

Legal Uncertainty and the Choice of Enforcement Procedures¹

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Abstract

In this paper we first propose a new approach to the concept of “legal uncertainty”. We set this out in the context of competition policy but the framework can apply much more widely. Our approach identifies legal uncertainty purely with the information structure of what a firm knows about the process by which a competition authority would reach a decision should an action that the firm has taken be investigated by the authority. As such legal uncertainty is clearly distinct from the phenomenon of decision errors made by the authority, which are neither necessary nor sufficient for the existence of legal uncertainty. We distinguish three information structures with no legal uncertainty, partial legal uncertainty and complete legal uncertainty. Our second contribution is to revisit the analysis in our previous paper, Katsoulacos and Ulph (2009), where we undertook a welfare comparison of two different legal standards – *Per Se* and *Effects-Based*. In that analysis we considered just a single information structure under an *Effects-Based* standard – partial legal uncertainty – and penalties were fixed. In this paper we re-examine the comparison allowing for different information structures under an *Effects-Based* standard **and** for the authority to set the appropriate penalty. We obtain a clear welfare ranking: an *Effects-Based* standard with partial legal uncertainty dominates one with no legal uncertainty which dominates one with complete legal uncertainty which dominates a *Per Se* standard. Moreover optimal penalties may be *higher* when there is legal uncertainty than when there is no legal uncertainty. These conclusions run counter to a number of prescriptions by legal scholars in the existing literature.

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 consideration is the degree of legal uncertainty⁴ - the extent to which agents know, at the time they decide to take an action, what decision a regulatory authority will make as to whether to allow or disallow (and possibly penalise) the agent's action should it ever be investigated by the authority. Certain enforcement procedures are advocated in policy circles as being superior, *ceteris paribus*, because the legal uncertainty⁵ they generate is relatively low.

While this issue is important for a broad range of regulatory interventions⁶ 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 procedures⁸. Under *Per Se* an *entire class* of actions is allowed (resp. disallowed), depending on whether their *average* harm⁹ 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)¹⁰. 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

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 Usually it is “harm to others” that is the adopted criterion, or a consumer surplus substantive standard is used (see also below)

¹⁰ 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.

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, 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.”¹¹

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)¹²” 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*¹³. In terms of policy it does not make sense to impose such high fines for anti-competitive behaviours, which are not per se illegal...”¹⁴.

In this paper we first propose a new approach to the concept of legal uncertainty. This is explained and related to the existing literature in Section 2. In a previous paper,

¹¹ 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 and Schmidtchen (2008).

¹² 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.

¹³ This Latin phrase may be translated as “no penalty unless there is certainty under the Law”

¹⁴ *Ibid.* p. 98.

Katsoulacos and Ulph (2009)¹⁵ we undertook a welfare comparison of *Per Se* and *Effects-Based* legal standards, assuming, for the latter case, a specific information structure that we now call *Partial Legal Uncertainty*. In addition we assumed fixed absolute penalties. Of relevance to this paper, one of our key results was that one of the factors that made an *Effects-Based* decision procedure potentially superior to a *Per Se* procedure was that it had a *differential deterrence effect* – firms were more likely to be deterred from taking an action the more harmful it would be, as the more harmful the action the higher the perceived probability of being convicted if investigated.

In the present paper we extend significantly our previous analysis by allowing for different information structures under *Effects-Based* procedures – namely what we will call *No Legal Uncertainty* and *Complete Legal Uncertainty* - and also by allowing the competition authority to adjust the penalty depending on both the legal standard that is employed and the information structure that prevails.¹⁶ The model is set out in Section 3. In Section 4 we establish the welfare levels under the different information structures and in Section 5 we establish our main conclusions which are as follows.

A) When penalties are fixed exogenously:

- (i) *Effects-Based* procedures with *No Legal Uncertainty* 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 conclusion will hold when this effect is strong enough.

B) 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

¹⁵ See also Kwak (2010) that deals with related issues to those discussed here, concerning judicial errors and the choice of the liability standard.

¹⁶ 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).

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.

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 lege certa*.

2. The Concept of Legal Uncertainty and Relation to Existing Literature

While one legal expert has noted that there is an “absence of rigorously defined yet practical measures of legal uncertainty”¹⁷, the concept has been subject to extensive discussion by economists and legal experts. Calfee and Craswell (1984) provide an excellent informal review of early contributions, and, in a follow-up article – Craswell and Calfee (1986) - provide some more formal analysis. They distinguish two potential sources of legal uncertainty.

The first is uncertainty regarding the liability standard which we can think of as the threshold level of harm caused by an action such that if the authority perceives the harm caused by a firm’s action to be above this threshold it will disallow and penalise the

¹⁷ Davis (2011), p. 1.

action, while if the perceived level of harm is below this threshold then the authority will allow the firm's action¹⁸.

The second source of legal uncertainty, which has received more extensive attention in the literature¹⁹, arises because authorities are unable to determine the actual harm caused by an action and so have to form some estimate of the harm, and an action is disallowed if the estimated value of harm is above the liability standard. Since these estimates contain errors this gives rise to possible Type I and Type II *decision errors* whereby actions that should be allowed are disallowed and actions that should be disallowed are allowed.

In their analyses, Craswell and Calfee (1984, 1986) examine welfare implications of the above considering more specifically how under-compliance and over-compliance are affected.²⁰ In line with this reasoning, assume that the decision rule used by the authority is to set *liability standard* \underline{h} and then disapprove the action taken by firm k iff

$$h_k^e > \underline{h}.$$

In principle the liability standard may be positive negative or zero. While below we could also permit the possibility that firms do not know the liability standard, since we are going to allow the possibility that one of the reasons why they may not know for sure what decision the authority will make in their case is that they don't know what estimate of harm the authority will make, and since the decision rule depends simply on the difference between the estimate of harm and the liability standard, it will simplify the analysis if we assume that firms know the liability standard, and, furthermore that this is normalised so that $\underline{h} = 0$.

In this paper we propose another approach to the analysis of legal uncertainty, which can be termed the information structure approach. By information structure we mean *what agents know* about the factors that influence the outcome of the authority's decision making process. It is very important to distinguish what agents know about this process from the errors made in reaching decisions. What agents know, influences their

¹⁸ Kaplow (1995) undertakes a more extensive analysis relating to the complexity of legal rules and the difficulty this poses for firms in understanding the "rules of the game" as to what is allowable.

¹⁹ For example Schinkel, M.P. and J. Tuinstra, (2006), Kwak J (2010) and Lang M (2012),

²⁰ More recent analyses of the impact of errors have been undertaken by Schinkel and Tuinstra (2006) and by Lang (2012).

perceived probability of being disallowed and it is on the basis of this perceived probability that we distinguish different information structures.

To clarify the difference between our and the traditional approach it is important to start by noting that decision errors made by the authority are neither necessary nor sufficient for the existence of legal uncertainty. Thus:

- (i) It is not true that *if* there are no errors there will be no legal uncertainty. This would only be true if also agents knew their *type*, that is, if they know the true value of the harm that their action causes to others.
- (ii) It is also not true that when there are errors there will be legal uncertainty in the standard sense defined above. After all, as noted, it is common to consider as an advantage of *Per Se* legal rules, that they do not involve legal uncertainty but of course *Per Se* legal rules can involve a substantial amount of decision errors.

Because of this we believe that a fruitful complementary approach to the traditional error-oriented analysis of legal uncertainty is one that relies on the *information structure* of firms since, irrespective of errors, legal uncertainty depends on what firms know or do not know about the factors that are relevant to the authority's decision making process that influence their perceived probability of being disallowed. Firms' perceived probability of being disallowed will be influenced by:

- (i) Whether or not they know their true type – the true value of harm on others that their action generates.
- (ii) Whether or not they know the estimate of the harm of their action that the authority will make (which depends on their understanding of exactly how the authority reaches its estimates of harm).
- (iii) Whether or not they know the liability standard that the authority is using.

Assuming, as already mentioned, that the authority uses a zero-harm liability standard and that this is common knowledge, we can then distinguish between three information structures (InSt):

- I. InSt 1: here all firms have a perfect understanding of exactly how the authority reaches its estimates of harm and thus know for certain the estimate

of harm that the authority will make in their case²¹. Hence, *irrespective of whether or not they know the true harm of their action*, they know for certain whether their action will be allowed or disallowed if investigated. However decision errors made by the authority imply that some benign actions will be disallowed (Type I errors) and some harmful actions will be allowed (Type-II errors). We term this information structure, **No Legal Uncertainty**, NLU. In contrast to the case of Partial Legal Uncertainty (below), under NLU firms of different type may face the same probabilities of being allowed or disallowed (convicted). Though in certain contexts this will be an unrealistic situation nevertheless it serves to make the point that even though the CA is using an *Effects-Based* procedure there still could be no *legal uncertainty* and that *variability of decision* across otherwise identical firms does not necessarily imply that there is *legal uncertainty*.

II. InSt 2: here all firms know their true type but have an imperfect understanding of exactly how the authority reaches its estimates of harm and thus do not know for certain the estimate of harm that the authority will make in their case. However, *all firms understand what is the distribution of errors in the authority's estimates* and this allows each firm to calculate the probability of being convicted if investigated given its type. This information structure is distinguished by two features:

- a) All firms of the same type perceive the same probability of being disallowed / convicted.
- b) This probability varies with firms' type, being monotonic with the harm caused by the action to others.

As we will see, these features generate differential deterrence effects and, with optimal penalties, the authority can then deter all harmful actions. We call this information structure **Partial Legal Uncertainty**, PLU.

III. InSt 3: here firms do not know their true type *and* also have an imperfect understanding of exactly how the authority reaches its estimates of harm and

²¹ This could arise if the CA set out the factors it would measure, the data it would use to measure these, and the calculations it would make, and if firms could costlessly access exactly the data the CA would use in its particular case and perform the calculations before it decided to take the action.

thus do not know the estimate of harm that the authority will make in their case. In other words, here *all* firms perceive the same probability of being found illegal and convicted, this being the *average probability* that an action is disallowed. We call this information structure **Complete Legal Uncertainty**, CLU.

So, in our framework, legal uncertainty relates solely to what firms know about the decision that will be made should their action be investigated under a *given* decision procedure used by the competition authority. Since the decision rule is fixed, so too are the associated decision error costs of the Type I and Type II errors to which it gives rise, and the different information structures matter solely because of the different deterrence effects that they generate due to the different perceived probabilities of conviction to which they give rise.

With *No Legal Uncertainty* the competition authority exploits none of the information that the firm itself knows about the harm caused by its action, so, amongst firms who will be convicted, those whose actions are more harmful perceive no greater probability of conviction than those whose actions are less harmful. Similarly amongst firms whose actions will not be convicted. So, in that sense, there is no *differential deterrence effect*. While there is some statistical sense in which there is a differential deterrence effect at work – on average actions which are more harmful will be more likely to be deterred than actions that are less harmful, this does not happen at the level of individual firms.

With *Partial Legal Uncertainty* there is a strong *differential deterrence effect* since all firms whose actions are more harmful will face a higher probability of conviction than those whose actions are less harmful. Finally, under *Complete Legal Uncertainty* there is absolutely no differential deterrence effect since all firms perceive exactly the same probability of conviction. As we show these generate important welfare consequences.

3. 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 $\bar{h} < 0$ (resp. $\bar{h} > 0$). We assume that γ is 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 firm²³. The distribution of b is independent of the environment from which the firm comes²⁴. 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 that detects and initiates enforcement procedures against a fraction π , $0 < \pi \leq 1$ of the actions taken. These enforcement procedures include verifying that a potentially anti-competitive action has been taken by the firm and, in the case of an *Effects-Based* standard, carrying out an investigation into 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.

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 (2010) 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.

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 administrative effectiveness of the CA given by the parameter $\alpha = \pi(1 - \delta)$, $0 \leq \alpha \leq 1$.

We assume that the CA uses a liability standard $\underline{h} = 0$, and can use one of two decision procedures.

Per Se Here the CA allows all actions of a given type if that type is *Presumptively Legal* and disallows all 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 CA’s model for estimating harm is embodied in 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.

We are interested in the question of whether legal uncertainty would ever be a reason for preferring a *Per Se* procedure to an *Effects-Based* one in situations where there was a *prima facie* reason to prefer to use *Effects-Based*, and we take that *prima facie*

²⁵ For simplicity we assume in this paper that the delay is the same whatever legal standard is used.

reason to be that the *Effects-Based* procedure has lower decision error costs²⁶ than *Per Se*. In Katsoulacos & Ulph (2009) we establish the condition for this to be true. Consequently in all that follows we assume:

ASSUMPTION 1 *Effects-Based Procedure Has Lower Decision-Error Costs*

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

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

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

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

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.

Characterization of Information Structures

We assume that firms know whether the CA is using a *Per Se* or an *Effects-Based* procedure, and that, if it is *Per Se*, whether it is *Per Se Legal* or *Per Se Illegal*. When an *Effects-Based* procedure is used, then, consistent with our assumption in Section 2 above, that the distribution of errors is known we make the assumption:

ASSUMPTION 2 All firms know the parameters p_B , p_H . Further, as mentioned, we assume that firms know the liability standard, $\underline{h} = 0$

For simplicity, in what follows we make the following additional assumption, though almost all our results go through without it²⁷.

²⁶ In Katsoulacos & Ulph (2009) we say that in the case the *Effects-Based* model can *effectively discriminate*

²⁷ 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.

ASSUMPTION 3 All firms face exactly the same type of legal uncertainty.

We can then characterise the three information structures identified in Section 2 as follows.

- *No Legal Uncertainty* As explained in Section 2, here firms know what decision the authority will take in their case. So 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. As already noted, here there is no legal uncertainty though there are decision errors.
- *Partial Legal Uncertainty* Here firms know whether their actions are truly harmful or truly benign. However, at the time they decide whether or not to take the action, they do not know what estimate of harm the CA will make in their particular case. Instead 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.
- *Complete Legal Uncertainty.* Here firms do not know how harmful their action is, nor what view the authority will take of how harmful it is. We assume that the uncertainty is so great that all that firms know is just the average probability of conviction, $\bar{p} = \gamma p_H + (1 - \gamma) \cdot (1 - p_B)$.

Fines

In general fines can take the form of a fixed penalty plus a component that is proportional to the private benefit, δb , that is obtained by the firm²⁸ taking account of the duration, δ , over which this benefit accrues owing to the delay in reaching a decision and stopping the action. The fixed component reflects the desire to link the penalty to the social harm that an anti-competitive action causes, while the proportional component reflects the desire to create deterrence by eliminating the private benefit of firms by acting anti-competitively. Formally our assumption is that if a firm with private benefit

²⁸ 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 Buccrossi and Spangolo (2006), Wils (2006) and Katsoulacos and Ulph (2012).

$b > 0$ has its action disallowed after a delay, δ , it has to pay a penalty $\psi + \varphi\delta b$, $\psi \geq 0, \varphi \geq 0$.

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 β , $0 < \beta \leq 1$ of having its action banned/disallowed by the CA should it ever be investigated. Since it anticipates a probability π , $0 < \pi < 1$ of being investigated, and a delay δ , $0 \leq \delta \leq 1$ 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

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

where

$$\Phi(\beta) = \left(\frac{1}{\beta\pi} - 1\right) + \delta > 0^{29} \quad (4)$$

. There are then two cases. If:

- (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:

²⁹ 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.

- 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 enforcement³⁰, 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:*

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

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 $\varphi = \Phi(\beta)$ 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 penalty³¹. 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.

³⁰ See, for example, the review article by Polinsky and Shavell (2000) or Buccirosi and Spangolo (2006).

³¹ 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. For a full treatment of these issues see Katsoulacos Y and D. Ulph (2012)

4. Outcomes Under Different Enforcement Procedures and Legal Uncertainty

In this section we set out the levels of welfare under different enforcement procedures and under different information structures in the case of an *Effects-Based* procedure, and we do this for both the case where penalties are exogenous and the case where the CA can choose the level of penalty.

4.1 Effects-Based Procedure

In this sub-section we assume that the CA uses an *Effects-Based* procedure, and that this has lower decision error costs than under the appropriate *Per Se* procedure, so both (1) and (2) hold. We consider in turn different information structures.

4.1.1 No Legal Uncertainty

Here a fraction p_B (resp. $1-p_H$) 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 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

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

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:

$$W^{EB0}(\alpha) = \{(1-\gamma)(-h_B)p_B - \gamma h_H(1-p_H)\} - (1-D^{EB0})(1-\alpha)\{\gamma h_H p_H - (1-\gamma)(-h_B)(1-p_B)\} \quad (6)$$

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

$$\hat{\varphi}^{EB0} = \Phi(1) = \left(\frac{1}{\pi} - 1\right) + \delta, \quad \hat{\psi}^{EB0} = 0, \quad (7)$$

giving rise to welfare:

$$\hat{W}^{EB0} = (1 - \gamma)(-h_B) p_B - \gamma h_H (1 - p_H) > 0. \quad (8)$$

4.1.2 *Partial Legal Uncertainty*

Here, while no firm knows for sure whether their action will be allowed or disallowed, firms know the liability standard and so know for sure whether their action is 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,

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

while the fraction from the Benign environment that are deterred is

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

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:

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

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:

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

Notice that this level of welfare is a strictly decreasing 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.

4.1.3 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

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

from each environment will be deterred from taking the action. If $j < \tilde{j}(\bar{p})$ 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

$$W^{EBC} = (1 - D^{EBC}) \bar{W}^{EBC}(\alpha) \quad (12)$$

where

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

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 increasing function of the *administrative effectiveness* of the CA, α , with

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

where the sign of $\bar{W}^{EBC}(1)$ 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, $(\bar{W}^{EBC}(\alpha) > 0)$

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

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

and the associated level of welfare is:

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

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

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

$$\hat{j}_-^{EBC} = F(\bar{\rho}) = \frac{1}{\bar{\rho}} - 1 + d, \quad \hat{y}^{EBC} = 0 \quad (17)$$

and the associated level of welfare is:

$$\bar{W}_-^{EBC} = 0. \quad (18)$$

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

$$\bar{W}^{EBC}(a) = \text{MAX}\left\{\bar{W}^{EBC}(a), 0\right\}. \quad (19)$$

4.2 Per Se Procedure

In this sub-section we assume that the CA uses a *Per Se* procedure 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.

4.2.1 *Presumptively Legal* ($\bar{h} < 0$)

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

$$W^{PSL} = -\bar{h} > 0. \quad (20)$$

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

$$\hat{j}^{PSL} = 0, \quad \hat{y}^{PSL} = 0 \quad (21)$$

and, for completeness, welfare is:

$$\bar{W}^{PSL} = -\bar{h} > 0. \quad (22)$$

4.2.2 Presumptively Illegal ($\bar{h} > 0$)

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

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

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:

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

This is a strictly increasing 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

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

giving rise to welfare

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

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

$$\bar{W}^{PS} = \text{MAX} \{ -\bar{h}, 0 \}. \quad (26)$$

5. Comparisons and Main Results

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

5.1 *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.

5.1.1 *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:

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

and

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

The intuition is straightforward. Given our Assumption 1 that the *Effects-Based* rule has lower decision-error costs (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.

5.1.2 *Effects-Based Legal Standard: Partial Legal Uncertainty vs No Legal Uncertainty*

From (6) and (9) we have

$$\begin{aligned}
W^{EBP} - W^{EB0} &= (D_H^{EBP} - D_B^{EBP})(1-\gamma)(-h_B)[1-\alpha(1-p_B)] \\
&\quad - D_H^{EBP} \{ (1-\gamma)(-h_B)p_B - \gamma h_H(1-p_H) \} \\
&\quad - (D^{EB0} - D_H^{EBP})(1-\alpha) \{ \gamma h_H p_H - (1-\gamma)(-h_B)(1-p_B) \}
\end{aligned} \tag{27}$$

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,³² 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*³³.

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

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

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

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*

³² That is $\tilde{f}(p_B) > j$ ³³ $\tilde{f}(p_H) > \tilde{f}(1)$

³³ 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*

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

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

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

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.

5.2 *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

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

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

5.2.1 Welfare Comparisons

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

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

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 decreasing 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 increasing 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*.³⁴

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 negative³⁵ and

³⁴ 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.

³⁵ This arises only if the action is *Presumptively Illegal* and the degree of administrative effectiveness is low.

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 positive³⁶, 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 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 happen 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 *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

³⁶ 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.

of the *Effects-Based* procedure to *Effectively Discriminate* will produce lower decision-error costs and so higher welfare.

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 than an *Effects-Based* standard – whatever the degree of Legal Uncertainty.

5.2.2 Comparison of Penalties

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

$$\begin{aligned}
 0 = \hat{\phi}^{PSL} = \hat{\phi}_+^{EBC} &< \hat{\phi}^{PSI} = \hat{\phi}^{EBO} = \Phi(1) \\
 &< \hat{\phi}^{EBP} = \Phi(p_H) \\
 &< \hat{\phi}_-^{EBC} = \Phi(\bar{p})
 \end{aligned} \tag{32}$$

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 lege certa* as advocated by Dethmers and Engelen (2011) and other legal scholars, there is no **general** support for this principle.

6. Concluding Remarks

In this paper we have proposed a new approach to the concept of “legal uncertainty”. We have set this out in the context of competition policy but the framework can apply more widely. Our approach identifies legal uncertainty purely with the information structure of what a firm knows about the process by which a competition authority would reach a decision should an action that the firm has taken be investigated by the authority. As such legal uncertainty is clearly distinct from the phenomenon of decision errors made by the authority, which are neither necessary nor sufficient for the existence of legal uncertainty. We distinguish three information structures with no legal uncertainty, partial legal uncertainty and complete legal 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 than *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.

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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