



# Use and Abuse of the Concept of ‘Excess Burden’ in the Theory of Public Finance\*

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## Abstract

Optimal tax theory assigns two roles to the measure of excess burden, one to compare the costs of alternative tax instruments, the other to measure the deadweight loss of specific tax instruments, which presumably correspond to the welfare costs of their distortionary effects. This paper claims that the deadweight loss provides misleading measures of welfare costs from tax distortions, because it requires to make unverified assumptions to equate costs to distortions and ensure that the deadweight loss is greater than zero. Taxes other than the lump-sum tax and tax-induced changes in relative prices cannot generally be assumed to be distortionary.

*Keywords:* Excess burden, Deadweight loss, Optimal taxation, Tax distortions, Lump-sum tax.

*JEL Classification:* H21, H24, J22.

## 1. Introduction

Traditional public finance theory asserts that the lump-sum tax is the only non-distortionary tax instrument, and that any other tax instrument imposes distortions that reduce the maximum attainable level of welfare. The welfare losses resulting from these distortions are measured by the deadweight loss of a tax, assumed to be equal to what is lost in excess to the taxes collected by the government, or its excess burden. Since the lump-sum tax is by definition equal to tax collections, any additional cost associated with any other tax instrument corresponds to a deadweight loss. Moreover, since the lump-sum tax imposes only an income effect, the deadweight loss is associated only with substitution effects. For this reason, tax-induced changes in relative prices are generally interpreted as distortions and all (non-Pigouvian) taxes that affect relative prices are said to create a deadweight loss.

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Lump-sum taxation has become a synonym with non-distortionary taxation, and it is deeply intertwined with the concept of tax efficiency, the central focus of the optimal tax literature.<sup>1</sup> According to Ballard and Fullerton (1992, p. 129), for instance, “the traditional definition of the word distortionary [...] involves a comparison with a lump-sum tax”. Despite its importance, however, careful discussions of the conceptual and practical limitations of the lump-sum tax are scarce,<sup>2</sup> and very few authors contest the validity and applicability of the traditional measure of the deadweight loss of taxation.<sup>3</sup>

This paper criticizes the concept of deadweight loss and its interpretation as a measure of welfare loss from tax distortions. It does so by arguing that the excess burden is a measure of the costs, not the economic inefficiencies or the costs of the “distortions” created by a tax, and by describing common situations that can lead to incorrect measurements. For ease of presentation, the discussion focuses on the labor income tax, but most of the arguments can easily be applied to other tax instruments.

We can distinguish two different (although commingled) roles played by the concept of excess burden in the mainstream tradition. One is a “referential” role, whereby the excess burdens of alternative tax instruments are compared in order to minimize the costs of taxation. The other is an “incriminating” role, in which the excess burden of a specific tax instrument is called deadweight loss and interpreted as an *absolute* measure of its distortionary effects. This is the role played, for instance, in Harberger (1964a), Feldstein (1999) and Chetty (2009a), and this paper argues that it is an abuse of the concept of excess burden because it equates costs to distortions and makes several unverified assumptions to ensure that the deadweight loss is greater than zero.

The concept of deadweight loss is misleading because it wrongly considers, *by assumption*, all (non-Pigouvian) tax-induced changes in relative prices as economic distortions, and because its measure tends to overestimate the welfare costs of available tax instruments. Pigouvian taxes are well-known examples of tax-induced changes in relative prices that are considered to be non-distortionary, so there is already acknowledgement that some prices in the economy are “distorted” before the implementation of a tax. But more in general, we do not know what the “undistorted” price vector is, nor how tax-induced changes in relative prices affect the level of social welfare. Therefore, we cannot say that (non-Pigouvian) tax-induced changes in relative prices are necessarily distortionary.

This conclusion suggests that it is necessary to disassociate the concept of tax distortions from the price changes and substitution effects induced by taxes, and to stop using the deadweight loss of taxation as a valid measure of the welfare costs of tax distortions. In this regard, the goal is shared with Manski (2013), who argues that there is “no need to use the concepts of inefficiency, deadweight loss, and distortion”, and calls “for the profession to discard them and make analysis of taxation and public spending distortion-free”. As Manski (2014a) states, “[p]osing an optimal taxation and spending problem appropriately recognises the benefits and costs of taxation, making it unnecessary to study concepts such as inefficiency and distortion”.

A framework where the optimal taxation and spending problem is posed without the need to resort to the concepts of inefficiency and distortion has already been developed, for

instance, by the literature of the Marginal Cost of Public Funds (MCF). Consistent with the “referential” role given to the concept of excess burden in the public finance literature, the MCF informs about the cost of collecting an additional unit of tax revenue under alternative tax instruments, allowing to optimize the level of public spending while simultaneously minimizing its costs and identifying the optimal tax mix. In this framework, concepts like inefficiency and distortion could (more properly) be associated with deviations from the optimal solution, instead of deviations from the effects of lump-sum taxation.

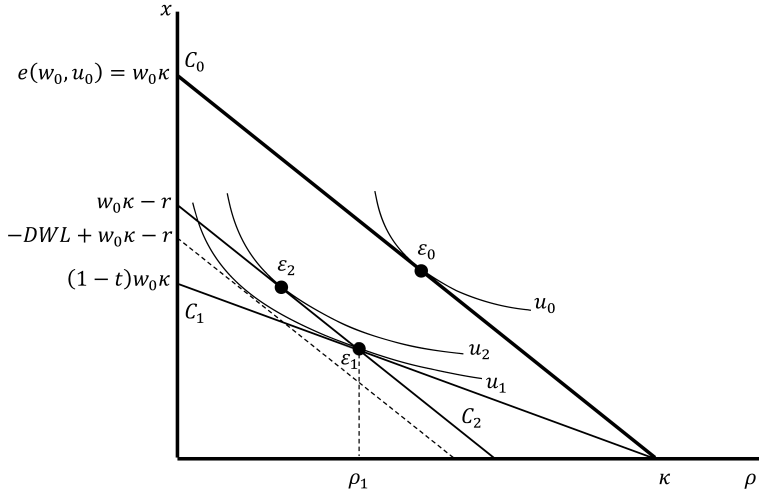
The rest of the paper is organized as follows. Section 2 briefly presents the traditional definition of deadweight loss. After this section, the presentation strategy consists of making explicit and analyzing the implications of some of the assumptions necessary for the traditional measure of deadweight loss to be well defined and positive (and thus all non-Pigouvian tax-induced price changes to be distortionary). Section 3 critically analyzes some of the assumptions made explicitly in the mainstream tradition and distinguishes between the “referential” and “incriminating” roles played by the concept of excess burden in the optimal tax literature. Section 4 focuses on assumptions that are not made explicitly in the literature and argues that the excess burden of a tax should not be interpreted as distortionary effects. Section 5 focuses on situations in which internal solutions are not available and the deadweight loss (as measured in the traditional approach) can be zero or negative. Section 6 discusses the artificial separation between efficiency and distributional issues. Section 7 concludes.

## 2. The traditional definition of deadweight loss

Mainstream optimal tax theory defines the deadweight loss (*DWL*) of the labor income tax by comparing its effect on utility with the effect of an equal yield lump-sum tax. The measure is described in Figure 1, where the vertical axis represents a composite private good  $x$ , or equivalently, individual income, and leisure  $\rho$  increases rightward in the horizontal axis.  $\kappa$  is the time constraint and labor is implicitly defined as  $\lambda = \kappa - \rho$ . The figure displays strictly convex preferences and the budget constraint of one taxpayer.

The initial equilibrium is at  $\varepsilon_0$ , where the initial budget constraint  $C_0$  is tangent to the indifference curve  $u_0$ . A proportional tax rate  $t$  on labor income reduces the wage rate from  $w_0$  to  $(1-t)w_0$ , rotating the budget constraint over point  $\kappa$ , from  $C_0$  to  $C_1$ . The optimum under  $t$  is at  $\varepsilon_1$ , associated with a utility level  $u_1$ . A lump-sum tax that raises the same amount of tax revenue  $r$  would lead to a different equilibrium at  $\varepsilon_2$ , allowing the taxpayer to reach a higher utility level  $u_2$ . Using the expenditure function  $e(w_i, u_i)$  to represent the minimum amount of money (in this case “full” income available to purchase leisure and the private good) required to obtain a utility level  $u_i$  with a wage rate  $w_i$ , the (equivalent variation) measure of deadweight loss of the labor income tax can be expressed as  $DWL = e(w_0, u_0) - e(w_0, u_1) - r$ . In general, the welfare cost of the inefficiency or *DWL* of any tax instrument corresponds to the additional amount of money required to obtain the same level of utility obtained with an equal yield lump-sum tax. Provided that the lump-sum tax imposes only an income effect, the entirety of the *DWL* is associated with the substitution effect of the other tax. For this reason, tax-induced changes in relative prices and substitution effects are considered to be sources of *DWL*.

**Figure 1**  
**TRADITIONAL MEASURE OF THE DEADWEIGHT LOSS OF THE LABOR INCOME TAX**



The way in which tax revenue is spent is often (but not necessarily) disregarded in the presentations of the deadweight loss. If preferences are convex, and the benefits of public expenditures are not taken into account, then  $u_0 > u_2 > u_1$ . This ranking changes if the benefits from public expenditures are considered. For simplicity, assume that all public expenditures are used to finance non-rival and non-excludable (pure) public goods. We can think about the quantity of public goods as represented by a third dimension not shown in the two-dimensional space of Figure 1. If public goods are weakly separable from private goods and leisure in the utility function, then the shape of the indifference map does not change with the level of public goods and the amount of public goods would affect only the level of utility represented by each indifference curve.<sup>4</sup> Assuming also that public expenditure has no effect on the budget constraint, a government program that is worthwhile (with positive net benefits) under the labor income tax would result in  $u_2 > u_1 > u_0$ . The graphical representation and the monetary value of *DWL* remain identical, but the welfare effect may change.

### 3. About the traditional interpretation of deadweight loss

This section analyzes some of (not all) the explicit assumptions in which the traditional measure of deadweight loss is based. The discussion at this stage includes ideas that are well known to economists specialized in microeconomic theory or public economics, but are often misunderstood by other economists. Together, the assumptions presented in this and the next sections provide a non-exhaustive list of the conditions necessary for the traditional measure of deadweight loss, in particular the aggregate measure of deadweight loss of the labor

income tax considered, for instance, by Feldstein (1999) and Chetty (2009a), to be correctly defined and greater than zero.

In the traditional public finance literature, “[l]ump-sum taxes are defined as those that do not depend on any action of the individual; there is no way he can change the tax liability” (Atkinson and Stiglitz, 1980, p. 23). Since the tax liability is predetermined,<sup>5</sup> the lump-sum tax does not affect the relative price of leisure (or any other good). This means that the lump-sum tax does not impose substitution effects *by definition*, and that all other tax instruments (in which the procedures to compute tax liabilities are based on behavior), are also by definition sources of tax distortions because they do affect some relative price(s).

Even though the assumption that the lump-sum tax does not depend on any action of the individual can rule out labor income tax avoidance, in practice it is difficult, or even impossible, to ensure that all relative prices will be unaffected by a lump-sum tax. For instance, if announced in advance, a poll tax would affect the relative price of increasing the size of a household (e. g., getting married, having children, caring for the elderly, the sick and the less able), or the relative price of remaining in the area instead of emigrating to a place without such a tax.<sup>6</sup> These are examples of substitution (as opposed to income) effects because the tax burdens are affected by the decisions to be made.<sup>7</sup>

*Assumption 1:* The lump-sum tax does not affect relative prices and creates no excess burden and no deadweight loss.

One possible way to ensure that the Atkinson and Stiglitz’s (1980) definition is consistent with no changes in relative prices is to assume, in addition, that the lump-sum tax is arbitrary from the perspective of the taxpayer, and that there is perfect tax compliance; but these assumptions are usually not acknowledged nor can be regarded as plausible. For instance, taxpayers may try to evade a lump-sum tax, assuming an additional cost that would otherwise not exist,<sup>8</sup> or claim that are not eligible, or that they do not have enough means to pay it, adding costs and complexity into the system.

These potential costs of lump-sum taxation are generally overlooked by the mainstream approach, even though they should be included because “[t]he deadweight loss from a tax system is that amount that is lost in excess of what the government collects” (Auerbach, 1985).<sup>9</sup> Since these costs, as well as the possible substitution effects, are simply *assumed* not to exist, we can say that the notion that lump-sum taxation is associated with no deadweight loss is also an assumption.

To make the welfare effects of the labor income tax and the lump-sum tax comparable, it is also assumed that the amount collected under the latter is equal to the amount that would have been collected under the former.

*Assumption 2:* Hypothetical equal-revenue yield (and equal-cost) lump-sum tax.

This assumption ensures that other aspects of the problem like the public expenditure policy or the distribution of income are unaffected by the change of tax instrument; but dif-

ferences in the costs of implementing alternative tax instruments can still remain, affecting the comparability of the results. Differences in the costs faced by taxpayers (e. g., costs of tax compliance, avoidance and evasion) can lead to differences in the individual budget constraints under the two taxes, while differences in the costs faced by the government (e. g., tax administration, collection and enforcement), can lead to differences in the amounts effectively spent on public goods and services, and thus to differences in the utility levels and indifference maps of individual taxpayers, and possibly in some of the parameters that determine the position of the individual budget constraints.<sup>10</sup> Of course, any difference in the budget constraint and/or individual preferences under the two taxes would render the traditional measure of deadweight loss invalid even under the equal-yield assumption.

Assumptions 1 and 2 expose, from the outset, the nature of the concept of deadweight loss. It is, by definition, based on a hypothetical, *ad hoc* counterfactual (a costless lump-sum tax), which is used as a baseline to define and measure the costs of tax distortions. The choice of this counterfactual is arbitrary because it is not based on empirical evidence of economic distortions, and because the definition of distortions does not require the use of a hypothetical baseline, nor to assume away all the costs faced by the government and taxpayers under that baseline.

Note also that given the simple framework used to define deadweight loss, Assumption 2 all but ensures that the labor income tax cannot lead to a higher level of utility than the lump-sum tax. This assumption implies that all allocations resulting in lower tax burdens under the labor income tax (to the right of  $\varepsilon_1$  in Figure 1) are excluded from the welfare comparisons; only points with labor equal or greater than  $\lambda_1$  (at or to the left of  $\varepsilon_1$  in Figure 1) can be considered. Once this set of possible solutions has been determined, it is unsurprising to find that no rational individual would be better off under the greater tax burden and lower wage rate of the labor income tax. This happens even without knowing whether the tax burdens computed under the labor income tax are part of an optimal solution or not.

A third assumption ensures that the traditional measure of deadweight loss is greater than zero for any tax-induced change in relative prices.

*Assumption 3:* Strictly convex and differentiable indifference curves.

If indifference curves are strictly convex and differentiable, then for any amount of taxes collected with the labor income tax, a lump-sum tax that satisfies Assumptions 1 and 2 would necessarily allow to reach a higher utility level. In Figure 1, that welfare maximizing equilibrium is at  $\varepsilon_2$ , associated with utility  $u_2 > u_1$ .

Strictly convex and differentiable indifference curves have well-defined slopes at all points, which represent the tradeoffs between leisure and income (or the composite good). A relatively low slope means that the individual is willing to sacrifice a lot of leisure time to obtain a little more income, and a steep indifference curve means that the individual is willing to sacrifice a lot of income to obtain a little more leisure time. Unfortunately, we do not know what the actual shapes of indifference curves are, as the empirical literature focuses

more on testing the predictions of the model than the validity of the assumptions. Still, we can safely say that individuals need some leisure time to enjoy the goods they purchase, and that income can be used to make leisure more desirable. Therefore, leisure and income can be expected to display a relevant degree of complementarity. In the extreme case of perfect complementarity, the indifference curves are not strictly convex. Instead, they are L-shaped and not differentiable at the point where the maximum attainable indifference curve touches the budget constraint. In this case the lump-sum tax does not lead to a higher level of utility than the labor income tax, and thus the traditional measure of deadweight loss is zero.

Differentiability is not required to obtain a positive deadweight loss.<sup>11</sup> However, the mainstream approach considers *all* (non-Pigouvian) tax-induced changes in prices as distortionary, and a positive deadweight loss can only be ensured for any tax-induced price change with strictly convex and differentiable indifference curves.

The discussion so far leads to at least three basic conclusions. First, the traditional measure of the deadweight loss of the labor income tax includes not only the costs in excess to the best possible lump-sum tax, but any costs above the tax burden. This is the traditional meaning of *excess burden*, which is today used as synonym of deadweight loss. Second, price changes or substitution effects alone do not *necessarily* lead to tax distortions (as measured by the traditional approach) but need to be combined with strictly convex and differentiable indifference curves in order to ensure that result.<sup>12</sup> Third, the measure of deadweight loss cannot be expected to be always valid and positive for all individuals. In practice, if Assumption 1 does not hold, the traditional measure of deadweight loss is not valid, and the labor income tax could possibly lead to a higher utility level. If only Assumption 3 does not hold, the measure can be zero and it is not true that (non-Pigouvian) tax-induced price changes generally have welfare costs (or are distortionary in the traditional sense).

Most economists specialized in optimal tax literature are well aware of these caveats. They understand that the lump-sum tax is considered to be non-distortionary to the extent that it is *defined as such*, and usually restrict the use of deadweight loss measures to comparing the effects of different tax instruments. This is the main role that the concept of deadweight loss serves in the optimal taxation literature, where “[d]esigning an optimal tax system means keeping tax distortions to a minimum, subject to restrictions introduced by the need to raise revenue and maintain an equitable tax burden” (Auerbach and Hines, 2002, p. 1349). The general approach is to *compare* alternative tax instruments in terms of the excess burden they create, and to identify the most and least distortionary alternatives. Under this approach, the costs of a hypothetically efficient tax (and the choice of a counterfactual) become irrelevant, because the focus is on *relative* excess burdens, which is equivalent to focusing on relative costs.

But the use of the concept of deadweight loss has, in practice, extended far beyond the “referential” role that it plays in the optimal tax literature. The traditional concept of deadweight loss has also been popularized as a measure of the *absolute* loss created by individual tax instruments due to their “distortionary” effects. In part, this practice started with Harberger (1964a, 1964b), who refined an existing method used to measure the deadweight loss of a tax based on the loss of consumer and producer surplus (thereafter called the “Harberger

triangles” method) and applied it to estimate the deadweight loss of the income tax in the United States.<sup>13</sup> These and other Harberger’s works “illustrated the techniques, the usefulness, and the realistic *possibility* of performing such calculations, and in so doing, ushered in a new generation of applied normative work” (Hines 1999, p. 168, emphasis in the original).

Following on in the tradition of Harberger, Feldstein (1999) published an influential study of the deadweight loss of the labor income tax in the United States. He argued that the deadweight loss of the labor income tax can be correctly calculated with the use of the elasticity of taxable income with respect to the net of tax income share. Both taxable income and the net of tax income share are readily available from tax returns and the tax code, so the approach greatly facilitated the estimation of the deadweight loss. Moreover, since taxable income changes with tax avoidance (which is by itself a function of the tax rate), the Feldstein’s (1999) measure is more sensitive to the tax rate than labor supply alone, leading to comparatively higher estimates of the deadweight loss. The study helped to renovate not only the discussion about the efficiency costs of tax revenue, but also the perceived distortionary nature of the labor income tax. Indeed, Feldstein (1999) concluded that “the deadweight losses are of a substantial enough magnitude to make further research on these issues a high priority”.

More recently, Chetty (2009a) extended Feldstein’s (1999) deadweight loss formula to account for differences between the perceived private costs of tax avoidance and evasion, and the actual social costs of these behavioral responses to taxation. In addition, Chetty (2009b) labeled and explained the marginal response of taxable income to the tax rate as a “sufficient statistic”, providing a stronger theoretical footing to the original Feldstein’s (1999) insight.<sup>14</sup>

There are therefore two contrasting roles of the concept of excess burden in public finance theory. One a “referential” role, whereby the *relative* size of the excess burden is relevant to compare the welfare costs of alternative tax instruments. The other, a rather “incriminating” role, considers all the price effects of labor income taxation (or any other tax instrument) to be distortionary and subsumes them all into an *absolute* measure of deadweight loss. The two applications coexist in the traditional optimal tax literature with no apparent conflict. For instance, they are presented as coherent parts of the literature in subsequent sections of the reviews by Auerbach (1985) and Auerbach and Hines (2002).

#### 4. Distinguishing excess burden from deadweight loss

The previous section critically discussed some of the assumptions made to define deadweight loss in traditional public finance theory. This section focuses on assumptions that are required for the mainstream conclusions to hold but are not commonly acknowledged in academic articles. The objective is to show that the interpretation of the deadweight loss as a measure of the welfare effect of tax distortions is the result of the *assumptions* made; it is not at all clear that what is being measured are actual distortions.

Arguably, an intuitive way to obtain a measure of the welfare costs of tax distortions is to compare a scenario with a certain (supposedly distortionary) tax instrument with a similar



scenario with the best possible tax instrument.<sup>15</sup> But this is not what the measure of the deadweight loss does, because the alternative scenario it describes is not necessarily possible. By assuming away the effects that a lump-sum tax may have on decisions about where to live and whom to live with, the wide array of possible tax avoidance and tax evasion responses, and the additional costs faced by the government and the taxpayers, the mainstream approach is implicitly assuming that the welfare costs from tax distortions include some costs that are, in practice, impossible to avoid even under the best lump-sum tax available.

Another intuitive way to obtain a measure of the welfare costs of tax distortions could be based on an *optimal* lump-sum tax; but again, this is not what the mainstream literature uses to define the deadweight loss. The optimal lump-sum tax is not only considered to be unfeasible, but also unknowable in the specialized literature. Since part of the information required to obtain the optimal tax amounts is only known to the taxpayers, the government must rely on them to disclose that information. The problem is that some individuals have the incentive to hide relevant characteristics that are unobservable to the government in order to reduce their tax burdens (Hammond, 1979), making the first-best allocation unattainable.<sup>16</sup>

To understand what the deadweight loss measures, and what public finance theory refers to as the welfare costs of tax distortions, it is useful to identify some of the possible meanings that the term 'lump-sum taxation' may take in the literature. At this point the discussion has mentioned several types of lump-sum tax, including the 'optimal' lump-sum tax, an 'equal-revenue yield' lump-sum tax, 'the best' lump-sum tax available, and a poll tax. For clarity, here we will distinguish only four alternative concepts of lump-sum tax, two ideal (and impossible) and two possible lump-sum taxes:

- Lump-sum tax 1: Lump-sum taxes and subsidies (most likely different amounts per person in a heterogeneous society) associated with the first-best allocation. The implementation of this tax is unfeasible due to the incentive-compatibility problem.
- Lump-sum tax 2: Tax associated with the mainstream definition of deadweight loss. The tax burden is set equal to the revenue collected under an alternative tax, in an amount likely different than the required for the first-best allocation. This tax is assumed to be costless and not to affect relative prices.
- Lump-sum tax 3: The "best possible" lump-sum tax, which has not been discussed in the literature (and neither it is in this paper). Defining the tax as "possible" requires, for consistency, that the costs of design and enforcement should be accounted for when comparing the effects of alternative tax instruments.
- Lump-sum tax 4: A feasible lump-sum tax subject to design and administrative imperfections.<sup>17</sup>

There is no reason to presume that the last two lump-sum taxes will consistently lead to higher welfare levels than other tax instruments like the labor income tax. This observation can be used to contextualize Granqvist and Lind's (2005) claim about the irrelevancy of the

traditional measure of deadweight loss. This measure is based on definition 2, which is impossible to implement, but if the more “realistic” definition 3 is used, then the very notion deadweight loss ceases to be conceptually sound, as its measure could plausibly take negative values.<sup>18</sup>

In addition, there is no reason to presume that the second concept, which is the one used in the traditional definition of deadweight loss, is in any way associated with the first-best allocation. This last point is important because it implies that the welfare costs from distortions measured under the second concept do not represent deviations from the most desirable social allocation. The tax burdens used to compute the deadweight loss under the lump-sum tax do not correspond to the “right” amounts under an optimal tax system, but instead to the amounts determined by other tax instruments. In this sense, the lump-sum tax used to compute the deadweight loss is not *per se* a tax instrument, as it does not describe a procedure to compute the tax burden, but merely a tax collection scheme.

*Assumption 4:* The tax policy must be set, and the lump-sum tax must be collected, by the beginning of the period.

For the after-tax solution to the time allocation problem under the labor income tax ( $\varepsilon_1$  in Figure 1) to be valid, the tax rate must be set at the beginning of the period. Otherwise, the relevant relative price of leisure would be unknown to the taxpayer *while* making the time allocation decisions, which could lead, for instance, to a situation in which the taxpayer runs out of time before reaching the solution predicted by the model. Only if the relevant relative price of leisure is known at every moment during the period, the taxpayer can manage her decisions and realize the optimal time allocation decision at the *end* of the same period. In addition, for the after-tax solution under the lump-sum tax ( $\varepsilon_2$  in Figure 1) to be valid, the lump-sum tax amount must be set *and collected* by the beginning of the period. Otherwise, the budget constraint  $C_2$  may not be an accurate representation of the budget constraint under lump-sum taxation, leading to an optimal solution different than the one predicted by the model.

Assumptions 2 and 4 require predicting, before the beginning of the period, the amount of revenue to be collected under the labor income tax for each taxpayer.

*Assumption 5:* Tax authorities have perfect (and costless) information about taxpayers’ preferences.

The importance of properly identifying taxpayers’ preferences for the estimation of welfare effects of income tax policies was recognized by Heckman (1974); but even after four decades of theoretical and empirical research, Manski (2014b, p. 146) concludes that “we lack the knowledge of preferences necessary to credibly evaluate income tax policies.”

Of course, the traditional definition of deadweight loss uses the hypothetical equal-revenue yield only as an analytical tool; there is no intention to actually implement the lump-sum tax, and therefore the knowledge of preferences is unnecessary and the cost of that knowl-

edge irrelevant. However, by the same token the welfare cost of distortions measured under these assumptions should be considered hypothetical or referential, not the cost of actual distortions.

By disregarding this caveat and claiming that non-Pigouvian tax-induced changes in relative prices are generally distortionary, the public finance literature has created a false equivalence between the concepts of 'excess burden' and 'deadweight loss'. Excess burden is simply the *cost* faced by the taxpayer in excess of the tax revenue collected by the government.<sup>19</sup> There is nothing inherently wrong with measuring and comparing the excess burden of alternative tax instruments, as routinely done under the "referential" role of the concept in the optimal tax literature. Provided other things are equal, these comparisons could lead to identifying the least costly tax instruments and to minimizing the costs of taxation, which is an economically sound way to reach an optimal solution to the problem of funding government spending.

However, claiming that *all* these costs correspond to an absolute measure of the welfare costs from distortions of individual tax instruments, which is what the "incriminating" role of the concept of excess burden does, is at odds with common economic reasoning. It implies that for the traditional approach to consider a tax to be non-distortionary, paying taxes should be costless.<sup>20</sup> While cost minimization is a common objective in economics, eliminating costs altogether is considered to be a standard of efficiency only in optimal tax theory.

The interpretation of the excess burden as an absolute measure of the welfare cost of tax distortions requires an additional assumption about relative prices. If *any* (non-Pigouvian) tax-induced change in relative prices is distortionary, or equivalently, any change to the initial (before tax) price vector is a distortion, then the initial price vector is implicitly being assumed to be undistorted.

*Assumption 6:* Prices in the economy are "correct" (undistorted) before the implementation of the tax policy.

This assumption is rather surprising, since economists are well aware that the economy is plagued with market failures like externalities, public goods, information asymmetries and non-competitive markets, that prevent the attainment of the first-best solution, and also that the first-best solution is unknown due to information constraints and incentive-compatibility problems. Therefore, the related notion of "undistorted prices" is known to be no more than an idealistic theoretical reference. In practice, prices can safely be assumed to be distorted (in the traditional sense), and we usually do not know whether specific price changes will increase or reduce those distortions. Moreover, even if we know the sign of some distortions, the "movement of prices in the direction of their optimal levels does not guarantee [...] an improvement [in social welfare]" (Auerbach, 1985, p. 62).

This is a straightforward application of the Theorem of the Second Best, first formalized in general terms by Lipsey and Lancaster (1956). The theorem states that if one constraint prevents the attainment of the Pareto optimum, then the other Pareto conditions are in general

no longer satisfied. If we agree that some prices in the economy are distorted due to market failures, then the Second Best Theorem suggests that we should expect no specific price in the economy to be aligned with the optimal solution (no individual price is at the optimal level), and therefore we cannot claim that tax-induced changes in relative prices will necessarily reduce welfare or be distortionary.

While the definition of deadweight loss assumes that before-tax prices are undistorted, public finance theory switches position in the presence of externalities and assumes that Pigouvian taxes lead to undistorted *after-tax* prices.<sup>21</sup> The idea is that Pigouvian taxes (and subsidies) force markets to account for the externalities associated with their activities, pushing market prices to their “corrected” or “undistorted” levels. But the problem here is that even when one distortion is corrected, if other distortions remain the Second Best Theorem implies that neither the before-tax nor the after-tax price vectors can be expected to be undistorted. Public finance theory seems to overlook this point and commonly considers Pigouvian taxes to be non-distortionary, arguably because they clearly allow for a more complete account of social benefits and social costs in the price determination process.<sup>22</sup>

Public finance literature has extended the argument of “corrective” taxation to other situations. For instance, Blomquist *et al.* (2010) argue that the income tax may have a non-distortionary component, equal to the share of the marginal labor income tax that corresponds to a payment for publicly provided private goods that increase with labor (e. g., childcare for working parents). Following a similar logic, we can argue that some (likely not insignificant) shares of existing commodity taxes in the economy could be considered non-distortionary (or price corrections) as they account for the marginal environmental damage and other marginal social costs associated with the production and consumption of the respective taxed commodities.

It follows that the public finance literature does recognize that prices in the economy are not undistorted, while both the Second Best Theorem and the corrective role of Pigouvian taxation imply that there is no predetermined undistorted price vector that could effectively be distorted by price changes, as assumed in the definition of deadweight loss. The distortionary effects of tax-induced changes in relative prices make sense around the first-best and second-best optima, where comparisons between distorted and (presumably) undistorted scenarios are possible, not in the actual economy where the number and magnitude of distortions due to market failures seem to be relevant but are impossible to fully identify and measure.

It should not be necessary to clarify that, from an economic perspective, one of the main reasons to collect taxes is to give the government the means to provide goods and services that increase welfare (the benefits outweigh the costs). In general, before-tax prices cannot be expected to be “correct”, and it would be inefficient *not* to transfer those resources to the government. Moreover, welfare enhancing tax and expenditure policies can be expected to change relative prices (even if lump-sum taxes are used), and in the presence of market failures we cannot know what price vector (before-tax or after-tax, with or without lump-sum taxation, before or after public expenditure, etc.) is “less” distorted.

### 5. Corner solutions and identification problems

Strict convexity and differentiability (Assumption 3) are necessary to ensure an interior solution of the labor decision, characterized by a first order condition that equates the marginal rate of substitution (marginal benefit) of leisure for the composite private good (or income) to the after-tax wage rate (marginal cost). In particular, differentiability requires the composite private good and time to be perfectly divisible and that all values within a relevant range are possible. One problem with this is that discrete choices (e. g., indivisible goods, time restrictions) are quite common in practice and can impede the validity of the first order conditions, forcing the taxpayer to choose a suboptimal time allocation and driving a wedge between marginal benefits and marginal costs. In this situation, it is easy to find cases in which the lump-sum tax does not lead to a greater welfare level than the labor income tax, implying that the deadweight loss of the latter is zero.

*Assumption 7:* Labor time is unrestricted within the time constraint.

It is not uncommon for workers to have access to limited job opportunities and to have little say about the number of hours they are required to work. Many individuals find jobs that require a fixed number of hours (e. g., 40 per week); others can only find part-time positions; others may have to choose whether or not to work a shift, but not the number of hours, etc.<sup>23</sup> This implies that even if an interior solution to the time allocation problem exists “in theory”, that solution may not be reachable; the taxpayer may *have* to choose an alternative (suboptimal) time allocation that does not satisfy the first order condition.

**Figure 2**  
**CORNER SOLUTIONS LEADING TO NO DEADWEIGHT LOSS**

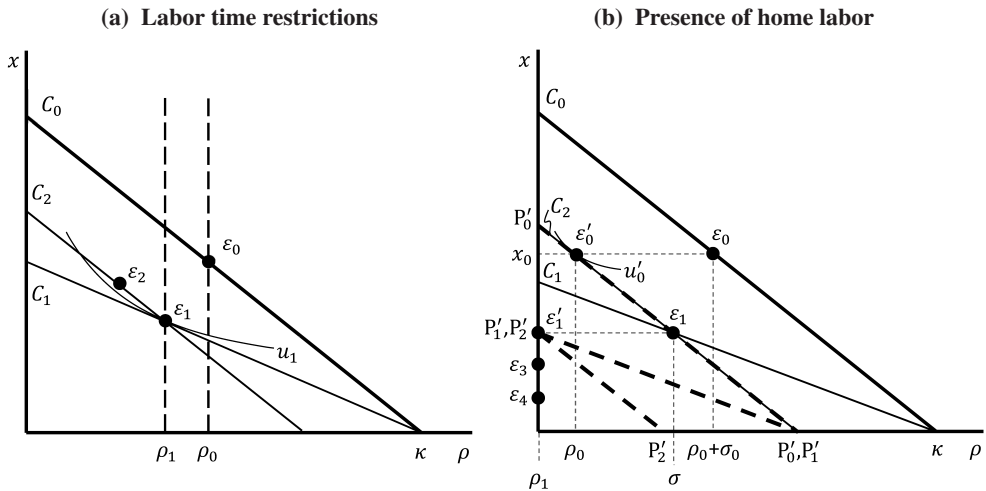


Figure 2(a) shows two vertical lines representing a case in which labor time is restricted to only two values,  $\lambda_0^r$  and  $\lambda_1^r$ . The before-tax equilibrium is at  $\epsilon_0$ , where the indifference

curve (not shown) is tangent to the budget constraint and leisure time is  $\rho_0 = \kappa - \lambda_0^r$ .<sup>24</sup> After the labor income tax is imposed, the equilibrium is at  $\varepsilon_1$ . If the individual is constrained to work for either  $\lambda_0^r$  and  $\lambda_1^r$  units of time, then the optimal solution under the equal-yield lump-sum tax, at  $\varepsilon_2$ , is not attainable. The deadweight loss of the labor income tax would be zero because the taxpayer would choose to work  $\lambda_1^r$  and maximize utility at  $\varepsilon_1$  under both taxes.

This argument can be applied very broadly to other taxes in the economy. For instance, many goods and services are purchased in discrete amounts, and very often the purchasing decision is reduced to whether to buy one unit of a good or not to buy it. These cases can also be represented as restricted choices, and it is plausible that a tax that is affecting relative prices leads to the same decision as a tax that does not affect relative prices, implying that the deadweight loss of the former is zero.

*Assumption 8:* There is no home labor.

The traditional measure of deadweight loss also disregards the existence of home labor, defined as non-enjoyable activities without pay, because it divides the time constraint  $\kappa$  into leisure  $\rho$  and *market* labor  $\lambda$  only. If home labor, denoted as  $\sigma$ , is considered in the analysis, then provided that  $\sigma > 0$ , the tangency between the indifference curve and the budget constraint no longer characterizes the optimal individual decision. The reason is that what remains available for leisure depends not only on the market labor decision, but also on the time spent on home labor ( $\rho = \kappa - \lambda - \sigma$ ). This implies that points on the budget constraint that in the absence of home labor represent attainable combinations of leisure and market labor, are not attainable in the presence of home labor.

Sepulveda (2022) analyzes home labor under the assumption of costly time savings, and shows that a higher wage rate allows to afford more time savings (in the form of more goods and services that save time) and thus to reduce home labor and make more time available for leisure and market labor. The same argument can be generalized to include also non-wage income. The key insight is that lower-income individuals must spend more time on home labor, or equivalently, that individuals with higher incomes have more time available for leisure and market labor.<sup>25</sup> Note that this negative relationship between home labor and income contributes to a positive relationship between the wage rate and market labor, which is the sign commonly expected for that relationship.

Figure 2(b) presents a case with “significant” home labor, which may be more representative of low-income individuals. For simplicity, home labor is assumed to be a constant  $\sigma_0$ . The first important difference with respect to the mainstream analysis is that  $\varepsilon_0$  no longer represents the before-tax utility maximizing allocation. In general, the “traditional budget constraint” no longer defines the set of affordable combinations of the composite good and leisure. To find the new set of affordable combinations we need to shift the original budget constraint  $C_0$  to the left; the size of the horizontal shift must be equal to  $\sigma_0$ . The new “effective” budget constraint is given by the segment  $P'_0P'_0$ . Point  $\varepsilon_0$  shows the optimal quantity of the composite good  $x_0$ , which is associated with optimal labor  $\lambda_0 = \kappa - \rho_0 - \sigma_0$ ; but since home labor  $\sigma_0$  provides no utility, the combination of “goods”  $x_0$  and  $\rho_0$  that is maximizing

utility is located at  $\varepsilon'_0$ , where the utility level is  $u'_0$  (with the indifference curve conveniently assumed to be tangent to  $P'_0P'_0$ ). It is only at  $\varepsilon'_0$  where the first order condition of the utility maximization problem is being satisfied.

Assume that, given  $\sigma_0$ , after the labor income tax is imposed the effective budget constraint is the segment  $P'_1P'_1$ , and the effective budget constraint under the equal-yield lump-sum tax is  $P'_2P'_2$ . Assuming also a “flat enough” indifference curve, the utility maximizing allocation is found under both taxes at  $\varepsilon'_1$ , where  $\rho_1 = 0$  and the time available is spent only on home labor and market labor. Again, the lump-sum tax is found not to lead to higher utility, implying that the labor income tax has no deadweight loss. Of course, this is one of several possible outcomes in the presence of home labor. Under alternative scenarios leisure may not be zero; or the lump-sum tax may lead to a greater utility level and positive deadweight loss. However, note that in this example, if home labor is greater than the previously assumed amount ( $\sigma > \sigma_0$ ), the three effective budget constraints would have shifted further to the left, leading to the labor income tax into a corner solution (for instance, at  $\varepsilon_3$ ) with greater utility than the lump-sum tax (for instance, at  $\varepsilon_4$ ). This outcome is not possible under the traditional assumptions, and it is incompatible with the notion of distortionary taxation.

An important insight from the case with home labor is that the measure of deadweight loss may depend on the level of income. If it is true that lower-income individuals spend more time on unpleasant home labor, then they will more likely face corner solutions with no leisure and no (or a smaller) deadweight loss of the labor income tax. In contrast, higher income individuals spending less time on home labor will more likely face interior solutions with positive deadweight losses. This means that at the aggregate level the substitution effects displayed by low and high-income individuals may be explained by different reasons. For instance, what appears to be a substitution effect in the case of poor individuals could instead be the result of having less time available for work. The traditional approach does not distinguish among these differences, so empirical studies estimating own wage (or taxable income) substitution effects might be observing “time effects” (higher paid individuals have more time available for work) instead of pure price and income effects.

*Assumption 9:* Individual substitution (and income) effects are equal to the population average(s).

The empirical literature on labor supply has developed substantially in the last decades. Significant progress has been made in properly identifying the determinants of labor decisions that involve intensive (hours of work) and extensive (participation) margins, non-linear and discontinuous budget constraints, hour restrictions, imperfect labor mobility, household restrictions, etc.<sup>26</sup> In spite of this progress, we still know little about the effects of tax rates on labor supply, as the estimates of wage and income elasticities vary widely (Keane, 2011; Bargain and Peichl, 2016),<sup>27</sup> and the available findings also suffer from important limitations. For instance, even though “models which assume that hours worked are determined by preferences only will be misspecified, and can produce biased estimates of labor supply elasticities” (Dickens and Lundberg, 1993, p. 169), consistent with Assumption 7, “[m]ost authors assume all the values of hours of work within some range are equally available” (Aaberge *et al.*, 2009, p. 586).

For our purpose, maybe the most consequential assumption made in the applied literature to estimate the deadweight loss of a tax is that the elasticity parameters estimated for the population are valid for all the individuals. The broadly shared understanding is that *any* tax-induced price change is distortionary, regardless of whether the price change is associated with individual substitution effects or not. This allows economists to suggest that substitution effects observed in empirical analyses at an aggregate level can directly be used to measure aggregate deadweight losses, even though there is no knowledge about deadweight losses occurring at the individual level. Representing this position, Piketty and Saez (2013, p. 403) state: “We *know* that the efficiency costs of taxation depend on the *size of behavioral responses* to taxes and hence that optimal tax systems are going to be heavily dependent on the size of those empirical parameters” (emphases added). Similarly, Saez *et al.* (2012, p. 4) claim, while discussing the merits of the elasticity of taxable income, that “under some assumptions, *all* responses to taxation are symptomatic of deadweight loss” (emphasis in original).

The problem is that the empirical elasticity parameters generally correspond to estimations of the *average* marginal responses in the population, not to estimations of individual marginal responses.<sup>28</sup> It is possible to obtain a sizable and statistically significant estimate for the own wage (or taxable income) elasticity, and at the same time have many individuals in the population reaching corners solutions. As pointed out in the discussions about Assumptions 7 and 8, those taxpayers could be making decisions characterized by corner solutions with no substitution effects and no deadweight losses. In an extreme case, the behavioral responses of all taxpayers might be associated with no deadweight loss, such that the aggregate deadweight loss is zero, while the population elasticity parameters could be suggesting the presence of a sizable and significant aggregate deadweight loss. In general, population parameters are useful to estimate effects on aggregate labor supply and the tax base, *not* on aggregate deadweight loss as assumed, for instance, by Harberger (1964a), Feldstein (1999) and Chetty (2009a).

## 6. Artificial separation between efficiency and distribution

The equal-yield Assumption 2 sets the amount of the lump-sum tax with reference to the individual burden of the labor income tax, without attempting to maximize social welfare and without dealing with distributional matters. This allows us to assume distribution away, and therefore to ensure that the analysis focuses on efficiency only. In this context, the exercise could be thought to be valid for *any given* income distribution.

*Assumption 10:* Redistribution can be disregarded when measuring inefficiencies.

This assumption, together with the traditional conclusion that the lump-sum tax is the only non-distortionary tax instrument, suggests that there is a clear separation between the problems of efficiency and distribution. Indeed, lump-sum taxation and efficiency are often considered in mainstream tax theory to be mutually dependent and logically equivalent. This view –which seems to coalesce the properties and implications of lump-sum tax definitions 1 and 2 in Section 3, is explicit, for instance, in Sandmo (1998, pp. 378-379), who claims



that “the distortionary effects of taxation [...], can only be justified from a welfare economics point of view by their positive effects on the distribution of income.”

However, distributional matters will be present whatever the procedure used to set the lump-sum amount is, and simply disregarding distribution does not ensure that a clean line between efficiency and distribution is being drawn. On one side of that line, lump-sum taxes and transfers have obvious distributional implications. This point is highlighted, for instance, by Hindriks and Myles (2013, p. 428) who, in contrast to Sandmo's (1998) position, state that “the role of the lump-sum taxes is fundamentally redistributive”.

On the other side of that line, lump-sum taxation is neither sufficient nor necessary to ensure efficiency. To see why it is not sufficient, consider for instance that “wrong” amounts of lump-sum taxes and transfers can alter individuals' behavior (through income effects), leading to (tax-induced) price changes and “wrong” economic incentives.

Lump-sum taxes are also unnecessary to ensure efficiency because efficient allocations can be reached without their use. Consider for instance an economy where some goods exhibit negative and increasing marginal externalities, and where Pigouvian taxes can be imposed to fully correct for those externalities. Now assume for convenience that the tax revenue collected is exactly equal to the amount necessary to finance the optimal provision of public goods, defined as the amount that maximizes social welfare. This system is efficient, as it reaches a Pareto efficient allocation, but uses no lump-sum tax.

Arguably, a more intuitive separation between efficiency and equity can be found in the literature on the marginal cost of public funds (MCF) and the application of the concept of MCF in the literature on optimal tax *systems*.<sup>29</sup> The MCF provides a measure of the marginal welfare cost of collecting additional tax revenue under specific tax instruments, which can be used to choose the least costly tax instruments as well as the optimal level of public expenditure. Mayshar and Yitzhaki (1995) showed that the MCF can be decomposed into the marginal *efficiency* cost of funds (MECF), equal to the marginal private consumption forgone per additional unit of revenue collected, and a distributional characteristic, a factor that increases (decreases) the MCF when the impacts of a tax on individuals' welfare is less (more) aligned, on average, with the relevant preferences for redistribution. The optimal level of public expenditure can be found by equating the MCF to the marginal benefits of public expenditure. This outcome maximizes social welfare and is consistent with the choices suggested by traditional cost-benefit analysis.

Much of the literature on the MCF has focused on the relationship between the MCF and the marginal excess burden of taxation. The traditional concept of distortion based on lump-sum taxation, and the way efficiency and distribution are separated in accordance with this concept, have had a great influence in that discussion. Lump-sum taxation is normally associated with a value of the MECF equal to one (although some assumptions are required), while other “distortionary” tax instruments are associated with MECFs greater than one. Moreover, since the distortions of a tax have been attributed to substitution effects, the distortionary component of the MECF is usually measured with the compensated elasticities

of the taxed good (which excludes income effects) instead of the uncompensated (Marshallian) elasticities. However, the concepts of MCF and MECF are originally based on uncompensated behavioral responses, and their applications in cost-benefit analysis do not require corrections to account for “distortions”. Indeed, there is some agreement in the literature that cost-benefit analysis is better informed by measures based on uncompensated elasticities (see, for instance, Ballard and Fullerton, 1992 and Triest, 1990).

Lump-sum taxation, as well as the notion of distortion and their association with substitution effects and compensated elasticities, are not necessary to describe optimal government decisions and to separate efficiency from distributional matters.

## 7. Conclusions

This paper provides a critical analysis of the traditional concept of deadweight loss, a measure of the welfare costs from distortionary effects of taxation that is assumed to be equal to the excess burden of a tax. It is argued that the excess burden does not measure the effects of tax distortions, but instead represents simply part of the taxpayer’s costs of paying taxes. The traditional measure of deadweight loss provides a misleading account of these costs because it *assumes* that they are all tax distortions and makes additional unverified assumptions to ensure that the deadweight loss is always greater than zero. Two key conclusions of this paper are that (non-Pigouvian) tax-induced changes in relative prices are not necessarily distortionary as presumed in public finance theory, and that aggregate measures of deadweight loss based on aggregate substitution effects can be expected to severely overestimate the excess burden of taxation.

The criticisms of the concept of deadweight loss presented in this paper can be associated with the choice of an appropriate counterfactual. The theory of public finance distinguishes the first-best allocation, attainable only if lump-sum taxation is fully available, from the second-best allocation, which is the best possible solution when other tax instruments must be used. All taxes other than the lump-sum tax are considered to be distortionary because their use reduces the maximum attainable level of welfare. But this reduction is observed in the context of very stylized assumptions that characterize the first-best and second-best allocations, as well as lump-sum taxation. The problem is that the economy in which we actually operate is far away from the second-best described by the theory, as it contains *many additional* constraints (besides taxes other than the lump-sum tax) that prevent the attainment of the second-best solution. In this context, it is not clear that tax-induced changes in relative prices will reduce welfare, and the Second Best Theorem suggests that social welfare can instead increase with those changes. In a nutshell, public finance theory has shown that taxes other than lump-sum are distortionary in (one very restrictive) theory, but not in practice.

This conclusion calls for economists to abandon their focus on estimating hypothetical measures of the welfare costs of distortions for individual tax instruments and focus instead on the relative costs (and benefits!) of alternative tax policies. This does not necessarily re-

quire a new agenda, as the literature has already made significant progress in the analysis of many relevant aspects of taxation. For instance, besides those contributions of optimal tax theory that are not dependent on measures of deadweight loss, the literature on optimal tax *systems* (based on the literature on the marginal cost of public funds) provides a well established theoretical framework to analyze tax policies not only in terms of their relative costs and efficiency, but also in terms of their benefits and distributional effects, while accounting for a variety of behavioral responses and additional costs faced by taxpayers and decision makers.

## Notes

1. The deadweight loss of taxation is discussed, for instance, in Auerbach and Hines (2002), who provide an overview of optimal tax theory. More recent surveys about optimal income taxation can be found in Boadway (2012), Piketty and Saez (2013) and Sørensen (2010).
2. One recent exception is Hindriks and Myles (2013).
3. Granqvist and Lind (2005) observe that the mainstream measure of deadweight loss of the labor income tax is not based on a "commonsense perspective" because it does not compare the situations before and after the introduction of the tax; and claim that it is "irrelevant from a policy perspective" because the lump-sum tax in which it is actually based is impossible to implement. Lind and Granqvist (2010) extend this discussion and explain that there has been a shift in the meaning given by mainstream economists to the deadweight loss, from the "commonsense perspective" described by Pigou (1962) to the currently dominant approach based on a hypothetical equal-yield lump-sum tax.
4. See Browning *et al.* (2000) for an analysis of the welfare costs of taxation that exploits the weak separability assumption.
5. The tax liability could be identical for all eligible taxpayers, in which case we talk about a head tax or a poll tax, or could also be set on an individual basis.
6. The example provided by Atkinson and Stiglitz (1980) is a poll tax in an area without emigration or immigration. Poll (or head) taxes may be applied only to the adult population, thereby reducing the influence on the decision about the number of children. However, there remains the problem of adults that will be subject to the tax but unable to pay it, or the consideration of the level of income they are able to raise. Many households will see the cost of incorporating each of these adults increase with a poll tax.
7. To make the substitution effect evident, it is sufficient to include the decisions affected by the lump-sum tax (e.g., the number of household members), in the utility function and the budget constraint. A change in the lump-sum tax would have both an income effect and a substitution effect in the utility maximizing decision.
8. The problem of lump-sum tax evasion can be characterized by an all-or-nothing outcome in which successful evasion means paying only the cost of evasion efforts, and unsuccessful evasion means paying the full tax burden, plus the cost of evasion efforts, and possibly an additional penalty. Engaging in lump-sum tax evasion is different than engaging in labor income tax evasion, as in the labor income tax the taxpayer also has the option of (legally) avoiding the tax by reducing labor.
9. Auerbach (1985) presents the basic concept of deadweight loss and discusses alternative definitions of the concept.
10. Note that (other types of) inefficiencies incurred while collecting tax revenue are not considered as part of the mainstream measure of deadweight loss.
11. For instance, if indifference curves are kinked at several points (thus not differentiable at those points), the lump-sum tax can still lead to higher levels of welfare than the labor income tax.

12. This paper focuses on taxpayers' choices, but similar arguments can be developed to the case of firms. For instance, firms' isoquants can display discontinuities (e. g., due to a change in plant size) and be non-differentiable (e. g., due to perfectly complementary inputs) as a consequence of relevant technological constraints.
13. A history of the concept of deadweight loss up to Harberger's work is provided in Boehne (1968).
14. The sufficient statistic approach championed by Chetty (2009b) develops formulas that calculate welfare effects of public policies based on key elasticities instead of specific, often difficult to estimate, structural parameters.
15. Another alternative, considered by Granqvist and Lind (2005) to be a "commonsense" measure of deadweight loss, consists of comparing "the situation after the tax is introduced (or raised) and the situation before this occurred" (p. 454). This statement is very general, as it does not specify if administration and compliance costs and the benefits of public expenditures should be included, but it suggests that efficiency costs could be computed for each tax instrument separately, instead of relative to another (hypothetical or not) tax instrument.
16. For discussions about the incentive-compatibility problem of optimal lump-sum taxation see, for instance, Stern (1984), Mirrlees (1986) and Hindriks and Myles (2013).
17. Real-life examples of lump-sum taxes are both scarce and inauspicious. For instance, the implementation of a poll tax in the United Kingdom between 1989 and 1993 was patently unsuccessful. Besides its severe noncompliance problems (Besley *et al.*, 1997), "[t]he unpopularity of the poll tax is widely seen as a major contributory factor of the downfall of Margaret Thatcher" in 1990 (Alt *et al.*, 2010, p. 1204). The historical use of lump-sum taxation is discussed, for instance, in Tam (2004), who also shows that the lump-sum tax can be less credible (and thus less likely to be implemented) than other forms of taxation under autocracies.
18. Recall that Granqvist and Lind (2005) advocate for disregarding lump-sum taxation altogether. Note also that the lump-sum tax definition 3 cannot be considered as a "commonsense" definition of lump-sum tax –compatible with the "commonsense" definition of deadweight loss proposed by Granqvist and Lind (2005), because definition 3 could possibly lead to a positive deadweight loss even when labor supply is unaffected by the labor income tax, a situation that these authors consider incompatible with the idea of excess burden.
19. Note that a tax burden by itself can have behavioral effects, and that income effects could also be costly. As Atkinson and Stiglitz (1980, p.23 footnote) clarify, lump-sum taxes do have effects on behavior, "the correct statement is that they have no *substitution* effect" (emphasis in the original). It follows that the excess burden of taxation is limited to the effects of tax-induced changes in relative prices.
20. Hindriks and Myles (2013, p. 428) recognize that "the theoretical efficiency of lump-sum taxes rests partly on the fact that their imposition is costless."
21. The procedure described in Section 2 can be applied to a Pigouvian tax to obtain a positive deadweight loss. Consider Figure 1 and assume that a Pigouvian tax is imposed on a good represented in the vertical axis, while the other untaxed (composite) goods are represented in the horizontal axis. The Pigouvian tax would lead to an equilibrium at  $\varepsilon_1$ , while an equal yield lump-sum tax would lead to a higher level of utility at  $\varepsilon_2$ . This tax-induced change in relative prices is not considered to be distortionary, and the deadweight loss of a Pigouvian tax is considered to be zero, because this tax is assumed to bring the relative prices to their optimal level.
22. Sandmo (1975) recognized "the second-best problems which arise as soon as it is realized that Pigouvian taxes only constitute part of a more comprehensive system of commodity taxes" and showed that Pigouvian taxes should be equal to an *adjusted* value of the marginal externality that accounts for those second-best problems. Still, this presumes that after the adjustments are made the resulting prices are second-best optimal, which is at odds with the argument in this paper because, *in practice*, other market failures surely remain in the economy and therefore prices cannot be undistorted.
23. See, for instance, van Soest *et al.* (1990), for a discussion and a clear illustration of the greater frequency of male hours of work at 40 per week in The Netherlands.
24. Tangencies are generally unnecessary to maximize utility in the presence of labor time restrictions, but the graph reproduces some basic features of Figure 1 to facilitate comparisons.

25. Home labor is not necessarily associated with specific activities (e. g., painting a house, car repairs); instead, it may also depend on the “enjoyability” of goods, services or activities. For instance, cooking and driving can be considered home labor by some individuals that do not enjoy these activities; however, if they become enjoyable, say with a renovated kitchen or a luxury car, then the time spent on the same activities turns into leisure.
26. See Chetty (2012) for a review of contributions to the relevant literature and Müller et al. (2019) for a recent example of empirical approaches developed to deal with some of these problems.
27. Among the few findings for which there seems to be some degree of (not general) consensus are the relatively large own-wage elasticities for married women and the small elasticities for men (Bargain and Peichl, 2016), and the significant responses to tax rates among the top 1 percent of income earners (Saez, 2004).
28. While explaining a logarithmic specification of the labor supply function, Keane (2011) observes that “[c]rucial is the addition of the stochastic term [...], which enables the model to explain heterogeneity in behavior”. However, as Manski (2014b, p. 148) points out, “the model permits only a very restricted form of heterogeneity”, because the key parameters representing the estimated elasticities are the same for all individuals.
29. Slemrod and Gillitzer (2014) present the theory of optimal tax systems and provide a broad review of the relevant literature.

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**Resumen**

El concepto del exceso de gravamen de la teoría de la imposición óptima tiene dos funciones: comparar los costes de instrumentos fiscales alternativos, y medir la pérdida de eficiencia producida por instrumentos fiscales específicos, que presumiblemente corresponde a los costes de bienestar de sus efectos distorsionadores. En este documento se afirma que la pérdida de eficiencia proporciona medidas engañosas de los costes de bienestar derivados de las distorsiones fiscales, porque exige hacer suposiciones no verificadas para equiparar costes a distorsiones y asegurar que la pérdida de eficiencia sea positiva. En general, no se puede suponer que los impuestos distintos del impuesto a tanto alzado y los cambios en los precios relativos inducidos por los mismos sean distorsionadores.

*Palabras clave:* carga excesiva, pérdida de eficiencia, fiscalidad óptima, distorsiones fiscales, impuesto a tanto alzado

*Clasificación JEL:* H21, H24, J22.