Competition Authority Substantive Standards and Social Welfare

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Abstract

Recent years have witnessed a very significant resurgence in the debate concerning the optimal substantive standard to be used in the enforcement of competition law. One of the arguments, initially made by Lyons (2002) in the context of mergers, that has been used in favour of using a consumer surplus standard, is that it may induce firms to adopt those, among mutually exclusive, actions that lead to a higher level of total welfare than would a total welfare standard. In this paper we generalise and re-examine this argument for any anti-competitive action – we have in particular in mind extending the existing analyses to actions often challenged as attempted monopolisation (or abuse of dominance). We confirm the presence of what we term a Lyons-effect in this more general setting and examine how the magnitude of this effect depends on parameters such as the extant market power of the firms taking anti-competitive actions, the size of efficiency effects and the strength of the price-raising effect generated by different actions.

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1. Review: Substantive Standards in the Enforcement of Competition Law – the Debate

Recent years have witnessed a very significant resurgence in the debate concerning the optimal substantive standard to be used in the enforcement of competition law (see, for example, for earlier contributions, Besanko and Spulber, 1993; Neven and Roeller, 2000; Lyons, 2002; and, more recently, Padilla, 2005; Carlton, 2007; Farell and Katz, 2006; Heyer, 2006; Fridolsson, 2007; Pittman, 2007; Salop, 2010; Armstrong and Vickers, 2010; Kaplow, 2011, Lianos, 2013; Blair and Sokol, 2013).

Those arguing in favour of a total welfare standard have been pointing out that “overall economic efficiency” should remain the paramount criterion for the assessment of potentially anticompetitive acts and for this the income transfers between agents (consumers/producers) in the economy should be treated as welfare neutral. The proponents of a total welfare standard have stressed that by using such a standard, instead of a consumer surplus one, ALL possible efficiencies that might appear when a firm takes an action are taken into account and the implications of the action on the firm’s competitors’ profitability.

Proponents of the consumer surplus standard on the other hand have argued that treating all income transfers as welfare neutral may not reflect the common society’s judgment of a fair distribution of wealth. According to this view, efficiencies that might occur, and which are likely to have an impact on consumer welfare should be taken into account while other efficiencies that just affect the distribution of profit between firms should be ignored.
It is certainly very important that the world’s two largest economies, EU and USA, continue to use a pure Consumer Surplus standard in order to appraise firms’ practices under competition law.

In the EU, under Art. 101 of the EC Treaty\(^5\), agreements between undertakings and concerted practices which have as their object or effect the prevention, restriction or distortion of competition shall be automatically void. The exception in par. 3 however states that those provisions may be declared inapplicable as long as it “…contributes to improving the production or distribution of goods or to promoting technical or economic progress while allowing consumers a fair share of the resulting benefit”.

The 2008 Commission’s Guidance Paper on Art. 102 EC\(^6\) states (in paragr. 5) that the Commission “will focus on those types of conduct that are most harmful to consumers”. In par. 19 of the Paper the Commission reiterates that its aim is to protect consumer welfare and does link the concept of “anticompetitive foreclosure” directly to consumer welfare.

The latest version of Merger Guidelines in US\(^7\) clearly states that “the Agency considers whether cognizable efficiencies likely would be sufficient to reverse the merger’s potential harm to consumers in the relevant market, e.g. by preventing price increases in that market”. So there must be clear evidence that part of efficiencies passes through to consumers. The Merger Guidelines explicitly suggest that when prices

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are raised because of a merger, then this merger should be banned irrespective of cost efficiencies for the merging firms. Only if cost savings are large enough so that they are passed through to consumers and prices do not raise a merger will be allowed.

Salop\textsuperscript{8} (2010) reviews the US evidence observed in a large number of specific antitrust issues – including mergers, horizontal agreements, predatory pricing, monopsony conduct, and harm to competitors (from mergers or exclusionary conduct) - and concludes that the standard that has been and is used in USA by antitrust authorities and by courts is the \textit{true} consumer welfare standard. He argues that it is not just that authorities and courts apply in practice a consumer surplus standard but that “normative analysis” shows that this is indeed the right approach. He makes three points in this regard:

(i) There is no reason to think that adopting the total welfare standard would maximize long-run consumer welfare

(ii) Adopting the consumer welfare standard does not involve or require using antitrust law to redistribute income and wealth.

(iii) Adopting the total welfare standard may lead to inefficient economic conduct that harms consumers \textit{and} lowers aggregate welfare relative to the use of a consumer surplus standard.

On the other hand Carlton (2007) arguing in favor of a total welfare standard puts forward the following points:

(i) A (short run) total welfare standard is more likely to maximize long run consumers surplus than is a (short run) consumer surplus standard, given that efficiencies, like reductions in fixed costs, not taken into account by the latter but taken into account by the former imply, especially in high-tech dynamic industries, enhanced incentives to invest in R&D, new products and plants – that provide the greatest consumer benefits in the long run. As he notes “By focusing only on efficiencies that influence price over a short period\(^9\), a government agency runs the risk of failing to credit the future efficiencies, which will benefit consumers in the long-run”. Salop (2010) counteracts this by pointing out that long run consumer gains depend on the diffusion of innovations which, especially under entry barriers, “is neither instantaneous nor complete”.

(ii) The notion that antitrust should focus on consumers, not firms, is premised on a false vision of who are consumers and who are firms and putting an excessive weight on the welfare of the former. More specifically, it should be recognized that most transactions in modern economies are between firms, consumers get profits flowing-back to them as shareholders and, finally, that if one shows a preference for one group of people “it is a small step in logic to treat different groups of consumers differently” – something that even proponents of the consumer surplus standard would not wish.

\(^9\) Assuming that, in practice at least, competition authorities adopting a consumer welfare standard do not take into account considerations that affect long-run consumer welfare.
(iii) By ignoring upstream sellers’ harm, a consumer surplus standard would treat buying cartels as perfectly legal.

In this paper we would like to concentrate on one of the issues in the debate above, related to Salop’s point (iii) – or, to the issue that, as he states: “The adoption of an aggregate welfare standard likely would not require firms to engage in conduct that maximizes aggregate welfare”.

The point goes back to the clever insight of Lyons (2002) who examined firms choosing among mutually exclusive mergers subject to antitrust constraints. That is firms choose which type of merger to undertake anticipating the decision that a competition authority will take as to whether or not to allow the merger. He showed that under some circumstances social welfare may be higher if the competition authority uses a consumer surplus standard than if it uses a total welfare standard, since the consumer surplus standard will deter firms from taking certain actions and lead them to take actions that are better from the point of view of overall welfare.

Since Lyons (2002), a number of papers have discussed or further pursued this issue: Farrell and Katz, 2006; Nocke V. and M. D. Whinston (2011); Armstrong M. and J. Vickers (2010). However all this discussion has again been conducted in the context of mergers.

In this paper we generalize the analysis of Lyons (2002) and others to the case where firms choose between mutually exclusive potentially anticompetitive actions of any type. We have in particular in mind extending the existing analyses to actions often challenged as attempted monopolisation (or abuse of dominance in EU). The type of mutually exclusive actions relevant
for dominant firms (i.e. monopolization cases) include, for example, the following:

(a) Marketing products under alternative tying/bundling arrangements.

(b) Offering different rebate schemes.

(c) Offering exclusive contracts with differing non-compete clauses.

Further, as for the case of mergers, it is well known that these actions will often entail both market power raising effects as well as efficiency effects\(^\text{10}\), so these effects form an integral part of our model below.

In our model, firms differ in the environment from which they come, which is specified in quite a general way. The extent to which actions of some specific type influence welfare depends on the price-cost margin raising and (the marginal) cost reducing effects of these actions and on the characteristics of the environment in which the firms operate, such as the extant market power that firms enjoy.

Considering first actions that are equivalent in terms of their cost reducing potential, total welfare for any given environment is smaller when higher-profit actions are chosen. And, while higher profit actions may pass a total welfare standard they may not pass a consumer welfare standard. So, as we show, there will exist environments for which having a consumer welfare standard may induce firms to choose lower-profit actions that result in higher welfare than would higher-profit actions, which would be chosen under a total welfare standard. This is what might be termed the *Lyons Effect*. However, there will always be some other environments for which welfare is higher when a total welfare standard is used than when a consumer surplus standard

\(^{10}\) See for example O'Donhue and Padilla (2007) and Whinston (2006).
is used, because the consumer surplus standard may be too strict and deter firms from taking any action even though there are welfare-enhancing actions that could have been chosen. We characterize the environments under which the Lyons effect will emerge and under which it will not emerge, and show that whether a consumer-surplus standard generates higher welfare than a total welfare standard will depend on the distribution of firms across these different environments.

We then examine the case of actions also differing in their cost-reducing capacity. We show that in this latter case the Lyons Effect may emerge in a smaller range of environments, and indeed, in some cases, may not exist at all.

Also, we examine how the range of environments over which the Lyons-effect is present depends on parameters such as the extant market power of the firms taking anti-competitive actions, the size of efficiency effects and the strength of the price-raising effect generated by different actions. Importantly, we show that the range is larger, the larger the initial market power of the firm, the greater the size of efficiencies and the greater the difference in the price-raising effect of mutually exclusive actions. The first of these results indicates that arguments in favour of a consumer surplus standard are, all other things equal, more likely to be valid when the actions challenged are undertaken by firms that have significant market power to start with.

In Section 2 we set out our model and then we use it in Section 3 to undertake a comparison of consumer surplus and total welfare standards under the assumption that there is no market power in the “but-off” situation prior to a firm taking an anti-competitive action. In Section 4 we examine the general case where the extant market power of firms may be positive. Finally Section 5 offers concluding remarks.
2. Basic Assumptions and a Model

2.1 Basic Assumptions

Suppose that a number of firms from a range of environments are considering taking a type of action which will result in their increasing their price-cost margin but can also have some efficiency benefits of driving down their marginal costs. There may be many potential actions of this type any one firm can take, each associated with particular levels of cost reduction and increase in the price-cost margin. In particular we will always allow for the default action of doing nothing and so neither increasing price nor lowering cost. Firms can choose which action within this class to take.

In making this decision firms take account of the possibility that a Competition Authority (CA) will assess their action and, if it is ruled to be anti-competitive in the light of the specific standard used by the CA, their action will be disallowed and they will have to pay a penalty.

Here we assume for simplicity that:

(i) all actions that are taken will be detected and assessed by the CA – in other words, the coverage or detection rate is unity;
(ii) the CA can determine absolutely accurately whether or not the action is anti-competitive in the light of its standard – there are no Type I or Type II errors;
(iii) there are no delays by the CA in detecting anti-competitive actions and reaching decisions.

We consider two different standards that the CA might use:

• a consumer surplus standard
• a total welfare standard that is based on the sum of both consumer and producer surplus (profit).

We assume that firms know what standard the CA will use and have the capacity to determine what impact any action they take will have on the welfare standard (consumer surplus or total welfare) used by the CA. Given our assumptions about the capacity of the CA, firms will anticipate making negative profits if they take an action that produces a negative value of the CA’s standard, but a positive profit if the action does not. Firms will choose the action that gives them the highest private benefit given the anticipated reaction of the CA. Since the default action will not produce a negative value under either standard firms will always make non-negative profits.

We are interested in how social welfare depends on the criterion / standard being used by the CA. To consider this we will use the following model.

2.2 The Model

Consider a typical firm that takes a typical action that has market power raising and marginal cost reducing effects. Let us assume that in the “but-for” (counterfactual) situation the firm may enjoy some market power translated in an (original) elevation of its price above the constant marginal cost, that is,

\[
p^\circ - c^\circ = \Delta m^\circ \geq 0 \tag{1}
\]

Assume that \( c^\circ = 1 \). The effect of undertaking an action with efficiency and market power raising effects on the price will be to change price to \( p^1 \) with
\[ \Delta p = p^1 - p^o = \Delta m - \Delta c - \Delta m^o, \text{where} \]
\[ \Delta m = p^1 - c^1, \Delta m \geq 0 \]
\[ \Delta c = c^o - c^1, 0 \leq \Delta c \leq 1 \]

Notice that the extent of the change in price due to the action is affected by the efficiency effects of the action and by pre-existing market power. The price can rise or fall depending on the balance of these two effects with the price-cost margin raising effect of the action.

Of course, the increase in the price-cost margin cannot be just anything – we will take it that firms are not charging a higher price than under monopoly. We assume that the price-cost margin is just some fraction of that which the firm would have charged had it been a monopolist. In order to work out the price-cost margin under monopoly, we need to specify in more detail the environment from which this typical firm comes.

**Demand**

Let the inverse demand function faced by a typical firm be

\[ p = 1 + A - Q, A > 0 \]  

(3)

or, the demand function is:

\[ Q = 1 + A - p, A > 0 \]

So, \( \Delta Q = -\Delta p \). Notice that the inverse elasticity of demand in the default position is

\[ \varepsilon^o = -\frac{dp}{dQ} \frac{Q^o}{p^o} = -\frac{Q^o}{p^o} \]

where \( Q^o > 0 \) is the output that the firm will produce in the default position. So if in that position there is no market power
\[ \begin{align*}
p = p^o = c^o = 1 \text{ then } Q = Q^o = A \text{ and } \varepsilon^o (at p^o = 1) &= A \quad (4) \\
\text{while if in the counterfactual position there is market power} \\
p = p^o = 1 + \Delta m^o, \text{ then } Q = Q^o = (1 + A) - (1 + \Delta m^o) = A - \Delta m^o \text{ and} \\
\varepsilon^o (at p^o = 1 + \Delta m^o) &= \frac{A - \Delta m^o}{1 + \Delta m^o} < \varepsilon^o (at p^o = 1) \quad (5) \\
i.e. \text{ as expected the elasticity increases (inverse elasticity decreases) as price rises along the linear demand function. The parameter } \varepsilon \text{ provides a measure of the potential opportunities for raising price that a firm might face if it can raise its existing market power. In all that follows we will use the parameters } A \text{ and } \Delta m^o \text{ (and hence } \varepsilon^0) \text{ to represent the environment from which a firm comes.} \\

Monopoly with cost } c^1: \\

\text{Given our linear demand function, the price cost margin at the monopoly price (with marginal cost } c^1) \text{ would be:} \\

\[ p^* - c^1 = M = \frac{(1 + A) - c^1}{2} = \frac{\Delta c + A}{2} \quad (6) \]

\text{We assume that at the counterfactual there is some competition so that} \\

\[ p^o < p^M \]

\text{We assume that by taking an action a firm increases the price-cost margin by some fraction } (\mu) \text{ of what it could charge under monopoly. In order for the action to be genuinely anti-competitive we also assume that the action will lead to an increase in price if there are no efficiency effects } (\Delta c = 0) \text{ irrespectively of the initial market power. That is, we would like } \mu \text{ to be sufficiently high so that } \Delta p > 0 \text{ when } \Delta c = 0. \text{ Given (2), this requires that} \]
\( \Delta m > \Delta m^o \). In turn, this requires that in the counterfactual there is market power, from (6), with \( \Delta c = 0 \), we must have \( \mu \geq (\Delta m^o / A) \).

Accordingly, we have that, if the counterfactual is competitive

\[
\Delta m = \mu(\Delta c + A), 0 \leq \mu \leq 1/2
\]  

(7)

while if there is market power in the counterfactual:

\[
\Delta m = \mu(\Delta c + A), (\Delta m^o / A) \leq \mu \leq 1/2
\]  

(8)

Below an action will be characterised by the pair of parameters \( (\mu, \Delta c) \), and denoted by \( a = (\mu, \Delta c) \).

**Effect of action on price**

Thus, from (2), the change in price generated by an action can be expressed as:

\[
\Delta p = p^1 - p^o = \Delta m - \Delta c - \Delta m^o
\]

\[
= \mu(\Delta c + A) - \Delta c - \Delta m^o
\]

\[
= -(1 - \mu)\Delta c + \mu A - \Delta m^o
\]

\[
= -(1 - \mu)(\Delta c + \Delta m^o) + \mu(A - \Delta m^o)
\]

(9)

so we also have:

\[
\Delta Q = -\Delta p = (1 - \mu)\Delta c - \mu A + \Delta m^o
\]

(10)

and

\[
Q^1 = Q^o + \Delta Q = (1 - \mu)(\Delta c + A) > 0
\]

**Two points to notice:**

- From (9), whether or not the price rises or falls depends in part on the nature of the action taken, and in part on the environment from which the firm comes. In particular, for any given \( \mu > 0 \), and \( \Delta c > 0 \), if initially
there is no market power \( \Delta m^0 = 0 \), then in environments with very low inverse elasticities (where these are given by \( e^0_A \)) prices will fall, while in environments with very large inverse elasticities prices will rise. The presence of extant market power \( \Delta m^0 > 0 \) dampens a price rise and magnifies a price reduction.

- From (7), the post-action output is positive – whatever the action and whatever the environment.

**Effects of action on Consumer Surplus, Profit and Total Welfare**

We can now calculate the change in consumer surplus, profits and hence total welfare when a typical firm takes a typical action.

The change in Consumer Surplus is:

\[
\Delta CS = -\Delta p(Q^o + \frac{\Delta Q}{2})
\]

and given:

\[
Q^o = A - \Delta m^o,
\]

\[
\Delta CS = -\frac{1}{2} \Delta p[2(A - \Delta m^o) + \Delta Q]
\]

so since \( \Delta Q = -\Delta p \), and as expected, the sign of this will be driven entirely by the change in price. Given (9), by substituting into the expression above:

\[
\Delta CS = \frac{1}{2} [\Delta c(1 - \mu) + \Delta m^o - \mu A][(A - \Delta m^o) + (\Delta c + A)(1 - \mu)]
\]

or equivalently:

\[
\Delta CS = \frac{1}{2} [(1 - \mu)(\Delta c + A) - (A - \Delta m^o)][(1 - \mu)(\Delta c + A) + (A - \Delta m^o)]
\]

or:

\[
\Delta CS = \frac{1}{2} [(1 - \mu)(\Delta c + A) - (A - \Delta m^o)][(1 - \mu)(\Delta c + A) + (A - \Delta m^o)]
\]
\[ \Delta CS = \frac{1}{2}[(1 - \mu)^2(\Delta c + A)^2 - (A - \Delta m^0)^2] \]  

(11')

The increase in profits (private benefit) from taking the action is:

\[ \Delta \Pi = \Delta mQ^1 - \Delta m^0Q^0 = \Delta m(Q^0 + \Delta Q) - \Delta m^0Q^0 \]

so since

\[ Q^0 = A - \Delta m^0, \Delta Q = -\Delta p, \]

\[ \Delta \Pi = \mu(1 - \mu)(\Delta c + A)^2 - \Delta m^0(A - \Delta m^0) \]  

(12)

The change in total welfare is just the change in consumer surplus, plus the change in profits (producer surplus) or:

\[ \Delta W = -\Delta p(Q^0 + \frac{\Delta Q}{2}) + [\Delta m(Q^0 + \Delta Q) - \Delta m^0Q^0] \]  

(13)

Making the relevant substitutions from above:

\[ \Delta W = \Delta c(A - \Delta m^0) + \frac{1}{2}[\Delta c - \mu(\Delta c + A) + \Delta m^0][\Delta c + \mu(\Delta c + A) + \Delta m^0] \]  

(13')

Given that \( Q^0 = A - \Delta m^0 \), from (13'), the first term is positive and shows the benefits to society from a reduction in costs if output were to remain at its original level. However, as is clear from (13), we need to take into account the change in output. If price falls and consequently output increases then there is an unambiguous increase in welfare since the change in both consumer surplus and producer surplus are both positive. However if the net result of the action is to drive prices up and so cause output to fall, then while society benefits from the fall in costs it loses from the reduction in output and overall welfare might fall. This will happen when the reduction in costs is very small.

For later reference, we write here also the expressions for \( \Delta CS \), \( \Delta \Pi \) and \( \Delta W \) for the special case when in the counterfactual market power is zero so, \( \Delta m^0 = 0 \) and \( e^0 = A \). In this case:
\[ \Delta CS = \frac{1}{2} \{ [(1 - \mu)(\Delta c + \varepsilon)]^2 - \varepsilon^2 \} \quad (11'') \]
\[ \Delta \Pi = \mu(1 - \mu)(\Delta c + \varepsilon)^2 \quad (12') \]

and:
\[ \Delta W = \Delta c \cdot \varepsilon + \frac{1}{2} \{ (\Delta c)^2 - [\mu(\Delta c + \varepsilon)]^2 \} \quad (14) \]

or, equivalently,
\[ \Delta W = \Delta c \cdot \varepsilon + \frac{1}{2} [\Delta c - \mu(\Delta c + \varepsilon)] [\Delta c + \mu(\Delta c + \varepsilon)] \quad (14') \]

where for simplicity we use \( \varepsilon \) for the elasticity at the competitive “but-for” position.

The expressions for the change in CS, \( \Pi \) and TW show how the change depends on:

- the nature of a typical action as captured by the parameters \( (\mu, \Delta c) \);
- the nature of the environment from which a firm comes, as captured by the parameters \( A \) and \( \Delta m^0 \), and hence the elasticity \( (\varepsilon) \) in the “but-for” position.

We now want to understand in more detail the nature of this relationship. We by assuming, in the next section, that the “but-for” position is competitive.

3. **Comparison of Welfare Standards When the “But-For” Position is Competitive**

3.1 Preliminary comments and results
A case where it is relatively straightforward to obtain analytical results is that in which the “but-for” position is competitive, so that $\Delta m^0 = 0$ and $\varepsilon^0 = A$. In this case the higher is $A$ in a market, the higher is the inverse elasticity at the “but-for” position, hence the lower is the elasticity and the higher the potential for raising price though an anticompetitive reduction in output. Thus $A$ is a measure of how uncompetitive a market potentially is.

Before proceeding with our analysis, there are a number of points that is useful to note at the outset.

First, the default case where no action is taken can be thought of as taking the default action characterised by the pair $(0,0)$, in which case the change in consumer surplus, profit and welfare are all zero irrespective of the environment from which a firm comes.

Second for any non-trivial action $\left(\frac{1}{\varepsilon}, 1\right) > (\mu, \Delta c) > (0,0)$ we have the following results:

- The change in consumer surplus is, from (11”), a strictly increasing function of $\Delta c$ and a strictly decreasing function of $\mu$. Also, if $\varepsilon < \varepsilon_0 = \frac{\Delta c(1-\mu)}{\mu}$ then the change in consumer surplus is positive, while if $\varepsilon > \varepsilon_0 = \frac{\Delta c(1-\mu)}{\mu}$ it is negative. In other words, as we would expect:
  - consumers benefit from lower costs and lose from an increase in the price-cost margin;
  - and, using a consumer surplus standard, there is a critical value of the inverse price elasticity such that the action is beneficial if the environment is more competitive than that determined by this critical value, and harmful when it is less competitive.
For any environment and any non-trivial action, the change in profits is positive and is, from (12'), a strictly increasing function of both $\Delta c$ and $\mu$ and also of $\varepsilon$. So, as we would expect:

- firms benefit from both lower costs and anything that allows them to charge a higher price-cost margin;
- The more uncompetitive is the environment the bigger is the increase in profits.

The change in total welfare is, from (14), a strictly increasing function of $\Delta c$ and a strictly decreasing function of $\mu$. If $\varepsilon < \varepsilon = \frac{\Delta c(1-\mu)}{\mu}$ then the change in total welfare is positive. It is easy to see that there exists a $\bar{\varepsilon} > \varepsilon = \frac{\Delta c(1-\mu)}{\mu}$ such that the change in total welfare is positive if $\varepsilon < \bar{\varepsilon}$ and negative if $\varepsilon > \bar{\varepsilon}$. So:

- While everyone in society benefits from a reduction in costs, the loss to consumers from an increase in the price-cost margin outweighs the benefit to firms and overall total welfare falls.
- Using a total welfare standard, there is a critical value of the inverse price elasticity such that the action is beneficial if the environment is more competitive than that determined by this critical value, and harmful when it is less competitive.

The critical value of the inverse price elasticity is higher for a total welfare standard than for a consumer standard, so, as we would expect, there are environments which would be judged to be harmful using a consumer surplus standard but benign using a total welfare standard.
The above results immediately tell us that if there is just a single non-trivial action that firms can take, then welfare is higher under a total welfare standard than under a consumer surplus standard.

The reason is as follows.

1. When firms come from an environment for which \( \varepsilon < \underline{\varepsilon} = \frac{\Delta c(1-\mu)}{\mu} \) then the action will be taken under both a consumer surplus and a total welfare standard.

2. When firms come from an environment for which \( \varepsilon > \bar{\varepsilon} \) then the action will not be taken under both a consumer surplus and a total welfare standard.

3. However when firms come from an environment for which \( \frac{\Delta c(1-\mu)}{\mu} = \varepsilon < \underline{\varepsilon} < \bar{\varepsilon} \) then the action will not be taken under a consumer surplus standard but will be taken under a total welfare standard and this will contribute positively to aggregate social welfare.

What happens when there is more than one non-trivial action?

Drawing on the framework developed above, we can pose this question in a very general way. So suppose that there are \( n > 1 \) non-trivial actions, indexed \( j = 1,\ldots,n \). Index the trivial action by \( j = 0 \), and let \( \Delta CS(j, \varepsilon), \Delta \pi(j, \varepsilon), \Delta W(j, \varepsilon) \) be the changes in consumer surplus, profits and total welfare from action \( j = 0, 1,\ldots,n \) when a firm comes from some environment which we will index by a parameter \( \varepsilon > 0 \).

Assume that:

1. For all \( \varepsilon > 0 \) \( \Delta CS(0, \varepsilon) = \Delta \pi(0, \varepsilon) = \Delta W(0, \varepsilon) = 0 \).
2. For all $j > 0$, $\exists \varepsilon_j > 0$ such that
   a. $\Delta CS(j, e) > 0$ if $e < \varepsilon_j$;
   b. $\Delta CS(j, e) < 0$ if $e > \varepsilon_j$;

3. For all $j > 0$ and for all $e > 0$ $\Delta \pi(j, e) > 0$

4. For all $j > 0$, $\exists \bar{\varepsilon}_j > \varepsilon_j$ such that
   a. $\Delta W(j, e) > 0$ if $e < \bar{\varepsilon}_j$
   b. $\Delta W(j, e) < 0$ if $e > \bar{\varepsilon}_j$

Under any welfare standard each firm will choose the action that maximises their private benefit subject to the constraint that the relevant welfare standard is not negative. So let:

$$j^{CS}(e) = \arg \max_j \Delta \pi(j, e) \text{ s.t. } \Delta CS(j, e) \geq 0 \quad (15)$$

be the action chosen by a firm from environment $e$ under a consumer surplus standard and

$$j^T(e) = \arg \max_j \Delta \pi(j, e) \text{ s.t. } \Delta W(j, e) \geq 0 \quad (16)$$

be the action chosen by a firm from environment $e$ under a total welfare standard.

Notice that this allows the possibility that firms choose the default action of doing nothing. Let:

$$\Delta \bar{W}^T(e) = \Delta W[j^T(e), e] \quad (17)$$

be the welfare generated by a firm from environment $e$ under a total welfare standard, and

$$\Delta \bar{W}^{CS}(e) = \Delta W[j^{CS}(e), e] \quad (18)$$
be the welfare generated by a firm from environment $e$ under a *consumer surplus standard*.

So the question is, which of these two is higher – both for specific environments and in aggregate when account is taken of the distribution of firms across different environments.

### 3.2 Comparison for the case where efficiencies are the same across actions

To answer this, assume $n = 2$, and go back to the explicit framework we have worked out above. Let us simplify even further, and, firstly, confine attention to the comparison of two actions with the same value of $\Delta c$ and which consequently differ solely in $\mu$, the extent to which they increase the price-cost margin. Let $e = \frac{\Delta c}{\mu}$ now denote the variable that captures the impact of the environment. By substituting this into (11’), (12’) and (14’) we find that the changes in consumer surplus, profits and welfare are all proportional to the square of $\Delta c$ and so we can effectively ignore this constant in all our analysis. Then we can re-write these expressions as:

\[
\begin{align*}
\Delta CS(\mu, e) &= \frac{3}{2}[[1 - \mu](1 + e)]^2 - e^2] \\
\Delta \pi(\mu, e) &= \mu(1 - \mu)(1 + e)^2 \\
\Delta W(\mu, e) &= \sigma + \frac{1}{2} [1 - (\mu(1 + e))^2]
\end{align*}
\]

The crucial features are that:

- Both $\Delta CS$ and $\Delta W$ are strictly *decreasing* functions of $\mu$, but strictly concave quadratic functions of $e$ and so inverse U-shaped in $e$;
\( \Delta \pi \) is a strictly increasing function of \( \mu \) and a strictly increasing but convex function of \( e \).

It follows that for any increase in the price-cost margin, \( \mu \), there are critical values:

- \( \frac{1}{\mu} - 1 > 0 \) such that: \( \Delta CS(\mu, e) > 0 \ \forall \ e < \varepsilon(\mu); \ \Delta CS(\mu, e) < 0 \ \forall \ e > \varepsilon(\mu); \)

- \( \overline{\varepsilon}(\mu) > \varepsilon(\mu) \) such that \( \Delta W(\mu, e) > 0 \ \forall \ e < \overline{\varepsilon}(\mu); \ \Delta W(\mu, e) < 0 \ \forall \ e > \overline{\varepsilon}(\mu). \)

These curves are illustrated in Figure 1.

Figure 1 here

Consider now two actions \( a_j = (\mu_j, \Delta c), j = 1,2 \text{ with } 0 < \mu_1 < \mu_2 < \frac{1}{2}. \) Then action 2 is more profitable than action 1 and so will be chosen whenever both are available, though that will lead to lower total welfare. If we define \( \varepsilon_j = \varepsilon(\mu_j), \overline{\varepsilon}_j = \overline{\varepsilon}(\mu_j), j = 1,2, \) then:

- \( 0 < \varepsilon_1 < \varepsilon_2, j = 1,2 \)

- \( 0 < \varepsilon_2 < \varepsilon_1; \ 0 < \overline{\varepsilon}_2 < \overline{\varepsilon}_1 \)

Figure 2 illustrates the two functions \( \Delta W_j(e), j = 1,2 \) as functions of the environment \( e \) and also locates the points \( \varepsilon_j, \overline{\varepsilon}_j, j = 1,2 \)

Figure 2 here

Consider first what happens under a total welfare standard.

- For \( 0 < e < \overline{\varepsilon}_2 \) both actions 1 and 2 generate positive total welfare and so both will be allowed. Hence action 2 will be chosen, generating welfare \( \Delta W_2(e). \)
• However for $\bar{e}_2 < e < \bar{e}_1$ only action 1 generates positive total welfare and so it will be chosen, thus generating welfare $\Delta W_1(e)$.

• Finally for $e > \bar{e}_1$ neither action generates positive welfare, so the default action will be chosen generating zero change in welfare.

So

$$\Delta \tilde{W}^T(e) = \begin{cases} 
\Delta W_2(e), & 0 < e < \bar{e}_2 \\
\Delta W_1(e), & \bar{e}_2 < e < \bar{e}_1 \\
0, & e > \bar{e}_1 
\end{cases} \quad (22)$$

Now suppose that a consumer surplus standard is used. We then have the following.

• For $0 < e < \bar{e}_2$ both actions 1 and 2 generate positive consumer surplus and so both will be allowed. Hence, action 2 will be chosen, generating welfare $\Delta W_2(e)$.

• However, for $\bar{e}_2 < e < \bar{e}_1$ only action 1 generates positive consumer surplus and so it will be chosen, thus generating welfare $\Delta W_1(e) > \Delta W_2(e)$.

• Finally, for $e > \bar{e}_1$ neither action generates positive consumer surplus, so the default action will be chosen generating welfare $= 0$.

So

$$\Delta \tilde{W}^{cs}(e) = \begin{cases} 
\Delta W_2(e), & 0 < e < \bar{e}_2 \\
\Delta W_1(e), & \bar{e}_2 < e < \bar{e}_1 \\
0, & e > \bar{e}_1 
\end{cases} \quad (23)$$

Putting this together we get 5 cases depending on the environment which are illustrated in Figure 3:

Figure 3 here
• For $0 < e < \underline{e}_2$ both actions 1 and 2 generate positive consumer surplus and hence positive total welfare and so both will be allowed under both standards. Hence, action 2 will be chosen, and so $\Delta W^{CS}(e) = \Delta W^{T}(e) = \Delta W_2(e)$

• For $\underline{e}_2 < e < \bar{e}_1$ only action 1 generates positive consumer surplus, though both will generate positive total welfare. So action 1 will be chosen under a consumer surplus criterion while action 2 will be chosen under a total welfare criterion. So we have $\Delta W^{CS}(e) = \Delta W_1(e) > \Delta W_2(e) = \Delta W^{T}(e)$ so a consumer surplus standard generates higher welfare than a total welfare criterion in this range of environments. This is the Lyons (2002) effect.

• For $\bar{e}_1 < e < \underline{e}_2$ neither action generates positive consumer surplus, and so neither would be chosen under a consumer surplus standard and only the default action would be chosen. However both generate positive total welfare and so since both would be available under such a standard 2 will be chosen. Hence on this interval, welfare is higher under a total welfare standard since $\Delta W^{T}(e) = \Delta W_2(e) > 0 = \Delta W^{CS}(e)$.

• For $\bar{e}_2 < e < \bar{e}_1$ only action 1 generates positive total welfare and so only it will be chosen under a total welfare criterion, but since neither action generates positive consumer surplus on this interval neither will be chosen under a consumer surplus criterion. Hence, welfare is higher under a total welfare standard since $\Delta W^{T}(e) = \Delta W_1(e) > 0 = \Delta W^{CS}(e)$.

• Finally for $e > \bar{e}_1$ neither action generates positive welfare and so, a fortiori, neither generates positive surplus. Hence under both standards only the default action will be chosen, generating zero welfare, so , on this interval $\Delta W^{CS}(e) = \Delta W^{T}(e) = 0.$
So we have:

**Proposition 1**

Overall we see that there is one interval of environments, \( e_2 < e < e_1 \) for which welfare is higher under a consumer surplus standard, since here using such a standard induces firms to use the less profitable action 1 thus generating higher total welfare.

However there is another interval \( e_1 < e < \bar{e}_1 \) for which welfare is lower under a consumer surplus standard since the use of such a standard forces firms to do nothing, so generating zero change in welfare whereas under a total welfare standard there is always one non-trivial action that will be chosen and this generates positive increase in welfare.

So if there are actions that increase profits but lower both consumer surplus and also welfare, then using a consumer surplus criterion can increase welfare in those cases where it restricts choice but still leaves firms with a non-trivial action they can take. However using such a standard will lower welfare when it restricts choice to just the trivial action, while there are non-trivial actions that contribute positively to welfare.

### 3.3 Extension: comparison when actions differ in efficiencies

So far we have considered above actions which differ only in the price-cost margin. It is worth considering what happens in the more general case where actions differ also in the extent of their cost reduction (\( \Delta c \)).

To analyse this, consider again the case where there are just two non-trivial actions. Since actions differ in both their cost reduction and the extent to
which they generate higher price-cost margins, they are no longer one-dimensional and so, as before, \( a_i = (\mu_i, \Delta c_i), \ i = 1,2 \). As above we assume that action 2 is such that it generates a bigger increase in the price-cost margin, so \( 0 < \mu_1 < \mu_2 < \frac{1}{2} \).

We can get some simplification by defining \( e = \frac{\pi}{\Delta c_1} \); \( k = \frac{\Delta c_2}{\Delta c_1} \). Then, ignoring the common constant \((\Delta c_1)^2\) to which consumer surplus etc. will be proportional under both actions we have:

\[
\Delta CS_1(e) = \frac{1}{2} \left[ (1 - \mu_1)(1 + e)^2 - e^2 \right] \tag{24}
\]

\[
\Delta \pi_1(e) = \mu_1 (1 - \mu_1)(1 + e)^2 \tag{25}
\]

\[
\Delta W_1(e) = e + \frac{1}{2} [1 - (1 + e)^2] \tag{26}
\]

and

\[
\Delta CS_2(e) = \frac{1}{2} \left[ (1 - \mu_2)(1 + e)^2 - e^2 \right] \tag{27}
\]

\[
\Delta \pi_2(e) = \mu_2 (1 - \mu_2)(1 + e)^2 \tag{28}
\]

\[
\Delta W_2(e) = ke + \frac{1}{2} [k^2 - (1 + e)^2] \tag{29}
\]

There are then two cases to consider.

**Case 1.** \( k > 1 \)

Here action 2 results in a higher price-cost margin but also a greater reduction in costs. This has two implications:

- For all environments action 2 will generate a bigger increase in profits than action 1 and so will always be chosen if both are available;
• But now it is less clear how the two actions compare from the point of view of both consumer surplus and total welfare.

If $k$ is quite close to 1 then everything will be dominated by the increase in the price-cost margin and the previous results will go through.

Consider then the other extreme where the cost differences are very large. In particular consider the situation where $k \geq \frac{\mu_2(1-\mu_1)}{(1-\mu_2)\mu_2}$. This implies that $e_2 \geq e_1$ and so, whenever action 1 is profitable under a consumer surplus standard, so too is action 2. In this case, under a consumer surplus standard action 2 will always be chosen whenever a non-trivial action is available. Now if action 2 is profitable under a consumer surplus standard it is profitable under a total welfare standard, and so will be chosen when a total welfare standard is used. So:

• Whenever a non-trivial action is chosen under a consumer standard this will be action 2 and this will also be chosen under a total welfare standard so generating the same level of welfare;

• However for those environments for which $e_2 < e < \bar{e}_2$ action 2 will be chosen under a total welfare standard while only the trivial action will be chosen, and so, for these environments it is certainly the case that welfare is higher under a total welfare standard than under a consumer surplus standard.

So we have:

**Proposition 2.**

If the cost differences are sufficiently large in favour of the action with the higher price-cost margin, specifically if $k \geq \mu_2 \frac{(1-\mu_1)}{(1-\mu_2)\mu_1}$ then a total welfare standard welfare dominates a consumer-surplus standard.

Case 2: $k < 1$

Here action 2 generates a greater increase in the price-cost margin but lower reduction in costs than action 1. This has two implications:

- under both a consumer surplus and a total welfare standard action 2 is worse than action 1 in all environments – in particular, $e_2 < e_1$;
- however it is less clear which of the two actions is more profitable.

To understand this latter point define $\beta = \sqrt{\frac{\mu_1(1-\mu_2)}{\mu_2(1-\mu_1)}}$ so $0 < \beta < 1$.

Then it is possible to show the following:

I. If $\beta \leq k < 1$ then action 2 is more profitable than action 1 in every environment and so the analysis goes through exactly as in the simple case where $k = 1$.

II. If $k < \beta$ then if we let $\bar{e} = \frac{\beta - k}{1-\beta}$ then action 1 is more profitable than action 2 if $e < \bar{e}$ while action 2 is more profitable than action 1 if $e > \bar{e}$.

So what matters now is how $\bar{e}$ relates to $e_2$ and $e_1$. In particular we have:

a. If $\bar{e} < e_2 < e_1$ then the conclusions about the relative welfare levels under a consumer surplus standard and under a total welfare standard go through exactly as in the case where $k = 1$. That is welfare is higher under a consumer surplus standard (i.e. there is a Lyons effect) if $e_2 < e < e_1$ but higher under a total welfare standard if $e_1 < e < \bar{e}_1$. The only difference is that for
\[ \varepsilon < \hat{\varepsilon} \text{ then under both a consumer surplus standard and a total welfare standard action 1 is chosen and so private incentives are aligned with social incentives.} \]

b. If \( e_2 < \hat{\varepsilon} < e_1 \) then the Lyons effect only operates for \( \hat{\varepsilon} < \varepsilon < e_1 \).

c. If \( e_1 < \hat{\varepsilon} \) then there is no Lyons effect and a consumer surplus standard is worse than a total welfare standard.

**Proposition 3.**

The greater the cost differences in favour of the action with the lower price-cost margin, that is the further is \( k \) from 1 then the less likely is the Lyons effect to exist, and it may disappear altogether if \( k \) lies sufficiently far below 1.

**4. General Comparison**

In this section we return to the general case where in the “but-for” environment there is positive market power, so that

\[ \Delta m^o > 0 \text{ and } \varepsilon^o(\text{at } p^o = 1 + \Delta m^o) = \frac{A - \Delta m^o}{1 + \Delta m^o} < \varepsilon^o(\text{at } p^o = 1 = c^o) \]

Also, in this case, equation (8) must hold for the action to raise price when \( \Delta c = 0 \) – i.e. for the action to be genuinely anti-competitive.

We are particularly interested to examine how extant market power affects the impact of an action on CS, \( \Pi \) and TW and the comparison between consumer surplus and total welfare standards. It is worth remembering that the enforcement of competition law in monopolization (US) or abuse of dominance (EU) cases is characterized by a two-stage process in which it is first
established whether there is “significant” extant market power and only if this is the case the anti-competitive impact of the challenged action is examined. So an examination of how the magnitude of extant market power affects the comparison between consumer surplus and total welfare standards is very important.

Nevertheless, we also examine, in the context of the more general framework of this section a number of other questions. Consider two actions characterized by $\mu_1, \mu_2, \text{and } \Delta c$. First, we examine how does the size of efficiencies affect the comparison of standards, given $\mu_1, \mu_2$ and the environment in which the action is undertaken? Second, we examine how the size of the difference in the price-cost margin raising effects of different actions (the difference between $\mu_1, \mu_2$) affects the comparison, given the size of efficiencies and the environment.

The downside of using a more general framework in this section, however, is that it is not as straightforward to obtain analytical results. Indeed the results reported below rely on extensive numerical analysis.

**Effect of the size of extant market power on the comparison of standards**

In the examples below we consider two actions characterised by $0 < \mu_1 < \mu_2 \text{ and } \Delta c > 0$. Specifically, we assume that $\mu_1 = 0.125, \mu_2 = 0.25 \text{ and } \Delta c = 0.5$.

We examine how an increase in extant market power from $\Delta m^\alpha = 0.25$ to $\Delta m^\alpha = 0.75$ affects the comparison between the two welfare standards.

\[\text{One issue is if of course, that we by-pass here, is that it is not at all clear how to interpret the term “significant” here as has been stressed, for example, by Kaplow and Shapiro (2007).}\]
As can be seen by comparing the two Diagrams below the following result holds:

**Result 1:** Given some $0 < \mu_1 < \mu_2$ and $\Delta c > 0$ a higher initial market power of the firm implies that the *Lyons effect* will hold over a greater range of A (or $\varepsilon$) values. That is, the higher the initial market power the more likely that a consumer surplus standard will be superior.

![Diagram 1](image1.png)

**Diagram 1:** Initial price cost margin is low ($\Delta m(0)=0,25$)
- For action 1: $\Delta CS_1 = \Delta CS(\mu_1=0,125)$
- $\Delta W_1 = \Delta W(\mu_1=0,125)$
- For action 2: $\Delta CS_2 = \Delta CS(\mu_2=0,25)$
- $\Delta W_2 = \Delta W(\mu_2=0,25)$
- Both actions generate $\Delta c = 0,5$

![Diagram 2](image2.png)

**Diagram 2:** Initial price cost margin is high ($\Delta m(0)=0,75$)
- For action 1: $\Delta CS_1 = \Delta CS(\mu_1=0,125)$
- $\Delta W_1 = \Delta W(\mu_1=0,125)$
- For action 2: $\Delta CS_2 = \Delta CS(\mu_2=0,25)$
- $\Delta W_2 = \Delta W(\mu_2=0,25)$
- Both actions generate $\Delta c = 0,5$

**Result 2:** As shown in the two Diagrams below larger efficiencies (i.e. a higher $\Delta c$), given initial market power, imply that the *Lyons effect* will hold over a greater range of A (or $\varepsilon$) values.

**Effect of the magnitude of efficiencies**
Result 2: Effect of $\Delta c$
Given $\Delta m(0)$ and two actions $\mu_1<\mu_2$, as $\Delta c$ increases the range of $A$ (or $\varepsilon$) values over which the Lyons effect holds increases

Diagram 3:
There is no efficiency effect generated by actions 1&2 ($\Delta c=0$)
Initial price-cost margin $\Delta m(0)=0,5$
For action 1:
$\Delta CS_1=\Delta CS(\mu_1=0,125)$
$\Delta W_1=\Delta W(\mu_1=0,125)$
For action 2:
$\Delta CS_2=\Delta CS(\mu_2=0,25)$
$\Delta W_2=\Delta W(\mu_2=0,25)$

Diagram 4:
Both actions 1&2 generate efficiency effect $\Delta c=0,5$
Initial price-cost margin $\Delta m(0)=0,5$
For action 1:
$\Delta CS_1=\Delta CS(\mu_1=0,125)$
$\Delta W_1=\Delta W(\mu_1=0,125)$
For action 2:
$\Delta CS_2=\Delta CS(\mu_2=0,25)$
$\Delta W_2=\Delta W(\mu_2=0,25)$

Compared to Propositions 2 and 3, Result 2 says that if efficiencies across all actions are symmetric and larger then the Lyons effect is enhanced, while Propositions 2 and 3 say that if there is an increase in the difference in efficiencies between actions then the Lyons effect becomes smaller.

Effect of the difference in the price-cost margin raising effect of the actions

Result 3: As shown in the two Diagrams below a larger difference in the price-cost margin raising effect of the actions, given efficiencies and initial market power, imply that the Lyons effect will hold over a greater range of $A$ (or $\varepsilon$) values.
5. Concluding Remarks

In this paper we have presented a simple but general framework within which to examine the choice between different substantive standards for competition policy, when this choice depends on the level of aggregate welfare generated by each standard. We have showed, that there will exist environments for which having a consumer welfare standard may induce firms to choose lower-profit actions that result in higher welfare than would higher-profit actions, which would be chosen under a total welfare standard. This is what might be termed the Lyons Effect. However, there will always be some other environments for which welfare is higher when a total welfare standard is used than when a consumer surplus standard is used, because the consumer surplus standard may be too strict and deter firms from taking any action even though there are welfare-enhancing actions that could have been chosen.
We have also examined how the range of environments over which the Lyons-effect is present depends on parameters such as the extant market power of the firms taking anti-competitive actions, the size of efficiency effects and the strength of the price-raising effect generated by different actions. Importantly, we show that the range is larger, the larger the initial market power of the firm, the greater the size of efficiencies and the greater the difference in the price-raising effect of mutually exclusive actions. The first of these results indicates that arguments in favour of a consumer surplus standard are, all other things equal, more likely to be valid when the actions challenged are undertaken by firms that have significant market power to start with.

There are many directions in which the research could be extended.

In particular, we have followed the existing literature in assuming that competition authorities investigate cases and make decisions without error or delay. An obvious extension is to adopt the framework of Katsoulacos and Ulph (2009) which allows for such procedural costs.

Recognising these issues would change the analysis in two ways. First, since decision errors and delays in decision-making will affect the extent to which firms are led to choose one action rather than another these will affect the range of environments over which the Lyons effect may or may not operate. But secondly, to the extent that delays and decision errors might be higher for a total welfare standard than for a consumer surplus standard, given that under the latter additional considerations need to be taken into account in order to reach a decision, this introduces a potentially different reason for choosing a consumer standard even if the overall goal of policy is total welfare.
Appendix

Figure 1
Figure 2
Figure 3: Comparison of W standards
References


Article 101 of the EC Treaty is available at:


U.S. Department of Justice and the Federal Trade Commission, Horizontal Merger Guidelines, (Revised 1997) available at: