Legal Uncertainty and the Choice of Enforcement Procedures

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Abstract

This paper formally defines and theoretically analyses for the first time the concept of "legal (un-)certainty", a concept that is very often used by legal scholars but never formally defined. In particular it distinguishes legal uncertainty from other sources of enforcement uncertainty, and also identifies different degrees/dimensions of legal uncertainty. It looks at optimal enforcement by a benevolent agency, looking at different legal standards used for the decision and allowing the agency to optimize the level of sanctions/fines. It derives a welfare ranking for different information structures and legal standards and falsifies a number of presumptions that incorrectly drive the thinking of some law scholars, hence the practical design of law enforcement, including: i) that an increase in legal uncertainty should reduce welfare, and ii) that fines should be much lower with high legal uncertainty (according to the legal guidelines "nulla poena sine lege certa", where the implicit assumption is that a Rule of Reason makes the law less "certa").

JEL: K4, L4, K21, K23

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1. *Introduction*

It is widely argued that when deciding what type of procedures to use to enforce regulatory intervention in markets, an important criterion to use is Legal Certainty[4] - how well agents whose actions are being regulated understand the basis of any decisions to allow or disallow (and possibly penalise) their action should it ever come to the attention of a regulatory/enforcement authority. Certain enforcement procedures are advocated in policy circles as being superior, *ceteris paribus*, because the cost of the legal uncertainty[5] they generate is relatively low.

While this issue is important for a broad range of regulatory interventions[6] we frame our discussion and analysis in the specific context of competition policy and its enforcement. Here discussions on legal uncertainty usually involve comparisons of *Effects-Based*[7] enforcement procedures and *Per Se* enforcement procedures[8]. Under *Per Se* an *entire class* of actions is allowed (resp. disallowed), depending on whether their **average** harm is negative (resp. positive), whereas under *Effects-Based* procedures, the Competition Authority (CA) will investigate actions, and allow (resp. disallow) them if some estimate of their individual harm is negative (resp. positive)[9]. It is argued that under a *Per Se* rule firms are certain how their action will be treated if it ever comes under scrutiny by a CA, whereas, under an *Effects-Based* approach, they do not know for sure what decision would be taken, and consequently this Legal Uncertainty induced by *Effects –Based* procedures should lead the CA to favour *Per Se* procedures. For example,

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[4] Legal scholars and social scientists have, of course, discussed the issue of legal certainty in a much wider context than that of economic regulation. Among early prominent authors, Max Weber, thought of legal certainty as necessary for capitalist progress – see discussion in D'Amato (1983) with extensive references to legal scholars including Posner (8th edition, 2010). Forrester (2000) discusses the importance of Legal Certainty in the context of Competition Policy.

[5] Or, lack of ability to predict the outcome of a legal dispute. D'Amato (1983) defines "legal uncertainty" as a "situation that obtains when the (legal) rule that is relevant to a given act or transaction is said by informed attorneys to have an expected official outcome at or near the 0.5 level of predictability". For a recent extensive treatment of a legal expert see Kevin E. Davis (2011).

[6] These include interventions associated with the application of Competition Policy, Sectoral Regulation, Environmental Policy, determining eligibility for welfare benefits, Tax Compliance mechanisms etc.

[7] Sometimes alternatively called *discriminating or Rule-of-Reason* procedures. One can think of what in US is termed *Rule – of – Reason* as an extreme form of the *Effects-Based* approach under which competition authorities have the discretion to apply different economic methodologies and criteria on a *case-by-case* basis. For this last distinction see also Vickers (2007).

[8] Sometimes referred to as *object/form-based* procedures.

[9] This distinction is similar to the comparison between unconditional/rigid and conditional/flexible contracts. In the context of welfare policy there is an analogous distinction between universal and targeted benefits.

in his classic article, after reviewing all the reasons why it is hard to have clarity as to the circumstances under which an action may in principle be harmful or benign, and the difficulties of obtaining data and carrying out the calculations required to implement whatever tests might be available, Easterbrook (1992) writes "Do we then abandon antitrust? Hardly! We should instead use more widely the method we apply to cartels: per se rules based on ordinary effects disdaining the search for rare counter-examples."[10]

The issue of Legal Uncertainty has attracted attention in recent years for another reason. Legal experts have stressed that the increased tendency to use *effects-based* procedures should have been associated with a reduction in the level (or even removal) of fines imposed, though the reverse has been the case. Thus Dethmers and Engelen (2011) note that "the European Commission recently imposed a record fine of 1.06 billion euro on Intel for having abused its dominant position by employing conditional rebates…. *despite* the adoption by the Commission of a more effects-based approach under art. 102 (TFEU)[11]" The authors go on to argue that from a legal perspective the imposition of fines requires that "the Commission and courts must present evidence of intent or negligence in accordance with the principle of *nulla poena sine lege certa[12]*. In terms of policy it does not make sense to impose such high fines for anti-competitive behaviours, which are not per se illegal…"[13].

However, arguments about the implications of Legal Uncertainty for the choice of enforcement procedures – decisions rules and penalties - have not been subjected to a systematic welfare-based analysis, in part because, as one legal expert has noted, there is an "absence of rigorously defined yet practical measures of legal uncertainty"[14].

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[10] The issue has gained even more in importance recently as CAs worldwide have adopted significant reforms in decision and enforcement procedures, with an increasing use of Effects-Based rather than Per Se procedures. Examples include the adoption of a Rule-of-Reason standard for treating RPM in US, in the recent *Leegin* case (2007) – see for a discussion, Katsoulacos and Ulph (2009) – and the reforms in the assessment of article 102 practices by EU and national authorities (see the Commission Guidance Paper, 2008). These have followed earlier reforms adopting *effects-based* assessment procedures in merger, vertical and certain horizontal agreement cases. See also Katsoulacos and Ulph (2011a), Kokkoris and Lianos (2008), Will, B.E. and D. Schmidtchen (2008).

[11] Very high fines were imposed also in Microsoft and other recent cases – see for a review p. 86 – 89 of Dethmers and Engelen (2011). As the authors also note "The courts do not appear to impose any constraint on the Commission's discretion" to impose very high fines – p. 91.

[12] This Latin phrase may be translated as "no penalty unless there is certainty under the Law"

[13] Ibid. p. 98.

[14] Kevin E Davis (2011), p. 1. The paper by Craswell and Calfee (1986) refers to legal uncertainty as one factor that can generate uncertainty, but neither offers a definition nor distinguished different types of legal

In this paper we offer such an analysis by extending our previous welfare-based analysis of the choice between *Per Se* and *Effects-Based* legal standards – Katsoulacos and Ulph (2009)[15] - in two directions.

First, when analysing *Effects-Based* legal standards, we introduce a range of information structures that capture two different dimensions along which the legal uncertainty facing firms might differ.

a) Firms may or may not know whether, in the particular circumstances in which they take the action, the *true* harm that it will generate will be positive or negative[16];

b) Firms may or may not know whether, should their action ever come under scrutiny by the CA, the *estimate* of harm made by the CA will be positive or negative, and hence whether their action will be disallowed (resp. allowed).

This leads us to consider the following three information structures:

(i) *No Legal Uncertainty*: Here firms know for sure the sign of the CA's *estimate* of harm, and hence the decision that it will make should it ever consider their action. This situation can arise whether or not firms can accurately assess the *true* harm caused by their action.

(ii) *Partial Legal Uncertainty[17]*: Here firms do not know for sure the sign of the CA's *estimate* of harm in their case – and hence what decision it will reach - but they know the sign of the *true* harm generated by the action in their circumstances. Since the CA's estimate will be correlated with this, they know that their action is more likely to be disallowed if it is truly harmful than if it is truly benign.

(iii) *Complete Legal Uncertainty*: Here firms do not know the *true* harm that will be caused by the action in their particular circumstances, nor the estimate of harm that will be made by the CA. All they know is how likely it is on average that their action will be disallowed.

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uncertainty. Moreover their analysis conflates all sources of uncertainty that an agent might face as to whether an action would be subject to legal enforcement and penalty.

[15] There are also a number of recent articles that examine other issues related to the enforcement of Competition Policy - Immordino and Polo (2008), Schinkel et.al. (2006) and Sorgard (2009).

[16] In the terminology of Dethmers and Engelen (2011) cited above in footnote 13, they may not know whether their action is harmful by object.

[17] This is the only information structure considered in Katsoulacos & Ulph (2009).

The second extension we make is that, instead of assuming penalties are fixed and identical across legal standards, we allow penalties to be chosen by the Competition Authority and to vary depending on (i) the legal standard in force – *Per Se* or *Effects-Based* – and (ii) in the case of an *Effects-Based* standard, the information structure.

Underlying all our discussion and analysis is the recognition that all enforcement procedures – both *Effects-Based* and *Per Se* – are subject to Type I and Type II errors and associated *decision error costs*. A given *Effects-Based* enforcement procedure used by the CA, will be associated with a given level of *decision error costs,* and these will be exactly the same whatever information structure (type of Legal Uncertainty) applies. Legal Uncertainty relates only to firms' understanding of the basis of the CA's decision and so affects only whether or not firms will take an action and hence the deterrence effects produced by the enforcement procedure[18]. **It is important not to confuse decision errors with Legal Uncertainty** - the presence of decision errors is neither necessary nor sufficient for the presence of Legal Uncertainty[19,20]. A major contribution of our paper is to clearly distinguish Legal Uncertainty from decision errors and to isolate it from all other sources of uncertainty that might affect deterrence.

In relation to the two claims by legal experts that we discussed above we ask whether Legal Uncertainty might lead us to prefer a *Per Se* legal standard to an *Effects-Based* one in circumstances where the *Effects-Based* standard would otherwise have been preferable in terms of having lower decision error costs[21]. We do this by comparing the welfare levels produced by an Effects-Based procedure under the different information structures with those produced by *Per Se,* for both exogenous and endogenous penalties. We also compare the penalties that would be chosen under different legal standards and information structures.

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[18] Of course there are other uncertainties facing firms which will affect their decision as to whether or not to take the action - for example uncertainty as to whether their action will be investigated.

[19] There could in principle be Effect-Based enforcement procedures with decision errors but still no Legal Uncertainty, but equally situations where CAs can perfectly distinguish harmful from benign actions (and so make no decision errors) yet firms face legal uncertainty because they do not know whether their action is harmful or benign.

[20] The recent paper by Lang (2012), identifies legal uncertainty with decision errors and measures the degree of legal uncertainty through the size of the error bounds on the CA's estimate of harm.

[21] As in Katsoulacos & Ulph (2009) we ignore the potential cost advantage of decision-making under *Per Se* as compared to *Effects-Based* rules as an additional factor favouring *Per Se*. This is readily incorporated and we have no new insights to offer on this issue. See Christiansen, A. and W. Kerber. (2008).

Our main conclusions are as follows.

First, when penalties are fixed exogenously.

(i) While *Effects-Based* procedures **can** create *legal uncertainty* they do not **necessarily** do so. They allow CAs to discriminate and make different decisions in different cases, but this variability of treatment across different firms need not generate uncertainty on the part of any given firm as to how their particular case will be decided, should it ever be investigated. When there is *No Legal Uncertainty* then *Effects–Based* procedures generate higher welfare than *Per Se* because they have lower decision error costs. So *Per Se* is neither the only nor the best way of achieving legal certainty.

(ii) For an *Effects-Based* procedure, welfare may be higher with *Partial Legal Uncertainty* than with *No Legal Uncertainty* and so *a fortiori* higher than with *Per Se*. For under *Partial Legal Uncertainty* there is a **differential deterrence effect** - the fraction of harmful actions deterred is greater than that of benign actions - and the result will hold when this effect is strong enough.

Second when penalties can be chosen by the Competition Authority

(i) There is an unambiguous welfare ranking of welfare standards and information structures. For a given *Effects-Based* procedure, welfare is higher when there is *Partial Legal Uncertainty* than it is with *No Legal Uncertainty* which is in turn higher than when there is *Complete Legal Uncertainty*. Further the latter welfare dominates *Per Se*.

(ii) Under an *Effects-Based* legal standard the penalty chosen by the Competition Authority when there is *Partial Legal Uncertainty* will be *higher* than when there is *No Legal Uncertainty* and also higher than under the corresponding *Per Se* legal standard. The intuition is that Legal Uncertainty reduces the anticipated likelihood that an action will be disallowed and, to compensate for this and establish the desired deterrence level, the Competition Authority has to increase the level of penalties.

(iii) When there is *Complete Legal Uncertainty* there are circumstances where the Competition Authority will want to have no deterrence and so set a zero penalty, while in others it will want to have deterrence in which case, for the reasons given

above, it will set a higher penalty than under Partial Legal Uncertainty. Thus we find limited support for the legal principle of *nulla poena sine lega certa*.

2. *Basic Set Up and Modelling Legal Uncertainty*

Preliminaries

There is a population of firms of size 1 that could take a particular type of action – which is potentially prohibited under Competition Law.   A fraction γ, $0 < \gamma < 1$ come from a Harmful environment so, if they take the action and it is not stopped by a Competition Authority, this generates a social harm that is measured by the negative of the change in consumers' surplus, and denoted by $h_H > 0$ [22]. The remaining fraction come from a Benign environment, so, if they take the action, this generates harm that we denote by $h_B < 0$. Let $\bar{h} = \gamma h_H + (1-\gamma)h_B$ be the average harm for this type of action. The type of action is said to be *Presumptively Legal* (resp. *Illegal*) if $\bar{h} < 0$ $\left(\text{resp. } \bar{h} > 0 \right)$. We assume that γ and $\bar{h}$ are common knowledge.

In the absence of any intervention by the Competition Authority (CA), taking an action will confer a private benefit $b > 0$ for the firm [23]. The distribution of b is independent of the environment from which the firm comes [24]. We suppose that the private benefit has a positive continuous probability density $f(b) > 0$ on $[0,\infty)$ with cumulative distribution function given by $F(b)$, $0 < F(b) < 1$; $F'(b) = f(b) > 0$.

Competition Authority Decision Procedures

There is a Competition Authority which detects and initiates enforcement procedures against a fraction $\pi, 0 < \pi \le 1$ of the actions taken.   These enforcement procedures include verifying that a potentially ant-competitive action has been taken by the firm and, in the case of an *Effects-Based* standard, carrying out an investigation into

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[22] This is the substantive standard used by most Competition Authorities – see Motta (2004) or O'Donohue & Padilla (2007) - and employed in our previous paper – Katsoulacos & Ulph (2009). It is also the standard advocated by Salop (xxxx) This differs from a total welfare standard that would include the private benefit to the firm taking the action.
[23] Which we take to be the present value of the expected change in profits from the action over its 'natural' lifetime.
[24] The "symmetry" assumption - see Katsoulacos and Ulph (2009), in which we also discuss the implications of relaxing this assumption.

its potential harm. We refer to π as the coverage rate. In addition we assume that it takes time for the Authority to complete these enforcement procedures and reach a decision. We capture this through the fraction δ, $0 \leq \delta \leq 1$ [25] of the private benefit and social harm that accrue if the Authority decides to disallow the action. We refer to this as the delay.   We combine coverage rate and delay into a measure of the <u>administrative effectiveness</u> of the CA given by the parameter $\alpha = \pi(1-\delta)$, $0 \leq \alpha \leq 1$.

The CA can use one of two decision procedures.

Per Se   Here the CA allows <u>all</u> actions of a given type if that type is *Presumptively Legal* and disallows <u>all</u> actions if the type is *Presumptively Illegal.* Consequently, for any given type of action, only one type of decision error is made by the CA: Type I (False Convictions) if the type of action is *Presumptively Illegal* and Type II (False Acquittals) if it is Presumptively Legal.

Effects-Based   Under this procedure the CA undertakes an investigation of each action that comes before it, as a result of which it gets an estimate or a signal of the likely harm caused by the action. This signal, which is only imperfectly correlated with the true harm, will be either: "Positive Harm" indicating that on the basis of the evidence obtained the CA thinks the action is likely to reduce welfare; or "Negative Harm", indicating that the action is likely to increase welfare. The CA's decision rule is to disallow an action if it gets a Positive Harm signal and allow it if it gets a Negative Harm signal.

The quality of the "model" that the CA uses to generate its estimate of harm[26] is reflected by the parameters p_B, $0 < p_B < 1$ - the probability that a Benign action generates a Negative Harm signal - and p_H, $0 < p_H < 1$ - the probability that a Harmful action generates a Positive Harm signal.   We assume that the model used by the CA has some *discriminatory power* so that $p_B + p_H > 1$, so firms from the Harmful environment are more likely to generate a Positive Harm signal than are firms from the Benign environment, and vice versa.

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[25] For simplicity we assume in this paper that the delay is the same whatever legal standard is used.
[26] Equivalently we can refer to this as the quality of the *Effects-Based* Rule

As indicated in the introduction we are interested in the question of whether Legal Uncertainty would ever be a reason for preferring a *Per Se* legal standard to an *Effects-Based* one in situations where there was a *prima facie* reason to prefer the *Effects-Based* standard on account of its lower *decision error costs*. In Katsoulacos & Ulph (2009) we establish that the condition for an *Effects-Based* legal standard to have lower decision-error costs than the corresponding *Per Se* standard is that the "model" is sufficiently good that it can *Effectively Discriminate*. Formally this is captured by the following:

ASSUMPTION 1 *Effects-Based Standard Effectively Discriminates*

(i)   If the action is *Presumptively Legal* – so $\bar{h} = \gamma h_H + (1-\gamma)h_B < 0$ - then:

$$\frac{p_H}{1-p_B} > \frac{(1-\gamma)(-h_B)}{\gamma h_H} > 1 \qquad (1)$$

(ii)   If the action is *Presumptively Illegal* – so $\bar{h} = \gamma h_H + (1-\gamma)h_B > 0$ - then:

$$\frac{p_B}{1-p_H} > \frac{\gamma h_H}{(1-\gamma)(-h_B)} > 1 \qquad (2)$$

Assumption 1(i) guarantees that the average welfare of the actions that are disallowed will be negative, while 1(ii) guarantees that the average welfare of actions that are allowed is positive. It is straightforward to show that if an action is *Presumptively Legal* then (1) implies (2), while if it is *Presumptively Illegal* then (2) implies (1). So from now on we assume that **both** (1) and (2) hold.

Information Structures and Legal Uncertainty

We assume that firms know whether the CA is using a *Per Se* or an *Effects-Based* legal standard, and that, if it is *Per Se* whether it is *Per Se Legal* or *Per Se Illegal.* Accordingly under a *Per Se* standard there is *No Legal Uncertainty* since each firm knows for sure what decision the CA will make should it investigate their action.

When an *Effects-Based* approach is used we assume that firms understand that the CA will decide whether or not to disallow any action on the basis of the estimate of harm that it reaches as a result of its investigation, and that the CA is good enough at making this estimate that truly Harmful actions are more likely to be disallowed than truly Benign

ones. In fact, since we wish to focus purely on the potential Legal Uncertainty surrounding each firm's understanding of the basis of the decision that the CA will reach regarding their action, we make the assumption:

ASSUMPTION 2 All firms know the quality of the *Effects-Based* procedure as captured by the parameters p_B, p_H.

Legal Uncertainty may emerge for either or both of the following reasons:

(a) firms may imperfectly deduce from what is contained in Competition Law statutes (such as articles 101 and 102 EC) and other guidance what factors are taken into account and/or how they are taken into account for assessing harm,[27] and so any given firm k may not fully understand whether, in their circumstances, the true harm of their action, h_k is positive or negative – i.e. whether it is truly Harmful or truly Benign;

(b) despite the Guidelines produced by the CA which describe how the CA will assess actions related to specific business practices, any given firm k may only imperfectly understand what data and procedures will be used by the CA to estimate the harm that might be caused by its action and hence may or may not know whether the estimate of harm that will be made by the CA, h_k^e, will be positive or negative and hence whether its action will be allowed or disallowed. .

Consequently we can distinguish a number of situations of Legal Uncertainty in which firms may find themselves. For simplicity, in what follows we make the following assumption, though almost all our results go through without it[28].

ASSUMPTION 3 All firms face exactly the same type of Legal Uncertainty.

Given this assumption, the following situations of Legal Uncertainty arise.

- <u>No Legal Uncertainty</u> Here firms know whether h_k^e will be positive or negative and so will know in advance what decision that the authority will make should it ever investigate their action. Since the decision of the CA is all that matters in deciding whether or not to take the action, this case applies whether or not firms

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[27] Such considerations include the extent to which production is reduced, the prices are raised, innovative activity is enhanced, conduct is discriminatory etc.

[28] More precisely, if there were fixed but unknown fractions of firms facing different types of legal uncertainty, and if these were random subsets of the population of firms, then the welfare rankings of legal standards and of information structures that we derive in Section 4 will go through. The only result that would change would be that the CA would set just one level of penalty – that which applies when there is what we call Complete Legal Uncertainty.

know the sign of their true harm h_k. In this case a fraction p_H of firms from the Harmful environment will know for sure that their action will be disallowed, while the remaining fraction know for sure that it will be allowed. Similarly a fraction p_B of firms from the Benign environment will know for sure that their action will be allowed, while the remaining fraction know for sure that it will be disallowed.

- In the second situation firms do not know whether the estimate of harm h_k^e that will be made by the CA will be positive or negative – and hence what decision it will reach. This gives rise to two distinct cases.

    o <u>Partial Legal Uncertainty</u> In the first a firm knows its type (i.e. knows the sign of h_k), so a firm from the Harmful environment knows that there is a probability p_H of having its action disallowed, while a firm from the Benign environment knows that there is a probability p_B of having its action allowed.

    o <u>Complete Legal Uncertainty</u>. In this second case firms do not know their type, (i.e. do not know the sign of h_k), so anticipate that the probability of having their action disallowed is the average probability $\overline{p} = \gamma p_H + (1-\gamma).(1-p_B)$.

These cases and subcases are summarised in the following Table.

TABLE 1: Typology of LU Situations

		Firms know: the sign of h_k	
		YES	NO
Firms know: the sign of h_k^e	YES	No Legal Uncertainty	No Legal Uncertainty
	NO	Partial Legal Uncertainty	Complete Legal Uncertainty

Fines

We assume that in general fines take the form of a fixed penalty plus a component that is proportional to the private benefit, δb, that is obtained by the firm [29] taking account of the duration, δ, over which this benefit accrues owing to the delay in reaching a decision and closing the action down. The fixed component reflects the desire to link the penalty to the social harm that an anti-competitive the action causes, while the proportional component reflects the desire to create deterrence by eliminating the private benefit firms by acting anti-competitively. Formally our assumption is that if a firm with private benefit $b > 0$ has its action disallowed after a delay, δ, it has to pay a penalty $\psi + \varphi \delta b, \quad \psi \geq 0, \varphi \geq 0$.

Behaviour of Firms

Clearly if a firm knows for sure that, if investigated, its action will be allowed by the CA, penalties are irrelevant, and it will take the action whatever the penalty.

Consider then a firm that anticipates some positive probability $\beta, \quad 0 < \beta \leq 1$ of having its action banned/disallowed by the CA should it ever be investigated. Since it anticipates a probability $\pi, \quad 0 < \pi < 1$ of being investigated, and a delay $\delta, \quad 0 \leq \delta \leq 1$ in having the decision to disallow taken, its expected net benefit from taking the action is

$$b\{[1 - \beta\pi(1-\delta)] - \beta\pi\varphi\delta\} - \beta\pi\psi,$$

which we can write as

$$\beta\pi\{b[\Phi(\beta) - \varphi] - \psi\} \tag{3}$$

where

$$\Phi(\beta) = \left(\frac{1}{\beta\pi} - 1\right) + \delta > 0 \ ^{30} \tag{4}$$

. There are then two cases. If:

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[29] There is an extensive literature on fines and law enforcement – see in particular the survey of Polinsky and Shavell (2000). For treatments that address fines under antitrust law see Buccirossi and Spangolo (2006) and Wils (2006).

[30] Since the parameters π and δ are constant throughout the paper, we have suppressed the dependence of φ on them and focused solely on its dependence on the probability of being disallowed, which varies across legal standards and information structures.

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(i) $\varphi \geq \Phi(\beta)$, the firm cannot make a profit by taking the action, whatever the value of b and ψ;

(ii) $\varphi < \Phi(\beta)$ then taking the action is profitable for all values of

$$b > \frac{\psi}{\Phi(\beta) - \varphi} \geq 0.$$

So the interpretation of $\Phi(\beta)$ is that it is the critical value of the proportional component of the penalty above which ALL actions will be deterred, and below which some actions will be taken – potentially all if the penalty is purely proportional ($\psi = 0$). This critical value is higher:

- the lower is the probability of being investigated;
- the lower is the probability of having the action disallowed if investigated;
- the longer the delay in reaching a decision

This generalises the analysis appearing in typical treatments in the literature on law enforcement[31], where the critical value depends solely on just the first of these factors - the probability of detection – since it is implicitly assumed that conviction rates are 1 and there are no delays in decision-making.

Notice also that the case where the action will certainly be allowed - $\beta = 0$ - can be handled as a special case of the above analysis by defining $\Phi(0) = \infty$

Drawing all this discussion together, we see that for a group of firms with an anticipated probability β, $0 \leq \beta \leq 1$ of having their action disallowed by the CA, the fraction (D) of firms deterred from taking the action under any given penalty regime φ, ψ is:

$$D(\beta, \varphi, \psi) = \begin{cases} F\left[\dfrac{\psi}{\Phi(\beta) - \varphi}\right] & \text{if } \varphi < \Phi(\beta) \\ 1 & \text{if } \varphi \geq \Phi(\beta) \end{cases} \qquad (5)$$

As we will see, it turns out that if the CA can choose the penalty, it will want to deter either all or none of the firms from such a group. It can deter all firms by setting

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[31] See, for example, the review article by Polinsky and Shavell (2000).

$\varphi = \Phi(\beta)$ and $\psi = 0$, whereas it can deter none by setting $\varphi < \Phi(\beta)$ and $\psi = 0$. So the CA can achieve its objectives by using penalties that are purely proportional to private benefit. In what follows we assume that, when the CA can choose its penalty, it will indeed always choose a purely proportional penalty[32]. The dependence of the critical value of the penalty on the probability of an action's being disallowed means that the penalty chosen will vary depending on both the legal standard in force and the information structure – the type of legal uncertainty.

3. *Outcomes Under Different Enforcement Procedures and Legal Uncertainty*

In this section we set out the levels of welfare under different legal standards and information structures, for both the case where penalties are exogenous and the case where the CA can choose the level of penalty.

3.1 *Effects-Based* Legal Standard

In this sub-section we assume that the CA uses an Effects-Based legal standard. The quality of the decision-making rule under this standard is given by the parameters (p_B, p_H) which are common knowledge and it is assumed that the rule can *Effectively Discriminate* so both (1) and (2) hold. We consider different information structures - degrees of *Legal Uncertainty*.

3.1.1 *No Legal Uncertainty*

Here a fraction p_B $\left(\text{resp. } 1 - p_H\right)$ of firms from the Benign (resp. Harmful) environment know for sure that their action will be allowed and so will take it irrespective of the penalty. The remaining firms from each environment know for sure

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[32] This is indeed what competition authorities typically try to do, since many impose penalties that are proportional to the revenue made by a firm taking an action. The purely proportional assumption can also be justified by an appeal to a principle of proportionality – the CA uses the smallest penalty necessary to achieve its deterrence objectives.

that, if investigated, their action will be disallowed, albeit after a delay. Since private benefit is uncorrelated with harm, then, for any given penalty, the same fraction

$$D^{EB0} = \begin{cases} F\left[\dfrac{\psi}{\Phi(1)-\varphi}\right] & \text{if } \varphi < \Phi(1) \\[4mm] 1 & \text{if } \varphi \geq \Phi(1) \end{cases}$$

of these firms will be deterred from taking the action. Of those that take the action, harm will arise to the extent that only a fraction will be investigated, and, for those that are investigated, there will be a delay in reaching the decision to stop the action. So the harm generated will depend on the administrative effectiveness, α. Consequently welfare under a given penalty is:

$$\begin{aligned} W^{EB0}(\alpha) = &\left\{(1-\gamma)(-h_B)p_B - \gamma h_H(1-p_H)\right\} - \\ &\left(1-D^{EB0}\right)(1-\alpha)\left\{\gamma h_H p_H - (1-\gamma)(-h_B)(1-p_B)\right\} \end{aligned}$$

(6)

The first term captures the welfare arising from those who know for sure that their action will be allowed, while the second is the expected welfare arising from those who know for sure that their action will be disallowed. Since the CA's rule is assumed to be able to effectively discriminate, actions that are allowed will on average be beneficial while those that are disallowed will on average be harmful. Hence, from (1) and (2), both the expressions in curly brackets are positive. This has two implications.

The first is that welfare is a strictly increasing function of administrative effectiveness, α.

The second is that if the CA could choose the penalty, it would like to deter all those firms who know for sure their action will be disallowed from taking it, so it would set a penalty

$$\hat{\varphi}^{EB0} = \Phi(1) = \left(\frac{1}{\pi}-1\right) + \delta, \quad \hat{\psi}^{EB0} = 0,$$

(7)

giving rise to welfare:

$$\hat{W}^{EB0} = (1-\gamma)(-h_B)p_B - \gamma h_H(1-p_H) > 0.$$

(8)

3.1.2 *Partial Legal Uncertainty*

Here, while no firm knows for sure whether their action will be allowed or disallowed (and so there is Legal Uncertainty), firms do know for sure whether their action is

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Harmful or Benign. Firms from the Harmful environment anticipate that, if investigated, there is a probability, p_H of having their action disallowed, albeit after a delay, whereas firms from the Benign environment anticipate a lower probability $1 - p_B < p_H$ of an unfavourable decision by the CA. The fraction of firms from the Harmful environment that are deterred from taking the action is,

$$D_H^{EBP} = \begin{cases} F\left[\dfrac{\psi}{\Phi(p_H) - \varphi}\right] & \text{if } \varphi < \Phi(p_H) \\ 1 & \text{if } \varphi \geq \Phi(p_H) \end{cases},$$

while the fraction from the Benign environment that are deterred is

$$D_B^{EBP} = \begin{cases} F\left[\dfrac{\psi}{\Phi(1 - p_B) - \varphi}\right] & \text{if } \varphi < \Phi(1 - p_B) \\ 1 & \text{if } \varphi \geq \Phi(1 - p_B) \end{cases}.$$

Note that since $1 - p_B < p_H < 1$, then $\Phi(1 - p_B) > \Phi(p_H) > \Phi(1)$. Consequently if the penalty is so severe that all firms from even the Benign environment are deterred − i.e. $\varphi \geq \Phi(1 - p_B)$ - then we will have $D_B^{EBP} = D_H^{EBP} = D^{EB0} = 1$. However if $\varphi < \Phi(1 - p_B)$ it will be the case that $D_B^{EBP} < D_H^{EBP} \leq D^{EB0} \leq 1$.

Whatever the penalty regime, welfare in this case is given by:

$$W^{EBP}(\alpha) = (1 - \gamma)(1 - D_B^{EBP})(-h_B)\left[1 - \alpha(1 - p_B)\right] - \gamma(1 - D_H^{EBP})h_H\left[1 - \alpha p_H\right]. \quad (9)$$

The first term gives the welfare arising from those firms from the Benign environment who take the action, taking account of the fact that a fraction $\alpha(1 - p_B)$ of this will not materialise since some firms will be investigated and have their action disallowed, albeit after a delay. The second term is the analogous expression for firms from the Harmful environment.

If the CA can choose the penalty, it will want to ensure that NONE of the firms from the Benign environment are deterred, whereas ALL those from the harmful environment are deterred, and it can achieve this by setting a purely proportional penalty

$$\hat{\varphi}^{EBP} = \Phi(p_H) = \left(\frac{1}{\pi p_H} - 1\right) + \delta, \quad \hat{\psi}^{EBP} = 0, \quad (10)$$

giving rise to welfare:

$$\hat{W}^{EBP}(\alpha) = (1-\gamma)(-h_B)\left[1-\alpha(1-p_B)\right] > 0. \tag{11}$$

Notice that this level of welfare is a strictly <u>decreasing</u> function of the administrative effectiveness of the CA, since, because it is only firms from the Benign environment that are not deterred, welfare is higher the fewer of these are investigated and the longer it takes to curtail their action in the event that it is both investigated and disallowed.

3.1.3 *Complete Legal Uncertainty*

Once again, no firm knows for sure whether their action will be allowed or disallowed, so there is legal uncertainty. But, in this case, firms do not even know their type, so all firms anticipate the same probability $\bar{p} = \gamma p_H + (1-\gamma)(1-p_B) < p_H$ of having their action disallowed if investigated. Accordingly the same fraction of firms

$$D^{EBC} = \begin{cases} F\left[\dfrac{\psi}{\Phi(\bar{p})-\varphi}\right] & \text{if } \varphi < \Phi(\bar{p}) \\ 1 & \text{if } \varphi \geq \Phi(\bar{p}) \end{cases}$$

from each environment will be deterred from taking the action. If $\varphi < \varphi(\bar{p})$ so the penalty is sufficiently low that some firms do indeed take the action, then we will have $D_B^{EBP} < D^{EBC} < D_H^{EBP} \leq 1$.

For any given penalty regime welfare is

$$W^{EBC} = \left(1 - D^{EBC}\right)\overline{W}^{EBC}(\alpha) \tag{12}$$

where

$$\begin{aligned} \overline{W}^{EBC}(\alpha) &= (1-\gamma)(-h_B)\left[1-\alpha(1-p_B)\right] - \gamma h_H\left[1-\alpha p_H\right] \\ &= -\bar{h} + \alpha\left[\gamma h_H p_H - (1-\gamma)(-h_B)(1-p_B)\right] \end{aligned} \tag{13}$$

is the average welfare generated by those firms which take the action when there is Complete Legal Uncertainty. Given our assumption that the CA's *Effects-Based* rule can *Effectively Discriminate* we see from (1) and (13) that the average welfare generated by those firms that take the action is a strictly <u>increasing</u> function of the *administrative effectiveness* of the CA, α, with

$$\overline{W}^{EBC}(0) = -\overline{h}; \quad \overline{W}^{EBC}(1) = (1-\gamma)(-h_B) p_B - \gamma h_H (1-p_H) > 0 \qquad (14)$$

where the sign of $\overline{W}^{EBC}(1)$ follows from (2) and hence our assumption that the *Effects-Based* rule can *Effectively Discriminate.*

In considering the implications for the penalty that would be chosen by the CA, and the associated level of welfare, two cases arise:

Case 1. Positive Average Welfare, $\left(\overline{W}^{EBC}(\alpha) > 0 \right)$

From (14) and (13) it is easy to see that a <u>sufficient</u> condition for this case to arise is that the action is *Presumptively Legal* $\left(\overline{h} < 0 \right)$. In this case the CA will not want to deter any firm from taking the action, so the optimal penalty is:

$$\hat{\varphi}_+^{EBC} = 0, \quad \hat{\psi}_+^{EBC} = 0 \qquad (15)$$

and the associated level of welfare is:

$$\hat{W}_+^{EBC}(\alpha) = \overline{W}^{EBC}(\alpha) > 0 . \qquad (16)$$

Case 2. Negative Average Welfare, $\left(\overline{W}^{EBC}(\alpha) < 0 \right)$

Once again it is straightforward to see from (13) and (14) that a <u>necessary</u> condition for this to arise is that the action is *Presumptively Illegal* $\left(\overline{h} > 0 \right)$ In this case, the CA will want to deter all firms from taking the action in which case

$$\varphi_-^{EBC} = \Phi\left(\overline{p}\right) = \left(\frac{1}{\pi \overline{p}} - 1 \right) + \delta, \quad \hat{\psi}^{EBC} = 0 \qquad (17)$$

and the associated level of welfare is:

$$W_-^{EBC} = 0 . \qquad (18)$$

Taking the two cases together we see that, when the CA can set the penalty, welfare under an *Effects-Based* legal standard when there is *Complete Legal Uncertainty* is

$$W^{EBC}(\alpha) = MAX \left\{ \overline{W}^{EBC}(\alpha), 0 \right\} . \qquad (19)$$

3.2   *Per Se* Legal Standard

In this sub-section we assume that the CA uses a *Per Se* legal standard whereby all actions will be either allowed by the CA if the action is *Presumptively Legal* or, if the action is *Presumptively Illegal* will certainly be disallowed (albeit with a delay) if the action is investigated by the CA. This is common knowledge so there is no legal uncertainty when such a legal standard is used. To understand the implications consider in turn two cases.

3.2.1   *Presumptively Legal* $\left(\bar{h} < 0 \right)$

In this case all firms take the action whatever the penalty and the associated level of welfare is

$$W^{PSL} = -\bar{h} > 0. \tag{20}$$

Since penalties are irrelevant they can effectively be set to zero, so:

$$\varphi^{PSL} = 0, \quad \hat{\psi}^{PSL} = 0 \tag{21}$$

and, for completeness, welfare is:

$$W^{PSL} = -\bar{h} > 0. \tag{22}$$

3.2.2   *Presumptively Illegal* $\left(\bar{h} > 0 \right)$

In this case the same fraction of firms from both the Harmful and Benign environments will be deterred, namely

$$D^{PSI} = \begin{cases} F\left[\dfrac{\psi}{\Phi(1) - \varphi} \right] & \text{if } \varphi < \Phi(1) \\ 1 & \text{if } \varphi \geq \Phi(1) \end{cases} = D^{EB0},$$

and, of those who are not deterred, a fraction, π, will be investigated and have their actions disallowed after a delay, so welfare for any given penalty is:

$$W^{PSI}(\alpha) = -\left(1 - D^{PSI}\right)(1 - \alpha)\bar{h} \leq 0. \tag{23}$$

This is a strictly <u>increasing</u> function of administrative effectiveness, α, since, if actions are on average harmful society is better off the higher the proportion investigated and the sooner they are stopped.   If the CA can choose the penalty it will want to deter all actions and so will set a penalty

$$\hat{\varphi}^{PSI} = \Phi(1) = \left(\frac{1}{\pi} - 1\right) + \delta = \hat{\varphi}^{EB0}, \quad \hat{\psi}^{PSI} = 0, \qquad (24)$$

giving rise to welfare

$$W^{PSI} = 0. \qquad (25)$$

So, in general, when the CA can choose the penalty, welfare under a *Per Se* legal standard is

$$W^{PS} = MAX\left\{-\bar{h}, 0\right\}. \qquad (26)$$

4. *Comparisons and Main Results*

In this section we compare welfare under different legal standards and information structures. We start with the case where penalties are fixed and are the same across all regimes.

4.1 *Exogenous Penalties*

We begin by comparing the outcomes when there is the same information structure, *No Legal Uncertainty*, but different legal standards, *Effects-Based* and *Per Se*; and then we compare the outcomes when there is the same legal standard, *Effects-Based,* but different information structures.

4.1.1 *No Legal Uncertainty: Effects-Based vs Per Se*

We have the following result:

Proposition 1 If there is *No Legal Uncertainty* then an *Effects-Based* legal standard welfare dominates a *Per Se* legal standard.

Proof: Since $D^{EB0} = D^{PSI}$ it follows from (6), (20) and (23) , and from (1) and (2) that:

$$W^{EB0} - W^{PSI} = \left[1 - \left(1 - D^{EB0}\right)(1 - \alpha)\right]\left\{(1 - \gamma)\left(-h_B\right)p_B - \gamma h_H\left(1 - p_H\right)\right\} > 0$$

and

$$W^{EB0} - W^{PSL} = \left[1 - \left(1 - D^{EB0}\right)(1 - \alpha)\right]\left\{\gamma h_H p_H - (1 - \gamma)\left(-h_B\right)\left(1 - p_B\right)\right\} > 0.$$

The intuition is straightforward. Given our assumption that the *Effects-Based* rule can *Effectively Discriminate* (so equations (1) and (2) hold), the average welfare of all the

firms who know for sure that their action will be allowed is positive. Since, under this rule, all of these firms take the action, this welfare dominates a *Per Se Illegal* rule since, under that rule, some of these firms will be deterred from taking the action while of those who are not deterred a fraction will be investigated and have their action disallowed. On the other hand, under the *Effects-Based* rule, the average welfare of all the firms who know for sure that their action will be disallowed is negative. Under the *Effects-Based* rule some of these will be deterred from taking the action and for those who are not deterred some might have their action stopped. However, under a *Per Se Legal* rule all these firms generating negative welfare take the action. So if there is *No Legal Uncertainty* then it is better to have the discriminatory power of an *Effects-Based* legal standard.

4.1.2 *Effects-Based Legal Standard*: *Partial Legal Uncertainty vs No Legal Uncertainty*
From (6) and (9) we have

$$W^{EBP} - W^{EB0} = \left(D_H^{EBP} - D_B^{EBP}\right)(1-\gamma)\left(-h_B\right)\left[1-\alpha\left(1-p_B\right)\right]$$
$$- D_H^{EBP}\left\{(1-\gamma)\left(-h_B\right)p_B - \gamma h_H\left(1-p_H\right)\right\} \qquad (27)$$
$$- \left(D^{EB0} - D_H^{EBP}\right)(1-\alpha)\left\{\gamma h_H p_H - (1-\gamma)\left(-h_B\right)\left(1-p_B\right)\right\}$$

Recall that $D^{EB0} \geq D_H^{EBP} \geq D_B^{EBP}$ where the two inequalities are strict if, under *Partial Legal Uncertainty* some firms from the harmful environment take the action, and that, from (1) and (2) the two terms in curly brackets on RHS of (27) are positive.

The interpretation of this expression is as follows. The first term shows that welfare under *Partial Legal Uncertainty* may be higher than that under *No Legal Uncertainty* because of what we called in Katsoulacos & Ulph (2009) the **differential deterrence effect** – the fraction of Benign actions that are deterred is lower than the fraction of Harmful actions that are deterred – an effect not present under *No Legal Uncertainty*. The second effect reflects the fact that a fraction of those firms whose actions would be allowed for sure under *No Legal Uncertainty* will be deterred from taking the action under *Partial Legal Uncertainty*, and since, on average, the welfare generated by these firms is positive, this is a factor that makes welfare lower under *Partial Legal Uncertainty*. The third term reflects the fact that for those firms whose

actions will be disallowed for sure under *No Legal Uncertainty* a smaller fraction may be deterred under *Partial Legal Uncertainty*. Since, on average, the welfare generated by these firms is negative, this is another factor making welfare lower under *Partial Legal Uncertainty*.

The overall welfare difference depends on the balance of these three effects, but there are certainly circumstances under which the first dominates the other two. For example, this would arise if the *Effects-Based* rule was only barely good enough to *Effectively Discriminate* – so the second term on RHS of (27) was close to zero – while, if the penalty was so large that all the firms from the Harmful environment were deterred, while some from the Benign environment took the action,[33] then we would have $1 = D^{EB0} = D_H^{EBP} > D_B^{EBP}$ and the third term on RHS of (27) would be zero while first would be positive. So we have established:

Proposition 2 Welfare can be higher under *Partial Legal Uncertainty* than under *No Legal Uncertainty*.

From Proposition 1 and Proposition 2 we can establish the following:

Corollary 2

(a) If *Partial Legal Uncertainty* welfare dominates *No Legal Uncertainty* then *a fortiori* it welfare dominates *Per Se*.

(b) Even if welfare is lower under *Partial Legal Uncertainty* than under *No Legal Uncertainty* it may still be higher than under *Per Se*[34].

4.1.3 *Effects-Based Legal Standard*: *Complete Legal Uncertainty vs Partial Legal Uncertainty*

From (9), (12) and (13) we have:

$$W^{EBP} - W^{EBC} = \left(D^{EBC} - D_B^{EBP} \right)(1-\gamma)(-h_B)\left[1 - \alpha(1 - p_B) \right] + \left(D_H^{EBP} - D^{EBC} \right)\gamma h_H \left[1 - \alpha p_H \right] \geq 0 \tag{28}$$

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[33] That is $\tilde{\varphi}\left(p_B \right) > \varphi \geq \tilde{\varphi}\left(p_H \right) > \tilde{\varphi}(1)$

[34] See Katsoulacos & Ulph (2009) for an extensive analysis and discussion of the conditions under which an *Effects-Based* legal standard with *Partial Legal Uncertainty* welfare dominates *Per Se*

Note that $D_H^{EBP} \geq D^{EBC} \geq D_B^{EBP}$ with strict inequalities if some firms take the action under *Complete Legal Uncertainty*. Hence both terms on the RHS of (28) are non-negative: the first because, compared to *Partial Legal Uncertainty*, *Complete Legal Uncertainty* deters at least as many Benign actions and the second because it deters no more Harmful actions. So we have:

Proposition 3 *Partial Legal Uncertainty* welfare dominates *Complete Legal Uncertainty*

4.1.4 *Effects-Based Legal Standard*: *Complete Legal Uncertainty vs No Legal Uncertainty*

From (6), (12) and (13) we get:

$$W^{EBC} - W^{EB0} = -D^{EBC} \left\{ (1-\gamma)(-h_B) p_B - \gamma h_H (1-p_H) \right\}$$
$$- \left(D^{EB0} - D^{EBC} \right)(1-\alpha)\left\{ \gamma h_H p_H - (1-\gamma)(-h_B)(1-p_B) \right\} < 0 \qquad (29)$$

where, $D^{EB0} \geq D^{EBC}$. The two terms on RHS of (29) are just the analogues of the second and third terms that appear on RHS of (27), and so have the same interpretation. Since there is no offsetting **differential deterrence effect** we can unambiguously sign the welfare difference and so establish:

Proposition 4 *No Legal Uncertainty* welfare dominates *Complete Legal Uncertainty.*

Notice that following the discussion of the conditions under which *Partial Legal Uncertainty* may welfare dominate *No Legal Uncertainty* there are analogous conditions under which the first term on the RHS of (29) may be extremely small and the second zero so that welfare under *Complete Legal Uncertainty* is very close to that under *No Legal Uncertainty*. Since, from Proposition 1, an *Effects-Based* legal standard with *No Legal Uncertainty* welfare dominates *Per Se* we have:

Corollary 4 Although an information structure in which there is *Complete Legal Uncertainty* is the worst information structure for an *Effects-Based* legal standard, there are conditions under which it welfare dominates the outcome under a *Per Se* legal standard.

4.2 *Endogenous Penalties*

In this sub-section we first compare the levels of welfare across different information structures and legal standards if penalties are no longer fixed but can be chosen by the CA so as to best achieve its objective given the legal standard and information structure. We then compare the associated levels of penalty across both legal standards and information structures.

Before undertaking these comparisons we note that in a *First-Best* world with costless perfect information, the CA would be able to investigate all actions, accurately and distinguish Harmful and Benign actions; instantly disallow the former while allowing the latter. All Harmful actions would therefore be deterred and all Benign actions allowed generating a *First-Best* welfare level

$$W^{FB} = (1-\gamma)(-h_B). \tag{30}$$

Turning to the second-best world we have the following comparisons.

4.2.1 *Welfare Comparisons*

The following inequalities follow immediately from (8), (11), (13), (19), (26) and (30):

$$
\begin{aligned}
W^{FB} &= (1-\gamma)(-h_B) \\
&= W^{EBP}(0) \\
&\geq W^{EBP}(\alpha) = (1-\gamma)(-h_B)\left[1-\alpha(1-p_B)\right] \\
&\qquad = (1-\gamma)(-h_B)p_B + (1-\gamma)(-h_B)(1-p_B)(1-\alpha) \\
&\geq W^{EBP}(1) = (1-\gamma)(-h_B)p_B \\
&> W^{EB0} = (1-\gamma)(-h_B)p_B - \gamma h_H(1-p_H) \\
&= W^{EBC}(1) \\
&\geq W^{EBC}(\alpha) = MAX\left\{-\bar{h} + \alpha\left[\gamma h_H p_H - (1-\gamma)(-h_B)(1-p_B)\right], 0\right\} \\
&\geq W^{EBC}(0) = MAX\left\{-\bar{h}, 0\right\} \\
&= W^{PS}
\end{aligned}
\tag{31}
$$

This establishes the following:

Proposition 5 When the CA can choose the appropriate penalty then there is a clear welfare ranking of information structures and legal standards. In particular:

(a) With an *Effects-Based* legal standard *Partial Legal Uncertainty* strictly dominates *No Legal Uncertainty* which in turn dominates *Complete Legal Uncertainty.*

(b) An *Effects-Based* legal standard with *Complete Legal Uncertainty* welfare dominates a *Per Se* legal standard.

(c) Under an *Effects-Based* legal standard with *Partial Legal Uncertainty* welfare is a strictly <u>decreasing</u> function of administrative effectiveness, α, with the First-Best level of welfare being attained when $\alpha = 0$.

(d) Under an *Effects-Based* legal standard with *Complete Legal Uncertainty* welfare is a strictly <u>increasing</u> function of administrative effectiveness, α, achieving the same welfare as with *No Legal Uncertainty* when $\alpha = 1$ and the same welfare as under *Per Se* when $\alpha = 0$.

These results are illustrated in Figure 1 below. The explanation and intuition behind these results is as follows.

First Best Dominates Partial Legal Uncertainty

When there is *Partial Legal Uncertainty* the CA can exploit the fact that firms know their type and the fact that, since its rule has discriminatory ability, fewer firms from the Benign environment will be disallowed than from the Harmful environment, to set a penalty that ensures no Harmful actions are taken while all Benign actions are taken, even though some of these may subsequently be investigated and stopped, albeit after a delay. The CA thus completely separates Benign from Harmful actions. If administrative effectiveness is zero all Benign actions are effectively allowed and the First-Best is attained. When administrative effectiveness is positive some Benign actions are ultimately stopped so welfare falls the greater is administrative effectiveness.

Partial Legal Uncertainty Strongly Dominates No Legal Uncertainty

There are two reasons why this result holds. First, with *Partial Legal Uncertainty* ALL Harmful actions are deterred, whereas, under *No Legal Uncertainty,* some firms from the Harmful environment will take the action knowing for sure that, given the CA's imperfect model, they will subsequently be allowed. Second, under *No Legal Uncertainty*, knowing for sure that they will subsequently be disallowed, a fraction of

Benign actions will be deterred. This will be greater than or equal to the fraction of Benign actions that, though undeterred, will be stopped following an investigation under *Partial Legal Uncertainty*.[35]

No Legal Uncertainty Dominates Complete Legal Uncertainty.
There are two cases to consider. The first is where, under *Complete Legal Uncertainty,* the average welfare were all firms to take the action is negative[36] and consequently the CA would set a high penalty that deters ALL firms from taking the action, generating zero welfare. But then *No Legal Uncertainty* generates higher welfare since those firms that know for sure that their action will be allowed will take it and, on average, they generate positive welfare. The second case is where, under *Complete Legal Uncertainty,* the average welfare if all firms take the action is positive[37], and consequently the CA will set a zero penalty and so deter no actions. But now welfare with *Complete Legal Uncertainty* is a strictly increasing function of administrative effectiveness since the only thing that reduces the harm created by firms taking the action are the decisions of the CA, and, given it can effectively discriminate, the more actions it can get its decision-making ability to bite on and the faster it reaches its decision the higher is welfare. When there is complete administrative effectiveness and so all actions are investigated and decisions reached instantly to stop some of them with immediate effect, the remaining actions that are allowed will be exactly the same as those arising from those firms who know for sure their action will be allowed under *No Legal Uncertainty.*

Effects-Based Legal Standards with Complete Legal Uncertainty Dominate Per Se
If the action is *Presumptively Illegal* then under *Per Se* the CA will set a penalty that will deter all actions. However this will happened under an *Effects-Based* standard with *Complete Legal Uncertainty* only if, in addition, administrative effectiveness is low. In this case both procedures produce zero welfare. However when the action is

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[35] The fraction of Benign actions taken when there is *No Legal Uncertainty* will be the same as under *Partial Legal Uncertainty* only when there is complete administrative effectiveness.
[36] This arises only if the action is *Presumptively Illegal* and the degree of administrative effectiveness is low.
[37] This will arise either if the action is *Presumptively Legal* or if it is *Presumptively Illegal* but there is a sufficiently high degree of administrative effectiveness.

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Presumptively Illegal but administrative effectiveness is sufficiently high, then, as we have seen, under an *Effect-Based* standard with *Complete Legal Uncertainty* the CA will want to set a zero penalty so no actions are deterred, but it then uses its ability to *Effectively Discriminate* to allow predominantly Benign actions so producing positive welfare. When the action is *Presumptively Legal* the CA will set zero penalties under both a *Per Se* legal standard and under an *Effects-Based* legal standard with *Complete Legal Uncertainty.* But then in both cases all actions will be taken. However the power of the *Effects-Based* procedure to *Effectively Discriminate* will produce lower decision-error costs and so higher welfare.

As noted in the introduction, what this discussion brings out very clearly is that under an *Effects-Based* legal standard the CA can prevent actions either by deterrence – stopping them ever being taken – or desistance – investigating and stopping (possibly after a delay) those that have been taken – and that, through a careful choice of penalties, the balance between these two modes will shift in subtle ways depending on the informational structure and hence the extent of *Legal Uncertainty* faced by firms. Under a *Per Se* legal standard, if the action is *Presumptively Illegal* the CA makes it clear that any action that is taken will be stopped and combines this with a penalty that deters all actions. Whereas if the action is *Presumptively Legal* the CA neither deters nor desists any action. It is this much cruder nature of a *Per Se* standard that makes it unambiguously worse that an *Effects-Based* standard – whatever the degree of Legal Uncertainty.

4.2.2   *Comparison of Penalties*

From (7), (10), (15), (17), (21), and (24) we have the following inequalities:

$$0 = \hat{\varphi}^{PSL} = \hat{\varphi}_{+}^{EBC} < \hat{\varphi}^{PSI} = \hat{\varphi}^{EB0} = \Phi(1)$$
$$< \hat{\varphi}^{EBP} = \Phi\left(p_{H}\right) \qquad (32)$$
$$< \hat{\varphi}_{-}^{EBC} = \Phi\left(\overline{p}\right)$$

This establishes the following:

Proposition 6   Under an *Effects-Based* legal standard, the penalty chosen by the CA will be:

(a) higher when there is *Partial Legal Uncertainty* than when there is *No Legal Uncertainty*

(b) higher still when there is *Complete Legal Uncertainty* and average welfare if all firms take the action is negative;

(c) zero if there is *Complete Legal Uncertainty* and average welfare if all firms take the action is positive.

Thus in situations where there is legal uncertainty the appropriate penalty may be higher than when there is no legal uncertainty, though there is one class of cases where the appropriate penalty under *Complete Legal Uncertainty* is indeed zero. While this latter result is certainly consistent with the principle of *nulla poena sine lega certa* as advocated by Dethmers and Engelen (2011) and other legal scholars, there is no **general** support for this principle.

5. *Concluding Remarks*

This paper proposes a formalisation of the concept of Legal Uncertainty in a framework that, as in Katsoulacos and Ulph (2009) is based on the premise that Competition Authorities cannot assess without mistakes the harm created by specific actions associated with certain business practices and on the assumption that there is imperfect information by firms in assessing the true harm of their actions and/or the Competition Authority's estimate of harm in case these actions come under investigation. Depending on the type of information imperfection faced by firms a typology of Legal Uncertainty situations emerges that classifies *Effects–Based* procedures into those involving: *No Legal Uncertainty, Partial Legal Uncertainty,* or *Complete Legal Uncertainty*. These should be thought of as representing end-points on various spectra of uncertainty, since they capture situations where firms either know or do not know certain key features of the enforcement process used by a Competition Authority, whereas in practice firms might know these with different degrees of uncertainty. We compare these different information structures between themselves and with *Per Se* procedures first assuming that penalties are exogenously given and then assuming that penalties are endogenous.

Our analysis offers important grounds for scepticism about arguments coming mainly from legal experts, that *Effects-Based* procedures are less attractive than *Per Se* because of the Legal Uncertainty that they entail and that, if adopted, should involve much lower penalties according to the legal principle of *nulla poena sine lege certa.* Two important policy lessons emerge in particular from the analysis above.

First, enforcement procedures involving legal uncertainty may be welfare superior to those without any legal uncertainty because of their better deterrence effects. This is most likely when legal uncertainty arises because, although firms know their type, they cannot predict what the Competition Authority will decide in their case. Thus a decision by policy makers not to adopt *Effects-Based* procedures cannot be based solely or even mainly on arguments relating to the legal uncertainty of such procedures.

Second, the superiority of *Effects-Based* procedures is enhanced when Competition Authorities use penalties to achieve optimal deterrence effects. In that case it is never optimal to use *Per Se.* This is because under an *Effects-Based* legal standard the CA can prevent actions either by *deterrence* – stopping them ever being taken – or by *desistance* – investigating and stopping (possibly after a delay) those that have been taken. Under a *Per Se* legal standard, if the action is *Presumptively Illegal* the CA makes it clear that any action that is detected and investigated will be stopped and, to counter the risk of not being detected, combines this with a penalty that deters all actions. Whereas if the action is *Presumptively Legal,* the CA neither deters nor desists any action. It is this much cruder nature of *Per Se* procedures that makes them unambiguously worse that *Effects-Based* procedures whatever the type of *Legal Uncertainty* – a conclusion that runs directly counter to that proposed by many legal experts.

Finally, and more practically, our analysis shows that Competition Authorities may well be justified in *raising* their penalties after adopting *Effects-Based* procedures.

Of course our framework is rather simple and there are many extensions to our analysis that can be made. Some of these extensions are made in an accompanying discussion paper, Katsoulacos & Ulph (2011b) where we show that the results obtained here go through if (i) we endogenise the information structure that firms have by allowing them to invest resources in information acquisition; (ii) instead of all firms having the same information structure different firms may have different information structures.

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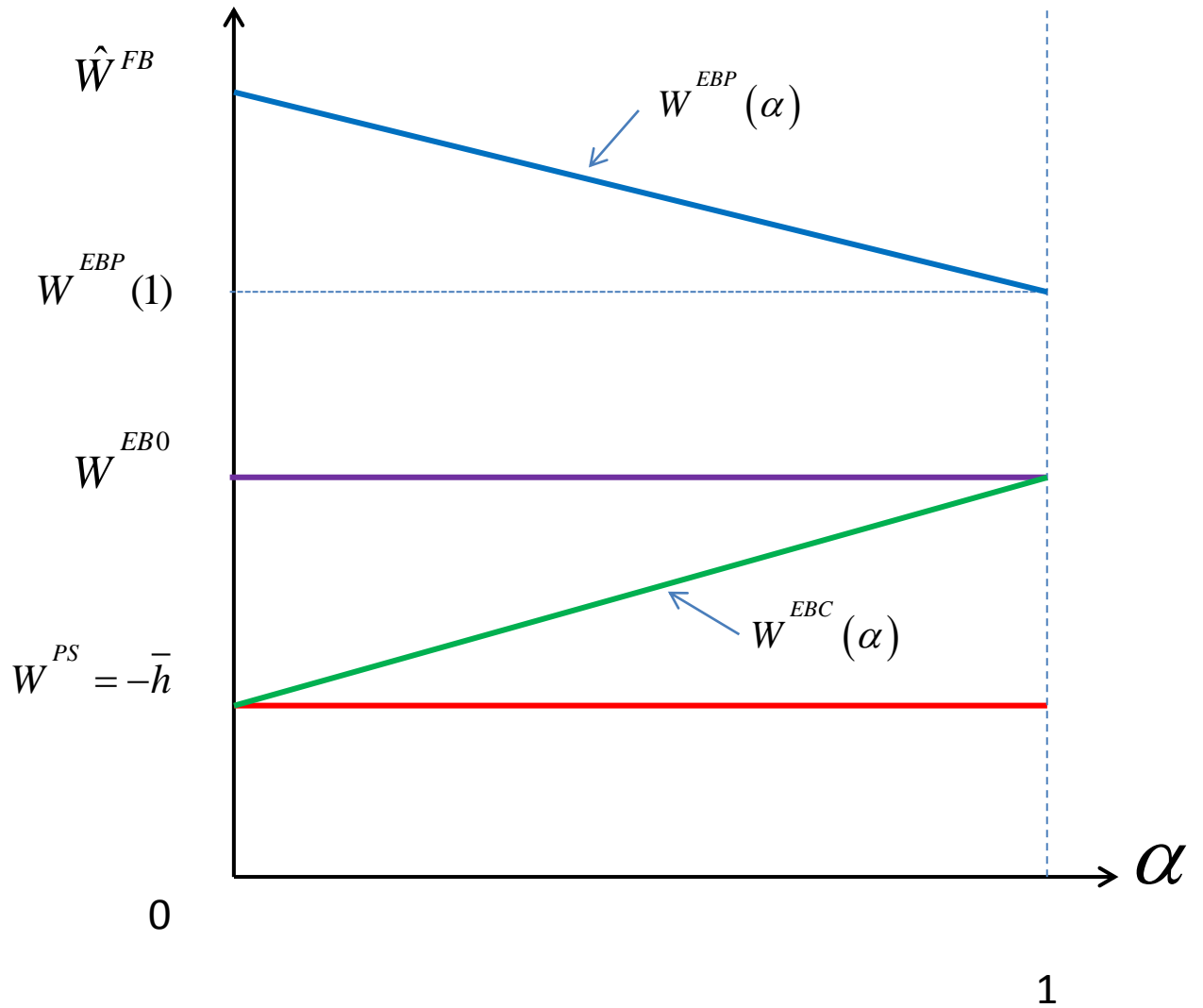
Figure 1a: *Presumptively Legal*

Figure 1b: *Presumptively Illegal*