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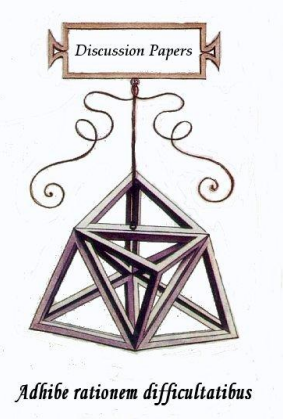

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TAX POLICY RESPONSE TO MARKET CHANGES: THE CASE OF THE GAMING SERVICES SECTOR

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Abstract

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Beginning with the 1990's, the gaming services sector has undergone several changes that have induced governments to review gambling taxes. We examine the economic rationale behind actual and prospected reforms, comparing different tax instruments with respect to their incidence.

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1. Introduction

The expansion undergone by the gambling sector in several OECD countries in recent years and the connected increase in government revenues have highlighted the efficiency and equity implications of gambling taxation. The assessment of these topics hinges on whether gambling taxes fall on consumers or on gambling operators. The answer to this question, in fact, allows to address the issue of the distortionary effects of gambling taxation, the case being much different, for instance, according to whether these taxes hit suppliers' economic rents or consumers. The same is true for the fairness issue, for instance, of their potential regressive impact.[1]

This paper aims at analysing the incidence of gaming taxation taking into account the peculiarities of the market structure and its recent evolution. In particular, government regulation, economies of scale, the need for a large capital base because of the high risk involved are element pushing towards market concentration. However, recent changes in the technological and legal environments, such as the growth of remote gambling and the reduction of trade barriers within the EU, have put the industry under a competitive pressure with repercussions onto the design of taxation.

[1] Traditionally, the disquiet towards the social costs of gambling activity, in particular the effects on excessive gamblers and the ease of criminal involvement, has explained the regulatory role of the state in the sector as a social guardian and a consumers' protector. While proving more effective than prohibition in reducing illegal gambling, legalisation and regulation have produced a base for taxation, introducing a fiscal stake of governments in the gambling industry (this ambiguity was pointed out at least since De Viti De Marco, 1936; see also Smith, 2000).

Section 2 describes the peculiarities of the gambling sector as for the impact of taxation. Section 3 compares the incidence of different taxation structures in oligopoly. Section 4 applies the results to the evolution of taxation policy as a response to the structural changes undergone by the gambling sector, in particular the shift from specific to *ad valorem* taxation. Section 5 concludes offering a research avenue for a new form of tax structure.

2. Tax Structures in the Gambling Sector

As recalled in section 1, government regulation, together with structural features of the gambling sector, has led to concentrated structures, with a few firms dominating the market. In this context taxation, together with the imposition of licensing fees, can capture firms' profits. Regulation might therefore be a way of limiting entry into the industry not to see this stream of revenues being competed away together with economic rents.

Should gambling taxation hit economic rents generated by government action, it would be both an efficient and equitable way of raising revenues. If, instead, it turned out to be a tax on consumption, it could be distortionary and regressive: taxation could in fact increase producers' (net) prices, therefore falling onto consumers. Moreover, under oligopoly, even firms' profits might increase as a result of taxation. This counterintuitive result has been demonstrated by Seade (1985) in the case of a specific tax.

The mechanism is the following. Producers in an oligopolistic market face a sort of public good problem: restraining output by one firm would raise the price(s) all firms face, thus producing a common benefit. However, the cost of the restraint (loss of profits) would remain a private cost of the firm undertaking it. Taxation, by inducing a cost increase, brings about the output restriction and mimics the collusion that firms are unable to achieve by themselves.

In the next section, we extend Seade's analysis to a variety of taxes, in order to verify the applicability of his findings to the gambling sector and to explain, on the basis of the results being obtained, the tendency to a shift from specific to *ad valorem* taxation that is taking place under the pressure of the changes in the industry environment (reduction in trade barriers, growth of internet gambling, increase in the number of available substitutes). Before doing this, some peculiarities of market variables for the gaming services sector must be taken into account.

In fact, in the gambling market, the definitions of output and price are not as obvious as for other goods and services. Conventionally, quantity is given by a money measure, that is the amount staked, also termed "number of unit bets", while the price is the take-out rate, that is the percentage of the stake retained by the operator after paying out winnings. As a consequence, total revenue is the total amount the operator retains after having paid out winnings.

Thus, (net) profits Π will be given by:

$$\Pi = (1 - w)s - c, \qquad (1)$$

where *s* indicates the total amount of money staked with the firm, *w* the winnings to stake ratio, (*1*-*w*)*s* total revenues and *c* total costs; (*1*-*w*) is the operator's take-out rate, also called "win percent", that is the price of a one unit bet; in what follows, we will indicate it by *r*.

These definitions of quantity, price and revenues have implications as for the definitions of taxes once they are applied to the gaming sector. In particular, a tax on stakes, that is a tax on revenues gross of winnings payout, is equivalent to a specific tax:

$$\Pi = s(r - t) - c,$$

where *t* is the specific tax rate, while a tax on revenues net of winnings payout is equivalent to an *ad valorem* tax:

$$\Pi = sr(1 - \theta) - c,$$

where θ is the *ad valorem* tax rate.

In order to analyse tax shifting, we adopt a conjectural variations model of oligopolistic equilibrium under conditions of industry-wide symmetry as in Seade (1980, 1985). The industry consists of *n* firms; each firm faces an inverse demand function for the aggregate amount of money staked *r*(*ns*) and is characterised by a cost function *c*(*s*, τ), where τ is a shift parameter connected to taxation. Considering taxes as a shift factor on the costs side is done by Seade for the case of a specific tax; we extend this framework to different kind of taxes to explain their different impact.[2]

Profits are maximised over the total amount of money staked with firm:

[2] Compare with the analysis of specific and *ad valorem* taxation in Delipalla and Keen, 1992).

$$\max_s \Pi = sr(ns) - c(s,\tau)\,. \qquad (2)$$

In the framework adopted, there exist a conjectured functional dependence of responses of $S=ns$ to own output changes, such that $\frac{dS^c}{ds} = \lambda$, where the suffix c stays for conjectured.

The first and second order conditions for a maximum of (2) are:

$$\lambda sr'(ns) + r(ns) - c_s(s,\tau) = 0 \qquad (3)$$

$$\lambda^2 sr'' + 2\lambda r' - c_{ss} < 0 \qquad (4).$$

Conditions for stability are:

$$(n+\lambda)r' + n\lambda sr'' - c_{ss} < 0 \qquad (5)$$

$$\lambda r' - c_{ss} < 0$$

as demonstrated in Seade (1980).

3. The Comparison of Different Tax Structures

We now turn to the comparison of different taxation structures.

3.1. The case of a specific tax

Let us consider the introduction of a specific tax, such that:

$$c(s,\tau) = b(s) + \tau s \qquad (6)$$

$$c_{s\tau} = 1 \qquad (7)$$

where $b(s)$ are before tax costs; marginal costs increase by the same amount of the tax.

We are interested in the effects on output, price and profits. Totally differentiating (3) and solving for $\frac{ds}{d\tau}$ yields:

$$\frac{ds}{d\tau} = \frac{1}{(n+\lambda)r' + n\lambda s r'' - c_{ss}} < 0; \qquad (8)$$

the expression is negative given (5). Thus, output falls as marginal costs increase because of the tax, which implies that shifting takes place. One finds the amount of the tax being shifted onto consumers by differentiating $r=r(ns)$:

$$\frac{dr}{d\tau} = r' n \frac{ds}{d\tau} = \frac{r' n}{(n+\lambda)r' + n\lambda s r'' - c_{ss}}. \qquad (9)$$

Given that $c_{st}=1$, we will have overshifting if $\frac{dr}{d\tau} > 1$, that is if $\frac{\lambda}{n} r' + n\lambda r'' - c_{ss} > 0$. One can show (see Seade, 1980) that this will occur if, for $\lambda<n$,[3]

$$-\frac{Sr''}{r'} > 1 - \frac{c_{ss}}{\lambda r'}. \qquad (10)$$

The term on the left hand side is the elasticity of the slope of inverse demand, that on the right hand side is one minus the effect on the firm's marginal cost of the perceived change in r due to the change in firm's output (which, for instance, will be equal to unity under linear costs, with $c_{ss}=0$). Therefore,

[3] This will be true unless collusion is very high.

overshifting will occur, for instance, under linear costs with any isoelastic demand function.[4]

Overshifting means that the producer's (net of tax) price rises. Under perfect competition and monopoly, profits nevertheless decrease because of the fall in output, as intuition would predict as a result of the introduction of a tax. Under oligopoly, however, profits might increase with the tax, as outlined above: taxation, by increasing marginal costs, induces the restraint that collusion would have achieved. Thus, on the one hand, there is the direct, negative effect on profits due to the rise in costs because of the tax, c_τ, while, on the other hand, there is the positive effect deriving from the rise in price due to the fall in output driven by the increase in marginal costs, $c_{s\tau}$. When will the latter effect outweigh the former?

By differentiating (2), one gets:

$$\frac{d\Pi}{d\tau} = r\frac{ds}{d\tau} + sr'n\frac{ds}{d\tau} - c_s\frac{ds}{d\tau} - c_\tau, \qquad (11)$$

which, by using (3) and (8), yields:

$$\frac{d\Pi}{d\tau} = \frac{(n-\lambda)sr'}{(n+\lambda)r' + n\lambda sr'' - c_{ss}}c_{s\tau} - c_\tau. \qquad (12)$$

For $n \geq \lambda$ and given (5), the sign of the effect of τ on Π depends on the signs of $c_{s\tau}$ and c_τ; for a specific tax, c_τ=s and $c_{s\tau}$=1, that is:

$$\frac{d\Pi}{d\tau} = \frac{\lambda s(-2r' - nsr'' + \frac{c_{ss}}{\lambda})}{(n+\lambda)r' + n\lambda sr'' - c_{ss}}, \qquad (13)$$

[4] The elasticity of the slope of the inverse demand is related to the elasticity of ordinary demand ε, namely: $-\frac{Sr''}{r'} = 1 + \frac{1}{\varepsilon} + \frac{S(\frac{d\varepsilon}{dS})}{\varepsilon}$.

which is positive if the elasticity of the slope of inverse demand is greater than 2 minus the effect on the firm's own marginal costs of the perceived change in *r* deriving from the change in own output. For the case of linear costs and isoelastic demand, for instance, profits will increase if ε<1. As argued in Seade (1985) and Katz and Rosen (1983), profits and price overshifting is not a curiosity, but a result that is about as likely to take place as not.

3.2 The case of an ad valorem tax

Let us now turn to an ad valorem tax. This will determine a shift in costs such that:

$$c(s,\tau) = b(s) + \pi r(ns)s$$

$$c_s = b_s + \pi r(ns) + \pi r'(ns)s$$

$$c_\tau = r(ns)s$$

$$c_{s\tau} = r(ns) + r'(ns)s.$$

One should note that, differently from the case of a specific tax, the average cost increases by more than the marginal cost does:

$$\frac{c(s,\tau)}{s} = \frac{b(s)}{s} + \pi r(ns)$$

$$\frac{d(\frac{c(s,\tau)}{s}}{d\tau} = r(ns).$$

Under this respect, the effect of the tax resembles that of an increase also in fixed costs. This element is crucial in making a profit increase less likely with an *ad valorem* tax than with a specific tax. Starting with the effect on output, (8) becomes:

$$\frac{ds}{d\tau} = \frac{r(ns) + r'(ns)ns}{(n+\lambda)r' + n\lambda r'' - c_{ss}} < 0, \qquad (8')$$

since the numerator is positive by (3), while the denominator is negative by (5). Again, output falls as marginal costs increase with the tax, thus implying shifting.

As for the effect on prices, (9) becomes:

$$\frac{dr}{d\tau} = \frac{r'(ns)n[r(ns) + r'(ns)ns]}{(n+\lambda)r' + n\lambda sr'' - c_{ss}} > 0. \qquad (9')$$

Overshifting will occur if $\frac{\frac{dr}{d\tau}}{c_{s\tau}} > 1$, that is if $\frac{r'(ns)n}{(n+\lambda)r' + n\lambda sr'' - c_{ss}} > 1$, which is the case if $\frac{\lambda}{n} r' + n\lambda r'' - c_{ss} > 0$, as for a specific tax. This is because the difference with the previous case stems from the different change in average costs and therefore in profits[5]. In fact, (13) becomes:

$$\frac{d\Pi}{d\tau} = r(ns)[\frac{(n-\lambda)sr'}{(n+\lambda)r' + n\lambda sr'' - c_{ss}} - s] + \frac{S^2 r'(1-\frac{\lambda}{n})}{[(n+\lambda)r' + n\lambda sr'' - c_{ss}]/r'}, \qquad (13')$$

where the numerator is negative for $n > \lambda$, while the denominator is positive if equilibrium is stable.

The beneficial effect of the restraint is lower than before relatively to the direct negative effect on profits (the effect on average costs is relatively larger than that on marginal costs) – and it will be the lower, the lower λ with respect to n.

3.3 The case of a lump sum tax

The positive direct effect on profits of course disappears in the case of a lump sum tax:

[5] Compare with equations 2.10 and 2.11 in Delipalla and Keen (1992).

$$c(s,\tau) = b(s) + \tau$$

$$c_s = b_s$$

$$c_\tau = 1$$

$$c_{s\tau} = 0.$$

We thus obtain:

$$\frac{ds}{d\tau} = \frac{c_{s\tau}}{(n+\lambda)r' + n\lambda r'' - c_{ss}} = 0, \qquad (8'')$$

thus implying no effect of the tax on the output level;

$$\frac{dr}{d\tau} = r'(ns)n\frac{ds}{d\tau} = 0, \qquad (9'')$$

thus implying no effect on the price;

$$\frac{d\Pi}{d\tau} = [\frac{(n-\lambda)sr'c_{s\tau}}{(n+\lambda)r' + n\lambda sr'' - c_{ss}} - c_\tau] = 0 - 1 = -1. \qquad (13'')$$

A lump sum tax, not affecting marginal costs, only has a negative direct effect on profits. Note that combining a specific tax with a lump sum tax resembles the results obtained with an *ad valorem* tax, by reducing the relative impact of the output restraint with respect to the direct one on profits.

3.4 The case of take-out ratio tax

Let us finally consider a tax on the take out ratio *r*. This will be equivalent to a tax on price, analysed, for the perfect competition and the monopoly cases, by Tam (1991). This will affects costs as follows:

$$c(s,\tau) = b(s) + \tau r(ns)$$

$$c_s = b_s + \tau r'(ns)n$$

$$c_\tau = r(ns)$$

$c_{s\tau} = r'(ns)n.$

Such a tax introduces a negative relationship between net profits and the take out ratio. Thus, its effect on output will be positive, that on price negative and both the direct effect and the indirect (from the output change) effect on profits will be negative:

$$\frac{ds}{d\tau} = \frac{r'(ns)n}{(n+\lambda)r'+n\lambda sr''-c_{ss}} > 0, \qquad (8''')$$

$$\frac{dr}{d\tau} = \frac{(r'n)^2}{(n+\lambda)r'+n\lambda sr''-c_{ss}} < 0: \qquad (9''')$$

price decreases as output increases as a result of this tax structure.[6] As for the effect on profits:

$$\frac{d\Pi}{d\tau} = \frac{(n-\lambda)Sr'}{\left[(n+\lambda)r'+n\lambda sr''-c_{ss}\right]/r'} - r > 0, \text{ for } n>\lambda: \qquad (13''')$$

the indirect effect from the increase in output is now negative as the direct one. Recalling that $r=(1-w)$, that is, one minus the ratio between probability and stakes, a tax that is inversely related to the winning probability would be borne by operators, with a concomitant increase in the total amount of money being staked.

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6 $\frac{\frac{dr}{d\tau}}{c_{s\tau}} = \frac{r'n}{(n+\lambda)r'+n\lambda sr''-c_{ss}}$, which, as before, will be greater than one in absolute value if $\frac{\lambda}{n}r'+n\lambda r''-c_{ss} > 0$, as for a specific and an *ad valorem* tax.

4. The Evolution of Taxation Policy in the Gambling Sector

Fiscal systems largely differ in their treatment of gambling services. There are, nevertheless, some common tendencies that can be traced out and connected to the previous analysis. These concern the (interconnected) changes in social attitudes towards gambling and in the technological and legal environment.

The gaming sector is marked by a legacy of prohibition. The move to a legal status has typically gone through state monopolisation followed by a partial liberalisation, with firms operating under regulatory regimes that, though motivated by the aim of protecting the public, *de facto* have protected national industries. Limited competition results not only from regulation, but also from other market characteristics, in particular the presence of economies of scale (this is especially true for casinos, gaming machine manufacturing and lotteries). The market regime is thus that of an oligopoly.

The analysis of the previous section shows that, in this set up, protection can derive also from taxation policy, given some conditions concerning the elasticity of the slope of inverse demand, which is linked to ordinary demand elasticity. Generally speaking, in oligopoly equilibrium is compatible with an inelastic demand. Quantitative analyses of the elasticity of demand for gambling are relatively few, mostly in the context of a monopoly franchise. The main findings are that: a) demand is elastic but not very elastic; and b) elasticity falls when the monopolistic regime turns to one of imperfect competition (see Swiss Institute of Comparative Law, 2006, for a review). It is thus plausible to find situations compatible with overshifting and profit

increase. Actually, gaming taxes have for a long time been prevalently specific taxes (see, just to take one example, the general betting duty in the UK, levied as a proportion of stakes until the turn of the century). Under conditions of low elasticity, this guaranteed revenues for the government while maintaining firms' profitability, though at the consumers' expenses in terms of taxation burden (the tax generated increase in profits could anyway be hit by the corporate tax).

However, competitive pressures have increased within the gaming sector beginning with the 1990's. Several factors have been at work. First, being part of the entertainment sector, gaming services are subject to a product life cycle: innovation and marketing are needed not to lose customers, legal restrictions constituting a menace for the growth of the sector. Second, technological changes, in particular the growth of e-commerce, and the fall of trade barriers have increased both the number of available substitutes and that of operators, opening national markets to foreign competition. As for the EU, in relation to sports betting there has been a growing number of cases in the Court of Justice on the interpretation of Articles 56 and 49 TFEU, that state the freedom to provide and receive services and the freedom of establishment, respectively. The Court has held that national restrictions justified by general interest objectives, such as the protection of consumers, must be *consistent* and *systematic*: in particular, a member state cannot restrict the access to gambling services if, at the same time, it encourages the participation to games offered by national operators (see Court of Justice of the European Union Case C-260/04; C-42/07; joined Cases C-316/07, C-358/07, C-359/07, C-360/07, C-

409/07 and C-410/07; C-46/08; C-64/08; C-347/09; joined Cases C-72/10 and C-77/10)[7].

National industries have thus been put under threat and, together with them, governments' tax revenues. The difficulty of maintaining an effective protection of national markets has stimulated a wave of liberalisation concerning both the type of legally available products and the design of taxation. A key feature of the latter has been the shift from specific to *ad valorem* taxation (see, for instance, the replacement of the general betting duty in the UK, as reported in Paton *et al*, 2002, or the more recent introduction of a tax on stake net of winnings in the case of cash games and casino games in Italy; also, a combination of a licensing fee and a specific tax, that, as previously shown, mimics the effect of an *ad valorem* tax, has in some cases replaced specific taxation, as reported in Swiss Institute of Comparative Law, 2006). This shift represents an adaptation of taxation policy to the changing industry environment.

Actually, in the new situation, the increase in the competitive pressure has undermined the possibility of taxing gaming services without impairing firms'

[7] In particular, in the joined Cases C-72/10 and C-77/10, the Court held that, on the basis of the principles of equal treatment and of non discrimination on grounds of nationality and the consequent obligation of transparency, a member state that has unlawfully excluded a category of operators from a tendering procedure for licenses and that tries to remedy the breach of the EU law by putting out to tender new licenses is precluded from protecting the market positions of existing operators by requiring a minimum distance between the establishments of the new licensees and those of the old ones. Moreover, the Court held that these excluded operators could not be punished for engaging in the activity without a license, and that it followed from Articles 56 and 49 TFEU, the principle of equal treatment and the obligation of transparency that the conditions and rules of a tendering procedure should be drawn up in a clear, precise and unequivocal way.

profitability. Given this, value added taxation is preferable to specific taxation because, on the one hand, it induces a lower welfare loss and, on the other hand, it provides an incentive for firm to pursue technical efficiency. In fact, a specific tax typically results in a lower output level and a lower consumer surplus than those obtainable under and *ad valorem* tax yielding the same amount of revenues. This is connected to the fact that, under *ad valorem* taxation, firms enjoying some degree of price-setting power follow a low margin - high turnover strategy, while a specific tax induces a high margin - low turnover one. Moreover, incentives to pursue technical efficiency and to innovate to reduce costs are higher if taxation is proportional to the price charged. In the present context of the gambling sector, *ad valorem* taxation displays a further advantage for firms: as competition from abroad tends to reduce margins, the burden of taxation automatically decreases, thus providing a stabilisation mechanism in the face of changing market conditions.

5. Conclusion: A Take-Out Ratio Tax?

In the context of the gaming sector, the role of the price charged by producers is played by the take-out ratio. The analysis in section 3 shows that a tax on it, besides providing the same incentives for technical efficiency and displaying the same flexibility as in the case of an *ad valorem* tax, also would encourage an increase in output. This, under a market regime of imperfect competition, would be linked to an increase in consumer surplus and to an

overall efficiency gain even with respect to a situation without taxes. This reasoning is of course linked to the assumption that governments do use taxation in order to raise revenues and not in order to decrease the amount of gambling in consideration of its social costs. Further research is needed to verify the existence of ways of implementing this form of tax structure.

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