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Public Funds: concepts
and issues**

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The Opportunity Cost of Public Funds: concepts and issues

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Abstract: This paper reviews the main conceptual issues regarding the notion of Opportunity Cost of Public Funds (OCPF) and its use in normative economics. This notion occupies only a marginal and sometimes anecdotal role in the public economic literature and appears to be too often used without the definitional unambiguity that would make it helpful for economic analysis. This situation is unsatisfactory considering the importance of (some of) the mechanisms described by the concept and the magnitude of these effects that are such as to heavily impact any budgetary practice. We find that among the mechanisms that economists call "opportunity costs" the deadweight loss and, to a lesser extent, administrative costs seem to be the most relevant, whereas the impact of the crowding out is more discussible. We also analyze how the question of opportunity costs is contingent upon some hypothesis about the financing mechanism of the public expenditures and we suggest that the most likely situation is the one where public expenses are financed through the eviction of other alternative uses of the public funding. We also provide a review of available quantifications and recommendations to the practitioners.

Keywords: Opportunity costs of public funding, public expenditure, project evaluation

JEL Codes: D73 - Bureaucracy, Administrative Processes in Public Organizations; Corruption, E62 - Fiscal Policy; Public Expenditures, Investment, and Finance; Taxation; H30 - Fiscal Policies and Behavior of Economic Agents: general

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1. Introduction

The Opportunity Cost of Public Funds (OCPF) can be considered as a measure of the “real” cost of taxation. Because taxation is not neutral for the economy, once the Public Sector decides to collect funds the situation of economic agents is affected and society as a whole suffers a loss of efficiency. In other words, raising one unit of public funds costs more than one to the society. To say it with Lebègue, the OCPF represents a

"fictitious price to be assigned to every Euro of Public expenditure in the calculations, because of distortions and losses of efficiencies introduced by taxation in the economy" (Lebègue, 2005, p. 66).

The notion of OCPF is usually present in two different fields of economics: fiscal policy, where it is used in the discussion about the optimal size of the budget and the split of the fiscal burden across different forms of taxation; and project evaluation, where it provides the real cost of investments. OCPF is relevant in that it applies a social cost to transfers between the private and the public sector, which would otherwise be regarded in CBA as costless. Additionally, OCPF also increases the weight given to public sector revenues. Although intrinsically necessary in any public policy appraisal, the notion of OCPF is often omitted in empirical economic analysis. It is rarely emphasized in Cost-Benefit guidelines or in manuals and is frequently omitted in the practical implementation of Cost-Benefit analysis.

The problem of determining the actual cost of taxation started to catch some interest at the beginning of the '70s, with special reference to French administration and in particular within the Commissariat Général du Plan. Since then, its use has gradually developed and the OCPF is now integrated into cost-benefit analysis procedures in some countries (France for instance). Parallel to this interest for project evaluation, the '70s have also seen the emergence of an analogous interest in the American literature, which has concentrated on the specific issue of the deadweight loss of taxation.

The main purpose of this paper is to shed light on the most relevant aspects of the OCPF, to discuss the most debated issues of the concept, and to provide some guidelines for practitioners. In a first step (section 2), a definitional clarification is proposed; secondly (section 3), we concentrate on the problem of the deadweight loss of taxation; then (section 4), we consider the tax collection costs and the impact of corruption while section 5 is devoted to the so-called "crowding out" effect. Section 6 discusses the question of how the mechanism of funding (additional taxes vs. foregone alternative use of the budget) may influence the OCPF. Section 7 summarizes the most relevant findings of this paper and draws up the conclusion.

2. A multifaceted notion

The definitions of OCPF found in literature are heterogeneous. American economists tend to concentrate mainly on the problem of the deadweight loss and their analyses consist in estimating the reduction in workers' surplus when wage taxation is modified. By contrast, European authors (especially the French ones) consider also other elements, like administrative costs and corruption; nonetheless, most of their analyses are made in terms of more general concepts, as they often refer to "distortions" and "inefficiencies". Moreover, their approach is generally more theoretical than practical and only a few numerical estimations are provided. Additional to these main approaches that are mainly microeconomic, other approaches focus on macroeconomic effects, particularly the crowding out on private investments.

Table 1 – **Definitions of the OCPF and similar concepts in the economic literature** (Remark: roman numbers refer to appendix)

Expression	Reference	Rationale				
		Microeconomic effects on consumer		Costs related to the public administration		Macroeconomic effects
		“Distortions” in agents’ behaviour	Deadweight loss of taxation	Corruption	Tax collection costs	Crowding out effect on private investments
Opportunity Cost of Public Funds	Auriol and Blanc [2007] ⁱ	yes	yes			
	Bernard, Alexis [1974] ⁱⁱ	yes			yes	
	Butault [2004] ⁱⁱⁱ	yes			yes	
	Vaquin [1974]					yes ^{iv}
Opportunity Cost of Public Funds / Marginal Cost of Public Funds	Lebègue et al. [2005] ^v	yes			no	
	Marty et alii [2006]	yes				yes ^{vi}
Opportunity Cost of Public Funds /	Florio [2002,2006] ^{vii}	yes		yes		

Shadow Price of Public Funds						
(Marginal) Cost of Public Funds	Bernard, Alain [2004] ^{viii}	yes	yes		no	
Marginal Cost of Public Funds	Browning and Liu [1998]	yes ^{ix}				
	Dahlby and Ferede [2011]	yes ^x			yes ^{xi}	
	Hashimzade and Myles [2009] ^{xii}		yes		yes	
	Ruggeri [1999]	yes ^{xiii}	yes			
Marginal Excess Burden / Welfare Cost of Taxation	Ballard, Shoven and Whalley [1985] ^{xiv}	yes				
	Feldstein [1997]	yes ^{xv}	yes ^{xvi}			
Marginal Welfare Cost of Public Funds	Cullis and Jones [1987]	yes ^{xvii}	yes			
	Snow and Warren [1996]	yes ^{xviii}	yes			
Marginal Social Cost of Taxation (or of Public Funds)	Spackman [2006] ^{xix}	yes			yes	yes
Social Cost of Public Funds	Laffont [1998] ^{xx}			yes		
Social Opportunity Cost of Funds	Baumol [1968] ^{xxi}	yes				yes
Economic Opportunity Cost of Public Funds	Jenkins and Harberger [1998] ^{xxii}					yes

Table 1 presents a few approaches of the OCPF which could be considered as representative of the existing literature. The table suggests that more than one well defined concept, we are dealing with a constellation of realities, whose naming varies from one author to another.

First, some authors use different expressions to talk about the same thing. This fact is not an issue in itself: it is fairly understandable that authors may not use a somehow exhaustive but cumbersome expression like "*economic marginal social welfare opportunity costs of public funds*". In some situations, some differences between different expressions are fairly tractable as they relate to well established conventions of economic literature. For instance, some authors, especially in the American literature,

generally opt for the expression “Marginal Cost of Public Funds” (MCPF) rather than Opportunity Cost of Public Funds. In practice, these two expressions are often used with reference to the same phenomena and could be considered interchangeable, with the only provision that MCPF makes explicit the marginal nature of incremental spending that is usually at stake when considering public expenditures¹.

Second, apart from using different expressions to label the same things, there is a more critical issue in that the authors use the same expression to talk about different things. As it appears from table 1, the different objects that are designed through the wording "opportunity cost of public funding" relate to:

1 – microeconomic effects on consumers. This consists in the reduction of consumer surplus occurring when the increase in taxation shifts upward the supply curve. Although less specific, the concept of "distortion" seems to refer to the same mechanisms. This latter concept is also sometimes referred to with other expressions like "*Distortions in economic agents' behaviour*" which is sometimes inclusive of crowding out or "*Distortions and inefficiencies of the tax system*" which is admittedly loose.

2 – some administrative costs in a broad meaning that refer to the tax collection costs and to the incidence of corruption.

3 – some macroeconomic effects that mainly rely, in a 1970's fashion, on the fact that private investment is evicted due to public taxes.

In the next sections of this paper we concentrate on turn on each of these three components.

3. The deadweight loss is the core of OCPF

As suggested by table 1, the central element to be considered in OCPF's analysis is the deadweight loss of taxation.

¹ However, Auriol and Blanc (2007, p. 15) suggest a distinction :

"The opportunity cost of public funds is different from the marginal cost of public funds (i.e., the deadweight loss created by increasing marginally a specific tax). The marginal cost of public funds is a general equilibrium concept. It is relevant in the long run because it indicates the social cost (or benefit) of tax reform [...]. In the short run, however, the taxation level is more or less fixed. The Lagrange multiplier of the government budget constraint, referred to as the opportunity cost of public funds, is then the relevant parameter for cost-benefit analysis."

Auriol and Blanc add that, since each government is confronted to limited resources, once a certain amount of public funds is invested in a specific project, less money is then available for other initiatives. As a consequence, some beneficial projects must be postponed or abandoned. However, consistent with mainstream economic literature, we would be reluctant to generally accept the statement of the authors, as we find no reason to restrict the notion of marginal cost to general equilibrium approach (and opportunity cost to partial equilibrium).

Theoretical settings

Deadweight lost represents the fact that, when the tax burden rises, a certain amount of mutually advantageous transactions are not taking place any more. All these units of goods which are sacrificed represent a reduction of consumer and producer surplus: this welfare loss does not consist of monetary cost, but represents a form of inefficiency.

As illustrated in table 1, many economists present the deadweight loss as the only relevant mechanism in the OCPF's analysis. When data on equilibrium price and quantity and the elasticity of demand and supply are available, the deadweight loss can be calculated using equation (1) as in Bishop (1968):

$$DL = \frac{1}{2} \cdot \frac{P \cdot Q}{\frac{1}{\varepsilon_s} + \frac{1}{\varepsilon_d}} \cdot t^2 \quad (1)$$

with

DL: Deadweight loss of taxation

P and Q: respectively, Price and Quantity of the good/service before tax

ε_d and ε_s : respectively, the compensated price Elasticity of Demand and Supply for the good

t: Tax rate on the good

In equation (1), the deadweight loss varies with the square of the tax rate. This means that the level of inefficiency generated by additional taxation is far more considerable for high tax rates than for the low ones.

Based on this simple setting, some more detailed issues should be considered.

First, a distinction is sometimes made in literature between differential and balanced budget analysis (Ruggeri, 1999). In a “differential” analysis, tax revenue and the expenditure level are kept constant in order to assess what are the effects of a particular tax, compared to those of a lump sum tax providing identical revenue. Instead, In a “Balanced-Budget” analysis, we measure the social costs of collecting one more unit of public funds: that's why both tax revenue and the level of expenditure change. As will be illustrated below, there are some evidences that the welfare loss analyzed through differential analysis is larger than through balanced budget analysis (Browning (1987), Stuart (1984)).

Second, the magnitude of deadweight loss should take into account market imperfections. For instance, in presence of monopolistic positions, the effect of marginal taxation should be reformulated: starting from an initial situation where the monopolist can set the prices above the marginal cost of production, the introduction of taxation will, in certain conditions, generate a surplus reduction smaller than in the competitive situation. Considering that monopolistic markets are

not an infrequent situation in modern economies, one should certainly be careful in generalizing results from pure competition analysis.

Third, consideration is sometimes made of the use of tax incomes. This relates to (1) the fact that the welfare loss should be balanced with benefits of taxations resulting from Pigouvian taxes and to (2) the redistribution of revenues. This focus on the use of taxation may however be highly misleading.

Considering (1), the presence of externality: if the taxation is exactly offsetting an externality (simply suppose the consumption of one unit of a good generates a X \$ externality and a tax of X \$/unit is imposed), then taxation is not creating a deadweight loss but is reducing the loss due the externality. However, in many cases, the level of taxation may exceed the magnitude of the externality. In these circumstances, it is relevant to take into account a deadweight loss, as far as the taxation exceeds the externality. In other words, the existence of the externality means that taxation will be distortive insofar as it exceeds the magnitude of externalities. This statement has political implications (this means that the opportunity cost cannot be invoked a priori against taxation in all circumstances) as well as practical implications (in computation only the fraction of tax increase that exceeds externality should be associated with a deadweight cost)².

Considering (2), the impact of taxation on distribution, it is questionable whether the opportunity costs of public funds is an appropriate tool, and whether the effects of deadweight add up (and do not compensate with) redistributive effects.

For this reason, of the three issues that were quoted, it is reasonable that only the first two ones really raise questions of practical relevance.

Estimation issues

Having described the theoretical setting of the deadweight loss we can now proceed with the estimates of the magnitude of this effect.

The most relevant works devoted to the empirical estimation of the deadweight loss of taxation (Browning (1976 and 1987), Stuart (1984) and Feldstein (1997)) concentrate on the impact of taxation on the labor market of western countries. These authors generally focus on two key parameters: the marginal rate of taxation

² We are aware that this statement may become controversial in a general equilibrium analysis.

(as in Equation (1)) and the labor supply elasticity. To some extent, the latter substitutes the price elasticity which appears in Equation (1) when we want to calculate surplus loss within the labor market, since the relevant curves are then those of labor demand and supply.

Browning (1976) performed a differential analysis of partial equilibrium, with reference to an increase in wage taxes in the United States. One of his assumptions was that the whole tax revenue was distributed through direct transfers to poorest citizens; he considered both the compensated supply elasticity on work and the marginal rate of taxation. Varying the values of these parameters, his estimations of the OCPF felt within a range of 1.09-1.16³, including a 0.07 coefficient for the administrative costs. However, in Browning (1987), using different values of the supply elasticity and of the marginal rate of taxation, the OCPF is estimated as follows: within 1.18-1.47 for *differential* analysis and in a range of 1.15-1.32 for the *Balanced-Budget*. The first of each pair of values is associated with proportional taxation while the second refers to progressive taxation, thus indicating that the latter is more distortive than the former.

Also Stuart (1984) analyzed income taxation with reference to the same variables, but considering two sectors, one with taxes and the other one without taxation. By contrast, he did not make the specific assumption that the tax revenue is to be redistributed to the neediest population. His values felt within the ranges of 1.21-1.57 and 1.07-1.43, respectively for the *differential* and the *Balanced-Budget* analysis.

Feldstein (1997) made a significant Balanced-Budget analysis in a general equilibrium setting with reference to income taxation in the United States. His approach explicitly excludes Keynesian demand effects, and concentrates on three other crucial effects of taxation. First, increasing wage taxation may entail a reduction in the labor supply and, in the long term, also in the capital stock. At this stage, not only labor force participation and working hours should be considered, but also a broader range of behaviors like: the choice of occupation, the accumulation of human capital, working conditions and the level of personal engagement of workers. Second, both workers and enterprises are encouraged to search for alternative, tax-free wage systems (i.e., bonuses, tax-free rewards and indirect benefits), in order to minimize their fiscal burden. Third, the higher is work taxation, the more favored is the consumption of deductible and deducible goods. Taking all these effects into consideration, the author obtains an OCPF of 2.65 for the 1985-88 wage tax system of the USA. Feldstein (1997) introduces novel elements to assess some crucial issues, such as the fact that different taxation instruments can be associated with different

³ OCPF is expressed as a ratio. 1.16 means that each euro spent has to be counted for 1.16 euro.

levels of distortion. However, despite these advances, the author acknowledges the need for more studies on the subject.

A very comprehensive approach is then proposed by Snow and Warren (1996), who derived a formula to calculate the OCPF, without any particular a priori restrictions on individual preferences and on available technology. Their formula, with some modifications, is valid for both *differential* and *Balanced-Budget* analysis of taxation on the labor market. They considered both compensated and uncompensated supply elasticity, the marginal rate of taxation, the extent of tax exemptions and, with reference to the destination of taxation, the level of provision of the public goods as well as the extent of the direct transfers to poorer citizens. They concluded that, on the whole, the OCPF is determined by the result of three different effects: the first one is the income effect due to taxation, followed by the substitution effect (always due to taxation). The third one is then the effect generated on the worker/tax-payer from (positive) expenditure outcomes and from transfers financed by tax revenues. However, in this way, Snow and Warren made the same debatable choice as Browning as they decided to include the benefits of public expenditures in the definition of the OCPF: generally stating that there are benefits of budget expenditure is uncontroversial, but it is, again, in our view, confusing to include such effects in the notion of OCPF. Another issue is that with Snow and Warren's formula, no OCPF is associated with a compensated supply elasticity of zero. Nonetheless, and more importantly, with *lump sum* taxes, the OCPF could also be negative, if only the absolute value of positive outcomes on the tax-payer were greater than the income effect due to taxation.

Although these works do represent useful contributions to the analysis of the OCPF, one may find a limitation in that they often relate to the taxation of labor market, and may not be easily transferable in contexts where the source of funding is not related to labor market (or could even be unidentified). Moreover, these authors (with some exceptions like Snow and Warren, 1996) considered the deadweight loss as the only relevant aspect of the cost of public funds, thus stating that lump-sum taxes would be associated with no opportunity cost of public funds. However, the OCPF often refers to other effects as we will illustrate in the rest of this paper.

4. Administrative costs, including corruption, are also a cost of public funding

In addition to the deadweight loss, the cost of government expenditures should also include what we identify as "administrative costs".

Rationales for including administrative costs

Administrative costs represent all the costs associated with tax collection and public expenditure management as well as the private costs that agents have to bear in order to comply with fiscal obligations (bookkeeping for instance). Administrative costs are obviously only a component of the OCPF: none of the authors who explicitly mentioned them (Bernard (1976), Butault (2004)) proposed to refer to the administrative costs as the only relevant element of the OCPF. A. Bernard (1976) states that these costs have to be considered as:

"a cost pertaining to the functioning, in general, of the administrations; this kind of cost has its equivalent in the private sector, that is the transactional costs; but some components have with no doubt a greater relevance in the public sector than in the private. (...) the same happens for the costs of programs implementation and for the control of the undertaken decisions." (A. Bernard, 1976, p. 73-74)

According to this author, a value representing the larger administrative costs of the public sector compared to the private sector should therefore be included in the OCPF. However, this issue is controversial. Lebègue (2005) compared tax collection costs (estimated in terms of expenditures from the fiscal administration authorities) with collection, management and transactional costs of the private companies and found that they were of limited magnitude.

One of the most important arguments when considering the administrative costs of taxation relates to the relevance of fixed vs. variable administrative costs. An attractive solution would be to consider that additional administrative costs will be negligible when considering an increase of the tax rate, and may be non-negligible when the introduction of a new taxation is considered. However the specific source of public funding is often not identified (as will be illustrated more in details in section 6).

Besides the administrative costs which we have just discussed, also corruption can be included in the OCPF's analysis. Considering corruption, the reference to the administrative costs may seem improper; however, in some situations, corruption affects available public funds between tax collection and the use of these funds, in a way very similar to administrative costs. In such situations, corruption can mean that a fraction of public funds "disappears" after they are collected and before they can be employed. In some other situations, corruption does not relate not to the disappearance of some funds but to the misuse of these funds, which can translate into increased costs of certain outputs, or allocation of spending to projects that

provide only limited social benefits. When corruption operates in these latest forms, the issue of whether it should be included in the opportunity cost deserves careful investigation. Actually, if the cost data used for Cost-Benefit Analysis are realistic, they will reflect the cost increase due to corruption. Similarly, if the benefits of the project are estimated correctly, then any misallocation of the resources will be taken into account in the (low) benefits of the project. In these two situations, the inclusion of corruption in the opportunity costs of public funding would result in double counting.

Despite its potential impact on the use of public funds, corruption is often disregarded in the OCPF's analysis, especially in the most recent ones or in those which concentrate on western countries. However, even in some developed countries, the existence of corruption cannot be omitted from economic analysis as long as it is part of the real economy⁴. As far as some developing countries are concerned, available analyses (Laffont 1998) indicate that corruption can become the most relevant element in the OCPF.

Empirical estimation of the administrative costs and corruption

Very few estimates are currently available for both administrative costs and corruption, since the phenomenon is often peripheral in the literature on OCPF. As we have already mentioned above, Browning (1976) proposed the value of 1.07 for the administrative costs related to labor taxation, but no information is provided by the author on the methods adopted for estimation. Bernard (2004) stated that, in developed countries, administrative costs account for 1.5 %, whereas in France they would even reach 3 %.

As far as corruption is concerned, it is fair to say that available figures are often anecdotal. Providing more robust and consolidated estimates of how much corruption can impact the cost of public fund would be beneficial to the debate about costs of public funding.

⁴ Only few months ago, with reference to year 2009, the Italian Court of Accounts reported that corruption was still extraordinarily widespread in the country, particularly during the call for tenders procedures and the processes of public expenditure financing (with special regard to the healthcare system). (Turno, 2010, p. 6.)

5. The crowding out measures the effect of taxation on forgone private investments

Another effect which is often considered as part of the OCPF is the so-called "crowding out". Through this expression, the economic literature refers to the effects of public spending, either financed through taxation or public debt, on private investment. This effect is not very much present in the recent literature (with a few exception: Jenkins and Harberger (1998)), and one could consider that it corresponds to a macroeconomic setting that is somehow outdated and corresponds to limited international mobility of capital.

Most of the literature on crowding effect refers to public borrowing. Issuing public debt means that Government bonds placed on the market raise the demand of loan funds and, as a consequence, the equilibrium interest rate. Thus, loans would become more expensive for private investors, leading to lower investment.

Crowding effect also applies to situations where public expenditures are financed through taxation. In this situation, it is suggested that taxes paid by household will reduce present consumption and savings (or future consumption). As a consequence, reduction in consumption will decrease the profitability of private investments, while fewer savings will result in higher equilibrium interest rate.

Jenkins and Harberger (1998, chapter 12) observe:

"if public sector projects are not undertaken, then more resources will be available for allocation among private sector investment and consumption activities. Seldom, if ever, can the government isolate its investment and current expenditure activities from having an impact on their private sector counterparts. In every country capital resources are scarce; if the government expands faster, the growth of the private sector over the long run will tend to be slower."

This means that the reduced investments in the present due to the crowding out will imply fewer consumption possibilities for the future. On this issue, Vaquin states

"It is then intuitive to define the Opportunity Cost of Public Funds as the present value of the future consumption which is given up for one [Euro⁵] of public investment undertaken in the present." (Vaquin, 1974, p. 858-9)

As it appears, there is a fundamental difference between the crowding out effects and other approaches of opportunity costs, in that the first one explicitly takes into

⁵ Franc in the original text.

account the macroeconomic effect of public spending. This motivates three reflections.

First, crowding out has lost great part of its relevance in modern economies. Nowadays the capital market is largely internationalized which reduces the effect of public borrowing on equilibrium interest rate. Although there are still some links between high level of public spending and high interest rates, they relate mainly to the risk of default of a given country, and not to the crowding out of private investment.

Second, there is a need for consistency in the integration of macroeconomic linkages in Cost Benefit Analysis. Taking into account effects of *extra taxation* on savings and consumption is sound, but, to be consistent, the effect of *extra public spending* (on consumption and savings) should also be taken into account. This minimal requirement may seem obvious but the authors make available at reader's request a series of studies where this consistency is not respected.

Eventually, this implies that the question about crowding out is not to know how much it counts but whether it should be taken into account. Probably the effect on financial markets can be omitted consistently with the general openness of capital markets in modern economies. The other macroeconomic linkages are more relevant but it is legitimate to ask oneself whether it should be included in the OCPF. Most probably, these effects pertain to the realm of economic impact analysis and, although it is fully legitimate to take them into account in the evaluation of public spending, they ought to be isolated from the concept of opportunity cost of public funding. Generally, the actual relevance of the crowding out in the OCPF's analysis has to be carefully questioned.

6. Funding mechanisms: increased taxation, debt or foregone alternative expenditures?

As appeared in the previous sections, much of the reasoning that can be made about the impact of public expenditures considers different sources of taxation (income, corporate, payroll, sales taxes for instance). But, additional to this type of question, another fundamental one, to our view, relates not to the *source* (which tax revenue is used to finance a given expenditure) but rather (in our wording) to the *mechanisms* of funding (whether the spending is financed through extra taxation, debt or foregone alternative use of the budget). In many situations, the source of funding is unknown (and sometimes undefined), while an economist may have some knowledge about the funding mechanisms which he may want to use, as illustrated below, for his analysis.

This question creates a number of issues that usually are only marginally considered in the discussion among economists. Reasons for such limited attention can partly be found in the fact that, under the assumption of a fully informed, welfare maximizing public decision maker (and under the assumption that the voters would support such a decision maker), the social cost of public expenditure would equate among all different types of funding (all different taxes, debt), and the decision maker would additionally equate the marginal utility of public expenditures (per \$ spent) and the marginal welfare cost of taxation as depicted on figure 1 (otherwise, he would not be welfare maximizing). If so, the question of the financing sources or mechanisms would be irrelevant, and the calculation could be carried out with no consideration of this issue.

Figure 1 – a welfare maximizing public decision maker would equate marginal costs and marginal benefits of taxation

However, the presumption of a fully informed, welfare maximizing, public decision maker is obviously too limiting (actually if it were true, it would partly make public economists useless). This makes it useful to consider how the (lack of) information about sources or mechanisms of funding should be taken into account when assessing public expenditures. Several considerations need here to be made.

First, and it is fairly uncontroversial, the *source or mechanisms* of funding are sometimes unidentifiable or even undefined. This is more true regarding the source rather than the mechanism of funding. Regarding the source of financing, it is, in many circumstances, not only impossible to identify the source of financing, but it is also conceptually erroneous. This is linked to situations where funds are not earmarked. This can be due to national budgeting practice or to rules set by the Constitution or constitutional law, when these latter indicate that all State revenues

are placed in a single budget with no distinction of their provenience (see for instance the concept of "universalité budgétaire" (universality of the budget) that is applied to national budgeting in France based on ordonnance 2 Jan 1959). When no limitations are made *de jure*, there is often a *de facto* budget unity. In all these circumstances, it is wrong to consider that a given expenditure can have a given source of financing. This holds for the question about the funding source, but what about the funding *mechanism*? Different to funding sources, there will always be a funding mechanism since the expenditure is necessarily the outcome of some budgetary process (although not always a strictly deterministic or mechanistic one) and money will, in all occurrences, be obtained through some mechanism. The question is whether sufficient knowledge is available about these mechanisms to be used by economists even when they lack precise information about a given source of financing. Before to answer this question we need to make some other preliminary considerations.

A second consideration is that the set of possible financing *mechanisms* is incomplete if it only relies on increased taxation and debt and does not consider the shift of public funds from other expenditures⁶. This issue is obviously different from what the "differential taxation" approach performs, which investigates how the shift from one type of tax to another one impacts economic efficiency. Thus the cost of public funding may not be, in many circumstances, the cost of increased taxation or increased debt but the opportunity cost of foregone benefits of other expenditures. While this may seem Lapalissian, we find that this enlarged conception contradicts many implicit statements about public expenditures. Most of the literature about opportunity costs of public funding refers to "increasing public budget by one dollar", "increasing taxes", "increasing the size of the government" (we do not pinpoint here to specific references, but browsing the reference of this paper is sufficiently illustrative of our point). Lastly, this omission of alternative use of public funds is all the most contradictory with the concept of "opportunity cost" where "opportunity" literally places the emphasis on foregone alternative uses.

Then the challenge faced by economists is to know whether it is possible, when the source of funding is unidentified, to use some information about funding mechanisms in order to properly account for the opportunity cost of public funding. Or should the economist just rely on the fiction of equal marginal cost of taxation and equal benefit of public expenditures? The challenge is both theoretical and practical.

⁶ We will leave aside monetary creation that is strictly controlled in most of contemporary economies.

From a theoretical point of view, it appears often reasonable to assume that a project is actually financed through the **eviction of other expenditures** rather than through extra taxes. The reasons are that if any "new" expenditure were financed through an increase in taxation (respectively debt) then the public sector budget would increase its expenses at a rate that would not be compatible with any observed long term trend in public expenditure among modern economies. Thus, unless a specific source of financing can be identified it is reasonable to propose a calculation process that takes into account the opportunity cost represented by the foregone benefits of other expenditures. Theoretically, these opportunity costs can be based on the Lagrange multiplier of the budgetary constraint (as in Auriol and Blanc, 2007).

How can this theoretical solution be used in practice? In some cases, a solution is possible. We refer to situations where a lot of information is available about alternative expenditures. For instance, road projects in the UK systematically undergo a cost benefit analysis by the former DETR (Department of the Environment, Transport and the Regions). Then, if one classifies the different projects based on the ratio benefit/cost (where cost is solely defined as the public expenditures) and looks at the last financed project in this ranking, one obtains a valuation of the cost of foregone use of public funding. We however acknowledge that in many circumstances such a calculation is not possible. In this case, we may be disappointed to conclude that the economists may not have a better solution than relying on the (debatable) assumption that the policy maker equates marginal cost of public funds and marginal utility of public expenditures.

7. Discussion and Conclusion

In this paper, we have presented an extensive panorama of the multifaceted concept of OCPF. Our analysis suggests, first, that a definitional clarification is necessary when this concept is used.

We find that the same expression is indeed used to represent at least three phenomena: microeconomic deadweight loss due to taxation, administrative costs (and corruption), and the crowding out of private investment. Although all these different elements have, at different degrees, a scientific dignity they should probably be assigned to different conceptual tools. Probably, the dominating use of OCPF in the meaning of deadweight loss provides sufficient indication for the practitioners to adhere to this terminology (although it does not strictly represent an *opportunity* cost). As far as administrative costs are concerned, it could be wiser to consider them as a part of a larger category of transaction costs associate with public expenditure. Finally considering crowding out effects, we find that if referring to capital markets

they are not a relevant consideration in an open financial economy, while if referring to other macroeconomics linkages they probably deserve to be dealt with explicitly and not placed in a common Opportunity cost concept.

Second we propose to the practitioners a survey of the different values found in literature (table 2). Based on the elements presented in this paper, it appears that a reasonable provisional OCPF, corresponding to deadweight loss, can be proposed in the range of 0.2-0.3 for western countries. This assumes that every euro used by public authorities has a welfare cost of 1.20-1.30 euro. Additional to that deadweight effect, additional transaction costs linked to administrative costs can be added, considering the situation of a given country. Such indication is only to be taken as provisional, in particular referring to the differences that exist among tax systems of different countries (marginal taxation rate, collection cost).

Table 2– Estimates of the opportunity costs of public funds

Country	Estimation	Source
Australia	1.25	Australian Guidance of the Department of Finance and Administration (2006)
Canada	1.2-1.3	Ruggeri (1999)
Philippines	2.48	Jones, Tandon, Vogelsang (1990)
France	1.3 and 1.5 1.1-1.4 1.2-1.3 1.12 1.13-1.3 1.05-1.2 1.3	Commissariat Général du Plan (1973 and 1985) applying Snow and Warren's formula (1996) (2005) Bernard Alexis (1974) Bernard Alain, Vieille (2003) Lebègue (2005) Quinet (2006) quoting literature Auriol, Picard (2007) applying Snow and Warren's formula (1996)
Japan	1.03	Bernard Alain, Vieille (2003)
Malaysia	1.20	Jones, Tandon, Vogelsang (1990)
Western countries	1-1.5 1.3-1.5	Browning (1987) Laffont (1998)
United Kingdom	1.3 1.3	Florio (2002) UK Department for Transport (2004)
Russia	1.23	Bernard Alain, Vieille (2003)
Thailand	1.19-1.54	Jones, Tandon, Vogelsang (1990)
USA	1.17-1.56 1.02	Ballard (1985) Bernard Alain, Vieille (2003)

Table 3 - Estimates of the opportunity costs of public funds associated to a given tax source

Country	Tax instrument	Estimation	Source
Bangladesh, Cameroon and Indonesia	Trade, consumption	0.5-2.2	Devarajan, Suthiwart-Narueput and Thierfelder (2001)
Canada	Income	1.13-1.18	Ruggeri (1999)
India	Excise Consumption Import	1.66-2.15 1.59-2.12 1.54-2.17	Ahmad and Stern (1987)
New Zealand	Income	1.18	Diewert and Lawrence (1994)
Thailand	Consumption	1.065	Chandoevwit and Dahlby (2007)
USA	Income Income Income Income Income	1.09-1.16 1.07-1.57 1.32-1.47 1.08-1.14 2 or more	Browning (1976) Stuart (1984) Browning (1987) Ahmed and Croushore (1994) Feldstein (1997) <i>with reference to years 1985-88</i>

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Appendix: Full text quotations for table 1

- ⁱ *"The opportunity cost of public funds is different from the marginal cost of public funds (i.e., the deadweight loss created by increasing marginally a specific tax). The marginal cost of public funds is a general equilibrium concept. It is relevant in the long run because it indicates the social cost (or benefit) of tax reform. [...] In developed economies, [the opportunity cost of public funds] is mainly equal to the deadweight loss accrued to imperfect income taxation. [...] In developing countries, low income levels and difficulties in implementing effective taxation programs are strong constraints on the government's budget, which leads to higher values of [the opportunity cost of public funds]"*.
- ⁱⁱ *"[...] it could be assumed that the administration financing itself and the public expenditures financing entail specific costs. On the one side, a cost inherent to the functioning in general of the administrations [...]. On the other side, it is to be considered a cost of fiscal distortion which represents the losses in terms of efficiency due to the price distortions caused by tax collection.[...] This represents a psychological cost referred to an arbitrage between private and collective consumption, between a scale of preference left to the disposal of a certain income and that entrusted to the State or shifted to it"*.
- ⁱⁱⁱ *"Public funds have an opportunity cost: the financing thanks to public funds needs to collect a tax. Now, the collection of a tax implies a cost for the society: it implies an administrative cost; it also induces some losses due to a reallocation of national resources engendered by the modification of tax-payers' decisions which creates distortions to the economy"*.
- ^{iv} *"Every public investment has the consequence to directly or indirectly transfer a certain amount of private investment and thus to equally reduce future consumption"*.
- ^v *"Opportunity cost of public funds, as a fictitious price to be assigned to every Euro of Public expenditure in the calculations, because of distortions and losses of efficiencies introduced by taxation in the economy. [...] A first aspect often suggested to explain this cost – but that does not appear relevant –, corresponds to tax collection: establish and collect the tax costs to the society. [...] However, this point is not to be overestimated [...]. So we can conclude that it is not appropriate to keep it into consideration, with special reference to the fact that it is essentially a fixed cost [...]. The real cost of taxation, its economic cost is that of distortions which it causes in private agents' behavior"*.
- ^{vi} *"The opportunity cost of public funds, i.e. the impact of compulsory withdrawals and of debt on private investment and economic activity in general"*.
- ^{vii} *"Public funds have a shadow price due to distortionary taxation"; "The tax-payer finances the grant, plus any rent extracted by agents because of rent-seeking and corruption, and because taxation is distortionary, there is a shadow price for public funds"*.
- ^{viii} *"The collection of financial resources through taxation is costly [...]. There is a first aspect, which is the collection cost. Establish and collect the tax costs [...]. We do not have [...] to consider it, also because it is essentially a fixed cost [...].The real cost of taxation, its economic cost is that of distortions which it causes. Economists have realized that the neutral tax collection which they imagined – lump-sum transfers – only exists in the theory. Every concrete tax collection system creates distortions"*.
- ^{ix} *"the marginal cost of funds (MCF) [...] identifies the magnitude of the marginal distortionary cost in raising revenue"*.
- ^x *"the marginal cost of public funds (MCF) is a measure of the loss incurred by a society in raising an additional dollar of tax revenue from a particular tax source. [...] Tax increases distort economic decisions and erode tax bases because of*

tax avoidance and tax evasion by taxpayers. [...] These tax wedges distort economic decisions, leading to an allocation of resources that, generally speaking, is less productive or beneficial to society as a whole”.

^{xi} “Collecting taxes also involves large public administration costs and imposes compliance costs on the private sector.”

^{xii} “All implementable government tax instruments are distortionary and, as a consequence, impose deadweight losses upon the economy. These distortions are the inevitable cost of collecting the finance required to support public spending. [...] The cost of collecting revenue will depend upon the tax base that is chosen and the structure of rates that are levied. The marginal cost of public funds (MCF) is a measure of the cost of raising tax revenue from a particular tax instrument”.

^{xiii} “When tax revenue is used to pay for the purchase of goods and services, resources are shifted from the private to the public sector and some private spending is replaced by public spending. [...] there is the possibility that the coercive nature of taxation may produce behavioral responses that affect society’s welfare. [...] The measurement of the dead-weight loss can be applied to the total burden of a tax or to the tax system as a whole. It may also be confined to increases in the rate of taxation, for a given tax or for a variety of taxes individually or in combination. [...] If the tax increase raises the dead-weight loss of taxation by increasing distortions in the allocation of resources, it will cost society more than \$1 to transfer a dollar’s worth of resources from the private to the public sector and the MCPF is greater than 1. [...] the loss of output and utility produced by the tax-induced distortions of private agents’ choices”.

^{xiv} “estimates of MEBs [Marginal Excess Burden] stand in contrast to estimates of the welfare cost of taxes which are calculated by totally removing existing taxes and replacing them with equal yield lump-sum taxes. Instead, an MBE estimate measures the incremental welfare costs of raising extra revenue from an already distorting tax”.

^{xv} “there are three types of behavioral effects that should be taken into account. [...] A higher marginal tax rate on income induces a substitution of untaxed fringe benefits and more pleasant working conditions for taxable cash income. [...] Even individuals who appear to have no discretion about the form of their compensation will be able to make such a substitution in practice, because the invisible hand of the market induces employers to offer more attractive forms of compensation. [...] The relevant distortion to labor supply is not only the effects of tax rates on participation rates and hours but also their effect on education, occupational choice, effort, location, and all of the other aspects of behavior that affect the short-run and the long-run productivity and income of the individual. [...] the relevant distortion is not just in labor supply broadly defined but also in the forms of compensation and in the demand for deductions and other ways of reducing taxable income”.

^{xvi} “The magnitude of that burden depends on the increases in tax rates required to raise incremental revenue and on the deadweight loss that results from higher tax rates. [...] it is the deadweight loss of resource misallocation that we economists think of as the true cost of raising taxes. Both components depend on the full range of behavioral responses of taxpayers to increases in tax rates”.

^{xvii} “The expenditure of £1 million on project X in the public sector entails raising £1 million in revenue, and this is described as the direct burden of a tax. [...] However, [...] there are costs over and above this to be considered. These costs, variously known as the indirect burden, excess, welfare or allocative costs, of revenue-raising, arise because in circumstances where the starting point of analysis is a competitive equilibrium intervention will cause choices to be distorted by changing the signals economic actors receive. Although there are instances where there are no welfare costs (allocative distortions), these are thought to be the exception rather than the rule”.

^{xviii} “The opportunity cost of an additional dollar of tax revenue includes the marginal welfare cost (MWC) occasioned by the increase in distortionary taxation”.

^{xix} “spending on public investment is multiplied by a shadow price, relative to Euros of current expenditure or

consumption benefit, to reflect its supposedly higher opportunity cost. [...]Valuation of this opportunity cost – the marginal social cost of taxation of public funds – involves many factors. One is the marginal administrative cost of tax collection. More complex are other impacts on consumer, employee and corporate behavior (including private investment). Also relevant are political perspectives, such as the ethical arguments against taxation; and its potentially beneficial impacts on distribution".

^{xx} "Inefficient Tax Systems [...] to eliminate historical (often politically motivated) anomalies of the tax system. [...] transfers from the regulator are possible, but they entail a social cost of public funds. [...] The lack of resources and human expertise for monitoring, auditing and enforcement is pervasive in developing countries [...]. But these shortcomings are usually underestimates, despite their dramatic implications for many areas of public policy. They are a major cause of the inefficient tax system [...], they foster corruption".

^{xxi} "the government's use of resources deprives consumers of some goods [...]. The decision to devote resources to investment in a public project means, given the overall level of employment in the economy, that these resources will become unavailable for use by the private sector. And this transfer should be undertaken whenever a potential project available to the government offers social benefits greater than the loss sustained by removing these resources from the private sector".

^{xxii} "if people from their perspective have already allocated their funds between investment and consumption optimally, then if the government or the public sector is to put more resources into investment we should expect some displacement also of consumption. [...] if public sector projects are not undertaken then more resources will be available for allocation among private sector investment and consumption activities. [...] In every country capital resources are scarce; if the government expands faster, the growth of private sector over the long run will tend to be slower. [...] funds used in the public sector generally have an opportunity cost which is related to both postponed current consumption and forgone private investment".