Efficiency defense: Possible mitigating effects in presence of imperfect redistribution tools

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11th March 2005

Abstract: It is often argued that, first, the decision criterium of antitrust authorities should be total social welfare and that, second, mergers increasing the value of this criterium but ending with lower consumer surplus should be allowed in the name of efficiency gains realized by merging firms. This paper studies merger control by a government with, first, preferences over wealth distribution among agents (weights to put on consumer surplus and firms profit) and, second, imperfect redistribution tools. It shows that in such a case merger policy can not be parted off redistribution policy.

Keywords: Competition policy, Efficiency defense, Imperfect taxation, Redistribution

JEL codes: L40, H20

This paper does not intend to compete for the Young Economist Award.

*We would like to thank Franco Mariuzzo for his helpful comments.
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1 Introduction

Among the many issues for which industrial economics provides insights, mergers emerge as one of the most significant. Merger control stands as a key element of antitrust policies, with concerns ranging from pure economic theory, such as equilibria characterization, to empirical methodology and data analysis, and eventually policy recommendations. Following the development of the “new theoretical industrial organization” in the last thirty years, there has been a wide consensus regarding the basic methodological framework used in industrial economics.

Partial equilibrium Partial equilibrium approach as well as non-cooperative game theory have been widely acknowledged as keystone building blocks in this field. Tirole (1992), in his introductive part, provides a justification for the partial equilibrium approach based on the Vives’s (1987) argument. Because revenue effects are decreasing with the number of goods, one can conclude they are not significant in developed economies characterized by numerous available consumption goods, and thus neglect markets spill-overs.

This argument has been criticized. For example, Blackorby (1999), using an example, shows that Vives’s (1987) results rely on restrictive assumptions (mainly linear budget constraints) and cannot be extended. In a nutshell, the partial equilibrium second-best policy is shown not to be an approximation of general equilibrium second-best policy.

Surplus maximization and wealth redistribution In the context of partial equilibrium, surplus maximization is the usual tool economists use to characterize efficient outcomes. This methodology is fully correct and characterizes all optimal allocation under some restrictive assumptions. Mas-Colell, Whiston and Green (1995) mention two main assumptions utility functions (and profit functions) must be quasi-linear with respect to money so that there is no revenue effect; the government is able to transfer wealth or money between agents by means of lump-sum transfers.

Regarding the first assumption, it is quite difficult to extend surplus analysis to more general framework and, therefore, this paper assumes utility and profit functions to be quasi-linear. Nevertheless, we think that the second assumption is crucial and deserves some more attention. This assumption is needed for any efficient outcome to be identified through surplus maximization. Indeed, were lump-sum transfers feasible, allocative efficiencies and redistribution would be two separate issues: the former one being the main concern of antitrust authorities, the latter one being handled by taxation policy. Moreover, the information required to calibrate such lump-sum transfers would make tough to assume that a government endowed with such knowledge would not be able to fix all prices to marginal cost, which would make competition policy pointless.

\[\text{For a more detailed discussion on this issue, please refer to, e.g., Mas-Colell, Whiston and Green (1995, sections 4.D and 10.E) and Church and Ware (2000, section 2.3).}\]
However, would the government be prevented from costless wealth allocation among agents, what should she design as a policy? The first issue is that she would be prevented from implementing some efficient outcome, due to restriction in possible endowments, moving to a second-best world. The second issue is that her preferences over agents in the economy may well matter crucially in setting final outcomes.

Efficiency defense We think this second point is of particular relevance in the current debate on efficiency defense. In a nutshell, efficiency defense designates the possibility, for merging parties, to argue that significant (post-merger) cost savings (or other efficiencies) can compensate for otherwise (post-merger) anticompetitive effects. As stated by Röller, Stenneck and Verboven (2000, p. 27), the most common effect of a merger is price increase, which are of some concerns for two main reasons

First, there is the obvious fact that a price increase implies a transfer of wealth from consumers to producers. This is a distributional consideration. Second, an increase in the price of a product above its marginal cost creates (or strengthens) an allocative inefficiency, also called the dead-weight loss. [...] Competition authorities in most countries have been primarily concerned with the distributional effects of price increases. Economists, in contrast, tend to argue that one should focus on total welfare, and therefore focus on the allocative inefficiency (or deadweight loss) caused by the merger.

As we have already noticed, in a world of perfect taxation, wealth redistribution is not an issue and one should concentrate on efficiency. But because efficiency defense induces by assumption a shift of wealth to the benefits of firms, it exacerbates the consequences of imperfect redistribution tools. This issue has long been recognized as a potential weakness of the partial equilibrium approach, as stated by Tirole (1992, p. 12)

Market intervention does have desirable or undesirable income-redistribution effects. [...] If total surplus increases, the winners can compensate the losers and everyone is better off. The classical drawback of this approach is that the distribution branch may not function, and compensation need not occur [...] This caveat should be borne in mind in all our welfare conclusions.

Government’s ideology Coming back to the second issued previously identified, in a framework endowed with imperfect redistribution tools, one has to investigate what is the objective function of policy makers in such a framework. The usual assumption regarding government’s objective function is that she acts as an utilitarian body and maximizes the sum of consumers’

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2Please refer to Röller, Stenneck and Verboven (2000) for an indepth coverage of efficiency defence, including theoretical analysis, empirical evidences, its practice in competition policy and a framework for merger analysis which would take into account such arguments.
surplus and firms’ profits. On the one hand, some empirical findings seem to be in favor of such assumption. Crandall and Winston (2003) analyze several merger cases from the point of view of the consumers. They show that consumers’ welfare has not been significantly increased by American antitrust authority’s policy. Sibley and Heyer (2003), in their analysis of the American Department of Justice’s merger policy, clearly indicate that the achievement of a competitive outcome is the main goal of the actual American industrial policy. Therefore, this would rather push either for an utilitarian objective function, or for a bias towards firms’ interests.

On the other hand, other empirical evidences show that governments’ actions regarding antitrust are somewhat shaped by their political ideology. For example, Ghosal (2004) shows empirically that, in the US, antitrust enforcement experiences significant differences between Democrat and Republican governments. In other words, governments who have different ideologies regarding their objective function exhibit different policies in merger control. This cannot be explained by the traditional surplus maximization approach: surplus maximization is supposed to characterize any Pareto optimum allocation, independently of the welfare function considered or, equivalently, independently of the government’s preferences.

Therefore, we assume that the government’s objective function is a weighted sum of consumers’ surplus and firms’ profits, where the weights reflect government’s preferences over the allocation of surpluses among consumers and firms. In the reminding of the text, such weights are referred to as government’s “ideology”.

This paper In the present article, our intention is not to compare general and partial equilibrium approaches. We stand by the partial equilibrium approach, even if we know that it may be problematic, especially if markets considered are of some relative importance compared to the whole economy. We nevertheless depart from the traditional literature by introducing distortive corporate and income taxation, and we investigate how the introduction of such distortive taxes influences optimal governmental decisions regarding merger control. To focus on this issue, the model does not embody sophisticated specificities: markets are either classical monopoly or Cournot duopoly, income and corporate taxes are linear, and the government maximizes a generalized utilitarian criterion.

In this paper, we show that the lack of undistortive taxes impacts government’s decisions. Governments’ ideology are not neutral anymore and considering only the utilitarian criterion misleads their policy predictions. Therefore, the presence of distortive taxation schemes makes impossible to separate merging policy, or more generally industrial policy, and redistribution policy.

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3The empirical literature has also insisted on the influence of business cycles on antitrust enforcement (see, e.g., Suslow (1988), Baker (1989), Slade (1990), Dick (1996) or Ghosal and Gallo (2001)).
4Next section will provide a more detailed definition of what we call “ideology”.
5Mas-Colell, Whiston and Green (1995, sections 3.1, 10.C and 15.G), e.g., provide insightful discussions regarding the validity of partial equilibrium analysis with respect to the general equilibrium one.
Nevertheless, contrary to Ghosal and Gallo’s (2001) empirical findings, we do not exhibit sharp predictions concerning the effect of ideology on antitrust enforcement. We do not find any monotonic relationship between, roughly speaking, government’s ideology (or more precisely, the preferences of the antitrust authority) and her merger control policy. In other words, in this framework, there is no reason to think that a government more favorable to the consumers has a more restrictive merging policy.

Next section presents the model. Section 3 relates our setting to the traditional partial equilibrium approach. Section 4 introduces distortive taxation and shows how government’s decisions are altered. Last section concludes.

2 The model

Household We consider an economy with one representative agent, or household, whose preferences are represented by the following quasi-linear utility function

\[ U(y, x, l) = y + u(x) - v(l), \]

where \( l \geq 0 \) stands for the labor, \( x \geq 0 \) for the consumption good and \( y \geq 0 \) represents the money or an aggregate good which summarizes the rest of the economy. This last element enters linearly in the utility function.

We make the usual assumption on the preferences, namely that marginal utility of consumption is positive and decreasing, \( u'(x) > 0, u''(x) < 0 \), and that labor is unpleasant with this negative effects being increasing with the work load, \( v'(x) > 0, v''(x) > 0 \). Eventually, we assume that \( u'(x) + xu''(x) \) is strictly decreasing in \( x \). This is not strictly speaking necessary for our results to hold, but it simplifies the exposition of the results through an easier comparison between monopoly and duopoly outcomes.

Markets The labor market is assumed to be perfectly competitive and the wage, denoted by \( \omega \), is considered as exogenous and unaffected by government policies. This last point is a usual requirement in the public economics literature and, e.g., Mirrlees (1971) and Stiglitz (1982) develop their whole theory on income taxation assuming that it has no impact on the wages.\(^7\)

In this context, we can argue that \( \omega \) already includes the main part of the income taxation and that we are just studying the modification induced by the antitrust policy.

Eventually, the consumption good market is assumed to be of a relative small size so that it does not affect other markets. More specifically, this market being served by a monopoly or a

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\(^6\)Because our results can be interpreted as negative results, considering an economy with a representative agent is not that restrictive.

\(^7\)It can be justified if production functions are linear, which is the standard assumption in the optimal taxation literature. Our model would not be easily tractable with endogenous wages but we do think that our results would be preserved. Note that the natural reference with linear taxes is Sheshinski (1972).
duopoly has no impact on the rest of the economy, among which the labor market.

**Market structure** The consumption good is produced by two firms, identified by subscripts 1 and 2. The production technology can be summarized by their linear profit functions

\[ \Pi_i (x_i, e_i) = (p(x)x_i - c_i(e_i)x_i) - e_i, \]

where \( p(x) \) denotes the inverse demand function, and \( e_i > 0 \) represents the effort the firm can devote to reduce its decreasing and convex production cost \( c_i \), with \( c_i' < 0 \) and \( c_i'' > 0 \). This effort is privately chosen by each firm and it is not contractible by the government, who only observes profits. The impossibility to contract on such a variable is in line with the practice of competition authorities. Indeed, in remeasuring merger-related concerns, policy makers are rather reluctant to monitor firms conduct and therefore favor structural measures (e.g. divestment of assets or licensing of technology) rather than behavioral ones (e.g. specific ways to conduct commercial operations).\(^8\)

Both firms wish to merge. Their rationale for merging is twofold. First, thanks to the fewer number of market participants, namely moving from two to one, they increase their market power. Second, they anticipate efficiency gains that will drive the post-merger cost function \( \tilde{c}(e) \) dramatically lower. These efficiency gains are assumed to be certain, common knowledge between firms and the government, and to be such that

\[ \forall e \in \mathbb{R}_+, \quad \tilde{c}(e) < c_1(e) + c_2(e). \]

For simplicity, but it is not crucial, firms are assumed to be symmetric, \( c_1(e) = c_2(e) = c(e) \) and we will further concentrate our attention on symmetric equilibrium.

**Taxation** Except in next section, household income and firms profits are taxed and we assume that both taxations are distortive. More specifically, we assume that the only tool available to the government is a linear taxation scheme, i.e. income is taxed at the rate \( t_h \) and profits are taxed at the rate \( t_f \).

We can note that, first, there are empirical evidences that taxation is indeed distortive in the real world (see, e.g., Snower and Warren (1996) who compute the deadweight loss accrued to imperfect taxation in developed economies). Second, the presence of asymmetric information

\(^8\)Quoting former European Commissioner for Competition Policy Mario Monti, in a speech commenting the Commission notice on merger remedies (18/01/2002, Ecole Nationale Superieure des Mines, Paris, France): “The Notice’s second aim is to make sure that the remedies accepted by the Commission can be implemented effectively and within a short period. They should not require additional monitoring once they have been implemented. The commitments offered must, therefore, contain specific details and procedures relating to their implementation. In the Notice, the Commission clearly indicated that the preferred remedy is the divestiture of viable stand-alone businesses. In the Commission’s view, this form of structural remedy ensures that competition is restored in the market either by the emergence of a new independent competitive entity or by the strengthening of an existing competitor.” [http://europa.eu.int/comm/competition/mergers/legislation/](http://europa.eu.int/comm/competition/mergers/legislation/)
induces (income) taxation to be distortive. Third, following the line of distortion, the linear taxation scheme provides the simplest example, and a tractable one, which explains our choice.

Introducing the moral hazard component in firms profit function makes any linear profit taxation distortive as it influences the choice of $e$.

**Government** The government, or the authority in charge of the antitrust policy enforcement,\(^9\) takes two actions. First, she has to set tax levels. Second, she has to settle down the market structure for the consumption good, and therefore decide whether the good should be produced by the two competitive firms or by the resulting merging firm. If she accepts the merging case, the production will be more efficient, but increased market power can drive the price higher.

Both decisions are taken simultaneously by the government. We do not pretend that merger analysis and tax setting occur concomitantly in the real world. Changes in taxes are, generally speaking, far less common than competition policy decisions and involve a wider legal and political background. Nevertheless, we do not want to address the strategic interplay between a government, which would be in charge of tax setting and could be motivated by reelection, and a competition authority, which would only decide on merger proposals. Therefore, there is no need to explicitly model the strategic interactions between both decisions.

The objective function of a government is to maximize social welfare, defined as a weighted sum of consumers surplus and firms’ profits

$$\text{SW}(U, \Pi) = U + \lambda \Pi, \quad (1)$$

where $\lambda \geq 0$ and $\Pi$ is the aggregate profits of active firms on the consumer good market. When $\lambda = 1$, the government acts as a pure utilitarian social planner for who surpluses are equivalent whether they belong to consumers or to firms. When $\lambda > 1$, she puts an emphasis on surplus generated by firms, without any further discrimination among the active firms, if several are active. When $\lambda < 1$, the government favors consumers in her objective function. In the reminding of the text, we will respectively call utilitarian ($\lambda = 1$), firm-biased ($\lambda > 1$) and consumer-biased ($\lambda < 1$) each of these types of government.

The weight $\lambda$ represents what we referred to as government’s “ideology”. Indeed, left wing and right wing governments may have different opinions about the optimal distribution of surplus in the society. Alternatively, the weight $\lambda$ can reflect the influence of lobbies or be related to the probability of being reelected. We agree that considering different weights to formalize lobbying or strategic political behavior is naive. Nevertheless it is hard to argue that there exists an unique objective social welfare function, and an unique and well accepted optimal distribution of wealth in the society.

Next section studies what would decide a government endowed with the lump-sum taxation

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\(^9\)We do not make any difference between those two entities even if one ca argue that they may follow divergent objectives.
tool. This will build a benchmark to detail what are the consequences of introducing a distortive tax system.

3 Surplus and merging

In this section, we assume that the government can transfer wealth between agents without creating any distortion in their choices. We first derive the equilibrium conditions in the duopoly market.

**Household choice** The household maximizes his utility function $U(y, x, l) = y + u(x) - v(l)$ under his budget constraint $\omega l \geq px + y$. The inverse demand function can easily be derived from standard utility maximization conditions $p = u'(x)$.

We assume that the equilibrium price $p^d$ is such that this equation has an interior solution, $p^d \leq u'(0)$. This assumption is necessary since we consider a quasi-linear utility function. The labor supply function can be deduced in the same manner $\omega = v'(l)$ which is also assumed to have an interior solution. Labor supply is not affected by $p$ and, since there is no income taxation in this section, labor supply does not modify social welfare and, thus, does not play any role in the government decision.

**Duopoly equilibrium** The firm $i$ maximizes its profits by choosing its production $x_i$ and its effort $e_i$ given the choices $x_j$ and $e_j$ made by the other firm. This yields:

\[
\begin{aligned}
\frac{\partial \Pi_i}{\partial x_i} &= 0: \quad u'(x_i + x_j) + x_i u''(x_i + x_j) = c(e_i), \\
\frac{\partial \Pi_i}{\partial e_i} &= 0: \quad c'(e_i) x_i = -1.
\end{aligned}
\]

Let us denote $e(x_i)$ the solution of the second implicit function. The best reply function $x_i^*(x_j)$ is characterized by the equation

\[
u'(x_i + x_j) + x_i u''(x_i + x_j) = c(e(x_i)).
\]

Second order conditions of firm’s maximization are

\[
\begin{aligned}
\frac{\partial^2 \Pi_i}{\partial x_i^2} &= 2u''(x_i + x_j) + x_i u'''(x_i + x_j) \leq 0, \\
\frac{\partial^2 \Pi_i}{\partial e_i^2} &= -c''(e_i) x_i \leq 0.
\end{aligned}
\]

Assumptions on $c$ and $u$ are such that these two conditions are satisfied at equilibrium.
The last step consists in characterizing the equilibrium quantity $x^d$. From equation (2) and looking for a symmetric equilibrium, the individual quantity produced by a firm is given by

$$ u'(2x^d) + x^d u''(2x^d) = c(e(x^d)). \quad (3) $$

Given $x^d$ we can deduce unambiguously the equilibrium prices $p^d$, the profits $\Pi^d$ and the utility of the agent $U^d$. We can then deduce the value of social welfare, defined as the unweighted sum of consumer and firms surpluses

$$ u(2x^d) - 2x^d c(e(x^d)) - 2e(x^d) + v'(l) l - v(l). $$

Because the level of labor at equilibrium does only depend on the exogenous variable $\omega$, and is not related to other quantities or price, we will omit it and define

$$ W_d = u(2x^d) - 2x^d c(e(x^d)). $$

**Monopoly equilibrium** The analysis of the monopolistic equilibrium follows a similar path. Assuming interior solutions, the equilibrium quantity produced by the monopoly is given by

$$ u'(x^m) + x^m u''(x^m) = \tilde{c}(\tilde{e}(x^m)), \quad (4) $$

where $\tilde{e}(x)$ is the solution of the equation $\tilde{e}'(e_i)x = -1$. One can then compute the corresponding social welfare associated and, using the same remark concerning the level of labor at equilibrium, we define

$$ W_m = u(x^m) - x^m \tilde{c}(\tilde{e}(x^m)). $$

**Government’s choice** In order to decide upon her best choice, any government, characterized by $\lambda$, has to figure out how range monopoly and duopoly cases, once non-distortive (lump-sum) taxation $T$ is taken into account. In other words, she has to solve the following problem in the monopoly and duopoly cases

$$ \max_T \left\{ SW(U + T, \Pi - T) = U + \lambda \Pi + (1 - \lambda) T \right\} \quad \text{such that} \quad \begin{cases} U + T \geq 0, \\ \Pi - T \geq 0, \end{cases} $$

and to compare the outcomes ($\Pi$ being the aggregate profit level in the consumption good market). Because of the linearity of the problem, the optimal transfer is, in both cases, $T = -U$ if $\lambda > 1$ and $T = \Pi$ if $\lambda < 1$. If $\lambda = 1$, then the government faces multiplicity of equilibria, with $T \in [-U, \Pi]$, among which one can pick-up, e.g., $T = 0$. The final level of government’s
objective function can then be written, in both monopoly and duopoly cases, \[ SW^*(U, \Pi) = \max [U + \Pi, \lambda(U + \Pi)]. \]

An utilitarian government, when choosing between monopoly and duopoly, simply considers the difference between the two surpluses, which ends up evaluating the sign of \[ W_d - W_m = u(2x^d) - 2x^d c\left(e\left(x^d\right)\right) - u(x^m) + x^m \tilde{c}(\tilde{e}(x^m)). \]

Assume now that the merger is not beneficial in terms of surpluses, that is \[ U^d + \Pi^d > U^m + \Pi^m. \]

An utilitarian government would refuse it. If a government characterized by \( \lambda \neq 1 \) accepts the merger, then it must be the case that \[ SW^*(U^m, \Pi^m) > SW^*(U^d, \Pi^d) \]
which is equivalent to \[ \max [U^m + \Pi^m, \lambda(U^m + \Pi^m)] > \max [U^d + \Pi^d, \lambda(U^d + \Pi^d)]. \]

Both conditions cannot hold at the same time. This drives the following proposition.

**Proposition 1.** Whenever a government can freely reallocate wealth among agents, her decision regarding the merger case does not depend upon her ideology, and this decision is only guided by pure utilitarian concerns.

Therefore, the antitrust decision does not depend on government’s ideology. This result is a reminiscence of a central result of partial equilibrium welfare analysis: government’s preferences do not affect her policy.

This statement, in its most general form plays a crucial role in partial equilibrium welfare analysis. It tells formally that policy prescriptions are independent of any political bias or any ideology. The key issues that drive this result are that, first, fiscal policy can be set independently of any antitrust policy and, second, fiscal policy is non distortive. If transfers \( T^d \) and \( T^m \) were not feasible anymore, then the proposition would not hold.

To complement this comment, let us assume that no taxation is feasible. Assume also that the merger is not beneficial in terms of surpluses, that is \[ U^d + \Pi^d > U^m + \Pi^m. \]

\(^{11}\)Note that the same analysis holds for an utilitarian government with \( \lambda = 1 \).
Firms rationale for merging requires that $\Pi^m > \Pi^d$: the merging firm could always replicate the duopoly outcome and, because of the assumed cost decrease, it would earn more.\footnote{This implies that $U^d > U^m$. Moreover, when taxation is lump-sum or in the absence of taxation, the choice of workload $l$ by the household is unaffected by the market structure of the consumer good. Otherwise stated, for the merger to be blocked by an utilitarian government, a necessary condition is that, despite efficiency gains, price increases with the merger.} Then, if $\lambda < 1$, it must be the case that

$$U^d + \Pi^d - (1 - \lambda) \Pi^d > U^d + \Pi^d - (1 - \lambda) \Pi^m > U^m + \Pi^m - (1 - \lambda) \Pi^m.$$ 

or equivalently

$$U^d + \lambda \Pi^d > U^m + \lambda \Pi^m.$$ 

Alternatively, assume that no taxation is feasible and that an utilitarian government chooses the merger, i.e.

$$U^d + \Pi^d < U^m + \Pi^m.$$ 

Then, if $\lambda > 1$

$$U^d + \Pi^d - (1 - \lambda) \Pi^d < U^d + \Pi^d - (1 - \lambda) \Pi^m < U^m + \Pi^m - (1 - \lambda) \Pi^m.$$ 

or equivalently

$$U^d + \lambda \Pi^d < U^m + \lambda \Pi^m.$$ 

Both results are summarized in the following corollary

**Corollary 1 (Monotonicity).** When the government has no ability to tax, if an utilitarian government prefers the duopoly, so does a consumer-biased government. Inversely, if an utilitarian government prefers the monopoly, so does a firm-biased government.

In this hypothetical world without taxation, a pure utilitarian government is not affected by the lack of a redistributive taxation. She cares only about total surplus and not about its distribution in the society.\footnote{Even with taxation capability, an utilitarian government optimal taxation policy may well be not to tax, i.e. $T = 0$.}

This corollary gives some rationale for the surplus analysis in merger control. It sets the benchmark of an utilitarian government who cares only about overall efficiency effects of the merger, abstracting from the redistribution of gains. Moreover, the weight $\lambda$ conditions what policy a government might take: if $\lambda < 1$, household-biased government blocks more merger cases than an utilitarian government; if $\lambda > 1$, firm-biased government clears more merger cases. This motivates the tittle of the corollary.

Next section focuses on a more realistic case than either non distortive taxation or no taxation at all, by considering that redistribution is feasible but creates some inefficiencies. These
inefficiencies come from the change they induce in the labor supply and in efforts made by firms.

4 Government ideology and distortive taxation

In this section, the government has the ability to tax, with a linear scheme, both household income at a rate $t_h$ and firms’ profits at a rate $t_f$. For simplicity, we assume that the rationale for taxation is not to finance a public good, or government’s expenditures, but rather to reallocate wealth between agents in the economy, so as to maximize her objective function. Therefore, what tax takes from one type of agent will end to be entirely redistributed to the other.

Market outcomes In such a context, firms profit function becomes

\[
\begin{align*}
\Pi &= (1 - t_f) (px - \tilde{c}(e)x) - e & \text{in the monopoly case,} \\
\Pi_i &= (1 - t_f) (px_i - c(e_i)x_i) - e_i & \text{in the duopoly case.}
\end{align*}
\]

In both cases, each firm maximizes its profit with respect to production level and effort, given the corporate tax level $t_f$, so that it gets at least zero profit.

Household also faces a linear income tax, $t_h$, and therefore maximizes his utility under his new budget constraint $(1 - t_h) w_l \geq px + y$. He ends up maximizing

\[
U(x, l) = (1 - t_h) w_l - px + u(x) - v(l)
\]

with respect to quantity of labor $l$ and to quantity of the consumption good $x$.

This drives the following first order conditions\textsuperscript{14} in the monopoly and duopoly cases (assuming interior solutions)

Household:

\[
\begin{align*}
\frac{\partial U}{\partial x} &= 0: \quad (1 - t_h) w_l = v'(l), \\
\frac{\partial U}{\partial l} &= 0: \quad p = u'(x),
\end{align*}
\]

Monopoly:

\[
\begin{align*}
\frac{\partial \Pi}{\partial x} &= 0: \quad u'(x) + xu''(x) = \tilde{c}(e), \\
\frac{\partial \Pi}{\partial e} &= 0: \quad (1 - t_f) \tilde{c}'(e)x = -1,
\end{align*}
\]

Duopoly:

\[
\begin{align*}
\frac{\partial \Pi_i}{\partial x_i} &= 0: \quad u'(x_i + x_j) + x_iu''(x_i + x_j) = c(e_i), \\
\frac{\partial \Pi_i}{\partial e_i} &= 0: \quad (1 - t_f) c'(e_i)x_i = -1.
\end{align*}
\]

An interesting feature related to this framework is that each tax has a specific effect which does not affect the other one. On the one hand, the income tax only influences the level of labor chosen by the household. But it does not change his behavior with respect to quantity of good he wishes to consume. On the other hand, the corporate tax modifies the choice of effort for a

\textsuperscript{14}Second order conditions are omitted because, as exhibited in previous section, they are rather standard.
given quantity produced. Given the interplay between firm’s effort and price on the consumer market, the final quantity of consumer good depends on the corporate tax.

Note that taxes must be lower than 1 but they can also be negative. Were this to occur, e.g. \( t_h < 0 \), the government would subsidize consumers to the expense of firms. More generally, one can interpret \( t_h \) as one piece belonging to a global taxation scheme, and thus a negative tax would correspond to a tax cut.

One can then, for given tax levels \( t_h \) and \( t_f \), compute the symmetric equilibrium \( l (t_h), x^k (t_f) \), \( e^k (t_f) \) where superscript \( k = m \) refers to monopoly outcomes and \( k = d \) for duopoly ones. Equilibrium prices \( p^m (t_f) \) and \( p^d (t_f) \) directly follow from quantity outcomes.

Eventually, for a given level of taxes, and assuming that those taxes are such that household’s and firms’ problems have interior solutions, the resulting indirect surpluses\(^{15} \) \( U^k (x (t_f), l (t_h)) \) and \( \Pi^k (e (t_f), x (t_f)) \) are noted, respectively, \( U^k (t_f, t_h) \) and \( \Pi^k (t_f) \), with superscript \( k = m \) for the monopoly case and \( k = d \) for the duopoly one.

**Government’s choice** The government faces two problems

\[
\max_{t_f, t_h} \left[ U^k (t_f, t_h) + \lambda \Pi^k (t_f) \right] \quad \text{such that} \quad \begin{cases} U^k (t_f, t_h) \geq 0, \\ \Pi^k (t_f) \geq 0, \end{cases}
\]

in the monopoly \((k = m)\) and duopoly \((k = d)\) case, taking into account the corresponding budget constraint \((\text{BC}^k)\)

\[
\begin{align*}
& \quad t_h \omega^m (t_h) + t_f \left[ p \left( x^m (t_f) \right) - \tilde{c} \left( e^m (t_f) \right) \right] x^m (t_f) \geq 0 \quad \text{in the monopoly case,} \\
& t_h \omega^d (t_h) + t_f \left[ p \left( 2x^d (t_f) \right) - c \left( e^d (t_f) \right) \right] 2x^d (t_f) \geq 0 \quad \text{in the duopoly case.}
\end{align*}
\]

The government has to take into account that, when selecting tax levels, she induces distortions to labor supply and firms’ effort level. Both distortions lead to inefficiencies in the economy.

The optimal corporate and the income tax may differ in the monopoly and duopoly case, and they will be noted \( t_f^m \) and \( t_f^d \) for the corporate tax rate and \( t_h^m \) and \( t_h^d \) for the income tax rate at equilibrium.

Let define the “Samuelson frontier” for each market structure, \( U^{ms} \) for the monopoly and \( U^{ds} \) for the duopoly, that is the maximum level of utility consumers can reach, through tax adjustments, for a given bottom constraint on firm(s)’ profit level

\[
U^{ks} (\Pi) = \max_{t_f, t_h} \left\{ U^k (t_f, t_h) \left| \forall t_f, t_h \quad \Pi^k (t_f) \geq \Pi \right. \right. \text{ and } \left( \text{BC}^k \right) \text{ is satisfied} \right\}. \quad (6)
\]

The following lemma describes useful properties of such frontier.

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\(^{15}\)Once again, we summarize in one formula the monopoly and duopoly cases, \( \Pi \) referring to industry aggregated profit.
Lemma 1. The function $U^{ks} (\Pi)$, $k = m$ and $k = d$, has the following properties

- There are continuous and derivable everywhere;
- $U^{ks} (\Pi^k) = U^k$, $k = m$ and $k = d$, with the slope of the derivative being $-1$ at that point;
- For all possible $\Pi$, $U^{ks} (\Pi)$, $k = m$ and $k = d$, lies under the straight line passing through the point $(U^k, \Pi^k)$ and of slope $-1$.

Proof. Continuity and differentiability come from standard results of optimization theory. Our setting is regular and does not exhibit any technical difficulties as long as we assume interior solutions. Other properties of the shape of $(U^k, \Pi^k)$ are standard in taxation theory and proofs are straightforward.

Let us first consider an utilitarian government ($\lambda = 1$). From previous section, she is indifferent between reallocating or not wealth between household and firms when taxation is free of distortions. Otherwise stated, she is indifferent between all redistribution points in the straight line passing through $(U^k, \Pi^k)$ and of slope $-1$. When, on the contrary, inefficiencies arise from the usage of taxes, the only solution that leaves her objective function unaffected by the distortive tax system is not to tax. This solution yields the highest possible level of social welfare for this type of government. Therefore, an utilitarian government sets $t^d_f = t^d_h = 0$ and $t^m_f = t^m_h = 0$, and implements laissez-faire outcomes noted $LF^k$ in figure 1. Equilibrium points with perfect taxation schemes, identified in previous section, are called $PT^k$. 

Figure 1: Samuelson frontier
Let know turn a government with biased preferences, e.g. a consumer-biased one ($\lambda < 1$). Would she also select the laissez-faire outcomes? A priori, she would rather prefer final surpluses level slightly in favor of household ($U^k + \varepsilon_h; \Pi^k - \varepsilon_f$) as long as $\varepsilon_f, \varepsilon_h > 0$ are such that $\varepsilon_h/\varepsilon_f > \lambda$. This point would lie below the line of slope $-1$ that goes through the laissez faire point ($U^k; \Pi^k$). Using the continuity argument, lemma (1) asserts that one can find $\varepsilon_f, \varepsilon_h > 0$ with $\varepsilon_h/\varepsilon_f > \lambda$ such that the point ($U^k + \varepsilon_h; \Pi^k - \varepsilon_f$) belongs to the “Samuelson frontier” in either the monopoly ($k = m$) case or the duopoly ($k = d$) one. The same reasoning applies for a firm-biased government. The presence of imperfect taxation tools ends up with government selecting the point noted $IT^k$. This analysis is formalized in the following lemma.

**Lemma 2.** Whatever the preferred market structure, a biased government ($\lambda \neq 1$) does not choose a tax scheme $t^d_f = t^d_h = 0$ or $t^m_f = t^m_h = 0$ that leads to laissez-faire outcomes.

Equipped with these results, we can now turn to our two main propositions.

**Proposition 2 (Non-neutrality).** When the government is not endowed with lump-sum taxation, her merging clearance decisions may be affected by her preferences or “ideology” ($\lambda$).

This proposition is a direct consequence of lemma 2, and it complements the discussion regarding proposition 1. Even when the merger induces the sum of surpluses to increase, the distribution of the gains for each surplus may be biased towards the household or towards the firm. If the taxation system is imperfect, the redistribution will necessarily be limited and, as a consequence, a government may, for egalitarian reasons, refuse a surplus improving merging case.

Moreover, one can wonder whether clearance decisions are monotonic with ideology, that is whether mergers cleared by one $\lambda_1$ government will for sure be cleared by a more firm-biased $\lambda_2 > \lambda_1$ government.

### 5 Government ideology and merger analysis

In order to investigate this question, let consider an example where moral hazard does not play any role before firms merge, that is where

\[ \forall e \in \mathbb{R}^+, \quad c_1(e) = c_2(e) = c, \quad (7) \]

and where efficiency gains still insure that

\[ \forall e \in \mathbb{R}^+, \quad \tilde{c}(e) < 2c. \quad (8) \]

Consequently, the duopoly would not provide any more cost-reducing effort, yielding $e^*_i = 0$. We also assume that the labor supply is perfectly inelastic. These two assumptions imply that

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16The “egalitarian” criteria is related to the objective function targeted by the government, i.e. the parameter $\lambda$. 

pre-merger taxation induces no distortion, neither on effort nor on labor. Thus, the Samuelson frontier for the duopoly case is a straight line with slope $-1$ passing through point $(\Pi_d, U_d)$, the \textit{laissez-faire} equilibrium in case of merger, noted $LF^d$. Therefore, in the absence of distortion, the government always sets $t_f^d = 1$, $t_h^d = 0$ if $\lambda < 1$ (point called $IT^d_{[\lambda<1]}$ in figure 2), and $t_f^d = 0$, $t_h^d = 1$ if $\lambda > 1$ (point noted $IT^d_{[\lambda>1]}$).

Assume first that the cost function of the monopoly is such that an utilitarian government is just indifferent between clearing or opposing the merger, i.e. the sum of consumer surplus and firm(s)’ profit are strictly equal when the market is served by the two firms or by the merged entity. For example, the price pre- and post-merger is the same for the final good, and reduction in cost related to the merger compensates for the increase in market power.\footnote{Finding cost functions $c$ and $\tilde{c}(e)$ that induce pre- and post-merger prices to be equal does not require drastic assumptions. Nevertheless, this specific point on prices is not central for our example to hold.} Denote $LF^m$ the \textit{laissez-faire} equilibrium that emerges. By construction, this point must lie on the same straight line of slope $-1$ as $LF^d$ and, if prices are identical, it coincides with $LF^d$.

Let now increase the constant pre-merger marginal cost $c$ by a small positive amount $\varepsilon$. This means that the merger induces efficiency gains. For example, post-merger price is lower than pre-merger one in the \textit{laissez-faire} case. Post-merger total surplus must increase and, as aggregate profits must rise for firms to rationally decide to merge, so does consumer surplus un this case. Thus, an utilitarian government would clear the merger. This is the perfect example of firms advocating for efficiency defense.

Graphically, the new Samuelson frontier for the duopoly case, a straight line of slope $-1$, must lie below the former one. And, following the post-merger price decrease example, $LF^m$ must lie above the horizontal line and at the right of the vertical line passing through $LF^d$.\footnote{Conversely, $LF^d$ must lie below the horizontal line and at the left of the vertical line passing through $LF^m$.} As a consequence, by continuity, the duopoly frontier must cross the monopoly frontier at least

![Figure 2: Constant pre-merger cost, inelastic labor and efficiency gains](image-url)
twice for $\varepsilon$ sufficiently small, as shown in figure [2].

For small efficiency gains ($\varepsilon \gtrsim 0$), government without strong bias ($\lambda \approx 1$) clears the merger. Thus, a slightly household-biased government clears a concentration that offers small efficiency gains. Moreover, keeping efficiency gains to be small, clearly biased governments ($\lambda \gg 1$ and $\lambda \gtrsim 0$) block the merger, and a strongly firm-biased government ends up blocking a merger that benefits both firms and society. In post-merger price decrease example, the merger would benefit both firms and consumer. (The graphs exhibits an example with small efficiency gains, a strongly firm-biased government and a slightly household-biased one.)

As efficiency gains increase ($\varepsilon \gg 0$), blocking the merger would require strongly household-biased government or, more surprisingly at first sight, strongly firm-biased government. This example drives the following lemma.

**Lemma 3.** When the government is not endowed with lump-sum taxation, an utilitarian government clearing a merger does not prevent either a household-biased or a firm-biased government to block the exact same merger.

Let now turn to another polar example. Assume that post-merger cost is constant, equal to $\tilde{c}$ and that labor supply remains perfectly inelastic. Thus, taxation induces no distortion in case of merger, and the Samuelson frontier for the monopoly case is a straight line with slope $-1$ passing through point $LF^m$, the *laissez-faire* equilibrium in case of merger. Therefore, in the absence of distortion, the government selects the extreme segment point $IT^m$ that corresponds to her ideological bias. Assume first that the symmetric cost function of each duopolist is such that an utilitarian government is just indifferent between clearing or opposing the merger and denote $LF^d$ the *laissez-faire* equilibrium that emerges. By construction, this point must lie on

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19In the reminding of the text, we refer to "slightly-" and "strongly-" biased government in a qualitative manner.
the same straight line of slope $-1$ as $LF^m$.

As we did with the previous example, let now increase $\tilde{c}$, the constant marginal cost of the merged firm, by a small positive amount $\varepsilon$. This means that efficiency gains are getting lower, and an utilitarian government would oppose the merger. The overall level of surplus under monopoly decreases and the new monopoly frontier must then move in the bottom-left direction. As showed by figure 3, it must cross the duopoly frontier at least twice for $\varepsilon$ sufficiently small.

For small efficiency gains ($\varepsilon \gtrsim 0$), government without strong bias ($\lambda \approx 1$) follows an utilitarian government and blocks the merger. Thus, a slightly firm-biased government blocks such a concentration, whereas she would accept it would she be more biased towards firm. More surprisingly, a strongly household-biased government prefers facing a merged firm rather than duopoly. This example proves the following lemma.

**Lemma 4.** When the government is not endowed with lump-sum taxation, an utilitarian government rejecting a merger does not prevent a household-biased or a firm-biased government to accept the same merger.

Both examples show that one cannot insure that, in general, a more household-biased government would favor duopoly, and a more firm-biased government monopoly. Next proposition deals with such statement.

**Proposition 3 (Non-monotonicity).** When the government is not endowed with lump-sum taxation, a move in the ideology towards household, at the expense of firm (increasing $\lambda$), does not guarantee a move from merger clearance to merger refusal.

Thus, clearance decisions are not monotonic with the “ideological” parameter $\lambda$. In the first example, a strongly firm-biased government ends up blocking merger with significant efficiency gains. The core reason lies in the taxation system. Because taxation has no distortive effect in the duopoly situation, such a government could perfectly reallocate wealth according to her preferences. Moving from duopoly to monopoly induces higher firms’ pre-tax profits but introduces also frictions regarding tax efficiency. And, in this example, the benefits from efficiency gains do not compensate for the cost related to imperfect taxation (and its further consequences on efforts and labor).

The same effect occurs in the second example. There, a strongly household-biased government prefers to clear a merger that do not benefits from efficiency gains, thereby lowering total surplus were tax distortions absent. Here again, taxing the monopoly does not induce distortions and, therefore, the government can monitor her preferences without loosing welfare. The duopoly, on the contrary, faces distortions that are not corrected by the gains related to market power and cost all together.

One can extrapolate from these simple examples the more general case where no Samuelson frontier remains straight, with all potential scenarios regarding the crossing points between both frontiers. Even if such case prove hard to be further discuss, we want to emphasize that the
main idea that difficulties in taxation schemes play a key role in the final decision of a biased government is not an artefact of the simplicity of the above-mentioned examples.

6 Conclusion

This work shows how the introduction of taxation impacts competition policy of a government with regards to mergers. Our argument is mainly related to intrinsic limits of redistribution induced by a distortive tax system, and consequences of such redistribution caveats regarding merger characterized by efficiency gains. A striking result is that even if, first, a proposed merger decreases total surplus, and, second, the government puts a strong value on household’s surplus in her objective function, the merger can be cleared because this total surplus, and in particular the assumed efficiency gains generated by the merger, is not fairly distributed in the society due to limited redistribution tools. A striking result is that even if, first, a proposed merger increases total surplus, and, second, the government puts a strong value on firm(s)’ profit in her objective function, the merger can be blocked because this total surplus, and in particular the assumed efficiency gains generated by the merger, is not fairly distributed in the society due to limited redistribution tools.

The law literature recently echoed the issues investigated in this paper by considering the relationship between fairness and industrial policy. Crandall and Winston (2003), in an extensive discussion on this issue, remark that fairness is a widely shared social value and they argue that antitrust policy should not be only driven by efficiency. Kaplow and Shavell (1994) take the opposite point of view. For them, redistribution should be done only throw the tax system and should not affect antitrust policy. They argue that a tax system has always less distortive effects than the redistribution done through antitrust policy.

Technically speaking, our arguments are related to Blackorby’s (1999) ones. Basically, we also question surplus analysis and show that assumptions behind this approach are quite restrictive. Nevertheless, our arguments are less sophisticated and our framework less general. Blackorby (1999) concludes “that partial-equilibrium welfare is misleading and that policy prescriptions based on it should be regarded skeptically”. This paper is less pessimistic and we do not deny interesting insights that partial equilibrium analysis can bring. Nevertheless, we would agree on the fact that partial equilibrium results should be interpreted carefully.

Moreover, our arguments are not specific to merger analysis. Surplus analysis is not widely used only in industrial organization, but it is also a standard methodology in many other fields. For example, Behrens, Gaigné, Ottaviano and Thisse (2003) defines, in a international eco-

\[20\]Sanchirico (2001) argue than one can reduce the inefficiencies induced by the tax system by decreasing the tax and using instead other tools such as antitrust policy. Kaplow and Shavell (2000) criticize this approach, saying that effects of these redistributive policy are indeed very low.

\[21\]Both papers are related even if they are not similar. In particular, the model studied in this work is not a particular case of Blackorby’s (1999) one. We explicitly introduce imperfect competition whereas Blackorby considers only a perfect competition model.
nomics context, social welfare as the sum of individual surpluses. They are perfectly right to do so, but they consider a restrictive definition of the social welfare as they do not allow for centralized lump-sum transfers.

Eventually, this paper drives negative policy prescriptions: any antitrust policy can be considered as optimal for some type of government. Of course, we do not deny the necessity for antitrust policies, but we arguably conclude that it cannot be independent of governments’ ideology. If one neglects taxation problems, antitrust policy design ends up a responsibility shared by lawyers and economists. If taxation problems are relevant, data on tax distortions are needed and public economists as well as political scientists should join the debate.

References


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