

$$\begin{aligned} \int_{V_1}^{\overline{V}} f(V)\,dV + \int_{V_2}^{\overline{V}} f(V)\,dV &= S(w-\tau;r); \\ w &= \overline{u}V_1 = \underline{u}V_2 \end{aligned}$$

and choosing τ at given r is equivalent to choosing the supply S and consequently the wage. Indeed we have

$$\tau = w - W(S;r)$$

where $W(S;r)$ defines the level of w solving $S(w;r) = S$.

Then differentiating (7) with respect to S, using (9) and (8) we obtain

$$\frac{\partial \Omega}{\partial S} = -\left(\omega^{hh} - \omega^{ll}\right)\left(z_2^{hl}V_1 f(V_1)\frac{\partial V_1}{\partial S} + z_1^{hl}V_2 f(V_2)\frac{\partial V_2}{\partial S}\right) - W(S;r)$$

which equates the gain in judicial decisions with the cost of additional certified lawyers.

Using (5) and (6), the optimal level of S solves

$$\begin{aligned} f(V_1)\frac{\partial V_1}{\partial S} + f(V_2)\frac{\partial V_2}{\partial S} &= -1; \\ \frac{\partial V_1}{\partial S}\overline{u} &= \frac{\partial V_2}{\partial S}\underline{u}. \end{aligned}$$

which yields

$$\begin{aligned} \frac{\partial V_1}{\partial S} &= \frac{-\underline{u}}{f(V_1)\underline{u} + f(V_2)\overline{u}} \\ \frac{\partial V_2}{\partial S} &= \frac{-\overline{u}}{f(V_1)\underline{u} + f(V_2)\overline{u}} \end{aligned}$$

and substituting back into $\frac{\partial \Omega}{\partial S}$ we have expression 4. ■

Proof of Proposition 7. From (4), at the optimal supply we have

$$\left(\omega^{hh} - \omega^{ll}\right)\frac{f(V_1)\underline{u}z_2^{hl}V_1 + f(V_2)\overline{u}z_1^{hl}V_2}{f(V_1)\underline{u} + f(V_2)\overline{u}} = W(S;r)$$

Using $W(S;r) = w - \tau$ and $w = V_1\overline{u} = V_2\underline{u}$, we have

$$\left(\omega^{hh} - \omega^{ll}\right) \frac{f(V_1)\frac{\underline{u}}{\overline{u}} z_2^{hl} + f(V_2)\frac{\overline{u}}{\underline{u}} z_1^{hl} V_2}{f(V_1)\underline{u} + f(V_2)\overline{u}} w = w - \tau$$

or

$$\tau = \left(1 - \left(\omega^{hh} - \omega^{ll}\right) \frac{f(V_1)\frac{\underline{u}}{\overline{u}} z_2^{hl} + f(V_2)\frac{\overline{u}}{\underline{u}} z_1^{hl} V_2}{f(V_1)\underline{u} + f(V_2)\overline{u}}\right) w$$

The tax is positive if

$$\frac{\frac{\omega^{hl}-\omega^{ll}}{\overline{u}} f(V_1)\underline{u} z_2^{hl} + \frac{\omega^{hh}-\omega^{hl}}{\underline{u}} f(V_2)\overline{u} z_1^{hl}}{f(V_1)\underline{u} + f(V_2)\overline{u}} < 1$$

Then

$$\frac{\omega^{hh} - \omega^{hl}}{\underline{u}} = \frac{2z_1^{hl}}{\left(2z_1^{hl} - 1\right)\left(\frac{2+\delta-r}{r}\right) + \left(1 + \delta - \bar{A}\right)} \left(\lambda - \bar{A}\right)$$

$$\frac{\omega^{hl} - \omega^{ll}}{\overline{u}} = \frac{2z_2^{hl}}{\left(2z_1^{hl} - 1\right)\left(\frac{2+\delta-r}{r}\right) + 1 + \delta - \bar{A} + \left(2z_1^{hl} - 1\right)\left(\bar{A} - \delta\right)} \left(\lambda - \bar{A}\right)$$

Noticing that $1 + \delta - \bar{A} < \frac{2+\delta-r}{r}$,it follows that the first ratio decreases with z_1^{hl}. Thus it is smaller than 1 if the value at $z_1^{hl} = 1/2$ is less than 1. This is the case if $\frac{\lambda-\bar{A}}{1+\delta-\bar{A}} \leq 1$ or if $\lambda \leq 1 + \delta$. Moreover $\frac{\omega^{hl}-\omega^{ll}}{\overline{u}} \leq \frac{\omega^{hh}-\omega^{hl}}{\underline{u}}$ because $z_2^{hl} < \frac{1}{2} < z_1^{hl}$ and $\bar{A} > \delta$. Thus both ratios are smaller than 1 if $\lambda < 1 + \delta$. It follows that

$$\frac{\frac{\omega^{hl}-\omega^{ll}}{\overline{u}} f(V_1)\underline{u} z_2^{hl} + \frac{\omega^{hh}-\omega^{hl}}{\underline{u}} f(V_2)\overline{u} z_1^{hl}}{f(V_1)\underline{u} + f(V_2)\overline{u}} < z_2^{hl} + z_1^{hl} = 1.$$

as required for positive tax to be optimal. ■

Case of $\delta > \overline{A}$

Proof of Proposition 8. (i) and (ii) follow from the proofs of Lemma 1 and of Corollary 5. The difference is that in the range $\frac{w}{\underline{u}} < V < \frac{w}{\overline{u}}$, the second mover follows the choice of the first one. The first mover then chooses l since $u^{ll}V > u^{hl}V - w > u^{hh}V - w$.■ ■

The invariance of the other results (though Proposition 6 (iii) clearly does not apply) is proven by following the same procedures as for the case of $\delta < \overline{A}$.

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