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Should Benefit-Cost Analysis Include a Correction for the Marginal Excess Burden of Taxation?¹

Abstract: This paper provides an overview of theoretical, empirical, and practical arguments in favor of or against a correction for the marginal excess burden of taxation (MEB). Benefit-cost analysis (BCA) should be used to compare the costs and benefits of a policy measure and its major alternatives, and whenever relevant, also to compare different ways of financing this. The best pragmatic approach is then to assume first that a policy measure is financed out of general tax revenues and then that the MEB of these taxes is broadly counterbalanced by the benefits of redistribution of these taxes. The latter assumption is consistent with the preferences for equality in a country's current tax system. It is a simple and politically neutral assumption, and it implies that the marginal cost of public funds is equal to 1 and that no correction is needed in BCAs for the MEB. This shortcut assumption does not imply that the tax system is optimal or that BCAs should be distributionally weighted. Choosing an alternative source of financing, i.e., other than general tax revenues, should be regarded as a separate policy measure that should be analyzed separately in a BCA, including its distortionary and distributive effects.

Keywords: benefit-cost analysis; distributionally weighted BCA; Hicks-Kaldor criterion; marginal cost of public funds; marginal excess burden of taxation.

JEL classifications: D61; H20; H43.

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1 Introduction

A basic insight from economic theory is that taxation drives a wedge between private and public benefits. This distorts labor supply, consumption, and investment, and leads to loss of welfare. One would therefore expect that in benefit-cost analysis (BCA) of public expenditure, a correction is made for the costs of taxation, i.e., for the marginal excess burden of taxation (MEB) (see, e.g., Pigou, 1928 and references in Section 2).

In line with this, Boardman et al. (2006) recommend a correction for the MEB. For the USA, it is suggested to use 40 % for federal projects (assuming the income tax is the marginal source of finance) and 17 % for locally financed projects (assuming local real estate tax is the marginal source of finance). The federal BCA guidelines in the USA (OMB, 1992, Circular A94, paragraph 11) recommend an MEB correction of 25 % for public investments.^{2,3} A recent article on preschool programs (Heckman et al., 2010) uses three different corrections for the MEB to calculate their social rate of return: 0, 50, and 100 %.

However, in BCA practice all over the world, it is most common not to make a correction. An overview of BCAs on transport infrastructure in Europe (Bickel et al., 2006) shows that in only four countries, a correction for the MEB is made. For example, in Denmark and Slovenia, the correction is 20 % and in Sweden, 30 %. In the other countries, no correction is made. In the USA, despite the federal BCA

2 “This guidance applies only to public investments with social benefits apart from decreased Federal costs. It is not required for cost-effectiveness or lease-purchase analyses. Because taxes generally distort relative prices, they impose a burden in excess of the revenues they raise. Recent studies of the U.S. tax system suggest a range of values for the marginal excess burden, of which a reasonable estimate is 25 cents per dollar of revenue. a. Analysis of Excess Burdens. The presentation of results for public investments that are not justified on cost-saving grounds should include a supplementary analysis with a 25 percent excess burden. Thus, in such analyses, costs in the form of public expenditures should be multiplied by a factor of 1.25 and net present value recomputed. b. Exceptions. Where specific information clearly suggests that the excess burden is lower (or higher) than 25 percent, analyses may use a different figure. When a different figure is used, an explanation should be provided for it. An example of such an exception is an investment funded by user charges that function like market prices; in this case, the excess burden would be zero. Another example would be a project that provides both cost savings to the Federal Government and external social benefits. If it is possible to make a quantitative determination of the portion of this project’s costs that give rise to Federal savings, that portion of the costs may be exempted from multiplication by the factor of 1.25.”

3 “This Circular applies to all agencies of the Executive Branch of the Federal Government. It does not apply to the Government of the District of Columbia or to non-Federal recipients of loans, contracts, or grants. Recipients are encouraged, however, to follow the guidelines provided here when preparing analyses in support of Federal activities.” “...Specifically exempted from the scope of this Circular are decisions concerning: (1) Water resource projects (guidance for which is the approved Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies). (2) The acquisition of commercial-type services by Government or contractor operation (guidance for which is OMB Circular No. A-76). (3) Federal energy management programs (guidance for which can be found in the Federal Register of 25 January 1990, and 20 November 1990).”

guidelines and the textbook by Boardman et al., no correction is made for BCAs on transport infrastructure,⁴ BCAs on flood control,⁵ BCAs on police interventions on crime,⁶ or the costing of policy measures by the Congressional Budget Office.⁷

The reasons why no correction should be made are often not spelled out or only very briefly discussed. In many BCA guidelines, such as those by the World Bank (1994), the Asian Development Bank (2013), the OECD (2006), and the USA Benefit-Cost Center (Zerbe et al., 2010), the issue of the MEB is not even mentioned. In the European Union (EU) BCA guidelines for investment in infrastructure financed by the cohesion funds (European Commission, 2014), the issue is hardly discussed, and no correction is recommended unless the national BCA guidelines prescribe this. In the European overview on BCAs on transport infrastructure (Bickel et al., 2006, Full report, p. 47), in particular the uncertainty of the estimate of MEB is put forward as a reason not to make a correction.⁸ In some economic literature, it is argued that no correction for MEB is needed in the case of optimal taxation (e.g., Jacobs et al., 2009; Jacobs, 2018) or when a public good is financed in a distributionally neutral way (e.g., Kaplow, 1996, 2004). However, it does not discuss what to do in BCA practice when the theoretical conditions of their model may not apply. In the classic BCA textbook Mishan and Quah (2007, p. 240), corrections for the MEB are regarded as “a common error in the many textbooks on the subject.”⁹ It stresses the uncertainty of the MEB estimates, but does not discuss the theoretical perspectives of optimal taxation and distributionally neutral financing.

In the Netherlands, BCA and the correction for MEB has been subject to intense debate among leading economists for some time.¹⁰ The recently revised Dutch BCA guidelines (Romijn & Renes, 2013) only state that the issue still has to be clarified.

⁴ Source: Jack Wells, former senior economist at the US Department of Transportation.

⁵ Water Resources Council (1983).

⁶ See, e.g., Heaton (2010).

⁷ Conover (2010).

⁸ “The high degree of uncertainty in the estimates of the marginal cost of public funds that are currently available, combined with the fact that use in transport appraisal would lead to a distortion effect on the allocation of public finance more generally, suggests that use of a marginal cost would not be justified. The recommendation that relates to the treatment of the marginal cost of public funds is:

- (i) To assume a marginal cost of public funds of 1, i.e., not to use any additional costs for public funds.
- (ii) To use a cut-off value for the RNPSS (Ratio of NPV and public sector support) of 1.5 when applying decision criteria.”

⁹ In the federal BCA guidelines in the USA (OMB Circular A4), reference is made to this textbook for further guidance and background on BCA. But the opinion of MEB in this textbook clearly contradicts the federal BCA recommendation to make a MEB correction of 25 %.

¹⁰ See De Nooij and Koopmans (2004), Jacobs and de Mooij (2009a, 2009b) and Koopmans and de Nooij (2009).

Therefore, the Dutch government has asked a special BCA Working group¹¹ to advise on this issue. The advice should be relevant for all policy areas, not only for transport infrastructure, but also for health care, energy, environmental policies, social security, labor market policy, and tax policy. Broadly in line with the Working group's report,¹² this paper investigates the theoretical, empirical, and practical arguments in favor or against an MEB correction.¹³

This paper contributes in various ways to the existing literature. First, with the exception of the book by Dahlby (2008), no systematic overview of these arguments exists. Textbooks and guidelines on BCA ignore the issue or provide a limited and unbalanced overview of these arguments, while many academic papers ignore their link with BCA practice. Second, several new arguments are put forward, in particular about the plausibility of the theoretical assumptions of optimal taxation and distributionally neutral taxation. Third, the link between BCA practice and a broad concept of welfare is discussed. This reveals that from a welfare point of view, corrections are needed not only for the MEB, but also for distributional benefits of these taxes and for the distributional benefits of the policy measure itself. Proposals for corrections for the MEB should therefore also be discussed in view of how to take account of these distributional benefits.

Section 2 starts with the perspective from economic theory and explicitly shows the links to the common practice of BCA, i.e., without any correction for MEB. This section includes a discussion not only of the costs of taxation, but also of the distributional benefits of taxation and their link to the practice of BCA and a broad concept of welfare. To this end, a general framework for BCA is presented, in which the costs of taxation and the benefits of redistribution are linked to the other elements that are commonly identified in a BCA.

The framework consists of two parts. The first part starts from the current worldwide BCA practice and covers the costs and benefits without any correction for MEB. The balancing item "net benefits" aggregates costs and benefits irrespective of who gains and who loses and thus follows the principle of "1 euro is 1 euro." This principle is also known as the Hicks-Kaldor criterion. The second part of the framework shows

11 The working group consisted of four professors in economics (van Ewijk, Jacobs, Koopmans and Schokkaert) and representatives of various Ministries and representatives of three national research institutes: PBL Environmental Planning Agency, CPB Netherlands Bureau of Economic Policy Analysis and KiM Netherlands Institute for Transport Policy Analysis. One professor served as chairman, the Ministry of Finance and CPB provided the secretaries and CPB provided also research support. An overview on cost-benefit analysis in the Netherlands is provided by Bos and Zwaneveld (2017). On the role of cost-benefit analysis in the Dutch fiscal framework, see Bos (2008), Bos and Teulings (2012, 2013).

12 See Werkgroep Kosten van belastingheffing en MKBA's (2017).

13 It is also possible to correct indirectly for the MEB, e.g., by employing a benefit/cost criterion substantially higher than one, or to incorporate it in the discount rate, as taxation of capital makes it more expensive to transfer money from one period to another (see Harberger, 2007; Burgess & Zerbe, 2011; Burgess, 2013).

the corrections for MEB and distributional benefits of taxation and distributional benefits of the policy measure, which are needed to arrive at a broad concept of welfare.

Starting from this framework, Section 3 investigates whether the marginal distributional benefits of taxation are equal to the marginal distortionary effects of taxation. If this is true, then no correction for the MEB is needed and the marginal cost of public funds (MCPF) is equal to 1. This issue will be investigated for financing via the general tax revenues and for other types of financing, e.g., specific types of tax or social security contributions, loans, local taxes, and toll fees.

How to account for distributional benefits of the policy measure in BCA practice is the topic of Section 4. From a welfare perspective, such distributional benefits are important and should be included in the net BCA balance by distributional weighting and not by applying the Hicks-Kaldor criterion, which is most commonly applied in BCA practice all over the world. Conclusions are drawn in Section 5.

2 Costs of taxation, welfare, and benefit-cost analysis

2.1 Marginal cost of public funds and distortionary taxes

The MCPF¹⁴ can be defined as the ratio of the social value of an extra public euro (i.e., a euro used for a public policy measure) and the social value of an extra private euro (i.e., a euro used for private purposes). Taxation drives a wedge between social and private benefits from economic activities, such as work, entrepreneurship, and schooling. This wedge induces substitution toward less taxed or untaxed activities (e.g., leisure) and this causes a loss of welfare. As a consequence, in order to finance one euro of public expenditure, more than one euro needs to be extracted from the private sector. It is therefore commonly argued that the MCPF is larger than 1 due to the distortionary costs of taxation.¹⁵

¹⁴ This definition is in line with Diamond (1975). It stresses that the public value of an extra private euro differs from the private value of an extra private euro by amount of the income effects of taxation. This definition of MCPF resolves major problems in the economic literature (see Jacobs, 2018). First, MCPF is 1 if lump-sum taxes are optimized. Second, a direct correspondence is obtained between MCPF and MEB if distributional benefits are absent. In particular, the MCPF of distortionary tax equals the inverse of one minus the MEB. Finally, MCPF measures become insensitive to the normalization of the tax code.

¹⁵ This includes also the extra costs of tax collection and the extra costs in order to limit tax evasion and tax avoidance. In average terms, these costs will not be negligible. But in marginal terms, they will be generally small, as these costs mostly consist of fixed costs irrespective of the level of the tax rates (see Jacobs, 2015).

In economic theory, Pigou (1920)¹⁶ was the first to advocate that when comparing the benefits and costs of a public good, these distortionary costs of taxation also should be taken into account. In formal economic theory, this idea was taken up by Stiglitz and Dasgupta (1971), Diamond and Mirrlees (1971), and Atkinson and Stern (1974). They modified Samuelson's rule on the optimal provision of public goods (Samuelson, 1954)¹⁷ to also take tax distortions into account. In the case that public goods are financed by distortionary taxes, this adds to the cost of providing the public goods. This reduces the optimal provision of public goods¹⁸ and causes the optimal size of the government to be smaller.

The size of the distortion is different for different taxes. A number of well-known cases are distinguished in economic theory. For example, lump sum taxes do not distort, neither do taxes on goods with inelastic supply or inelastic demand. On the other hand, taxes on wages and investment income distort the supply of labor and decisions on personal saving and investment. Some taxes may even reduce distortion by internalizing negative externalities, e.g., a tax on polluting activities.

2.2 Distributional benefits of taxation

Taxes are needed to finance public expenditure. However, if taxes on wages and investment income are distortionary, this raises the question why, nonetheless, such taxes are in practice preferred to less distortionary taxes. The answer lies in the distributional benefits of such taxes. Taxes with minor distortionary effects,¹⁹ like fixed levies per inhabitant ("poll tax"), are in particular a heavy burden for households with low income. In order to avoid or limit this, most major taxes are related to income, wealth, or consumption: these are more distortionary, but they reduce inequality.

¹⁶ "Where there is indirect damage, it ought to be added to the direct loss of satisfaction involved in the withdrawal of the marginal unit of resources by taxation, before this is balanced against the satisfaction yielded by the marginal expenditure. It follows that, in general, expenditure ought not to be carried so far as to make the real yield of the last unit of resources expended by the government equal to the real yield of the last unit left in the hands of the representative citizen" (Pigou, 1928, p. 34).

¹⁷ According to Samuelson's rule, a public good should be provided as long as the overall benefits to consumers from that good in terms of their aggregate willingness to pay are at least as great as the cost of producing it.

¹⁸ Provided that the public good is complementary with taxed private goods.

¹⁹ Nondistortionary taxes are taxes that do not influence the behavior of producers and consumers. Examples are fixed levies on land per acre and to a lesser extent fixed levies per inhabitant or per dwelling. Differences and changes over time in the amount of land, the income of an inhabitant or the value of the dwelling have then little influence on the amount of tax to be paid. Fixed levies are therefore usually regressive, i.e., in case of a lower income a relatively higher percentage of income has to be paid.

The distributional benefits of income tax were already stressed by Pigou (1920, p. 89):

“The old law of diminishing (marginal) utility ... leads securely to the proposition: any cause which increases the absolute share of real income in the hands of the poor, provided that it does not lead to a contraction in the size of the national dividend from any point of view, will, in general increase economic welfare.”

This quote also indicates that Pigou was aware that distributional benefits may be accommodated by efficiency losses, i.e., a contraction in the size of the “national dividend”. This trade-off between equity and efficiency is the theme in Okun (1975). His central rule is “Promote equality up to the point where the added benefits of more equality are just matched by the added costs of greater inefficiency.” He argues that a leaky-bucket experiment can test attitudes toward this trade-off. To carry money from the rich to the poor is like transporting water with a leaking bucket, as some money will inevitably disappear. How much leakage will you accept and still support to levy an added tax to the top 5 % of income distribution to benefit the bottom 20 % of income distribution? According to Okun, this requires a judgment on how much the poor need the extra income and how much the rich would be hurt by the extra taxes.

As a consequence, in designing an optimal tax system and in assessing the marginal costs of public funds, distortionary costs of taxation should be regarded as the price to be paid for distributional benefits in terms of reduced inequality. This trade-off between equity and efficiency of the tax system has been further analyzed by Boadway (1976), Sandmo (1998), Slemrod and Yitzhaki (2001), Dahlby (2008), Kaplow (1996, 2004), Jacobs et al. (2009), and Jacobs (2018), among others. This literature does not assume homogeneous agents and a representative consumer, but heterogeneity in skills or preferences. Such heterogeneity is essential for justifying and understanding the benefits of redistribution.

2.3 Formal MEB and MCPF definitions

Briefly discussing some formal definitions of MEB and MCPF can clarify the basic theoretical concepts used above. Let us first briefly introduce some marginal excess burden (MEB) definitions. The excess burden (EB) or total deadweight loss of a tax system is the difference between the welfare losses caused by it and the tax revenues it generates. The MEB of taxation is the additional excess burden to raise an additional euro of tax revenue:

$$\text{MEB} = \frac{dEB/dt}{dR/dt} \quad (1)$$

From this general definition, MEB definitions for specific taxes in different settings can be derived. For example, one can show that the MEB of a marginal increase of a linear consumption tax (τ) is equal to (Dahlby, 2008, Equation 2.35; Jacobs, 2018, Equation 15):

$$\text{MEB} = -\frac{\tau}{1+\tau}\varepsilon^c \quad (2)$$

where ε^c is the compensated income elasticity of consumption demand with respect to the tax rate.

In contrast to MEB definitions, there is no agreed definition on how the MEB relates to the MCPF. Early works (Stiglitz and Dasgupta 1971; Atkinson & Stern, 1974) suggest that the optimal provision of public goods has to be lower in order to account for distortionary taxes. These works gave rise to the idea that for public projects a “MCPF = 1 + MEB > 1” rule has to be applied. The rationale for these rules is elaborated in detail in Dahlby (2008, Chapter 2), such as:

$$\text{MCPF} = (1 + \text{MEB})c \quad (3)$$

where c is conversion factor, which is larger than 1 if normal good is taxed, and MEB is for the compensating variation case as, e.g., in Equation (2).

However, MCPF > 1 rules are not necessarily applicable, even if distribution concerns are ignored. For example, Ballard and Fullerton (1992) argue that modified versions of the Samuelson rule

$$\sum \text{MRS} = \text{MCPF} * \text{MRT} \quad (4)$$

can in some cases result in a MCPF that is smaller than 1 if the tax system is nonoptimal. Recall that MRS are the marginal rates of substitution between a public and a private good, and MRT is the marginal rate of transformation between the public good and the reference private good.

Moreover, it is by now well established that the MCPF also needs to include the social benefits of redistribution, as governments may choose distortionary taxes that aim to increase social equality. For example, Jacobs (2018) defines the MCPF as “the ratio of the social marginal value of public income and Diamond (1975)’s measure of the social marginal value of private income”. From this general definition, MCPF definitions can be derived for individual taxes. For example, for the linear consumption tax, the MCPF can be written as (Jacobs, 2018):

$$\text{MCPF} = \frac{1 - \xi}{1 - \text{MEB}} \quad (5)$$

Note that income redistribution is valued if $\xi > 0$, which lowers the MCPF as compared to the case without social benefits of income redistribution ($\xi = 0$). The tax is set optimally, if MCPF equals 1.

Table 1 Net benefits and the costs of taxation and the benefits of redistribution over different income groups (“income redistribution”).

	Million euros
Benefits of policy measure (direct, indirect)	B
Including labor market effects of policy measure in terms of welfare	L
Cost of policy measure	C
Net benefits in current Dutch BCA practice (<i>cf</i> Hicks-Kaldor criterion)	$S = B - C$
Costs of taxation (due to the marginal excess burden of taxation)	E
Benefits of income redistribution by taxation	F
Benefits of income redistribution by the policy measure	M
Net benefits according to a comprehensive measure of welfare, including the costs of taxation and the benefits of redistribution	$W = S - E + F + M$

2.4 A general framework for benefit-cost analysis

In order to link the costs of taxation and the distributional benefits of taxation to welfare and the practice of BCA, a general framework for BCA is presented in Table 1.

The top part of the framework covers the costs and benefits without any correction for MEB. The benefits (B) consist of direct and indirect effects. The latter consist of wider economic benefits, some of which pertain to the labor market (L); they show the welfare effects of behavioral changes due to the policy measure (see Atkinson & Stern, 1974).²⁰ For example, introduction of a childcare allowance will often lead to more labor supply, in particular because mothers will seek paid work or want to work more hours.²¹ The indirect effects or wider economic benefits are commonly included as part of the benefits B.

The cost of a policy measure (C) is the amount of resources sacrificed by the government and private stakeholders to implement the policy measure (see Romijn & Renes, 2013). Examples are the public cost of building a road or bridge, or the public cost of an investment in education.²²

²⁰ Also other behavioral changes due to a policy measure can be relevant and should then be incorporated, e.g., changes in saving-, schooling- and health behavior.

²¹ This leads to a welfare gain when it helps to reduce the current distortions due to redistributive taxes, such as the wage tax. For an employer, the benefits of extra labor supply in terms of extra net (wage) income will mostly be compensated by a loss of leisure time. The welfare gain of extra labor supply is therefore broadly equal to the extra (wage)tax revenues for the government.

²² All these costs are in terms of welfare. So, it should measure the effect on scarce public resources, such as goods, capacity of production, natural resources, and the quality of the environment. This implies that sometimes opportunity costs are relevant. It also implies that pure transfers or financial flows without any change in behavior are irrelevant for public costs (see Romijn & Renes, 2013, chapter 9).

The benefits (B) minus the costs (C) result in the balancing item “net benefits” without any correction for MEB. This BCA-balancing item (S) is obtained by aggregating costs and benefits following the principle “1 euro is 1 euro,” irrespective of who gains or loses. In particular, no account is taken of whether the recipient is poor or rich. This principle is also known as the Hicks-Kaldor potential compensation criterion. If these net benefits are positive, the policy measure can be interpreted as a potential Pareto-welfare improvement: the beneficiaries of the policy measure could compensate the losers and still be left with a gain. This would result in a real Pareto-welfare improvement. However, in practice, those who lose from the policy are usually not compensated and it would also be very difficult to do so without any extra costs and without any additional behavioral changes.²³

The bottom part of the framework shows the possibility of adding corrections for the cost of taxation and benefits of redistribution of income. The cost of taxation (E) refers to welfare loss caused by distortionary taxation, i.e., the marginal excess burden of taxation (MEB). In addition, two types of distributional benefits are distinguished: first, distributional benefits of taxation (F) and, second, distributional benefits of the policy measure under investigation (M).

If net benefits based on the Hicks-Kaldor criterion (S) are corrected for the costs of taxation (E) and the distributional benefits (F and M), this results in a BCA-balancing item based on a comprehensive welfare measure (W).

The way the framework is presented above with only one column for costs and benefits (see [Table 1](#)) suggests that the primary purpose of BCA is to assess whether the benefits of a policy measure exceed or justify its costs. However, the primary purpose of BCA is to help select the best or most appropriate policy measure. This is also stressed by the federal BCA guidelines in the USA (OMB, 1992, Circular A94, general principles 5.c.3):

“Evaluation of Alternatives. Analyses should also consider alternative means of achieving program objectives by examining different program scales, different methods of provision, and different degrees of government involvement. For example, in evaluating a decision to acquire a capital asset, the analysis should generally consider: (i) doing nothing; (ii) direct purchase; (iii) upgrading, renovating, sharing, or converting existing government property; or (iv) leasing or contracting for services.”

²³ However, in the Netherlands, when considering major policy changes, especially regarding tax policy or health care policy, policy practice is to come up with compensating measures to avoid significant losses of purchasing power for specific groups.

As a consequence, different columns should be introduced showing the costs and benefits of a policy measure and its major alternatives, and whenever relevant, also comparing different ways of financing them.

Starting from this framework with different columns for different alternatives, the question whether a correction should be made for the marginal excess burden of taxation can be decomposed and translated into two questions. The first question is: Are the marginal distributional benefits of taxation (F) equal to the marginal distortionary effects of taxation? (E) If this is true, then no correction for the MEB is needed and the MCPF is equal to 1 (see Jacobs et al., 2009; Jacobs, 2018). The second question is: How should the distributional effects of the policy measure for different income groups²⁴ be accounted for? Does taking such distributional effects serious imply that the Hicks-Kaldor criterion should be abandoned and be replaced by distributional weighting of costs and benefits?

A proper response to these questions implies that different kinds of argument are taken into account: economic-theoretic, empirical, practical, and political. An economic-theoretic argument is that some effects could, for theoretical reasons, cancel out or could only be relevant under strict theoretical conditions (see Section 3). Arguing that some effects are relatively small or will be hard to quantify and translate into monetary terms reliably is an empirical argument (see Section 3). The cost and time of extra analysis is more a practical argument (see Sections 3 and 4). A political argument is the politicians' wish to strictly separate issues of efficiency and equity (see Section 4).

3 Is the marginal cost of public funds equal to one?

3.1 Policy measures financed by general tax revenues

This section discusses whether the MCPF is 1, that is, whether a correction for the MEB is needed. We assume that the policy measures are financed by general national tax revenues, which is the case in which there is no clear relation between a policy measure and its way of financing. In the next subsection, the implications of other ways of financing are discussed. In the discussion, typically four arguments exist why no correction is needed:

- (i) Distributionally neutral financing;
- (ii) Optimal taxation;
- (iii) Consistency with the current tax system;
- (iv) Uncertainty about the size of MEB and distributional benefits of taxes;

²⁴ Distributional benefits may also relate to other distributional effects. For example, when different regions or population groups are involved, e.g., smokers and nonsmokers or those living nearby the new road and those not. Section 4 briefly addresses also the recording in BCA of such distributional benefits.

Table 2 Arguments in favor of assuming $MCPF = 1$ when the policy measure is financed by general tax revenues.

Argument	Explanation
1. Distributionally neutral financing	In case of distributionally neutral financing, those who benefit from a policy measure pay for it and those who lose are compensated for that. As a consequence, distributional effects and labor market effects are absent.
2. Optimal taxation	In an optimal tax system, marginal distortionary costs of taxation are equal to the marginal distributional benefits of taxation.
3. Consistency with the current tax system	Current tax policy reflects an implicit judgment on the distortionary cost of taxation and its distributional benefits. For evaluating new policy measures, consistency with this judgment implicit in the current system is a reasonable and pragmatic assumption. If over time political preferences for inequality aversion change drastically, first the general tax system will be revised and then for the analysis of specific policy measures the assumption of $MCPF = 1$ is again reasonable.
4. Uncertainty about the size of MEB and distributional benefits of taxation	Uncertainty with respect to the extent to which marginal cost of public funds (MCPF) is larger or smaller than 1. This uncertainty refers to the assumptions used for estimating the distortionary cost of taxation and the distributional benefits of taxation (e.g., how averse to inequality?).

The merits and limitations of these arguments are summarized in [Table 2](#) and discussed in more detail subsequently.

3.1.1 Argument 1: Distributionally neutral financing

According to Kaplow (1996, 2004) the income tax can often be adjusted to offset the benefits of the public good.²⁵ In the case of a uniform monetary benefit to individuals, e.g., for a park or a bridge, a lump sum tax can be used. In case of benefits proportional to income or wealth, a proportional rise in the income tax can be used. More generally, distributionally neutral financing implies that those who benefit from a policy measure should also pay for it and that those who lose should be compensated. For example, in the Netherlands, the introduction of a totally new health care system in 2006 was accompanied by policy measures compensating negative income effects. Kaplow proposes that benefit-cost analysis of a policy measure should be split into two steps: first, an analysis of the policy measure financed distributionally neutral and, second, an analysis of a purely redistributive adjustment to the tax system.

²⁵ In terms of our BCA framework, the total of F and M (the distributional benefits) are equal to zero and the costs of taxation (E) and the labor market effects (A) are each equal to zero. This implies that not only E and F, but also M and A can be ignored in the BCA-analysis.

However, distributionally neutral financing is only possible under very strict conditions.²⁶ These conditions will hardly ever be met for most policy measures and certainly not for policy measures financed by general tax revenues. So, the argument for distributionally neutral financing is usually not relevant for the practice of BCA.

3.1.2 Argument 2: Optimal taxation

In a world with distortionary taxes and redistribution, economic theory predicts that the costs of taxation are balanced against the benefits of redistribution²⁷ (see Jacobs et al., 2009; Jacobs, 2018). If the current tax system is optimal, then the marginal costs of general taxation are equal to the marginal benefits of reduced income inequality. In terms of our BCA framework (see Table 1), F is equal to E and $MCPF = 1$. This implies that for welfare measurement, the BCA balancing item (S) need not to be adjusted for the cost of taxation or the distributional benefits of this taxation. This conclusion depends critically on the assumption that the tax system and policy is optimal. If this is true, the theoretical conditions for $MCPF = 1$ to hold are not very stringent.²⁸

The design of an optimal tax system depends critically on the aversion to inequality. A higher aversion to inequality implies larger distributional benefits and therefore also the acceptance of more distortionary taxes.

26 For example, the assumption is that the preferences of individuals for private and public goods are homogeneous and that the indirect effects of the policy measure do not influence labor supply. However, a policy measure like a child care allowance will most probably influence labor supply and this is often also the intended purpose. Also taxation or user fees should be possible on the basis of the amount of benefit from a policy measure. This implies that the government disposes of a complete set of nonlinear taxes; otherwise, the government cannot skim from those who benefit. But in policy practice, the government mostly levies stepwise linear taxes and lacks information about who benefits and how much. Also compensation of losers will in practice be difficult. The argument of distributionally neutral financing will therefore be restricted to very general policy measures and will not apply to policy measures with regional effects or focused on specific groups. It will usually also not apply to financing by general tax revenues.

27 This theoretical model is a second-best world with heterogeneous agents and imperfect information about individual earning ability or skill level, like in Mirrlees (1971). It is also assumed that distortionary taxes are levied only for distributional purposes. In a first-best world without distortionary taxes, no $MCPF$ -correction is needed. The (first-best or original) Samuelson rule then applies for the optimal supply of public goods: this supply is optimal when the unweighted aggregates of the individual marginal benefits are equal to the marginal costs (Samuelson, 1954). In a second-best world with distortionary taxes, the Samuelson rule still applies provided the tax system is optimal, the preferences of all individuals are identical and the government disposes of a complete set of nonlinear income taxes (Boadway & Keen, 1993).

28 This applies both to linear and nonlinear taxes, also when the willingness to pay for public goods changes with labor supply (nonseparable preferences for private and public goods and leisure time) and even when households have heterogeneous preferences for public goods (see Zoutman et al., 2016).

An optimal tax system assumes that sufficient information is available for a proper balancing of the distortionary costs of taxation and the distributional benefits and that this information is used in a consistent way to choose the mix of taxes and tax rates. Zoutman et al. (2016) show that the welfare weights for different income groups that are implied by the Dutch tax system²⁹ are in general higher for high-income groups than for lower income groups. This is what you would expect of an optimal tax system if there were general aversion to inequality. But Zoutman et al. (2016) also note some anomalies that cannot be reconciled with an optimal tax system. In particular in the lower part of the income distribution, the welfare weights rise with income, instead of falling. This conclusion for the Dutch tax system is in line with the relatively low social welfare weights for the working poor found in studies on the tax system in other countries, see, e.g., Bourguignon and Spadaro (2012).³⁰

Optimal tax policy assumes that redistribution by the government is efficient given a certain degree of aversion against inequality. In the Netherlands, many different types of policy measures are used for redistributive purposes, e.g., progressive income tax, minimum wage, housing subsidies, and tax deduction for interest from mortgages. For many reasons (e.g., political strategic reasons or information problems about the policy measures' efficiency for redistribution), this current mix may not be optimal and efficient for any specification of aversion against inequality.

These arguments about the optimality of the tax system and tax policy in practice imply that the assumption of optimal taxation is probably too strong and therefore cannot be used for justifying $MCPF = 1$.

3.1.3 Argument 3: Consistency with the current tax system

A substantially weaker assumption than optimal taxation is consistency with the current tax system. The current tax system³¹ can be assumed to be broadly consistent with the current political and societal preferences. This tax system will roughly reflect the preferences and decision-making power of the successive governments

²⁹ This assumes that redistribution by the government is efficient.

³⁰ The insights from political economy, like the role of the median voter and lobby groups in public decision-making, can provide an explanation for such clear deviations from the optimal tax system. But optimal tax theory may also be combined in one model with key-assumptions from political economy, see, e.g., Acemoglu and Golosov (2010).

³¹ Together with often closely related transfers by the government to households. So, the assumption of optimal tax policy is about the tax and social security system as a whole.

and their constituents. The resulting tax system³² is a specific combination of distortionary taxes and distributional benefits. Financing public expenditure with less distortionary taxes would also have been possible, but apparently the distributional benefits of the actual choice of distortionary taxes provide sufficient compensation for the welfare loss due to these distortions. A correction for the MEB is then not necessary. BCAs can then proceed using $MCPF = 1$ resulting in BCA-outcomes that are consistent with the preferences for (in) equality as laid down in the current tax(-benefit) system and with other government policy.

Assuming consistency with the current tax system and hence using $MCPF = 1$ in BCAs is also the only politically neutral choice. Any alternative assumption ($MCPF > 1$ or $MCPF < 1$) implies that the BCA-analyst regards the current tax system as insufficiently redistributive ($MCPF < 1$) or as too redistributive ($MCPF > 1$), which can be regarded as a political statement.

Although it is reasonable to assume that the current tax system reflects current political preferences on the trade-off between equity and efficiency, such political preferences may change over time. Furthermore, political parties in the opposition or other groups outside the government may have a substantially different aversion against inequality. These arguments might suggest that with a forward-looking view or from the perspective of groups outside the government, the assumption that $MCPF = 1$ for BCAs of specific policy measures could well be arbitrary and misleading. However, such a suggestion is invalid, as becomes clear by applying a two-step argument. Suppose in the near future people with substantially different inequality aversion will come to power. Then they should first adjust the general tax system in line with their substantially different inequality aversion. In a second stage, specific policy measures can be evaluated on the basis of their costs and benefits, and then again the reasonable assumption can be made that for marginal changes the

³² This argument has also been applied to analyzing long-term trends in public expenditure in the USA, the UK, France, Germany, and Italy (see Florio & Colautti, 2005). Over time, the benefits of extra public expenditure are balanced by politicians and society against the distortionary costs of extra taxes. According to Wagner's law, the ratio between public expenditures and national income will grow exponentially, as higher income results in higher demand for public goods and transfers. But according to Pigou this requires rising taxation and leads to rising distortionary costs of these extra taxes; this will constrain the growth of public expenditure. The exponential growth of public expenditure according to Wagner's law and Pigou's conjecture about rising marginal excess burdens of taxation provides a logistic growth theory of public expenditures: first a slow increase, then an exponential increase and later a stabilization of public expenditure as a percentage of national income. This may also provide an explanation for the growth of public expenditure in the Netherlands from 14 % GDP in 1850 to more than 60 % GDP in 1983 (see Bos, 2006). However, in some decades Dutch public expenditure has dropped to 43 % GDP in 2017. This clearly does not fit in this logistic growth theory. It could perhaps be explained as a change in Dutch societal preferences for inequality (towards lower preference for inequality and a more limited role of the government) and which may partly be caused by more information about the distortionary costs of taxation and social security, e.g., in terms of rising unemployment and public debt.

Table 3 Estimates of MEB in the Netherlands: standard model and assumptions and some alternatives (Jacobs, 2015).

	Compensated labor supply elasticity	Elasticity of demand for labor	Marginal rate income tax and social security contributions	Marginal excess burden
Standard model and assumptions	0.3	infinite	0.56	0.38
Three alternative assumptions				
1. Different labor supply elasticity				
a. low	0.2	infinite	0.56	0.25
b. high	0.4	infinite	0.56	0.51
2. Including also distortions by employers' social security contributions	0.3	2.5	0.80	1.07

distortionary cost of taxation is equal to the distributional benefits of these taxes. As a consequence, whether the specific policy measure will be evaluated in view of the current or future tax system will not matter for its outcome.

3.1.4 Argument 4: Uncertainty about the size of the MEB and the distributional benefits

Estimates of the size of the MEB of the current tax system vary substantially and depend critically on the assumptions used. The European BCA-guidelines on transport infrastructure (Bickel et al., 2006) recommend not making a correction for the marginal excess burden of taxation (MEB) because of the uncertainty in the estimates. For example, Kleven and Kreiner (2003) illustrate for OECD countries that the size of the MEB depends on the way of financing (higher average tax rate or more progressive taxes), the inclusion of the participation decision, and whether also non-labor income revenues such as allowances and social benefits are taken into account.

Also for the Netherlands, estimates of the MEB can differ substantially depending on the assumptions used (see Table 3). According to Jacobs (2015), the MEB of general tax and social security revenues in the Netherlands is about 0.50, i.e., a tax burden of 50 eurocent per extra euro of public expenditure. Some very reasonable alternative assumption can lead to substantially different estimates. For example, in the standard model, the MEB is 0.38, but if labor supply elasticity is lower or higher, the MEB changes from 0.25 to 0.51. If also the distortionary effects of employers' social security contributions are taken into account the estimate of the Dutch, MEB more than doubles (1.07).

The distributional benefits of the tax system depend on the degree of inequality aversion and the specific method used (see Van der Pol et al., 2017). For some assumptions and methods, the MEB and the distributional benefits are of approximately equal size, but with other assumptions, the MCPF can be larger or smaller than one. This occurs particularly if the degree of inequality aversion is chosen in such a way that the current tax system does not come close to the degree of redistribution that is considered optimal for the chosen degree of inequality aversion. Such a choice for the inequality aversion implies that the current tax system does not reflect and is not consistent with current preferences.

However, the empirical evidence does not force one to choose such an inconsistent set of assumptions. The empirical evidence allows one to choose a consistent set of assumptions in which $MCPF = 1$. Therefore, empirical evidence does not help much when it comes to the size of the MCPF. We are essentially left with the earlier argument about consistency.

According to Mishan and Quah (2007, see, in particular, footnote 1 on p. 24, appendix 4 and 13), including a correction for the marginal excess burden of taxation is a common mistake in many BCA-textbooks. Their argument is not only that the estimate of MEB is uncertain, but also that it will in general be very small. Mishan and Quah argue that in the real world, there will be many different types of deviations from a perfectly competitive economy, e.g., due to monopolies, information problems, transaction costs, efficiency wages, regulations, taxes, subsidies, and external effects. In such a world, the net effect of a specific policy measure on overall distortions can be either positive or negative. As it concerns a policy measure of marginal importance to the whole economy, it will not have any significant effect on the distortions in the economy. The measurement of the net effect on welfare will be illusory and should therefore best be ignored.³³

Our conclusion is therefore that the argument of consistency with the current tax system (Argument 3) offers convincing ground for assuming MCPF is equal to one. The argument of uncertainty of the estimates of MEB and distributional benefits (Argument 4) is less convincing, but makes clear that empirical evidence does not help much in assessing the value of MCPF. The two other arguments, about distributionally neutral financing and optimal taxation, are purely theoretic arguments and do not help much in settling the debate on the best solution for BCA practice.

³³ In a separate appendix, the distortionary effect of an income tax is presented as a case in point. For example, it is stressed that fixed factor quantities like the number of hours work are generally the rule and not the exception in modern economies (Mishan & Quah, 2007, appendix 13). As a consequence, the trade-off between labor and leisure will be substantially distorted and will remain so after a marginal increase in the income tax rates.

3.2 Alternative sources of financing

Policy measures can be financed from other sources than general tax revenues. Examples are toll fees and congestion charges, social security contributions, public-private partnerships, local taxes, loans,³⁴ and a mix of financing by central and local government. Would our analysis about $MCPF = 1$ then still apply?

All these other types of financing should be regarded as a separate policy measure that should be analyzed separately in a BCA. It would be an analysis similar to a change in a specific tax or a general revision of the tax system. For all such policy measures, the financing issue of the policy measure can best be ignored. As a consequence, the question whether $MCPF = 1$ is not relevant, only measuring the costs and benefits, including the distortionary effects of the policy measure as such (L) and the distributional benefits of the policy measure (M).

Different policy measures may have positive and negative synergies. An example is the construction of a new road financed by (an increase in) a congestion charge. This case should be analyzed by a BCA of the construction of the new road financed by general tax and a separate BCA of the introduction of a congestion charge.³⁵ Finally, both measures can be combined in a joint BCA. This combination may in some cases reveal that broadly those who benefit should also pay or that the financing is distributionally neutral (Kaplow's argument, see Section 3.1).

Financing a road via a congestion charge may also be compared in a BCA with various other ways of financing, e.g. (an increase in) car registration tax, (an increase in) excise duty on petrol or a public-private partnership. In each of these cases, the financing measure is a separate issue and should be analyzed separately, while taking into account their distortionary cost and their distributional benefits.

Another case in point is extending the basic health care package of the Dutch government with a new long cancer medicine. This can be financed by raising general health care social insurance contributions, but also by income dependent social insurance contributions, lifestyle-dependent contributions or by out of pocket payments. The merits and limitations of such an extension of the basic health care package should preferably be analyzed for different types of financing.

³⁴ If the policy measure is financed *via* a loan, this may also have distortionary effects, for example, when the repayment of the loan is financed *via* postponed general tax revenues or by crowding out the financing of private investments. So, financing public expenditure via a loan instead of a tax is generally not a free lunch, but may have less distortionary effects than financing *via* general tax revenues.

³⁵ It is wise to investigate not one specific congestion charge, but several different schemes and assessing them using different long-term scenarios.

This logic also applies to major policy changes accommodated with a package of compensating policy measures. They should be first analyzed separately and then jointly.

The way policy measures are financed is often also a strongly politically motivated choice. Who should pay and to what extent is a normative issue in which political criteria like justice and solidarity are important. To what extent a BCA can be helpful in such issues of equity will also be a topic in the next section.

4 Distributional benefits of the policy measure

Nearly a century ago, Pigou emphasized the general principle that for optimal public expenditure the social gain from a marginal increase in resource use should be the same everywhere. This principle ensures not only an efficient balance between resource use in public and private sectors (see Sections 2 and 3), but also between resources used in different parts of the public sector. He illustrates the latter with the following example:

“Expenditure should be distributed between battleships and Poor Relief in such wise that the last shilling devoted to each of them yields the same return of satisfaction” (see Pigou, 1928; Sandmo, 2011, p. 261).

This quote indicates that distributional benefits of a policy measure should certainly not be ignored in a BCA.

However, the net benefits in a BCA following the Hicks-Kaldor criterion (S), give an equal weight to the effects of a policy measure for low and high incomes (1 euro is 1 euro irrespective of who gains or loses; see Section 2). As a consequence, distributional benefits (or costs) from a transfer from high income to low income (or vice versa) are ignored. A choice for $MCPF = 1$ implies that the distributional benefits of taxation are included. Consistency then suggests that also the distributional effects of the policy measure should be accounted for.

Two solutions are possible to remedy this. The first is to quantify the effects on various income groups and show these effects separately from the BCA balancing item, e.g., to present them as a token entry (p.m.). This would be on a par with the treatment in BCAs of any other effects, e.g., effects on biodiversity, that are mentioned but not translated into monetary (welfare) terms and therefore are excluded from the BCAs net benefits.

The second solution is to incorporate the distributional benefits in the BCAs net benefits by using distributional weighting, i.e., to give a higher weight to benefits for low-income groups than for high-income groups. In this way the distributional

benefits (M) are included in the BCA balancing item, possibly as a correction to net benefits following the Hicks-Kaldor criterion (see, e.g., Harberger, 1978; Mishan & Quah, 2007; Florio, 2014; Hendren, 2014; Zoutman et al., 2016).

The first solution requires data and models that allow the calculation of effects for different income groups. These are in principle available or could be developed, but require a lot of additional analysis. The second solution requires taking another step, which primarily involves establishing a set of weights for different income groups. van der Pol et al. (2017) show that various methods are possible and that for each method also various more operational choices are to be made.

In the Dutch BCA working group on the MCPF, the merits and limitations of distributional weighting were extensively discussed (see Table 4). The conclusion was that, though the Hicks-Kaldor criterion is not politically neutral, it is nevertheless a useful benchmark for political debate, in particular when also major effects for various groups of income are shown when relevant. The more ambitious solution of incorporating distributional benefits in the BCA by also adjusting the BCA balancing item using distributional weighting was rejected. This was considered to have major adverse effects on the use of BCA in general in Dutch political decision-making.

This conclusion is in line with international BCA practice. In international BCA practice welfare weights, i.e., different weights for different income groups, is hardly applied. This is even true when their BCA guidelines recommend it. Major cases in point are BCA at the World Bank and in the UK. Since the 1970s, BCAs are a major trademark of the World Bank. According to the old BCA Guidelines of the World Bank (Little & Mirrlees, 1974) benefits for households in BCA should take account of their income, in particular when a policy measure is aimed at improving the situation of the poor. However, in the World Bank's BCA practice (see World Bank, 2010; Van 't Riet, 2016) this was hardly ever done. One reason is that it would have made BCA for projects in development countries even more difficult. A second reason is that BCAs were often not relevant for financing a project. A third reason is that BCAs were mostly used for sectors in which redistribution of income was considered to be a secondary issue, e.g., for agriculture, energy, transport, and water. For policy measures with respect to education, health care, and the environment, hardly ever a BCA was made.

The BCA guidelines of the UK Ministry of finance ("UK Green Book", Treasury, 2011) support the idea that in assessing cost and benefits also the income and wealth of households that gain or lose should be taken into account. However, it is also remarked that compiling information on this would often lead to disproportionately extra costs. Furthermore, no explanation is given for what type of policy measures or under what kind of circumstances providing such additional information is needed.

Table 4 Should benefits of redistribution over income groups be included in the BCA balancing item?

	Yes	No
Informative?	Benefits of redistribution of income are important for a broad concept of welfare. Incorporating this in the BCA balancing item, would immediately show the importance of the income redistribution in comparison to the other costs and benefits of the policy measure.	BCA should show all major effects, but not all effects should be put in monetary terms and be included in BCA balancing item. When relevant the effects for various groups of income could be shown. This would stress the importance of income redistribution too much in comparison to other aspects that are also not reflected in BCAs net balancing item, e.g., environmental issues and other distributional issues. This would make BCA even more complex and inaccessible for many users. This would still not show the income effect on different types of households, workers and nonworkers, and other differences within income groups.
Sufficiently reliable, comparable, and objective?	Many different weighting schemes are possible, but by choosing an empirical method, national guidelines, and a standard sensitivity analysis, the major problems in terms of reliability, comparability, and objectivity can be resolved. It should then be preferred to the arbitrary and not politically neutral balancing item cf. Hicks-Kaldor, i.e., an unweighted aggregate of net benefits for different income groups.	Guidelines for a specific empirical method do not sufficiently resolve the problems of reliability, comparability, and objective. The method and assumptions used will still be arbitrary and not sufficiently reliable. The net effect would be that policy makers would discuss more the weighting scheme instead of the results of the BCA.
No serious conflict with division of task with politics?	A BCA should inform policy makers in a balanced way by stressing that the Hicks-Kaldor criterion is not politically neutral and by showing the implications of alternative weighting schemes.	A BCA should inform policy makers but should refrain from taking over the role of the politician. The Hicks-Kaldor criterion is not politically neutral, but it is nevertheless a useful benchmark for political debate, in particular when also major effects for various groups of income are shown.

5 Conclusions

According to economic theory, taxation drives a wedge between private and public benefits, which distorts labor supply, consumption, and investment and leads to loss of welfare. One would therefore expect that in BCA of public expenditure a correction is made for the costs of taxation, i.e., for the MEB. However, looking at BCA practice all over the world, textbooks on BCA, various specific BCA guidelines and economic literature, no consensus exists about such a correction. In most countries in the world, no correction for the MEB is made, in many BCA guidelines the issue is not even mentioned, while BCA textbooks and economic literature disagree on the need for a correction.

This paper provides an overview of the theoretical, empirical, and practical arguments in favor or against an MEB correction. It argues that a pragmatic approach for BCAs is to assume firstly that a policy measure is financed via general tax revenues and, secondly, that the MEB is broadly counterbalanced by the benefits of redistribution of these taxes. The latter assumption is consistent with the preferences for equality in a country's current tax system and is a simple, pragmatic, and politically neutral assumption. This assumption does not imply that the tax system is optimal or that BCAs should be distributionally weighted. This pragmatic approach implies that the MCPF is equal to 1 and then no correction is needed in BCAs for the MEB.

A policy measure may also be financed by an alternative source of financing than general tax revenues, such as a road financed via congestion charges or by higher excise duties on petrol. These alternative ways of financing should be regarded as separate policy measures that should be analyzed and compared separately in a BCA; this comparison includes also their distortionary costs and their distributional benefits.

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