Chapter 1

THE *CEQ ASSESSMENT*

Measuring the Impact of Fiscal Policy on Inequality and Poverty

Nora Lustig and Sean Higgins

As stated in the introduction, the purpose of this Handbook is to present a step-by-step guide to applying the incidence analysis used in *Commitment to Equity (CEQ) Assessments*. Developed by the Commitment to Equity Institute at Tulane University, the *CEQ Assessment* is a diagnostic tool that uses fiscal incidence analysis to determine the extent to which fiscal policy reduces inequality and poverty in a particular country.

The *CEQ Assessment* is designed to address the following four questions:

1. How much income redistribution and poverty reduction is being accomplished through fiscal policy?[1]
2. How equalizing and pro-poor are specific taxes and government spending?
3. How effective are taxes and government spending in reducing inequality and poverty?
4. What is the impact of fiscal reforms that change the size and/or progressivity of a particular tax or benefit?

The Handbook has been written to guide researchers and policy analysts in the completion of the *CEQ Master Workbook (MWB)* (available only in the Handbook's online Part IV), a spreadsheet file that contains all the information used in a *CEQ Assessment*. The *CEQ Stata Package* (which can be installed directly through Stata)

[1]Throughout this Handbook, "fiscal policy," "fiscal instruments," "taxes and government spending," "revenue collection and government spending," "taxes and transfers," "taxes and benefits," and the "net fiscal system" are used interchangeably.

includes a suite of user-written Stata commands that automatically produces and fills out the results section of the *CEQ Master Workbook*.[2] However, the Handbook can also be used as a stand-alone document for those interested in methodological and practical approaches to carry out fiscal incidence analysis.

This chapter presents key analytical insights in fiscal redistribution theory such as the fundamental equation that links the redistributive effect to the size and redistributive effects of taxes and benefits; how to calculate the contribution of each fiscal instrument (or combinations of them) to the change in inequality and poverty; and the implications of reranking (for the interested reader, their mathematical formulation is presented in detail in chapters 2 and 3 in this Handbook). The chapter also discusses the basics of fiscal incidence analysis used in *CEQ Assessments*. The *CEQ Assessments* rely on the fiscal incidence method known as the "accounting approach" because it ignores behavioral responses and general equilibrium effects. Because pensions frequently tend to be a combination of deferred income and government transfer, there is a section dedicated to discussing how contributory pensions should be considered in fiscal incidence analysis. Finally, the chapter describes the set of indicators used to answer the four key questions outlined above, and illustrates with examples from existing *CEQ Assessments*. Instructions for the implementation of a *CEQ Assessment* in practice are in the chapters in part II in this Handbook. Part III includes applications of the *CEQ Assessment* tool to specific countries and a cross-country comparison. Part IV, "The CEQ Assessment Tools," available online only, contains the *CEQ Master Workbook (MWB)* (a blank version), a completed *CEQ MWB* for Mexico as an example, an example of "do files" in Stata for constructing the income concepts with information from Mexico, and the *CEQ Stata Package* with user-written software to complete the results section of the *CEQ MWB*. It also contains guidelines for the implementation of *CEQ Assessments*, including the data and software requirements, recommendations for the composition of the team, and a thorough protocol of quality control.

1 The Theory of Fiscal Redistribution: Key Analytical Insights

In this Handbook, "fiscal redistribution" refers to the process by which the state collects revenues from individuals and households (primarily through taxes) and spends these revenues on benefits (for example, cash transfers, price subsidies, and in-kind benefits such as education and health) intended for specific individuals and households. In so doing, the state changes the postfiscal income distribution and poverty rates that would have prevailed in the absence of fiscal policy. Because of behavioral responses

[2] Higgins, Aranda, and Li (2018). In Part IV of the Handbook, available only online at www.ceqinstitute.org. Descriptions of how to use the *CEQ Stata Package* are in Higgins (2018) (chapter 8 in this Handbook) and Aranda and Ratzlaff (2018) (chapter 9 in this Handbook).

and general equilibrium effects, fiscal policy can also change the prefiscal income distribution and poverty rates. While at this point the *CEQ Assessments* do not estimate the counterfactual prefiscal income with these second-round effects in place, it is important to note that the analytical insights presented here and in chapters 2 (Enami, Lustig, and Aranda), 3 (Enami), 4 (Higgins and Lustig), and 5 (Enami) apply to fiscally induced income redistribution regardless of the method used to estimate its extent. That is, regardless of whether fiscal redistribution is calculated using run-of-the-mill fiscal incidence analysis, microsimulation methods, or partial or general equilibrium modeling, the theoretical results discussed below and in the next four chapters apply.

In addition to the taxes and benefits currently included in the *CEQ Assessments*, the state, of course, also spends on public goods, and collects revenues from and spends on subsidies that benefit corporations as well. While spending on public goods and taxing and subsidizing corporations also have redistributive effects, these forms of revenue collection and spending are not considered in the *CEQ Assessment* tool (at least, not for the moment).

In order to measure the redistributive effect and poverty impact of taxes and benefits, the core building block of fiscal incidence analysis is the definition and construction of a prefiscal income concept—what we in CEQ call "Market Income" or "Market Income plus Pensions," depending on the treatment of contributory pensions—and a postfiscal income concept—that is, income after taxes net of transfers. The construction of postfiscal income refers to the method of allocating the burden of taxes and the benefits of government spending to households. For example, Disposable Income is constructed by subtracting direct personal income taxes and adding cash transfers to a household's Market Income. Although this procedure may sound very simple, allocating taxes and transfers to households is among the most—if not *the* most—challenging tasks of fiscal incidence analysis. Below we present a brief description of the fiscal incidence method used in *CEQ Assessments*. Part II in this Handbook is devoted to explaining the approaches to be followed in practice.

1.1 The Fundamental Equation of the Redistributive Effect

In his seminal book *The Distribution and Redistribution of Income: A Mathematical Analysis*, Lambert defined the redistributive effect as the difference between inequality for postfiscal income and prefiscal income.[3] Lambert shows that the redistributive effect of the net fiscal system is equal to the weighted sum of the redistributive effect of taxes and transfers, where the redistributive effect of the tax system is defined as the difference between inequality of post-tax and Market Income; the redistributive effect of the benefit system is defined as the difference between inequality of post-transfer

[3]Lambert (2001).

income and Market Income; and the weights are equal to the ratios of taxes and benefits divided by total prefiscal (market) income, respectively.[4]

In mathematical terms:

$$RE_N = \frac{(1-g)RE_t + (1+b)RE_B}{1-g+b}$$

where RE_N, RE_t, and RE_B are the change in the Gini indices for the net fiscal system, taxes (only) and benefits (only), respectively; and g and b are the total tax and benefit ratios—that is, total taxes and total benefits divided by total prefiscal (original) income, respectively. Actually, Lambert's formulation measures the redistributive effect with the Reynolds-Smolensky index,[5] which in the absence of reranking of households (that is, when households occupy the same place in the ranking from poorest to richest whether they are ranked by prefiscal income or by postfiscal income) equals the difference between the prefiscal and postfiscal Gini coefficient.

We will call this the "fundamental equation of the redistributive effect."[6] It is a fundamental equation because it lies at a heart of two essential implications. The first implication is that to correctly estimate the redistributive effect of fiscal policy, it is essential to analyze taxes *and* benefits in tandem. The second implication is that whether a tax or a transfer exercises an equalizing or unequalizing force no longer depends on the progressivity or regressivity of the intervention vis-à-vis prefiscal income.

From the fundamental equation[7] one can formally derive the key condition that must be fulfilled for a net fiscal system to be equalizing.

$$RE_t > -\frac{(1+b)}{(1-g)}RE_B$$

This condition shows, for example, how taxes could be unequalizing $RE_t < 0$, but that given the ratios of taxes g and transfers b and the equalizing effect of transfers $RE_B > 0$,

[4]See Lambert (2001, equation 11.29, p. 277). This equation can be applied to the so-called S-Gini family o indicators of which the Gini coefficient is one particular case. For the description of S-Gini indicators see, for example, Duclos and Araar (2006). Other inequality indicators cannot necessarily be neatly decomposed into a weighted sum of the redistributive effect of taxes and transfers.

[5]For a definition, see Duclos and Araar (2006) and Enami, Lustig, and Aranda (2018) (chapter 2 in this Handbook).

[6]In chapter 2 in this Handbook, we reproduce Lambert's formulation and extend it to the case of multiple taxes and transfers. We show how if the redistributive effect is measured with the Gini coefficient, the fundamental equation can be expressed using the Kakwani index for taxes and transfers. In chapter 3 in this Handbook, Ali Enami shows how these conditions are affected if taxes and transfers rerank households.

[7]Lambert (2001).

the unequalizing effect of taxes would be more than compensated. While many authors have already stressed the importance of analyzing the redistributive impact of taxes and transfers in tandem,[8] it is important to emphasize that to do so is *essential*.

1.2 Lambert's Conundrum

Lambert's fundamental equation of the redistributive effect has another implication that has been largely overlooked in the literature. The equation can be used to show that relying on the typical indicators of progressivity such as the Kakwani index (described below and in chapter 2) to predict whether a tax or a transfer will exert an equalizing effect is wrong. Taxes, for instance, can be regressive according to the Kakwani index, but when combined with transfers (or, with other taxes), they can make the system more equalizing than without the regressive taxes. This startling result, which was first identified by Lambert,[9] has been largely ignored in applied fiscal incidence analysis. We proceed to explain how such a counterintuitive result is possible.

Suppose one observes that fiscal policy has an equalizing effect. Can one measure the influence of specific taxes (direct versus indirect, for example) or transfers (direct transfers versus indirect subsidies or in-kind transfers, for example) on the observed result?[10] A fundamental question in the policy discussion is whether a particular fiscal intervention (or a particular combination of them) is equalizing or unequalizing. In a world with a single fiscal intervention (and no reranking), it is sufficient to know whether a particular intervention is progressive or regressive to give an unambiguous response using the typical indicators of progressivity such as the Kakwani index (chapter 2 in this Handbook).[11] In a world with more than one fiscal intervention, this one-to-one relationship between the progressivity of a particular intervention and its effect on inequality breaks down. As Lambert so eloquently demonstrates,[12] depending on certain characteristics of the fiscal system, a regressive tax can exert an equalizing force over and above that which would prevail in the absence of that regressive tax.[13]

---

[8] See, for example, Bastagli, Coady, and Gupta (2015, p. 57) and Engel, Galetovi, and Raddatz (1999).

[9] Lambert (1985, 2001).

[10] Note that the influence of specific interventions may not be equalizing, even if the overall effect of the net fiscal system is.

[11] The Kakwani index for taxes is defined as the difference between the concentration coefficient of the tax and the Gini for Market Income. For transfers, it is defined as the difference between the Gini for Market Income and the concentration coefficient of the transfer. See, for example, Kakwani (1977).

[12] Lambert (2001).

[13] See Lambert (2001, pp. 277–78). Also, for a derivation of all the mathematical conditions that can be used to determine when adding a regressive tax is equalizing or when adding a progressive transfer is unequalizing, see Enami, Lustig, and Aranda (2018) (chapter 2 in this handbook).

TABLE 1-1
Lambert's Conundrum

	1	2	3	4	Total
Original income x	10	20	30	40	100
Tax liability $t(x)$	6	9	12	15	42
Benefit level $b(x)$	21	14	7	0	42
Post-benefit income	31	34	37	40	142
Final income	25	25	25	25	100

Source: Lambert (2001, table 11.1, p. 278).

The reader should note that this result can occur in the absence of reranking—that is, even if the order in which households are ranked by per capita income in the prefiscal situation remains intact in the postfiscal situation.

An example borrowed from Lambert helps illustrate this point in the case of a regressive tax (table 1-1).[14] The table shows that "taxes may be regressive in their original income . . . and yet the net system may exhibit more progressivity" than the progressive benefits alone. The redistributive effect for taxes (leaving out the transfers) in this example is equal to −0.0517, highlighting their regressivity.[15] Yet, the redistributive effect for the net fiscal system is 0.25, higher than the redistributive effect for benefits *only* equal to 0.1972. If taxes are regressive vis-à-vis the original income but progressive with respect to the less unequally distributed post-transfers income, regressive taxes exert an equalizing effect over and above the effect of progressive transfers.[16]

Note that Lambert's conundrum is not equivalent to the well-known result we mentioned above: that efficient regressive taxes can be fine as long as, when combined with transfers, the net fiscal system is equalizing.[17] The surprising aspect of Lambert's conundrum is that a net fiscal system *with* a regressive tax (vis-à-vis prefiscal income)

[14] Lambert (2001).

[15] Since there is no reranking, the Reynolds-Smolensky coefficient equals the difference between the Ginis before and after the fiscal intervention.

[16] Note that Lambert (2001) uses the terms "progressive" and "regressive" in a way that is different from other authors in the theoretical and empirical incidence analysis literature. Thus, he calls "regressive" transfers that are equalizing. See definitions in earlier chapters of his book.

[17] As Higgins and Lustig (2016) mention, efficient taxes that fall disproportionately on the poor, such as a no-exemption value added tax, are often justified with the argument that "'spending instruments are available that are better targeted to the pursuit of equity concerns' (Keen and Lockwood, 2010, p. 141). Similarly, Engel et al. (1999, p. 186) assert that 'it is quite obvious that the disadvantages of a proportional tax are moderated by adequate targeting' of transfers, since 'what the poor individual pays in taxes is returned to her.'" Ebrill, Keen, and Summers (2001, p. 105) argue that "a regressive tax might conceivably be the best way to finance pro-poor expenditures, with the net effect being to relieve poverty."

is *more* equalizing than *without* it.[18] The implications of Lambert's conundrum in real fiscal systems are quite profound: in order to determine whether a particular intervention (or a particular policy change) is inequality increasing or inequality reducing—and by how much—one must resort to numerical calculations that include the whole system. As Lambert mentions, the conundrum is "not altogether farfetched."[19] Two renowned studies in the 1980s found this type of result for the United States and the United Kingdom.[20] While it did not make its appearance in a 1990s study for Chile,[21] it did in the 2015 *CEQ Assessment* for Chile,[22] as discussed in chapter 13 in this Handbook.

The counterintuitive result embedded in Lambert's conundrum is the consequence of path dependency: a particular tax can be regressive vis-à-vis Market Income but progressive vis-à-vis the income that would prevail if all the other fiscal interventions were already in place.[23] As shown in chapter 2, there are other counterintuitive results; for instance, adding a regressive transfer to a system with an existing regressive transfer could reduce inequality by more than if one does not add the new regressive transfer.

Given path dependency, how should one calculate the sign and order of magnitude of a particular tax's or transfer's influence on the redistributive effect? There are several ways of calculating the contribution of a particular fiscal intervention to the change in inequality (or poverty). The most commonly used in the literature is the *sequential contribution*. The sequential contribution is calculated as the difference between inequality indicators with fiscal interventions ordered in a path according to their presumed institutional design.[24] For example, if direct transfers are subject to taxation, the sequential contribution of personal income taxes is the difference between Gross Income (market income plus transfers), on the one hand, and Disposable Income (market income plus transfers minus personal income taxes), on the other.

However, while it may be easy to identify based on institutional design a certain hierarchy for some taxes and transfers in the income construction tree, it will be

[18] It can also be shown that if there is reranking, a pervasive feature of net tax systems in the real world, making a tax (or a transfer) more progressive can *increase* post-tax and transfers inequality. In Lambert's example, regressive taxes not only enhance the equalizing effect of transfers, but making taxes more progressive (that is, more disproportional in the Kakwani sense) would result in higher(!) inequality; any additional change (toward more progressivity) in taxes or transfers would just cause reranking and an increase in inequality.

[19] Quotations are from Lambert (2001, p. 278).

[20] O'Higgins and Ruggles (1981) for the United Kingdom; Ruggles and O'Higgins (1981) for the United States.

[21] Engel, Galetovi, and Raddatz (1999). These authors showed that the Chilean system was equalizing in spite of featuring regressive indirect taxes. They did not discuss whether there was a "Lambert conundrum."

[22] Martinez-Aguilar and Ortiz-Juarez (2016).

[23] See the discussion on path dependency in chapter 7 of Duclos and Araar (2006).

[24] OECD (2011) used this method, for example.

difficult for others. To assume that market income plus (taxable) transfers—that is, Gross Income—occurs before (i.e., should come first in the hierarchical sequence) direct taxes seems quite reasonable. However, in which place of the hierarchy do the benefits derived from access to public education and health services belong? While for purposes of the *CEQ Assessments* we define income concepts following a particular accounting framework (more on this below) and place education benefits (together with health benefits) at the end of the accounting exercise, this does not mean that we think that this sequence responds to a particular institutional design.

If it is not possible to establish a precise hierarchy or sequence in the income construction tree according to a particular institutional design, then the contribution to fiscal redistribution of the taxes and transfers for which establishing a hierarchy is not feasible is path dependent: that is, there will be as many contributions as the possibilities to place the tax or the transfer of interest in a sequence. For instance, the contribution of benefits from public education could be calculated by comparing the change in inequality it induces vis-à-vis market income inequality, Gross Income inequality, or Disposable Income inequality. Each one would be equally valid because education benefits do not depend on any of these income concepts but on whether the household has school-aged children. The size of the contribution of this benefit will be different for each path.

Given path dependency, the result obtained by the sequential method can thus be wrong. In theory, path dependency would require measuring the total average contribution by considering all the possible paths and taking, for example, the so-called Shapley value (used in game theory)[25] or applying methods that combine the sequential and Shapley-value approaches where the latter is applied on the subset of fiscal interventions for which an institutionally defined hierarchical path cannot be determined.[26] Applying the latter is complex, and results are sensitive to the assumptions made about the hierarchy of interventions. A sensible alternative is to use what in the statistical literature is known as the *marginal contribution*.[27] In our context, the marginal contribution of a tax (or transfer) is calculated by taking the difference between the inequality (or poverty) indicator *without* the tax (or transfer) and *with* it.[28] For ex-

[25] For an analysis of the Shapley value and its properties, see, for example, Shorrocks (2013).

[26] See, for example, Sastre and Trannoy (2002) and Sastre and Trannoy (2008).

[27] The term "marginal" here is not to be confused with the term "marginal" used in defining a derivative in calculus.

[28] The *marginal contribution* should not be confused with the *marginal incidence*, the latter being the incidence of a small change in spending. Note that, because of path dependency, adding up the marginal contributions of each intervention will not be equal to the total change in inequality. Clearly, adding up the sequential contributions will not equal the total change in inequality either. An approach that has been suggested to calculate the contribution of each intervention in such a way that they add up to the total change in inequality is to use the Shapley value. The studies analyzed here do not have estimates for the latter.

ample, the marginal contribution of direct taxes is the difference between the Gini for Gross Income (market income plus transfers) and the Gini for Disposable Income (market income plus transfers minus direct taxes).[29]

The marginal contribution has a straightforward policy interpretation because it is equivalent to asking the question: Would inequality be higher, the same, or lower with the tax (or transfer) than without it?[30] It is important to note as well that the notion of marginal contribution is general. That is, it can be applied not only to any inequality indicator but to poverty indicators as well. The basic issue is always the same: one must compare the size of the indicator without the fiscal instrument in place with the indicator that *does* include the latter. One drawback of the marginal contribution in the context of inequality measures is that it does not satisfy the aggregation principle: that is, the sum of the marginal contributions of all the taxes and transfers will not equal—except by accident—the total redistributive effect. At this point, we are ready to give up the aggregation principle in exchange for always obtaining the correct answer as to whether a tax or a transfer exerts an equalizing or unequalizing influence.

1.3 The Wildcard: Reranking of Households

Reranking refers to the phenomenon whereby fiscal interventions arbitrarily alter the relative position of individuals (or households) across the distribution. In other words, reranking occurs if individual A was poorer than individual B before a fiscal intervention, but B is poorer than A after the intervention. The definition of horizontal equity postulates that the prefiscal policy income ranking should be preserved (Duclos and Araar, 2006). In other words, if individual A was poorer than individual B before the fiscal interventions, individual A should continue to be poorer than individual B after the interventions.

In chapter 2, Enami, Lustig, and Aranda reproduce Lambert's formulation and extend it to the case of multiple taxes and transfers. In chapter 3, Enami shows how conditions are affected if taxes and transfers rerank households (when households occupy a different spot in the ranking with prefiscal rather than with postfiscal income). It is important to note that if there is reranking, the *fundamental equation* can no longer be interpreted as a measure of the fiscally induced change in *inequality*. To illustrate, let's think of the hypothetical case in which taxes and transfers cause extreme reranking: that is, households switch places in such a way that the prefiscal richest becomes the postfiscal poorest, the second prefiscal richest becomes the second postfiscal poorest, and so on. In such a situation, the change in inequality will be zero.

[29] Note that if certain fiscal interventions come in bundles (for example, a tax that kicks in only if a certain transfer is in place), the marginal contribution can be calculated for the net tax (or the net benefit) in question.

[30] Or, equivalently, by replacing the existing tax (transfer) by one that is distributionally neutral.

However, the redistributive effect will be positive and equal to the weighted sum described above, but where RE_N, RE_t, and RE_B are the Reynolds-Smolensky indices for the net fiscal system, taxes (only) and benefits (only), respectively.

In other words, reranking introduces the equivalent of a "wildcard": the only way to know if the net fiscal system is equalizing or not is by empirical estimation. One cannot predict whether a net fiscal system is equalizing by relying on the size and progressivity of taxes and transfers. Most if not all fiscal systems in real life feature some degree of reranking of households. The order of magnitude can vary; below we present an indicator to measure reranking and illustrate with examples from existing *CEQ Assessments*. Reranking is interpreted as a measure of fiscally induced horizontal inequality.[31] The more reranking there is, the more horizontal inequity.

It can also be shown that if there is reranking—which as we say is a pervasive feature of net fiscal systems in the real world—making a tax more progressive (vis-à-vis Market Income) can result in an *increase* in postfiscal inequality. Let's go back to Lambert's table 1-1 to illustrate. Make the tax more progressive and see what happens. In Lambert's example, not only do regressive taxes enhance the equalizing effect of transfers, but making taxes more progressive (in other words, more disproportional in the Kakwani sense) would result in higher(!) inequality; any additional change (toward more progressivity) in taxes or transfers would just cause reranking and an increase in inequality.

In other words, reranking destroys the public finance dictum that

> if the combined redistributive impact of tax and spending is progressive then the higher the level of tax and spending in a country the larger is the redistributive impact. Similarly, for a given level of tax and spending, the more revenue collection is concentrated in more redistributive taxes (progressive income taxes) and the more spending is concentrated in more redistributive transfers (well targeted social transfers), the greater the redistributive impact of fiscal policy.[32]

If there is reranking, in order to determine whether a particular intervention (or a particular policy change) is inequality increasing or inequality reducing—and by how much—one must resort to numerical calculations. In particular, one must calculate the inequality indicator that would prevail with and without the specific intervention (or policy change).[33]

---

[31] Duclos and Araar (2006).

[32] Bastagli, Coady, and Gupta (2015, p. 57).

[33] The same applies to poverty indicators or any other indicator of interest. The difficulties are compounded when one wants to compare the impact of net fiscal systems across countries because the original distributions (that is, the income distribution before taxes and transfers) differ. For a discussion comparing systems when the original distribution must be taken into account, see Lambert (2001) and Duclos and Araar (2006).

2 Fiscal Incidence Analysis at a Glance

As stated above, the *CEQ Assessment* relies on state-of-the art fiscal incidence analysis to address the following four questions:

1. How much income redistribution and poverty reduction is being accomplished through fiscal policy?[34]
2. How equalizing and pro-poor are specific taxes and government spending?
3. How effective are taxes and government spending in reducing inequality and poverty?
4. What is the impact of fiscal reforms that change the size and/or progressivity of a particular tax or benefit?

Rooted in the field of Public Finance, fiscal incidence analysis is one of the most commonly used methods to measure the distributional impact of a country's taxes and public spending. Fiscal incidence analysis is designed to measure who bears the burden of taxes and who receives the benefits of government spending—in particular, of social spending—and who are the gainers and losers of particular tax reforms or changes to welfare programs. In practice, fiscal incidence analysis is the method utilized to allocate taxes and public spending to households so that one can compare incomes before taxes and transfers with incomes after them, and calculate the relevant indicators of prefiscal and postfiscal inequality and poverty, among others.

Without attempting to provide an exhaustive literature review here, it is worth mentioning that the tax incidence literature includes a long list of studies going back to the middle of the twentieth century—mainly on the US tax system—starting with the pioneer work of Musgrave and others (1951) and Musgrave (1959), and the Tax Foundation (1960); and, subsequently, by Musgrave, Case, and Leonard (1974), Pechman and Okner (1974), and Pechman (1985). On the expenditure side, early studies on its incidence can be found in Peacock (1954), Gillespie (1965), and the Tax Foundation (1967).[35] These studies, as does our current framework to produce *CEQ Assessments*, belong to the so-called accounting approach to fiscal incidence analysis.[36] That is, they

[34] As stated at the outset, throughout this Handbook, "fiscal policy," "fiscal instruments," "taxes and government spending," "revenue collection and government spending," "taxes and transfers," and "taxes and benefits" are used interchangeably.

[35] To this early work one should add, for example, Meerman (1979) and Selowsky (1979) who analyzed the incidence of public spending in Malaysia and Colombia, respectively. The Tax Foundation (1967) study, actually, looks at both taxes and expenditures. In some tax incidence work, taxes are measured as taxes net of cash transfers.

[36] For more recent descriptions and applications, and discussions on the limitations of standard incidence analysis, see also, for example, Adema and Ladaique (2005); Alleyne and others (2004); Atkinson (1983); Barr (2004); Barros and others (2009); Bastagli, Coady, and Gupta (2015); Bergh

ignore behavioral responses, general equilibrium effects, and intertemporal effects. An alternative to the accounting approach is to model behavioral responses in the incidence analysis. This can be done in a partial equilibrium or general equilibrium framework.[37] Intertemporal effects and lifetime tax incidence can also be done as long as there is the necessary data because results depend critically on the lifetime earnings profile of household members.[38]

As Martinez-Vazquez (2008) and this Handbook forcibly argue, from a policy viewpoint, net fiscal incidence is the relevant equity measure that government authorities need to use in judging particular policies. For instance, an increase in value added taxes (VAT) may be rejected on equity grounds as being regressive, but it may be desirable from an equity standpoint if the resulting revenues are used to finance primary-school services in poor neighborhoods. Taxes may be progressive, but if transfers to the poor are not large enough, they may worsen poverty. However, until the launch of the Commitment to Equity (CEQ) project in 2008, work that analyzed the incidence of both government revenue and spending simultaneously—including net indirect taxes and spending on in-kind services—was less common. Since the CEQ project has developed, this has changed quite strikingly, as evidenced by the publication of the ten country studies included in the Applications (part III) of this Handbook as well as in the following publications: Alam, Inchauste, and Serajuddin (2017); Arunatilake, Inchauste, and Lustig (2017); Bucheli and others (2014); Cabrera, Lustig, and Moran (2015); Cancho and Bondarenko (2017); Higgins and Lustig (2016); Higgins and Pereira (2014); Higgins and others (2016); Hill and others (2017); Inchauste and Lustig (2017); Inchauste and others (2017); Jaramillo (2014); Jellema, Wai-Poi, and Afkar (2017);

(2005); Birdsall, de la Torre, and Menezes (2008); Bourguignon and Pereira da Silva (2003); Breceda, Rigolini, and Saavedra (2008); Dilnot, Kay, and Keen (1990); Ferreira and Robalino (2010); Fiszbein and others (2009); Goñi, Lopez, and Serven (2011); Grosh and others (2008); Gupta and others (2015); Kakwani (1977); Lambert (2001); Lora (2006); Martinez-Vazquez (2008); Morra Imas and Rist (2009); O'Donnell and others (2008); Bibi and Duclos (2010); Shah (2003); Suits (1977); van de Walle (1992); van de Walle and Nead (1995); World Bank (2000/2001, 2006, 2009, 2011). The readings mentioned in the above paragraph or other sections of this chapter (including footnotes) are neither meant to be an exhaustive list nor represent the history of thought in fiscal incidence analysis. The cited readings are meant to give the reader a sample of references to early work on fiscal incidence analysis as well as of its evolution.

[37] For partial equilibrium analysis, see, for example, Coady (2006); Gertler and Glewwe (1990); Gertler and van der Gaag (1990); McClure (1970); Mieszkowski (1967); Musgrave (1959); Ravallion and Chen (2015); Rolph (1954); van de Walle (1998 and 2004); and Younger and others (1999). An example of fiscal incidence analysis in a general equilibrium framework is the article by Devarajan and Hossain (1998) for the Philippines. For estimates of the spillover effects of cash transfer programs, see Barrientos and Sabates-Wheeler (2009); Angelucci and De Giorgi (2009). There are other spillover effects through the externalities that a better educated and healthier population generates on society as a whole.

[38] See, for example, the fiscal incidence analysis in an intertemporal setting for the United States by Fullerton and Rogers (1991) and Slemrod (1992).

Lopez-Calva and others (2017); Lustig (2015, 2016); Lustig, Pessino, and Scott (2014); Paz Arauco and others (2014); Scott (2014); Younger and Khachatryan (2017); Younger, Myamba, and Mdadila (2016); and Younger, Osei-Assibey, and Oppong (2017), as well as the CEQ Working Paper series available at www.ceqinstitute.org.

As stated above, fiscal incidence analysis is used to assess the distributional impact of a country's taxes, transfers, and subsidies. Essentially, fiscal incidence analysis consists of allocating taxes (for example, personal income tax, payroll taxes, other direct taxes such as property taxes, VAT, sales taxes, and excise taxes) and public spending (for example, cash transfers, education, health, and housing spending, and consumption subsidies) to households so that one can compare incomes before taxes and transfers (prefiscal income) with incomes after taxes, transfers, and subsidies (postfiscal income).[39] "Transfers" in CEQ language refer to both cash transfers and near cash transfers such as school breakfasts and uniforms, as well as benefits in kind such as free government services in education and healthcare.[40] In addition to assessing the impact of fiscal policy on the personal distribution of income, one may be interested in how taxes and transfers affect the welfare of different morally or institutionally relevant social groups such as groups of individuals differentiated by gender, ethnicity, or location.

Usually, fiscal incidence analysis looks only at what is paid and what is received without assessing the behavioral responses that taxes and public spending may trigger on individuals or households. This is often referred to as the "accounting" approach. Put simply, the accounting approach consists of starting from an income concept and, depending on the fiscal intervention under study, allocating the proper amount of a tax or a transfer to each household or individual. If the fiscal intervention is a direct tax (transfer) and one starts the analysis from pretax (pre-transfer) income, the post-tax (post-transfer) income is calculated by subtracting (adding) the tax paid (transfer received).

More formally, define the before taxes and transfers income of household h as I_h and taxes as T_i (where i refers to the range of taxes whose incidence is being analyzed) and transfers or benefits B_j (where j refers to the range of transfers whose incidence is being analyzed); define the "allocator" of tax i to household h as S_{ih} (or the share of net tax i borne by unit h); then, post-tax income of household h can be defined as Y_h:

$$Y_h = I_h - \Sigma_i \, T_i S_{ih} + \Sigma_j \, B_j S_{jh}$$

Although the theory is quite straightforward, its application can be fraught with complications. Most of these arise because actual incidence can be quite different from statutory incidence (for example, due to tax evasion), and the data to calculate the actual incidence is usually incomplete or absent. Part II in this Handbook is dedicated to explaining how to carry out incidence analysis in practice and complete a *CEQ Assessment* using the *CEQ Master Workbook* as the repository of "input" data and results.

[39] In addition to the studies cited here and other studies in www.commitmentoequity.org, see, for example, Förster and Whiteford (2009), Immervoll and Richardson (2011), and OECD (2011).

[40] "Transfers" in this Handbook are also called "benefits" and "government spending."

The chapters also provide detailed recommendations on how to address a wide range of challenges stemming from lack of information and measurement error.

Fiscal incidence analysis can be partial or comprehensive. Partial fiscal incidence analysis assesses the impact of one or several fiscal policy interventions: for example, income taxes or use of public education and health services. Comprehensive fiscal incidence analysis assesses the impact of the revenue and spending sides simultaneously: namely, the impact of direct and indirect taxes, cash and in-kind transfers, and indirect subsidies. Incidence analysis can use income or consumption (per capita or equivalized) to measure household welfare. Additionally, there is point-in-time versus lifetime fiscal incidence analysis. The analysis can assess a current system or estimate the potential or actual effects of particular reforms. It can use the statutory incidence or the actual one (include tax evasion or less than full take-up of a cash transfer, for example). It can make different tax-shifting assumptions and about the value of in-kind benefits. The analysis can assess the average incidence of a tax or benefit, or it can assess the incidence on the margin, the distribution of an increase in the spending of public education to increase primary enrollment.

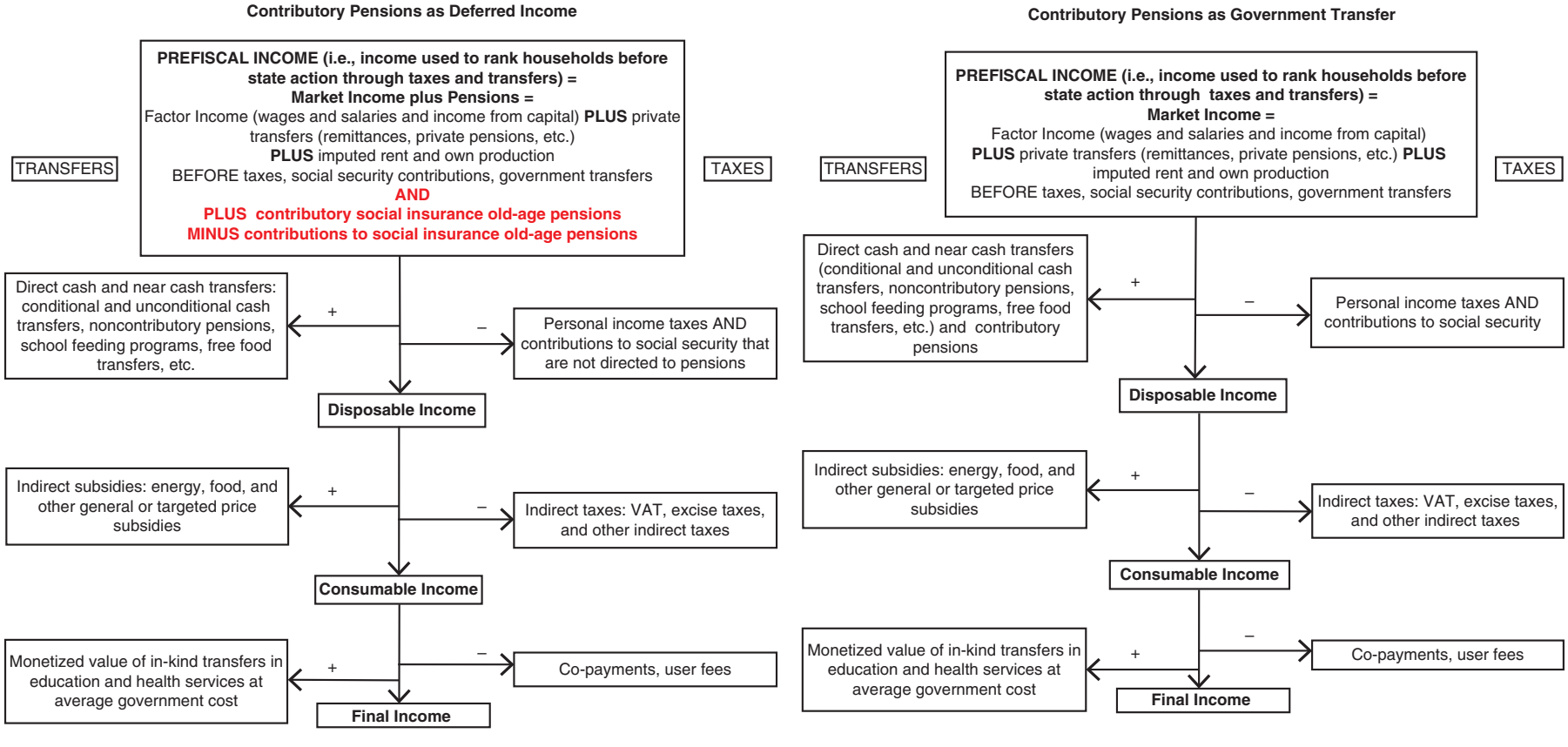
In terms of data, incidence studies use microdata from household surveys combined with budget data from fiscal accounts and other administrative registries. Since in practice surveys will not include information on every tax paid or transfer received (or, if the information exists, it may be inaccurate), that information must be generated in a consistent and methodologically sound way. Frequently, the information will have to be generated using a variety of assumptions to check the sensitivity of the results to assumptions that cannot be externally validated.

2.1 Allocating Taxes and Transfers to Individuals: The Art of Fiscal Incidence Analysis

As stated above, fiscal incidence analysis consists of allocating taxes (personal income tax and consumption taxes, in particular) and public spending (social spending and consumption subsidies, in particular) to households or individuals so that one can compare incomes before taxes and transfers with incomes after taxes and transfers. Transfers include both cash transfers and benefits in kind, such as free government services in education and healthcare. Transfers also include consumption subsidies such as food, electricity, and fuel subsidies. The building block of fiscal incidence analysis is the construction of income concepts. That is, starting from prefiscal income, Market Income (mainly, income from labor and capital and private transfers), each new income concept is constructed by adding another element of the fiscal system to the previous one. For example, Disposable Income subtracts direct personal income taxes and adds cash transfers to Market Income, Consumable Income subtracts indirect taxes and adds subsidies to Disposable Income, and Final Income adds government spending on education and health to Consumable Income (see figure 1-1). As discussed below, social insurance contributory pensions are partly deferred income and

FIGURE 1-1

Income Concepts under the Two Scenarios in *CEQ Assessments*: Pensions as Deferred Income (PDI) and Pensions as Government Transfer (PGT)



therefore should have a portion of them added to Market Income (and contributions subtracted from factor income); and partly government transfer and therefore a portion of them should be included with the rest of government transfers (and contributions treated as any other direct tax). However, since at this point there is no conventional method to determine which portion should be allocated to Market Income and which to government transfers when the only information available is a cross-section household survey, this Handbook recommends calculating the impact of the net fiscal system under the two extreme scenarios: (1) contributory pensions are pure deferred income (also known as replacement income) and (2) contributory pensions are a pure government transfer.

The basic incidence analysis used in *CEQ Assessments* is point-in-time rather than lifecycle and does not incorporate behavioral or general equilibrium modeling. That is, we do not claim that the prefiscal income obtained from this exercise equals the true counterfactual income in the absence of taxes and transfers. It is a first-order approximation (and in a variety of settings a first-order approximation is all one may need).[41] Despite being a standard incidence analysis that does not incorporate second-round or general equilibrium effects, the analysis is not a mechanically applied accounting exercise. We analyze the incidence of taxes by their (assumed) economic rather than their statutory incidence. For instance, we assume that individual income taxes and contributions (both by employee and employer) are borne by labor in the formal sector and that consumption taxes (on both final goods and inputs, using input-output tables for the latter) are fully shifted forward to consumers. This is equivalent to assuming that the supply of labor and demand for goods and services are perfectly inelastic.[42] In the case of consumption taxes, furthermore, we take into account the lower incidence associated with own-consumption (i.e., direct consumption of goods and services produced by the household such as corn products cooked from corn grown by peasant households) and tax evasion due to informality (i.e., employees or self-employed who are not registered in the administrative system and do not pay taxes or contributions to the social security system). Old-age contributory pensions are not automatically assumed to always be a government transfer, a subject that is discussed in more detail below.

[41] Coady and others, for instance, state, "The first order estimate is much easier to calculate, provides a bound on the real-income effect, and is likely to closely approximate a more sophisticated estimate. Finally, since one expects that short-run substitution elasticities are smaller than long-run elasticities, the first-order estimate will be a better approximation of the short-run welfare impact" (Coady and others, 2006, p. 9).

[42] The economic incidence, strictly speaking, depends on the elasticity of demand and/or supply of a factor or a good, and the ensuing general equilibrium effects. In essence, the accounting approach implicitly assumes zero demand price and labor supply elasticities, and zero elasticities of substitution among inputs, which may not be far-fetched assumptions for analyzing effects in the short-run, especially when changes are small.

Despite the fact that the *CEQ Assessments* do not model behavioral, lifecycle, or general equilibrium effects, the method and resulting studies are among the most comprehensive and comparable tax-benefit incidence analyses available for middle-income and low-income countries to date.

We attempt to cover a very broad spectrum of taxes and government spending. Taxes include personal income and payroll taxes, other direct taxes such as property taxes, and consumption taxes. Spending on public goods such as defense and corporate taxes and subsidies are not included in *CEQ Assessments* (at least, not at this point).

Spending covers direct cash and near–cash direct transfers, indirect subsidies (especially on food, housing, energy, and agricultural inputs), and benefits from public spending on education and health. Throughout the Handbook, we refer to "transfers," "benefits," and "social spending" interchangeably; "transfers" is intended to include indirect subsidies (which includes housing subsidies) and in-kind benefits from public spending on education and health.

As a rule, if taxes and transfers are explicitly available in the surveys, one should use this information unless there are reasons to believe that it is not reliable. However, the information on direct and indirect taxes, transfers in cash and in-kind, and subsidies is often not collected in household surveys. In order to allocate the benefits of transfers and burden of taxation to individuals included in the household surveys, the *CEQ Assessments* make use of administrative data on revenues and government expenditures as well as knowledge about how the tax and transfer programs work, and allocate these taxes and transfers following methods that are described below. Thus, one of the most important aspects of CEQ is a detailed description of how each component of income is calculated (for example, directly identified in the survey or simulated) and the methodological assumptions that are made while calculating it. In many cases, the authors must choose a method based on the institutional structure of the country and the data available. CEQ relies on local experts as a crucial part of the research team for precisely this reason. In many cases, the researcher must exercise judgment based on his or her knowledge of the country's institutions, spending, and revenue collection, as well as on the availability and quality of the data. It is of the utmost importance to always describe what method was used for a particular tax or transfer, the reasoning for using this method, and—whenever possible—the sensitivity of the results to using alternative methods.

When taxes and transfers can be obtained directly from the household survey, we call this the "direct identification method." When the direct identification method is not feasible, there are several options—namely, *inference*, *imputation*, *simulation*, and *prediction*, which are described in detail in chapter 6. If the primary survey being used for the *CEQ Assessment* does not have the necessary information, these methods can be used in an alternate survey, then benefits or taxes can be matched back into the main survey. As a last resort, one can use secondary sources: for example, incidence or concentration shares by quintiles or deciles that have been calculated by other authors. Finally, if none of these options can be used for a specific category, the analysis for that category will have to be left blank.

One of the biggest challenges for the *CEQ Assessments* has to do with how to treat the differences in scale and structure between survey-based values and administrative registries. The causes for these differences are multiple including differences in definitions, but most prominently measurement errors due to under-reporting of certain income categories (for example, income from capital) and under-sampling of the rich in the surveys and measurement errors in national accounts. Whatever the cause, the overriding principle followed in the CEQ is that—unless there are good reasons not to—the information in the surveys is taken as valid and given precedence over and above the information from administrative registries. However, whenever the team has sufficient evidence to believe that totals in the survey are less credible than those in administrative registries, the latter should be used and the rationale properly documented (more on this in chapter 6).

CEQ is not the only methodological framework for applying fiscal incidence analysis. EUROMOD, based in the University of Essex, and LATAX, a multi-country flexible tax microsimulation model housed in the Institute of Fiscal Studies, are two alternatives. Their characteristics are described in appendixes to chapter 6.

Because the process of allocating taxes and transfers relies on assumptions that one cannot truly test or uses definitions for which there is no overriding consensus, it is recommended that robustness checks be carried out to assess the reliability of results. For example, use consumption instead of income, use equivalized income instead of per capita income, change assumptions about tax evasion or program take-up, assume ratios of taxes and transfers to Disposable Income are the same in the surveys as in national accounts, and so on.

2.2 Old-Age Social Insurance Contributory Pensions: A Government Transfer or Deferred Income?

In assessing the extent to which there is fiscal redistribution, it is important to be able to distinguish fiscal redistribution in a cross-section versus fiscal redistribution over the life-cycle (that is, to take into account the redistribution that takes place for the same individual as she or he faces different circumstances). Although this distinction, in theory, affects several fiscal interventions (such as contributory health and unemployment compensation), the assumptions made about pensions has perhaps the most significant consequences in terms of the order of magnitude of redistribution. The treatment of pensions from government-sponsored social insurance compulsory pension schemes (henceforth, contributory pensions) poses a particular challenge. Should contributions be treated as a tax or a form of "forced saving"? Should income from contributory pensions be treated as a government transfer or deferred income (consumption)? This decision can have a significant impact on assessing the redistributive power of a fiscal system especially in countries with a high proportion of retirees and large spending on social security. See, for example, discussion in chapter 10 of this Handbook of the large difference in the size of the redistributive effect observed for

countries in the European Union, the United States, Argentina, Russia, and other countries in which the old-age social insurance pension system covers a large proportion of workers and the retirement age population is relatively high.

In the incidence analysis literature, one can find both approaches: in some cases contributory pensions are considered deferred income,[43] while in others—especially in systems with a large subsidized component—they are considered a pure government transfer.[44] We believe that treating income from contributory pensions as a pure transfer is misleading. In populations with a large proportion of retirees, Market Income will be zero or close to zero for a large number of individuals. The fiscally induced inequality and poverty reduction will be overestimated because the system will feature many "false poor." To make this point clearer, let's assume a pensioner had been earning a high wage during her working years and that, privately, she could have saved enough so that at the time of retirement, her pension would have been at an x percent replacement ratio. Let's assume that instead she receives a pension from the social security system and that this is her only income. If her pension is treated as a pure government transfer, she will have been ranked among high wage–earners during her working years and fall to the prefiscal destitute poor during retirement. This does not make sense. Part or all of her pension would be the equivalent of what she would have earned from saving the equivalent of her contributions in a private scheme. Also, although any government tax or transfer might generate behavioral changes,[45] social security is special in the sense that it is a lifelong contract between a working individual and society. Although a conditional cash transfer (CCT) or other cash transfer will likely induce some behavioral changes, not having a government-sponsored retirement plan would generate major behavioral changes in a significant part of the population.

Some may argue that in the absence of a government-sponsored program, individuals would not save enough for their old age and could become much poorer, and so treating pensions as a transfer makes sense. However, the government's role could be just that of a "piggy bank"[46] forcing individuals to save during their working years to ensure an income stream during retirement. Accordingly, many countries place social security in a separate budget, protected from the politics governing other public expenditures.

Thus, as long as there is a government-sponsored old-age pension system with a mandatory savings component during individuals' working years, pensions should not be treated as a pure government transfer (at least, not in full). Independently of whether a system is fully funded or pay-as-you-go, or whether it is a defined benefit or defined

[43] Alvaredo and others (2015); Breceda, Rigolini, and Saavedra (2008); Immervoll and others (2009).
[44] Goñi, Lopez, and Serven (2011); Immervoll and others (2009); Lindert, Skoufias, and Shapiro (2006); Silveira and others (2011).
[45] Bosch and Campos-Vazquez (2014); Camacho, Conover, and Hoyos (2014); Garganta and Gasparini (2015).
[46] Barr (2001).

contributions system,[47] the redistribution and transfer components of a pension from a government-sponsored system have to be calculated against what would have happened if the contributions had been placed in an interest-bearing individual account whose accrued assets would be used to finance consumption during retirement years through an annuity or in some other way. In addition, to be consistent, contributions have to be treated as "forced savings" and not a tax, to avoid double counting of this income (when it is earned as labor income and then later as retirement income).[48]

Let us illustrate with a simple set of formulas. Let us assume that there are only two types of individuals: working and retired. Given that we need to develop a framework that can be applied to cross-section household surveys, the individual during working years and the individual during retirement are not the same in the following.

Let us define:

Y_f = factor income during working years (grossed up for employer contributions to pensions)

s = rate of contributions to contributory pensions (as a proportion of factor income) during working period made by worker and employer (we assume that employer shifts contributions to the worker in the form of lower wages).[49] For simplicity and more easily interpreted formulas, we assume the interest rate r = 0, so the return to saving is denoted sY_f.[50]

$Y_m = (1-s)Y_f + Y_o$ = Market Income during working years, where Y_o = other income during working years (for example, private transfers, remittances, and alimony)

Y = Disposable Income during working years

Y′ = Disposable Income during retirement which is equal to pensions plus any other income. (Here we assume that other sources of income—e.g., remittances—except for other government transfers, are zero for simplicity.)

C = consumption during working years

C′ = consumption during retirement

ω = proportion of deficit in the pension system allocated to each pensioner

[47] See, for example, Barr (2012) for a description of pension systems.

[48] It is important to note that here we are ignoring within-system redistribution (i.e., from pensioners who receive less than what the private sector annuity counterfactual would yield to those who receive more but where this difference is funded from the savings obtained from those who receive less).

[49] See, for example, Melguizo and Gonzalez-Paramo (2013).

[50] If the interest rate were not equal to zero, the income from pensions would be equal to $(1+r)sY_f$, which is the annuity (or some other payment form) that would have been generated by the contributions sY_f made by the retirees over their lifetime and the returns rsY_f (with "r" equal to the interest rate) on those contributions in a purely private system.

B, B′ = direct transfers during working years, direct transfers during retirement (these are other direct transfers during retirement, different from the transfers due to within-system redistribution or those that emanate from the deficit of the social security system)

T, T′ = direct taxes during working years (these taxes do not include contributions to the old-age pensions of the social security system), direct taxes during retirement (these taxes are unrelated to the within-system redistribution of the social security system)

In *CEQ Assessments* we have decided to do the following. In household surveys, we usually construct Disposable Income (in income-based surveys) or private consumption (in consumption-based surveys). In the "pensions as deferred income" scenario, we assume that contributions during working years are a form of "forced saving" and define the prefiscal income as factor income plus private transfers AND plus income from contributory old-age public pensions LESS contributions to the old-age public pension systems (see figure 1-1). This way one avoids double counting since this saving is treated as income/consumption during retirement. Note that in the income-based scenario, the "double-counting" problem does not occur with other forms of savings since we do not include dissaving (either through selling of assets, withdrawing from savings, or borrowing) as part of income. In the consumption-based scenario, although dissaving is implicit in observed consumption, so is saving; thus, there is no double-counting issue either. This is so because observed consumption, by definition, will be equal to the portion of income consumed during the period plus dissaving (amounts borrowed or withdrawn from bank accounts, or revenues from selling of assets) minus saving.

During retirement, income from contributory pensions are assumed to be equal to the private saving counterfactual, and thus in the "pensions as deferred income" scenario, contributory pensions are considered part of prefiscal income and, thus, added to Market Income (independently of whether contributory pensions are subject to taxation or not). If the only income a retiree receives is income from contributory pensions, then Y′ (Disposable Income) is implicitly assumed to be equal to sY_f minus any taxes paid on contributory pensions plus any other transfers. In other words, Market Income is Disposable Income plus any taxes paid on contributory pensions, if such taxation exists, minus government transfers. In pensions' jargon, this scenario is equivalent to assuming a fully funded defined contributions system.

Table 1-2 summarizes CEQ practice in the case in which contributory pensions are considered deferred income. We call this Scenario 1.[51] For simplicity, here and in all the scenarios below, we assume that there are no retirees in the household during working years and that there are no working members in the household during retirement.

[51] In the previous version of the Handbook (Lustig and Higgins, 2013), scenario 1 was called the "benchmark case."

TABLE 1-2
Scenario 1 in *CEQ Assessments*

	Factor income	Contributions to old-age social security system (forced saving)	Market income	Tax	Transfer	Disposable income
				Income-based scenario		
Working	Y_f	sY_f	$Y_m = (1-s)Y_f + Y_o$	T	B	$Y = Y_m - T + B$
Retirement	0	0	sY_f	T′	B′	$Y' = sY_f - T' + B'$
				Consumption-based scenario		
Working	Y_f	sY_f	$C + T - B$	T	B	C
Retirement	0	0	$C' + T' - B'$	T′	B′	C′

Note: Pensions are treated as deferred income and contributions as forced saving.

However, in practice, we take into account the fact that—especially in developing countries—households will be frequently composed of both working members and retirees.

Comparing the Market Income of the working and retired in table 1-2, it is obvious why Market Income should be net of contributions to contributory pensions in the pensions as deferred income scenario: otherwise, sY_f would be double counted as part of the working individual's Market Income as well as part of the retired individual's Market Income. When reading the results for the consumption-based scenario, it is useful to read the table "backwards" by beginning at Disposable Income, then subtracting out benefits and adding taxes (the opposite of the usual operation of adding benefits and subtracting taxes) to arrive at Market Income, etc.

A hybrid scenario—relevant when the contributory pension system is in deficit and part of pensions are funded out of general revenue—is to assume that a portion of pensions are deferred income and a portion are a government transfer. In this scenario, we still assume that contributions are a form of "forced saving" during working years. Hence, *all* income concepts—including Market Income plus Pensions—are net of the contribution. This again avoids the double-counting issue. We allocate the portion of contributory pensions represented by the system's deficit to each individual receiving a contributory pension during retirement, proportionally to his or her observed pension income. Since pension income equals the gross returns to saving during working years, the portion of the pension considered a transfer is equal to ωsY_f, where ω is the portion of the contributory pension system funded by deficit spending. In other words, if D equals the deficit of old-age pensions system, i.e., total spending on social security old-age pensions less total revenues from contributions to contributory pensions in the year of the survey, then ω equals D divided by total spending on social security old-age pensions in the year of the survey.[52] Since in most consumption-only surveys we do not know how much of the income comes from pensions, and since many households are made up in practice of some retired individuals and some nonretired ones (so we cannot just set the proportion of the pension that is a transfer as $\omega C'$), we attempt to estimate pension income. For example, in the *CEQ Assessment* for Indonesia, sY_f was estimated as follows. Individuals potentially making contributions to (as well as those potentially receiving income from) the pension system were identified using individual characteristics such as relationship to household head, age, education, sector of work, and, most important, participation in other benefit schemes for civil servants. Contribution and benefit amounts were estimated using parameters from an imputed wage regression carried out in a secondary labor force survey.[53]

Table 1-3 summarizes CEQ practice in the scenario where a portion of pensions are considered as deferred income and a portion as a government transfer because

[52] Note that one might also want to use the actuarial deficit rather than the actual one if an estimate is available.

[53] Jellema, Wai-Poi, and Afkar (2017).

TABLE 1-3
Scenario 2 in *CEQ Assessments*

	Factor income	Contributions to old-age social security system (forced saving)	Market income	Tax	Transfer	Disposable income
				Income-based scenario		
Working	Y_f	sY_f	$Y_m = (1-s)Y_f + Y_o$	T	B	$Y = Y_m - T + B$
Retirement	0	0	$(1-\omega)sY_f$	T'	$B' + \omega\, sY_f$	$Y' = sY_f - T' + B'$
				Consumption-based scenario		
Working	Y_f	sY_f	$C + T - B$	T	B	C
Retirement	0	0	$C' + T' - B' - \omega\, sY_f$	T'	$B' + \omega\, sY_f$	C'

Note: Pensions are treated as partially deferred income and partially a government transfer; contributions as forced saving.

is a deficit in the social security system in the year of the survey. We call this Scenario 2.

In order to compare the results of a *CEQ Assessment* with exercises in which people assumed that contributions are a tax and pensions are a pure transfer, we suggest calculating such a scenario in the *CEQ Assessment* as well. In this extreme case, Market Income for pensioners equals zero or other income if there is one, and the transfer equals the entire pension.[54] Contributions paid during the year of the survey are equal to sY_f and are treated as a pure tax.[55] Table 1-4 summarizes the CEQ practice when contributory pensions are considered a pure government transfer and contributions a pure tax. We call this Scenario 3.

Note that in all three scenarios, Disposable Income is identical.

It is important to note that the above formulations do not calculate the within-system redistribution. If there is within-system redistribution, people are implicitly taxed, or receive a transfer, at the time of retirement. If their pension is below what they would have received had the contributions been privately saved at the market expected return, the difference is the tax; in contrast, for the retirees whose pension is above what they would have received in the private savings counterfactual, the difference is a transfer. In a system that is actuarially fair, this tax and transfer process occurs implicitly. In a system that is actuarially fair at the system level as well as at the level of each individual, there is neither redistribution within the system nor from other revenue sources. This would be, in the social security systems' jargon, equivalent to a fully funded defined contribution system. However, if the system is not actuarially fair, in addition to within-system redistribution, there is a redistribution process that takes place when government revenues (for example, taxes) are used to finance the deficit of the social security system. This corresponds to our Scenario 2. Ideally, one would like to be able to estimate the within-system redistribution. In practice, however, it is quite challenging to calculate the annualized income that would correspond to the accumulated contributions and their respective return in the private saving counterfactual from cross-section household surveys since one does not know either the history of contributions of individuals who are receiving a pension at the time of the survey or their life expectancy. The CEQ Institute is working on developing a methodology that would allow one to do just that.

It is also important to note that the formulations under Scenarios 2 and 3 do not calculate the implicit tax burden on future generations for the case in which the social security deficit is financed not by current taxes but through debt.

---

[54] In the previous version of the Handbook (Lustig and Higgins, 2013), Scenario 3 was called the "sensitivity analysis scenario."

[55] This scenario should not be viewed as a special case of the general framework developed above, but rather a scenario we construct to compare with the typical assumptions made in other exercises (for example, EUROMOD). As such, it is inconsistent (on purpose) with the general framework in which contributions are deferred income even if a portion of the transfer is subsidized, since this scenario is based on a different conceptualization.

TABLE 1-4
Scenario 3 in *CEQ Assessments*

	Factor income	Contributions to old-age social security system (forced saving)	Market income	Tax	Transfer	Disposable income
				Income-based scenario		
Working	Y_f	0	$Y_m = Y_f + Y_o$	$T + sY_f$	B	$Y = Y_m - T - sY_f + B$
Retirement	0	0	0	T	$B + sY_f$	$Y' = sY_f - T' + B'$
				Consumption-based scenario		
Working	Y_f	0	$C + T + sY_f - B$	$T + sY_f$	B	C
Retirement	0	0	$C' + T' - B' - sY_f$	T	$B + sY_f$	C'

Note: Pensions are treated as a government transfer and contributions as a tax.

Another clarification worth making is that if pensions of public servants have a component that is a transfer (i.e., non-contributory; whether partial or in full), this does not immediately mean that they should be treated as a pure transfer; this depends on whether pension income is part of the labor contract of public servants. For example, if the public servants' remuneration in the private sector during the working years would have been higher but their pension benefits lower or more subject to uncertainty, this would be the case in which pensions—although in the government's bookkeeping might appear as a transfer—are actually a component of wages of public employees, a component that is paid at retirement.

Summing-up, in CEQ we propose running three scenarios:

1. A scenario in which old-age contributory public pensions are treated as pure deferred income. We call this scenario "pensions as deferred income," or PDI. In the PDI scenario, the income from these pensions is added to factor income to generate the prefiscal income AND contributions to old-age contributory pensions are subtracted from factor income. In the PDI scenario, the prefiscal income (that is, the starting income concept by which households are ranked to calculate the incidence of taxes and transfers) is called "Market Income plus Pensions."
2. A scenario in which a portion of the old-age contributory public pension is treated as deferred income, and a portion as a government transfer. The fraction that will be treated as a government transfer is equal to the size of the deficit of the pension system.
3. A scenario in which old-age contributory public pensions are treated as a pure government transfer. We call this scenario "pensions as government transfer," or PGT. In the PGT scenario, the income from these pensions is added to the rest of government cash transfers AND contributions to old-age contributory pensions are added to direct taxes. In the PGT scenario, the prefiscal income (that is, the starting income concept by which households are ranked to calculate the incidence of taxes and transfers) is called "Market Income."

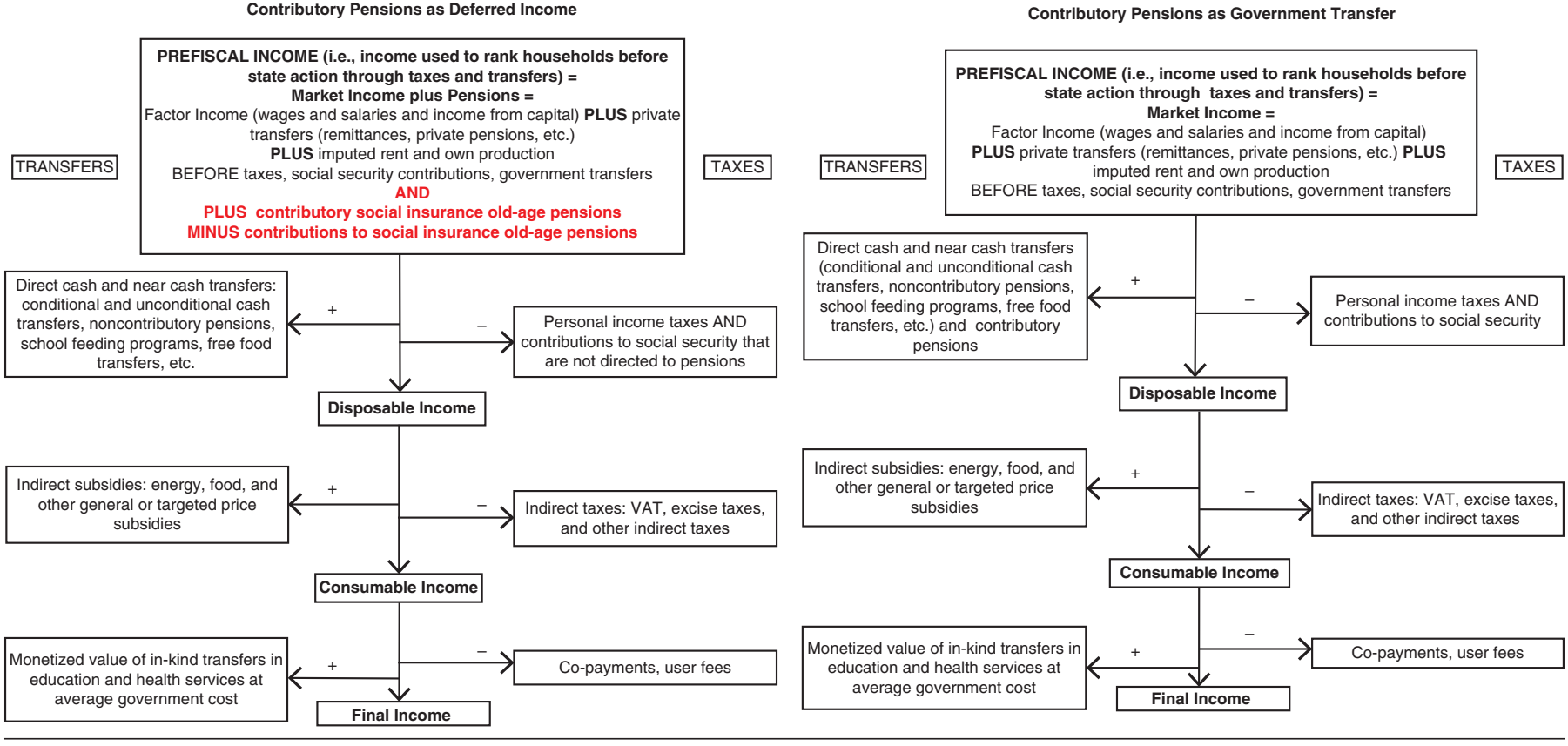
The income concepts for the two scenarios are presented in figure 1-1, which was shown earlier in the chapter but for the readers' convenience is repeated again on page 30.

2.3 Policy Simulations

The CEQ Handbook describes how to estimate the distributional impact of a system of taxes, cash transfers, and in-kind services using microdata. Once this is done for the existing public finance system, one might want to explore further issues to get a fuller understanding of the impacts of tax and spending policy, as well as the opportunities and risks of policy change. What is the impact of a particular set of reforms to the system on the incomes and spending power of different types of households and on the government's revenue or spending? What about the potential behavioral impacts of

FIGURE 1-1

Income Concepts under the Two Scenarios in *CEQ Assessments*: Pensions as Deferred Income (PDI) and Pensions as Government Transfer (PGT)



the existing system or of reforms to it? These are the kinds of issues that are typically examined using tax-and-transfer microsimulation models. There are several different types of model, which vary in the types of impact they can be used to assess.[56] Policy simulations in CEQ are done "manually." See chapter 16 by Stephen D. Younger on how one can use CEQ to simulate the elimination of energy subsidies in Ghana and Tanzania and the impact of compensatory cash transfers.

2.4 Caveats: No Behavioral Responses, No Intertemporal Effects, and No Spillover Effects

At this point, CEQ considers only first-order effects (also known as "partial equilibrium analysis"). We do not account for behavioral or general equilibrium effects, although it is worth noting that our economic incidence assumptions (for example, on who bears the burden of payroll or consumption taxes) are based on general equilibrium theory. In essence, one assumes zero demand price and labor supply elasticities and zero elasticities of substitution among inputs, which may not be farfetched assumptions for analyzing effects in the short run. "The first order estimate is much easier to calculate, provides a bound on the real-income effect, and is likely to closely approximate a more sophisticated estimate. Finally, since one expects that short-run substitution elasticities are smaller than long-run elasticities, the first-order estimate will be a better approximation of the short-run welfare impact."[57] Box 1-1 provides more detail on the accuracy of these first-order approximations. In some contexts, behavioral responses can be quite significant, so results based on first-order approximation must be taken with great caution.[58]

It is important to note that the first-order effects *do* take into account both the direct effects of indirect taxes and subsidies and the indirect effects on final goods' prices of indirect taxes/subsidies applied to inputs. For the latter, one uses input-output matrices, described in chapter 7 in this Handbook.[59] Indirect effects should not be confused with general equilibrium effects because the indirect effects measured with input-output tables still do not incorporate behavioral responses to changes in relative prices.

If a team decides to depart from partial equilibrium analysis, the decision should be carefully explained and the exercise done as an additional sensitivity analysis so that

[56] Two salient examples are EUROMOD and LATAX, descriptions of which are presented in chapter 6 of this Handbook. See also Bourguignon and Pereira da Silva (2003), Bourguignon and Spadaro (2006), and Urzua (2012). For further information on the different types of model that can be developed, and the data requirements for each of these, see O'Donoghue (2014, chaps. 1–9).

[57] Coady and others (2006, p. 9).

[58] Ravallion and Chen (2015).

[59] Jellema and Inchauste (2018).

Box 1-1

Ignoring Behavioral Responses to Tax and Expenditure Policies

Stephen D. Younger

Many incidence analyses, including standard CEQ analyses, ignore households' behavioral responses to taxes and expenditures. This greatly simplifies the analysis as it obviates the need for demand estimation, but it may also prove to be misleading. As it turns out, the estimate of a tax's cost or an expenditure's benefit used in the simple approach of a standard incidence analysis is usually a first-order approximation to the true cost or benefit. The question of how misleading this analysis is then boils down to asking: How good is a first-order approximation?

Consider an *ad valorem* indirect tax of t percent. In competitive markets, this will raise the price of the good(s) taxed by t percent. A standard measure of the cost of such a tax to consumers is the compensating variation: the amount of additional expenditure a consumer would need to keep her utility constant in the face of the price increase:

$$CV = e(p^1, u^0) - e(p^0, u^0) = \int_{p_0}^{p_1} x^c(p, u^0)dp$$

where $e(\ )$ is the expenditure function; p^1 is a vector of prices inclusive of the tax, which is what we usually observe; p^0 is a vector of prices without the tax; u is utility; and x^c is the compensated demand function. The second equality shows that the compensating variation is equal to the area under the compensated demand curve. If we take a Taylor expansion of this function around p^1 and allow all prices to vary with the tax, we have:

$$CV \approx \sum_i x_i^c(p^1, u^0)\Delta p_i + \frac{1}{2}\sum_i\sum_j \frac{\partial x_i^c(p^1, u^0)}{\partial p_j}\Delta p_i \Delta p_j + \cdots$$

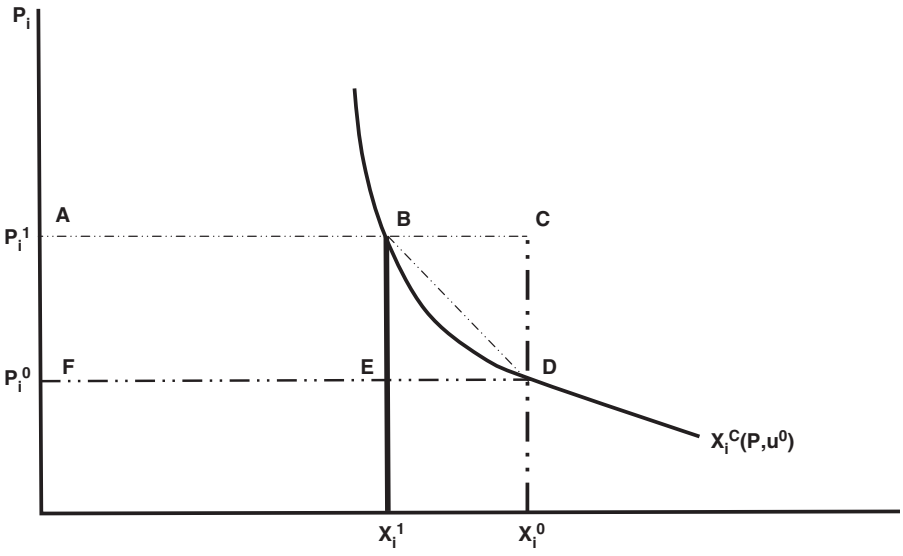
If we limit our interest to the change in one price only, this reduces to:

$$CV \approx x_i^c(p^1, u^0)\Delta p_i + \frac{1}{2}\frac{\partial x_i^c(p^1, u^0)}{\partial p_i} * \Delta p_i^2 + \cdots$$

The first term of the expansion is what a standard incidence analysis uses to estimate the cost of a tax to consumers: the ex post quantity consumed times the difference in prices, which is the tax rate. The second term is a linear approximation of the behavioral response—the change in (compensated) demand induced by the price change. Higher-order terms approximate any nonlinearity in the demand function. The accuracy of standard incidence methods thus depends on the size of the higher-order terms.

A figure can help assess this accuracy. The figure below shows the compensating variation for a single tax on good i, which is the area to the left of the

FIGURE B1-1
Variation for a Single Tax on Good i



demand curve from P_i^0 to P_i^1. The first-order approximation is area ABEF. The second-order term is BDE. And higher-order terms capture the eye-shaped area between the demand curve and the line segment BD.

The first-order approximation captures the largest share of the compensating variation, as it should. It is straightforward to show that the ratio of the second-order term to the first-order increases with the size of the price change and the demand elasticity. That is, the first-order approximation is more accurate for smaller price changes and for more inelastic demands.

It is worth noting that many of the tax and expenditure policies that a typical incidence analysis evaluates do in fact have inelastic demands: VAT taxes all consumption; income tax falls on labor supply; excises are often levied on products with inelastic demand like petroleum or tobacco. On the expenditure side, demands for the health and education services governments provide are often inelastic. All of this suggests that the first-order approximations to the compensating variation are adequate. On the other hand, the price changes tend to be non-marginal.

there still exists a standard *CEQ Assessment* (without behavioral responses or general equilibrium effects) to allow results to be compared with those for other countries.[60]

CEQ analyzes cross-sectional data and thus provides a point-in-time perspective on the incidence of taxation and social spending. While some work has focused on intertemporal effects and lifetime tax incidence, we do not due to data limitations. In particular, "The lifetime perspective requires much more data over long periods of time, because results depend critically on the whole shape of the lifetime earnings profile."[61] Compared to a lifetime perspective, we are therefore likely overstating the progressivity of income taxes and the regressivity of consumption taxes. We take some solace in findings that replacing annual income with a longer-term income average did not significantly reduce the measured degree of inequality in the United States,[62] as well as findings that "the lifetime incidence of the entire U.S. tax system is strikingly similar to the annual incidence."[63]

CEQ does not incorporate spillover effects—such as the effect of cash transfers on local employment or property prices due to the difficulty in estimating their magnitudes and the beneficiaries or payers.[64]

3 *CEQ Assessment*: Indicators

The indicators used in a *CEQ Assessment* can be categorized by the questions a *CEQ Assessment* is designed to address. The main indicators are reviewed here and described in more detail, including their mathematical formulas when applicable, and instructions on producing the indicators using the *CEQ Stata Package* in Higgins (chapter 8 in this Handbook).

1. How much income redistribution and poverty reduction is being accomplished in each country through the fiscal system (taxes, social spending, and subsidies)?

We use various indicators to answer this question, further organized by the following sub-questions.

1a. Does the fiscal system reduce inequality?

First, we compare inequality for the different income concepts described earlier in this chapter.[65] Doing so allows us to trace how inequality evolves as different trans-

[60] For work on incidence analysis accounting for behavioral effects, see, for example, Coady (2006) and Ravallion and Chen (2015).

[61] Fullerton and Rogers (1991, p. 277).

[62] Slemrod (1992).

[63] Fullerton and Rogers (1991, p. 277).

[64] For estimates of the spillover effects of cash transfer programs, see Angelucci and De Giorgi (2009) and Barrientos and Sabates-Wheeler (2009).

[65] For more detail about these concepts, see Higgins and Lustig (2018), chapter 6 in this Handbook.

fers and taxes are added to and subtracted from income. For example, comparing Market and Disposable Income inequality shows how much redistribution is achieved by direct transfers and taxes, while comparing disposable and Consumable Income inequality shows how much redistribution is achieved by indirect subsidies and taxes, and comparing Consumable and Final Income inequality shows how much redistribution is achieved by in-kind transfers in the form of education, health, and other public spending. Finally, comparing market and Final Income inequality shows the extent to which the fiscal system is redistributive as a whole: that is, incorporating the cash and in-kind components altogether.

The inequality measures used in CEQ include the Gini, S-Gini, Theil, and 90/10 indices.[66] In addition, we measure how ex-ante inequality of opportunity varies across income concepts, where inequality is measured using the mean log deviation.[67] We also decompose the change in inequality between income concepts into that of vertical equity and horizontal inequity (reranking), where the latter is measured by the Atkinson-Plotnick index of reranking.[68]

1b. Does the fiscal system decrease poverty?

We can again assess the impact of the fiscal system by tracing out the change in poverty across income concepts. The poverty measures we use are members of the FGT class of poverty measures,[69] and include the headcount index, which measures the proportion of the population that is poor; the poverty gap ratio, which measures the depth of poverty; and the squared poverty gap ratio, which measures the severity of poverty. We measure poverty for a number of poverty lines, including commonly used "international poverty lines," national extreme and moderate poverty lines, and any other extreme and moderate poverty line that is relevant, such as the lines estimated by the UN Economic Commission for Latin American and the Caribbean (in the case of countries in Latin America), and a relative poverty line set as a percent of median income (commonly 50 or 60 percent). If the 2005 International Comparison Project (ICP) is used for purchasing power parity (PPP) adjustments, these lines are commonly set at $1.25, $2.50, and $4 per person per day.[70] If the 2011 ICP is used, $1.90 is the official World Bank extreme poverty line.[71] Researchers at the World Bank have proposed to use of $3.20 in 2011 PPP for lower middle-income countries and $5.50 in 2011 PPP for upper middle-income countries[72] and a global societal—or weakly relative—

[66] For a comprehensive discussion of inequality indexes and their properties see, for example, Duclos and Araar (2006).

[67] See Ferreira and Gignoux (2011).

[68] See Duclos and Araar (2006).

[69] Foster, Greer, and Thorbecke (1984).

[70] Chen and Ravallion (2010); Ferreira and others (2013).

[71] Ferreira and others (2016).

[72] Jolliffe and Prydz (2016).

poverty line equal to \$1 + 0.5 times the median consumption (or, in its absence, the median household per capita income) from the country's household survey.[73]

Note that in some regions, other poverty lines are commonly used by the World Bank.

We also use dominance tests to assess whether poverty is unambiguously lower in one income distribution than another for a range of poverty lines and broad class of poverty measures.[74]

In addition to directly measuring the change in poverty caused by taxes and transfers, we assess whether various groups (for example, income deciles) are net payers to the fiscal system or net receivers of transfers on average. These averages provide an overall picture of who tends to benefit more from or pay more to the fiscal system across the income distribution, but could overlook substantial variation within each decile.

1c. Does the fiscal system make the poor poorer, or the non-poor poor?

Even if a tax and transfer system unambiguously reduces poverty and inequality and is progressive, it can make a substantial portion of the poor poorer, or non-poor poor.[75] This startling result occurs because poverty indicators are anonymous in the sense that we do not know whether a particular individual with a set postfiscal income had a lower or higher prefiscal income. Figure 1-2 illustrates this issue. The dark grey areas refer to poor (non-poor) individuals who were made poorer (poor) by the prevailing combination of taxes and transfers. In contrast, the light grey areas are prefiscal poor individuals who were made less poor.

We thus use the measure of Fiscal Impoverishment[76] to assess the extent to which the tax and transfer system makes some of the poor poorer and some of the non-poor poor.[77] As shown by Higgins and Lustig (chapter 4), the poverty gap ratio can be exactly decomposed into the measure of fiscal impoverishment and fiscal gains to the poor. When using these measures, please cite the Higgins and Lustig article, which is reprinted as chapter 4 in this Handbook for the reader's convenience.

2. How equalizing and pro-poor are specific taxes and government spending?

2a. Is a particular tax or transfer equalizing (unequalizing)?

To determine whether a particular tax or transfer is equalizing or unequalizing, we use the marginal contribution of that tax or transfer to inequality. In essence, the

[73] Jolliffe and Prydz (2017). For a thorough discussion of the advantages and limitations of proposed international poverty lines, see Lustig and Silber (2016).

[74] Atkinson (1987); Foster and Shorrocks (1988).

[75] Higgins and Lustig (2016).

[76] Derived in Higgins and Lustig (2016).

[77] Higgins and Lustig (2016).

FIGURE 1-2
Fiscal Impoverishment and Fiscal Gains to the Poor

Source: Higgins and Lustig (2016).

marginal contribution equals the difference between the inequality indicator measured without the tax or transfer of interest but with all the other components of fiscal policy in place MINUS the same indicator with all the components including the one whose effect we are considering. If this difference is positive (negative), then the tax or transfer is equalizing (unequalizing): that is, inequality is higher (lower) without the tax or transfer of interest than with it. If the difference equals zero, the tax or transfer is "neutral" (in other words, it does not affect inequality or poverty). So, for example, let's say one would like to know whether the value added tax (VAT) is unequalizing. One would calculate, for instance, the Gini coefficient with a new income concept defined as Consumable Income (see figure 1-1) less VAT and would subtract the Gini coefficient for Consumable Income. If the difference is positive (negative), the VAT is equalizing (unequalizing). Box 1-2 defines the marginal contribution in more formal terms.

We measure progressivity using concentration coefficients and Kakwani coefficients;[78] chapter 2 in this Handbook shows why a progressive tax or transfer is not

[78] The Kakwani coefficient is described in Enami, Lustig, and Aranda (chapter 2 in this Handbook).

Box 1-2

Marginal Contribution

Ali Enami

We use T and B to refer to "Taxes" and "Benefits," where T can refer to any combination of direct and indirect taxes, and B can refer to any combination of direct transfers, indirect subsidies, and in-kind transfers from public spending on health and education. The indicators can also be defined for combinations of taxes and transfers, which is why we write "T (and/or B)" throughout. We calculate the Marginal Contribution (MC) of any combination of taxes or benefits as follows:

$$MC^{End\ income}_{T\ (and/or\ B)} = Index_{End\ income \backslash T\ (and/or\ B)} - Index_{End\ income}.$$

"Index" refers to any inequality or poverty indices that one may use in the calculation of the marginal contribution. For example, we use the Gini index as a measure of inequality. The subscript of the index, that is "End income," refers to the income concept with respect to which we calculate the marginal contribution to the index of a tax or benefit. For example, $Gini_{Disposable\ Income}$ means the Gini coefficient of disposable income, and if we use it for $Gini_{End\ income}$, it implies that we are interested in calculating the marginal contribution of a tax or benefit to the disposable income Gini. "End income\T (and/or B)" refers to the income concept that is equivalent to the End income prior to the tax or benefit of interest. For example, "Disposable Income\Direct Taxes" equals disposable income plus direct taxes (to have the income concept *prior to* subtracting out direct taxes). Intuitively,

$$MC^{End\ income}_{T\ (and/or\ B)}$$

is how much the value of $Index_{End\ income}$ would have changed if T (and/or B) were removed from the fiscal system. It should be noted that the End income does not have to be one of the CEQ core income concepts.

An example is that if we want to calculate the marginal effect of indirect taxes with respect to disposable income (since indirect taxes have not yet been subtracted out of disposable income), the end income concept would be "Disposable Income minus Indirect Taxes." The MC in this case would be calculated as follows:

$$MC^{Disposable\ Income\ minus\ Indirect\ Taxes}_{Indirect\ Taxes} = Index_{Disposable\ Income} - Index_{Disposable\ Income\ minus\ Indirect\ Taxes}.$$

On the other hand, if we were calculating the MC of *direct* taxes with respect to disposable income, since disposable income is already net of direct taxes, the end

income would be disposable income, while the end income without the fiscal intervention would require taking disposable income and *adding back in* direct taxes, so we would have:

$$MC_{Direct\ Taxes}^{Disposable\ Income} = Index_{Disposable\ Income\ plus\ Direct\ taxes} - Index_{Disposable\ Income}.$$

In calculating MC, what matters is that we have two income concepts that are different from each other only because of one component or a bundle of taxes and/or transfers. In other words, one can use components of a fiscal system separately and also in different combinations (bundles) to perform a marginal contribution analysis. An example would be to evaluate the inequality-reducing effect of different taxes in a system separately and then the whole taxation system together as one entity. Regardless of how a component or bundle is set up, we consider the difference for a particular inequality index between these two income concepts (the End income with and without that specific component or bundle) as the MC of that fiscal intervention.

While the above examples are all about the Gini index, the concept of marginal contribution is applicable to any inequality or poverty index.

necessarily equalizing (as explained earlier in this chapter). By comparing the sign of the marginal contribution with the Kakwani coefficient, we can determine if a tax or transfer is equalizing despite being regressive or unequalizing despite being progressive. Note that this can happen for two reasons: due to Lambert's conundrum, which can occur even in the absence of reranking, or due to reranking.[79]

2b. What is the contribution of a tax or a transfer to the fiscally induced change in inequality and poverty?

We once again use the marginal contribution for this, comparing the size of the marginal contribution of a particular tax or transfer to the overall inequality or poverty reduction caused by the fiscal system. Note, however, that this does not provide a direct decomposition of the total effect into a sum of its parts from each tax or transfer. Attempting to do such a decomposition encounters path dependency issues.[80]

[79] The implications of reranking are explained in more detail in Enami (chapter 3 in this Handbook).

[80] Shorrocks (2013). While using something like a Shapley value would ensure that the sum of the individual contributions adds up to the total redistributive effect, a Shapley value does not lend itself to a clear policy interpretation. By contrast, the marginal contribution does: it tells us what would be the influence of a particular tax or transfer or a change in that tax or transfer on inequality.

2c. Is a particular spending item pro-poor?

Once it has been established that the marginal contribution of a fiscal intervention to inequality is positive (that is, the fiscal intervention is equalizing), we can determine whether it is pro-poor by comparing its concentration curve to the original income Lorenz curve. (The concentration coefficient also serves as a summary indicator of whether the concentration curve is above [coefficient less than Gini] or below [coefficient greater than Gini] the original income Lorenz, and above [coefficient less than 0] or below [coefficient greater than 0] the 45-degree line of perfect equality. Concentration *curves* provide a better assessment, however, as they could cross the Lorenz curve or 45-degree line, which is not revealed by the concentration *coefficient*.)

The pro-poorness of public spending here is defined using concentration coefficients (also called "quasi-Ginis").[81] In keeping with conventions, spending is defined as regressive whenever the concentration coefficient is higher than the Gini for Market Income. When this occurs, it means that the benefits from that spending as a share of Market Income *tend* to rise with Market Income.[82] Spending is progressive whenever the concentration coefficient is lower than the Gini for Market Income. This means that the benefits from that spending as a share of Market Income tend to fall with Market Income. Within progressive spending, spending is neutral in absolute terms—spending per capita is the same across the income distribution—whenever the concentration coefficient is equal to zero. Spending is defined as *pro-poor* whenever the concentration coefficient is not only lower than the Gini but its value is also negative. Pro-poor spending implies that the *per capita* government spending on the transfer *tends* to fall with Market Income.[83] Any time spending is pro-poor or neutral in absolute terms, it is by definition progressive. The converse, of course, is not true.[84] The taxonomy of transfers is synthesized in figure 1-3.

For the analysis of pro-poorness and progressivity (as that shown in figure 1-3 or by concentration coefficients), households are ranked by per capita prefiscal income (Market Income or Market Income plus Pensions, depending on the scenario), and no

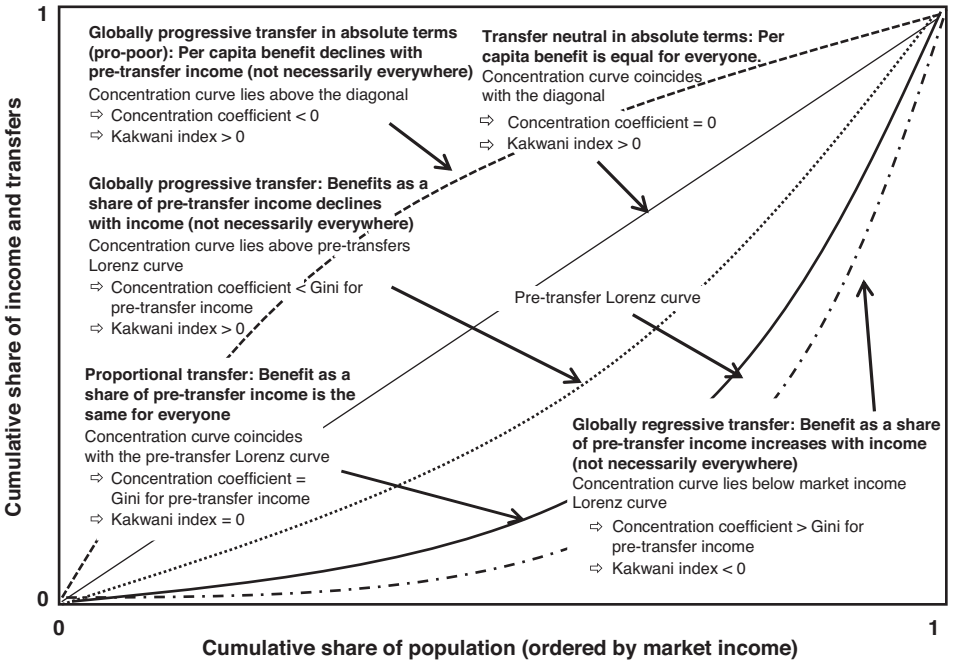
[81] A concentration coefficient is calculated in a way analogous to the Gini coefficient. Let p be the cumulative proportion of the total population when individuals are ordered in increasing income values using Market Income, and let $C(p)$ be the concentration curve—that is, the cumulative proportion of total program benefits (of a particular program or aggregate category) received by the poorest p percent of the population. Then, the concentration coefficient of that program or category is defined as $2\int_0^1 (p - C(p))dp$.

[82] For global regressivity/progressivity to occur, it is not a necessary condition for the share of the benefit to rise/fall at each and every income level. When the latter occurs, the benefit is regressive/progressive *everywhere*. Whenever a benefit is *everywhere* regressive/progressive, it will be *globally* regressive/progressive, but the converse is not true.

[83] This case is also sometimes called "progressive in absolute terms."

[84] As mentioned above, care must be taken not to infer that any spending that is progressive (regressive) will automatically be equalizing (unequalizing).

FIGURE 1-3
Progressivity of Transfers: A Diagrammatic Representation



adjustments are made to their size because of differences in the composition by age and gender.[85] If the country's poverty data are usually presented in equivalized income, it is advisable to estimate the indicators of pro-poorness and progressivity ranking household per equivalized income as well. In some analyses, the pro-poorness of education spending, for example, is determined using children—not all members of the household—as the unit of analysis. Since poorer families typically have more children, they would naturally benefit more from spending per child. As a result, pro-poor concentration curves may simply reflect this, rather than imply that poorer families receive more resources per child.

3. How effective are taxes and government spending in reducing inequality and poverty?

In addition to their impact on inequality and poverty, a question of interest to, especially, policymakers is whether specific taxes or transfers (or their combination) are

[85] Recall that in a number of countries the Market Income concept is derived from consumption data and will not be exactly the same as the Market Income that would be derived with income data. Also, for the purposes of robustness and comparisons, in some countries the calculations are performed using equivalized income as well.

effective. In CEQ, effectiveness is viewed as whether the tax or the transfer generates as much reduction in inequality (and poverty) as it could potentially do or, conversely, whether one could achieve the same reduction in inequality and poverty with a smaller mobilization of fiscal resources (a tax or a transfer) by optimally allocating it. "Optimal" and the "highest potential" in this context refer the theoretically maximum potential, which is explained in more detail below. The indices proposed below are classified into two broad categories: Impact Effectiveness (IE) and Spending Effectiveness (SE) indicators. IE and SE indicators are similar in the sense that they both compare the performance of a tax or transfer in reducing inequality or poverty with respect to its theoretically maximum potential. For IE indicators, we keep the amount of money raised (or spent) constant and compare the actual and potential performance of a tax (or transfer) to each other. For SE indicators, we keep the impact of a tax (or transfer) on inequality or poverty constant and compare the actual size of a tax (or transfer) with the theoretically minimum amount of tax (or transfer) that would create the same impact. All this is discussed in detail in chapter 5 by Ali Enami.

In addition to these new proposed indicators, there are of course the conventional indicators of coverage and leakages, discussed below.

3.1 Impact and Spending Effectiveness Indicators

The spending effectiveness indicator introduced in the previous CEQ handbook was defined as follows:

$$CEQ\ Old\ Effectiveness\ Indicator = \frac{Change\ in\ Gini\ as\ a\ Result\ of\ Transfers}{Transfers\ /\ GDP}$$

As shown by Enami (chapter 5 in this Handbook), however, this indicator suffers from some fundamental shortcomings. The most important is that the indicator would fail to rank transfers (and taxes) properly. If, for example, a transfer is scaled up proportionally, one would expect—everything else being equal—the effectiveness indicator to remain constant. The reduction in Gini, however, is a nonlinear function of the transfer, so if the transfer is multiplied by two, the reduction in Gini would not necessarily be multiplied by two. As a result, bigger programs could be ranked worse because of this nonlinearity and not because they are less effective at reducing inequality.

Enami (chapter 5 in this Handbook) derived new effective indicators whose main goal is to provide policymakers with meaningful but easy to interpret indices: the CEQ Impact Effectiveness and Spending Effectiveness Indicators. Policy analysts and policymakers are interested in what is called a tax's or a transfer's "bank for the buck": that is, how much inequality or poverty reduction is obtained given the amount collected and spent. In developing these indicators, Enami ensured that they fulfill the mathematical requirements for producing proper ranking of taxes and transfers. Specifically, the new indicators ensure that, everything else being equal, an intervention with a higher marginal contribution (MC) to the reduction of inequality (or poverty) has a

higher ranking and that an intervention with higher potential to reduce inequality (or poverty) yet with a lower realized effect gets a lower ranking. Enami presents an application of the indicators to the case of Iran in chapter 17 of this Handbook.

3.1.1 Impact Effectiveness (IE)

As discussed in chapter 5, IE is defined as the ratio of the observed marginal contribution of a tax (transfer) to the optimum marginal contribution of that tax (transfer) if the tax (transfer) was distributed in a way that maximizes its inequality- or poverty-reducing impact. In the case of a tax, to maximize the inequality-reducing impact of a tax of a given size, we would need to tax the richest person until her pretax income equals the pretax income of the second richest person; then, both would be taxed until their pretax income equals the pretax income of the third richest person, and so on until there is no more of the tax to be allocated. In the case of a transfer, the procedure would be analogous but moving from the poorest person and giving him enough of a transfer until his income equals that of the second poorest, and so on. If the indicator of interest is a Gini or S-Gini index, the IE indicator is identical to what is proposed by Fellman, Jantti, and Lambert.[86]

The IE indicator shows the relative realized power of a tax and/or transfer in reducing inequality or of a transfer (or combined tax-transfer system) in reducing poverty. (Since taxes can only increase poverty, the poverty reduction indicator is defined only for benefits or for combined tax-transfer systems that have a positive marginal contribution.) An example shows how to interpret this indicator: if the IE of a transfer is equal to 0.7, it means the transfer has realized 70 percent of its potential power in reducing inequality. Therefore, the higher the value of this indicator, the more effective a transfer is in fulfilling its potential to reduce inequality. An advantage of the IE is that its value does not depend on whether one uses change in Gini or percentage change in Gini.

For poverty, one calculates the IE only for benefits or combined tax-benefit systems that reduce poverty. For taxes, the denominator is always zero because taxes can only increase poverty (so the optimal effect of a tax on poverty is zero).

3.1.2 Spending Effectiveness (SE)

As discussed in chapter 5 in this Handbook, the SE indicator is defined as the ratio of the minimum amount of a tax (transfer) that is required to be collected (spent) in order to create the observed marginal contribution of the tax (transfer), if the tax (transfer) is instead redistributed optimally. This indicator shows how much less tax (transfer) is required to achieve the same observed outcome (in terms of inequality reduction) if the tax (transfer) is collected (spent) in an optimal way. For example, a value of 70 percent for SE of a transfer means that the same MC can be achieved by spending only 70 percent of the current resources if the resources are spent optimally (if the objective function is to

[86] Fellman, Jantti, and Lambert (1999, pp. 115–26).

Box 1-3

Fiscal Impoverishment and Gains Effectiveness Indicators

Ali Enami, Sean Higgins, and Stephen D. Younger

Here, we introduce effectiveness indicators that are specific to the effect of taxes and transfers on fiscal impoverishment (FI) and fiscal gains to the poor (FGP). Axiomatic indicators for FI and FGP are derived in Higgins and Lustig (2016) and described earlier in this chapter, and instructions on how to calculate them with the *CEQ Stata Package* are in chapter 8 of this Handbook by Higgins. Consider a set of policies that may include both benefits and taxes. We measure the effectiveness of these policies at reducing poverty without making many of the poor poorer as:

$$Effectiveness_{FI/FGP} = \left[\left(\frac{B}{T+B}\right)\left(\frac{FGP\_MC_{T\ and\ B}^{End\ income}}{B}\right)\right] + \left[\left(\frac{T}{T+B}\right)\left(1-\frac{FI\_MC_{T\ and\ B}^{End\ income}}{T}\right)\right].$$

where T and B are the size of total taxes and transfers (both positive values), $FGP\_MC_{T\ and\ B}^{End\ income}$ is the marginal contribution of the net system (i.e., T and B) to FGP (always a non-negative value), and $FI\_MC_{T\ and\ B}^{End\ income}$ is the marginal contribution of the net system (i.e., T and B) to FI (always a non-negative value).

Note that T and B are the maximum possible reduction or increase in the FGP and FI indicators. In other words, if taxes are all paid by the poor and no benefits reach the poor, $FI\_MC_{T\ and\ B}^{End\ income}$ becomes equal to T. Similarly, if all transfers go to the poor (only up to the point that brings them out of poverty) and the poor pay no taxes, the value of $FGP\_MC_{T\ and\ B}^{End\ income}$ becomes equal to B. As a result, both $\left(\frac{FGP\_MC_{T\ and\ B}^{End\ income}}{B}\right)$ and $\left(1-\frac{FI\_MC_{T\ and\ B}^{End\ income}}{T}\right)$ are bounded between zero and 1. Moreover, the higher the value of each of these two components, the more effective the bundle of taxes and transfers is from the poverty reduction perspective. The weights (i.e., $\left(\frac{B}{T+B}\right)$ and $\left(\frac{T}{T+B}\right)$) also add up to one. Therefore, the whole indicator is bounded between zero and one, and the higher the value of the indicator, the more effective the bundle of taxes and transfers is in reducing poverty.

For analyzing bundles that include only taxes, including a single tax, the indicator reduces to:

$$Tax\ Effectiveness_{FI} = 1-\frac{FI\_MC_{T}^{End\ income}}{T}.$$

For policies that include only benefits, it reduces to:

$$Transfer\ Effectiveness_{FGP} = \frac{FGP\_MC_B^{End\ income}}{B}.$$

Note that taxes can only hurt and transfers can only help the poor, and even though both above indicators have positive values, one should not compare the effectiveness of a tax to a transfer in reducing poverty.

These indicators vary between zero and one and the higher the value of the indicator, the better. In addition, the $Effectiveness_{FI/FGP}$ indicator (and its special cases for tax effectiveness and transfer effectiveness) satisfies the following axioms:

1. FI Monotonicity: if a person experiencing FI has a larger decrease in post-fiscal income, the measure must decrease.
2. FGP Monotonicity: if a person experiencing FGP has a larger increase in postfiscal income, the measure must not decrease, and must increase if that person's postfiscal income was still below the poverty line prior to this additional increase.
3. Weak Monotonicity in B: if B increases and all else equal, the measure must not increase.
4. Weak Monotonicity in T: if T increases and all else equal, the measure must not decrease.
5. Focus: if the pre- and post-incomes of all individuals experiencing FI and FGP are the same in two scenarios, and T and B are the same, the measure is the same.
6. Normalization: if the government performs as well as possible, so FGP=B and FI=0, then the measure equals 1. If the government performs as poorly as possible, so FGP=0 and FI=T, then the measure equals 0.
7. Continuity in individual prefiscal incomes, postfiscal incomes, and the poverty line, as well as continuity in FI, FGP, T, B.
8. Permutability.
9. Subgroup consistency.
10. Scale Invariance in FI, FGP, T, and B.

maximize equality). We calculate this indicator only for the taxes and transfers with a positive MC (as a result, the SE of taxes on poverty reduction is undefined).

We also measure effectiveness of achieving fiscal gains to the poor and avoiding fiscal impoverishment[87] using the fiscal impoverishment and gains effectiveness described in box 1-3 by Ali Enami, Sean Higgins, and Stephen D. Younger.

[87] See Higgins and Lustig (2016) on these concepts.

Table 1-5
Conceptualizing Coverage Indicators

	Receives benefits	Does not receive benefits
Poor	A	B
Non-poor	C	D

In addition to the impact and spending indicators, in the *CEQ Assessments* we estimate additional poverty reduction effectiveness indicators.[88]

3.2 Transfers: Indicators of Coverage, Errors of Exclusion, Errors of Inclusion, and Errors of Social Programs: Definitions

To generate the concepts of coverage, errors of inclusion or leakages, and errors of exclusion, we can think of separating the population into two groups based on poverty status and two groups based on whether they receive benefits. This results in four total groups, which we call group A, B, C, and D and represent with the 2×2 matrix shown in table 1-5.

We can then define the indicators of coverage, leakages, and errors of exclusion as follows:

Coverage: the total number of households that receive benefits[89] divided by the total number of households in the country, or $(A+C)/(A+B+C+D)$.

Coverage of the poor: the total number of *poor* households that receive benefits divided by the total number of *poor* households in the country, or $A/(A+B)$.

Errors of exclusion: the total number of *poor* households that do not receive benefits divided by the total number of *poor* households in the country, or $B/(A+B)$.

Leakages (also known as "errors of inclusion"): the total number of *non-poor* households that nevertheless receive benefits divided by the total number of households that receive benefits, or $C/(A+C)$.

Proportion of beneficiary households that are poor: the total number of poor households receiving benefits divided by the total number of households receiving benefits, or $A/(A+C)$.

[88] From Beckerman (1979) and Immervoll and others (2009).

[89] For the indicators at the household level, a beneficiary household will be a household that receives a benefit whether one can or cannot identify who within the household is the recipient of the benefit.

The above definitions can then be modified in any combination of the following ways to generate additional indicators of coverage, leakages, and errors of exclusion:

- Replacing total number of households with "total number of direct beneficiaries" or "total number of individuals" (that is, "direct and indirect beneficiaries");
- Replacing "total number of" with "benefits received by," where benefits can be defined at either the household or per capita (dividing by the number of members in the household) levels;
- Computing the mean benefits accruing to households in each group A, B, C, and D;
- Further disaggregating the population not just into *poor* and *non-poor* but into various income groups
- Replacing "poor and "non-poor" with "eligible for the program" (also called "target") and "not eligible for the program" if clear eligibility criteria are available, and potentially further disaggregating eligible and non-eligible by income group

Each of these definitions can be measured among *households*, which is how we define them here for illustration. Alternatively, they can be measured among *direct beneficiaries* (the individuals within the household who directly receive benefits) and among *individuals* or equivalently among *direct and indirect beneficiaries*, where "direct and indirect beneficiaries" are defined as all individuals within a beneficiary household. For example, a household may have five total members and two members who report directly receiving benefits from a particular program. For the household-level calculations, the household counts as one; for the direct beneficiaries calculation, there are two direct beneficiaries; and for the individual-level calculation, there are five individuals (or "direct and indirect beneficiaries").

In sections D and E of the *CEQ Master Workbook*, we compute all of the measures discussed here; for more detail, see chapter 8.[90]

4. What is the impact of fiscal reforms that change the size and progressivity of a particular tax or spending program?

The indicator used to answer this question is the derivative of the MC of a tax or transfer with respect to its size and progressivity. For more detail, see chapters 2 and 3 in this Handbook.[91]

[90] Higgins (2018).

[91] Mathematical expressions of these in the absence and presence of reranking are described in Enami, Lustig, and Aranda (2018) and Enami (2018a).

Acknowledgments

The authors are very grateful to François Bourguignon, Francisco Ferreira, Alvaro Forteza, Carlos Grushka, Santiago Levy, Angel Melguizo, Rafael Rofman, Sergei Soares, and Sergio Urzua for their invaluable insights and comments.

References

Adema, Willem, and Maxime Ladaique. 2005. "Net Social Expenditure, 2005 Edition: More Comprehensive Measures of Social Support," Employment and Migration Working Papers 29 (OECD Social).

Alam, Shamma A., Gabriela Inchauste, and Umar Serajuddin. 2017. "The Distributional Impact of Fiscal Policy in Jordan," in *The Distributional Impact of Taxes and Transfers: Evidence from Eight Low- and Middle-Income Countries*, edited by Gabriela Inchauste and Nora Lustig (Washington: World Bank).

Alleyne, Dillon, James Alm, Roy Bahl, and Sally Wallace. 2004. "Tax Burden in Jamaica," Working Paper 04-34 (Georgia State University International Studies Program).

Alvaredo, Facundo, Anthony Atkinson, Thomas Piketty, and Emmanuel Saez. 2015. "The World Top Incomes Database" (http://topincomes.g-mond.parisschoolofeconomics.eu/).

Angelucci, Manuela, and Giacomo De Giorgi. 2009. "Indirect Effects of an Aid Program: How Do Cash Transfers Affect Ineligibles' Consumption?" Working Paper 71 (International Policy Center, Gerald R. Ford School of Public Policy, University of Michigan).

Aranda, Rodrigo, and Adam Ratzlaff. 2018. "Analyzing the Impact of Fiscal Policy on Ethno-Racial Inequality," chap. 9 in *Commitment to Equity Handbook: Estimating the Impact of Fiscal Policy on Inequality and Poverty*, edited by Nora Lustig (Brookings Institution Press and CEQ Institute, Tulane University). Free online version available at www.commitmentoequity.org.

Arunatilake, Nisha, Gabriela Inchauste, and Nora Lustig. 2017. "The Incidence of Taxes and Spending in Sri Lanka," in *The Distributional Impact of Taxes and Transfers: Evidence from Eight Low- and Middle-Income Countries*, edited by Gabriela Inchauste and Nora Lustig (Washington: World Bank).

Atkinson, Anthony B. 1983. *Social Justice and Public Policy* (MIT Press).

———. 1987. "On the Measurement of Poverty." *Econometrica* 55, no. 4, pp. 749–64.

Barr, Nicholas. 2001. "The Truth about Pension Reform." *Finance and Development* 38, no. 3, pp. 6–9.

———. 2004. *Economics of the Welfare State*, 4th ed. (Oxford University Press).

———. 2012. "Credit Crisis and Pensions: International Scope," in *The Future of Multi-Pillar Pensions*, edited by Lans Bovenberg, Casper van Ewijk, and Ed Westerhout (Cambridge University Press).

Barrientos, Armando, and Rachel Sabates-Wheeler. 2009. "Do Transfers Generate Local Economy Effects?" Working Paper 106 (Brooks World Poverty Institute, University of Manchester).

Barros, Ricardo, Francisco Ferreira, Jose Molinas Vegas, and Jaime Saavedra Chanduvi. 2009. *Measuring Inequality of Opportunities in Latin America and the Caribbean* (Washington: World Bank).

Bastagli, Francesca, David Coady, and Sanjeev Gupta. 2015. "Fiscal Redistribution in Developing Countries: Overview of Policy Issues and Options," in *Inequality and Fiscal Policy*, edited by

Benedict Clements, Ruud Mooji, Sanjeev Gupta, and Michael Keen (Washington: International Monetary Fund).

Beckerman, Wilfred. 1979. "The Impact of Income Maintenance Payments on Poverty in Britain, 1975." *Economic Journal* 89, pp. 261–79.

Bergh, Andreas. 2005. "On the Counterfactual Problem of Welfare State Research: How Can We Measure Redistribution?" *European Sociological Review* 21, no. 4, pp. 345–57.

Bibi, Sami, and Jean-Yves Duclos. 2010. "A Comparison of the Poverty Impact of Transfers, Taxes and Market Income across Five OECD Countries." *Bulletin of Economic Research* 62, no. 4, pp. 387–406.

Birdsall, Nancy, Augusto de la Torre, and Rachel Menezes. 2008. *Fair Growth: Economic Policies for Latin America's Poor and Middle-Income Majority* (Brookings Institution Press).

Bosch, Mariano, and Raymundo M. Campos-Vazquez. 2014. "The Trade-Offs of Welfare Policies in Labor Markets with Informal Jobs: The Case of the 'Seguro Popular' Program in Mexico." *American Economic Journal: Economic Policy* 6, no. 4, pp. 71–99.

Bourguignon, François, and Luiz A. Pereira da Silva, eds. 2003. *The Impact of Economic Poverty and Income Distribution* (Washington: World Bank).

Bourguignon, François, and Amadeo Spadaro. 2006. "Microsimulation as a Tool for Evaluating Redistribution Policies." *Journal of Economic Inequality* 4, no. 1, pp. 77–106.

Breceda, Karla, Jamele Rigolini, and Jaime Saavedra. 2008. "Latin America and the Social Contract: Patterns of Social Spending and Taxation." Policy Research Working Paper 4604 (Washington: World Bank, World Bank Latin American and Caribbean Region Poverty Department Poverty Reduction and Economic Management Division).

Bucheli, Marisa, Nora Lustig, Maximo Rossi, and Florencia Amabile. 2014. "Social Spending, Taxes and Income Redistribution in Uruguay," in "The Redistributive Impact of Taxes and Social Spending in Latin America," edited by Nora Lustig, Carola Pessino, and John Scott, special issue, *Public Finance Review* 42, no. 3, pp. 413–33.

Cabrera, Maynor, Nora Lustig, and Hilcias E. Moran. 2015. "Fiscal Policy, Inequality and the Ethnic Divide in Guatemala." *World Development* 76, December, pp. 263–79.

Camacho, Adriana, Emily Conover, and Alejandro Hoyos. 2014. "Effects of Colombia's Social Protection System on Workers' Choice between Formal and Informal Employment." *World Bank Economic Review* 28, no. 3, pp. 446–66.

Cancho, Cesar, and Elena Bondarenko. 2017. "The Distributional Impact of Fiscal Policy in Georgia," in *The Distributional Impact of Taxes and Transfers: Evidence from Eight Low- and Middle-Income Countries*, edited by Gabriela Inchauste and Nora Lustig (Washington: World Bank).

Chen, Shaohua, and Martin Ravallion. 2010. "The Developing World Is Poorer than We Thought, but No Less Successful in the Fight against Poverty." *Quarterly Journal of Economics* 125, no. 4, pp. 1577–1625.

Coady, David. 2006. "The Distributional Impacts of Indirect Tax and Public Pricing Reforms," in *Analyzing the Distributional Impact of Reforms: A Practitioner's Guide to Pension, Health, Labor Markets, Public Sector Downsizing, Taxation, Decentralization and Macroeconomic Modeling*, edited by A. Coudouel and S. Paternostro (Washington: World Bank).

Coady, David, Moataz El-Said, Robert Gillingham, Kangni Kpodar, Paulo Medas, and David Newhouse. 2006. "The Magnitude and Distribution of Fuel Subsidies: Evidence from Bolivia, Ghana, Jordan, Mali, and Sri Lanka," International Monetary Fund Working Paper 06/247.

Devarajan, Shantayanan, and Shaikh I. Hossain. 1998. "The Combined Incidence of Taxes and Public Expenditures in the Philippines." *World Development* 26, no. 6, pp. 963–77.

Dilnot, Andrew, John Kay, and Michael Keen. 1990. "Allocating Taxes to Households: A Methodology." *Oxford Working Papers* 42, no. 1, pp. 210–30.

Duclos, Jean-Yves, and Abdelkrim Araar, 2006. *Poverty and Equity: Measurement, Policy and Estimation with DAD*. Economic Studies in Inequality, Social Exclusion and Well-Being 2 (New York: Springer, IDRC).

Ebrill, Liam, Michael Keen, and Victoria P. Summers. 2001. *The Modern VAT* (Washington: International Monetary Fund).

Enami, Ali. 2018a. "Measuring the Redistributive Impact of Taxes and Transfers in the Presence of Reranking," chap. 3 in *Commitment to Equity Handbook: Estimating the Impact of Fiscal Policy on Inequality and Poverty*, edited by Nora Lustig (Brookings Institution Press and CEQ Institute, Tulane University). Free online version available at www.commitmentoequity.org.

———. 2018b. "Measuring the Effectiveness of Taxes and Transfers in Fighting Inequality and Poverty," chap. 5 in *Commitment to Equity Handbook: Estimating the Impact of Fiscal Policy on Inequality and Poverty*, edited by Nora Lustig (Brookings Institution Press and CEQ Institute, Tulane University). Free online version available at www.commitmentoequity.org.

———. 2018c. "Iran: An Application of the CEQ Effectiveness Indicator," chap. 17 in *Commitment to Equity Handbook: Estimating the Impact of Fiscal Policy on Inequality and Poverty*, edited by Nora Lustig (Brookings Institution Press and CEQ Institute, Tulane University). Free online version available at www.commitmentoequity.org.

Enami, Ali, Nora Lustig, and Rodrigo Aranda. 2018. "Analytic Foundations: Measuring the Redistributive Impact of Taxes and Transfers," chap. 2 in *Commitment to Equity Handbook: Estimating the Impact of Fiscal Policy on Inequality and Poverty*, edited by Nora Lustig (Brookings Institution Press and CEQ Institute, Tulane University). Free online version available at www.commitmentoequity.org.

Engel, Eduardo, Alexander Galetovi, and Claudio Raddatz. 1999. "Taxes and Income Distribution in Chile: Some Unpleasant Redistributive Arithmetic." *Journal of Development Economics* 59, no. 1, pp. 155–92.

Fellman, Johan, Markus Jantti, and Peter J. Lambert. 1999. "Optimal Tax-Transfer Systems and Redistributive Policy." *Scandinavian Journal of Economics* 101, no. 1, pp. 115–26.

Ferreira, Francisco H. G., Shaohua Chen, Andrew Dabalen, Yuri Dihkanov, Nada Hamadeh, Dean Jolliffe, Ambar Narayan, Espen Prydz, Ana Revenga, Prem Sangraula, Umar Serajuddin, and Nobuo Yoshida. 2016. "A Global Count of the Extreme Poor in 2012: Data Issues, Methodology and Initial Results," Policy Research Working Paper 7432 (Washington: World Bank).

Ferreira, Francisco H. G., and Jeremie Gignoux. 2011. "The Measurement of Educational Inequality: Achievement and Opportunity," Policy Research Working Paper 5873 (Washington: World Bank).

Ferreira, Francisco H. G., Julian Messina, Jamele Rigolini, and Renos Vakis. 2013. *Socio-Economic Mobility and the Rise of the Middle Class in Latin America and the Caribbean* (Washington: World Bank Regional Flagship Report for Latin America and the Caribbean).

Ferreira, Francisco H. G., and David Robalino. 2010. "Social Protection in Latin America: Achievements and Limitations," Policy Research Working Paper 5305 (Washington: World Bank).

Fiszbein, Ariel, Norbert Schady, Francisco Ferreira, Margaret Grosh, Nial Kelleher, Pedro Olinto, and Emmanuel Skoufias. 2009. *Conditional Cash Transfers: Reducing Present and Future Poverty* (Washington: World Bank).

Förster, Michael, and Peter Whiteford. 2009. "How Much Redistribution Do Welfare States Achieve? The Role of Cash Transfers and Household Taxes," *CESifo DICE Report* 7, no. 3 (Ifo Institute–Leibniz Institute for Economic Research at the University of Munich), pp. 34–41.

Foster, James, Joel Greer, and Erik Thorbecke. 1984. "A Class of Decomposable Poverty Measures." *Econometrica* 52, no. 3, pp. 761–66.

Foster, James, and Anthony F. Shorrocks. 1988. "Poverty Orderings." *Econometrica* 56, no. 1, pp. 173–77.

Fullerton, Don, and Diane Lim Rogers. 1991. "Lifetime versus Annual Perspectives on Tax Incidence." *National Tax Journal* 44, no. 3, pp. 277–87.

Garganta, Santiago, and Leonardo Gasparini. 2015. "The Impact of a Social Program on Labor Informality: The Case of AUH in Argentina." *Journal of Development Economics* 115 (July), pp. 99–110.

Gertler, Paul, and Paul Glewwe. 1990. "The Willingness to Pay for Education in Developing Countries: Evidence from Rural Peru." *Journal of Public Economics* 42, no. 3, pp. 251–75.

Gertler, Paul, and Jacques van der Gaag. 1990. *The Willingness to Pay for Medical Care: Evidence from Two Developing Countries* (Johns Hopkins University Press for the World Bank).

Gillespie, W. Irwin. 1965. "The Effect of Public Expenditures on the Distribution of Income," in *Essays in Fiscal Federalism*, edited by Richard A. Musgrave, 122–86 (Washington: Brookings Institution).

Goñi, Edwin, J. Humberto Lopez, and Luis Serven. 2011. "Fiscal Redistribution and Income Inequality in Latin America." *World Development* 39, no. 9, pp. 1558–69.

Grosh, Margaret, Carlo del Ninno, Emil Tesliuc, and Azedine Ouerghi. 2008. *For Protection and Promotion: The Design and Implementation of Effective Safety Nets* (Washington: World Bank).

Gupta, Sanjeev, Michael Keen, Benedict Clements, and Ruud de Mooij, eds. 2015. *Inequality and Fiscal Policy* (Washington: International Monetary Fund).

Higgins, Sean. 2018. "Producing Indicators and Results, and Completing Sections D and E of *CEQ Master Workbook* using the *CEQ Stata Package*," chap. 8 in *Commitment to Equity Handbook: Estimating the Impact of Fiscal Policy on Inequality and Poverty*, edited by Nora Lustig (Brookings Institution Press and CEQ Institute, Tulane University). Free online version available at www.commitmentoequity.org.

Higgins, Sean, Rodrigo Aranda, and Ruoxi Li. 2018. "CEQ Assessment: CEQ Stata Package," in Part IV in *Commitment to Equity Handbook: Estimating the Impact of Fiscal Policy on Inequality and Poverty*, edited by Nora Lustig (Brookings Institution Press and CEQ Institute, Tulane University). Available online only at www.ceqinstitute.org.

Higgins, Sean, and Nora Lustig. 2016. "Can a Poverty-Reducing and Progressive Tax and Transfer System Hurt the Poor?" *Journal of Development Economics* 122, pp. 63–75.

———. 2018. "Allocating Taxes and Transfers, Constructing Income Concepts, and Completing Sections A, B, and C of *CEQ Master Workbook*," chap. 6 in *Commitment to Equity Handbook: Estimating the Impact of Fiscal Policy on Inequality and Poverty*, edited by Nora Lustig (Brookings Institution Press and CEQ Institute, Tulane University). Free online version available at www.commitmentoequity.org.

Higgins, Sean, Nora Lustig, Whitney Ruble, and Timothy Smeeding. 2016. "Comparing the Incidence of Taxes and Social Spending in Brazil and the United States." *Review of Income and Wealth* 62, no. S1, pp. S22–S46 (doi:10.1111/roiw.12201).

Higgins, Sean, and Claudiney Pereira. 2014. "The Effects of Brazil's Taxation and Social Spending on the Distribution of Household Income," in "The Redistributive Impact of Taxes and

Social Spending in Latin America," edited by Nora Lustig, Carola Pessino, and John Scott, special issue, *Public Finance Review* 42, no. 3, pp. 346–67.

Hill, Ruth, Gabriela Inchauste, Nora Lustig, Eyasu Tsehaye, and Tassew Woldehanna. 2017. "A Fiscal Incidence Analysis for Ethiopia," in *The Distributional Impact of Taxes and Transfers: Evidence from Eight Low- and Middle-Income Countries*, edited by Gabriela Inchauste and Nora Lustig (Washington: World Bank).

Inchauste, Gabriela, and Nora Lustig, eds. 2017. *The Distributional Impact of Taxes and Transfers: Evidence from Eight Low- and Middle-Income Countries*, edited by Gabriela Inchauste and Nora Lustig (Washington: World Bank).

Inchauste, Gabriela, Nora Lustig, Mashekwa Maboshe, Catriona Purfield, and Ingrid Wollard. 2017. "The Distributional Impact of Fiscal Policy in South Africa," in *The Distributional Impact of Taxes and Transfers: Evidence from Eight Low- and Middle-Income Countries*, edited by Gabriela Inchauste and Nora Lustig (Washington: World Bank).

Immervoll, Herwig, Horacio Levy, Jose Ricardo Nogueira, Cathal O'Donoghue, and Rozane Bezerra de Siqueira. 2009. "The Impact of Brazil's Tax-Benefit System on Inequality and Poverty," in *Poverty, Inequality, and Policy in Latin America*, edited by Stephan Klasen, and Felicitas Nowak-Lehmann, 271–302 (MIT Press).

Immervoll, Herwig, and Linda Richardson. 2011. "Redistribution Policy and Inequality Reduction in OECD Countries: What Has Changed in Two Decades?" IZA Discussion Paper 6030.

Jaramillo, Miguel. 2014. "The Incidence of Social Spending and Taxes in Peru," in "The Redistributive Impact of Taxes and Social Spending in Latin America," edited by Nora Lustig, Carola Pessino, and John Scott, special issue, *Public Finance Review* 42, no. 3, pp. 391–412.

Jellema, Jon, and Gabriela Inchauste. 2018. "Constructing Consumable Income: Including the Direct and Indirect Effects of Indirect Taxes and Subsidies," chap. 7 in *Commitment to Equity Handbook: Estimating the Impact of Fiscal Policy on Inequality and Poverty,* edited by Nora Lustig (Brookings Institution Press and CEQ Institute, Tulane University). Free online version available at www.commitmentoequity.org.

Jellema, Jon, Matthew Wai-Poi, and Rythia Afkar. 2017. "The Distributional Impact of Fiscal Policy in Indonesia," in *The Distributional Impact of Taxes and Transfers: Evidence from Eight Low- and Middle-Income Countries*, edited by Gabriela Inchauste and Nora Lustig (Washington: World Bank).

Jolliffe, Dean and Espen Beer Prydz. 2016. "Estimating International Poverty Lines from Comparable National Thresholds." Policy Research Working Paper 7606 (Washington: World Bank).

———. 2017. "Societal Poverty. A Relative and Relevant Measure." Policy Research Working Paper 8073 (Washington: World Bank).

Kakwani, Nanak C. 1977. "Measurement of Tax Progressivity: An International Comparison." *Economic Journal* 87, no. 345, pp. 71–80.

Keen, Michael, and Ben Lockwood. 2010. "The Value Added Tax: Its Causes and Consequences." *Journal of Development Economics* 92, no. 2, pp. 138–51.

Lambert, Peter. 1985. "On the Redistributive Effect of Taxes and Benefits." *Scottish Journal of Political Economy* 32, no. 1, pp. 39–54.

———. 2001. *The Distribution and Redistribution of Income*, 3rd ed. (Manchester University Press).

Lindert, Kathy, Emmanuel Skoufias, and Joseph Shapiro. 2006. "Redistributing Income to the Poor and Rich: Public Transfers in Latin America and the Caribbean." Social Protection Discussion Paper 0605 (Washington: World Bank).

Lopez-Calva, Luis Felipe, Nora Lustig, Mikhail Matytsin, and Daria Popova. 2017. "Who Benefits from Fiscal Redistribution in Russia?," in *The Distributional Impact of Taxes and Transfers: Evidence from Eight Low- and Middle-Income Countries*, edited by Gabriela Inchauste and Nora Lustig (Washington: World Bank).

Lora, Eduardo, ed. 2006. *The State of State Reforms in Latin America* (Washington: World Bank).

Lustig, Nora. 2015. "The Redistributive Impact of Government Spending on Education and Health: Evidence from 13 Developing Countries in the Commitment to Equity Project," in *Inequality and Fiscal Policy*, edited by Benedict Clements, Ruud Mooji, Sanjeev Gupta, and Michael Keen (Washington: International Monetary Fund).

———. 2016. "Inequality and Fiscal Redistribution in Middle Income Countries: Brazil, Chile, Colombia, Indonesia, Mexico, Peru and South Africa." *Journal of Globalization and Development* 7, no. 1, pp. 17–60 (doi:10.1515/jgd-2016-0015).

Lustig, Nora, and Sean Higgins. 2013. "Commitment to Equity Assessment (CEQ): Estimating the Incidence of Social Spending, Subsidies and Taxes. Handbook." CEQ Working Paper 1 (New Orleans: Center for Inter-American Policy and Research, Department of Economics, Tulane University, and Inter-American Dialogue).

Lustig, Nora, Carola Pessino, and John Scott, eds. 2014. "The Redistributive Impact of Taxes and Social Spending in Latin America," special issue, *Public Finance Review* 42, no 3, pp. 287–303.

Lustig, Nora, and Jacques Silber. 2016. Introduction, "Global Poverty Lines," special issue, *Journal of Economic Inequality* 14, no. 2, pp. 129–140.

Martinez-Aguilar, Sandra, and Eduardo Ortiz-Juarez. 2016. "CEQ Master Workbook: Chile. Version: October 7, 2016," CEQ Data Center on Fiscal Redistribution (CEQ Institute, Tulane University and the World Bank).

Martinez-Vazquez, Jorge. 2008. "The Impact of Budgets on the Poor: Tax and Expenditure Benefit Incidence Analysis," in *Public Finance for Poverty Reduction: Concepts and Case Studies from Africa and Latin America*, edited by Blanca Moreno-Dodson and Quentin Wodon, Directions in Development (Washington: World Bank).

McClure, Charles E. 1970. "Tax Incidence, Macroeconomic Policy, and Absolute Prices." *Quarterly Journal of Economics* 84, pp. 254–67.

Meerman, Jacob. 1979. *Public Expenditure in Malaysia: Who Benefits and Why* (Oxford University Press for the World Bank).

Melguizo, Angel, and Jose M. Gonzalez-Paramo. 2013. "Who Bears the Social Security Taxes? A Meta-Analysis Approach." *SERIEs—Journal of the Spanish Economic Association* 4, no. 3, pp. 247–71.

Mieszkowski, Peter. 1967. "On the Theory of Tax Incidence." *Journal of Political Economy* 75 (June), pp. 250–62.

Morra Imas, Linda G., and Ray C. Rist. 2009. *The Road to Results: Designing and Conducting Effective Development Evaluations* (Washington: World Bank).

Musgrave, Richard. 1959. *The Theory of Public Finance* (New York: McGraw-Hill).

Musgrave, Richard A., J. J. Carroll, L. D. Cook, and L. Frane. 1951. "Distribution of Tax Payments by Income Groups: A Case Study for 1948." *National Tax Journal* 4 (March), pp. 1–53.

Musgrave, Richard, Karl Case, and Herman Leonard. 1974. "The Distribution of Fiscal Burdens and Benefits." *Public Finance Quarterly* 2, no. 3, pp. 259–311.

O'Donnell, Owen, Eddy Van Doorslaer, Adam Wagstaff, and Magnus Lindelow. 2008. *Analyzing Health Equity Using Household Survey Data: A Guide to Techniques and Their Implementation*, WBI Learning Resources (Washington: World Bank).

O'Donoghue, Cathal, ed. 2014. *Handbook of Microsimulation*. Book Series: Contributions to Economic Analysis, Volume 293, series edited by Badi H. Baltagi and Efraim Sadka (West Yorkshire, UK: Emerald Insight).

OECD. 2011. *Divided We Stand: Why Inequality Keeps Rising* (Paris: OECD Publishing).

O'Higgins, Michael, and Patricia Ruggles. 1981. "The Distribution of Public Expenditures and Taxes among Households in the United Kingdom." *Review of Income and Wealth* 27, no. 3, pp. 298–326.

Paz Arauco, Veronica, George Gray-Molina, Wilson Jimenez, and Ernesto Yañez. 2014. "Explaining Low Redistributive Impact in Bolivia," in "The Redistributive Impact of Taxes and Social Spending in Latin America," edited by Nora Lustig, Carola Pessino, and John Scott, special issue, *Public Finance Review* 42, no 3, pp. 326–45.

Peacock, Alan T., ed. 1954. *Income Redistribution and Social Policy* (London: Jonathan Cape).

Pechman, Joseph A. 1985. *Who Paid the Taxes, 1966–1985* (Brookings Institution).

Pechman, Joseph A., and Benjamin A. Okner. 1974. *Who Bears the Tax Burden?* (Brookings Institution).

Ravallion, Martin, and Shaohua Chen. 2015. "Benefit Incidence with Incentive Effects, Measurement Errors and Latent Heterogeneity: A Case Study for China." *Journal of Public Economics* 128 (August), pp. 124–32.

Rolph, Earl R. 1954. *The Theory of Fiscal Economics* (University of California Press).

Ruggles, Patricia, and Michael O'Higgins. 1981. "The Distribution of Public Expenditure among Households in the United States." *Review of Income and Wealth* 27, no. 2, pp. 137–64.

Sastre, Mercedes, and Alain Trannoy. 2002. "Shapley Inequality Decomposition by Factor Components: Some Methodological Issues." *Journal of Economic Theory* 9, pp. 51–89.

———. 2008. "Changing Income Inequality in Advanced Countries: A Nested Marginalist Decomposition Analysis." Unpublished paper.

Scott, John. 2014. "Redistributive Impact and Efficiency of Mexico's Fiscal System," in "The Redistributive Impact of Taxes and Social Spending in Latin America," edited by Nora Lustig, Carola Pessino, John Scott, special issue, *Public Finance Review* 42, no. 3, pp. 368–90.

Selowsky, Marcelo.1979. *Who Benefits from Government Expenditures? A Case Study of Colombia* (Oxford University Press).

Shah, Anwar, ed. 2003. *Handbook on Public Sector Performance Reviews* (Washington: World Bank).

Shorrocks, Anthony F. 2013. "Decomposition Procedures for Distributional Analysis: A Unified Framework Based on the Shapley Value." *Journal of Economic Inequality* 11, no. 1, pp. 99–126.

Silveira, Fernando Gaiger, Jhonatan Ferreira, Joana Mostafa, and Jose Aparecido Carlos Ribeiro. 2011. "Qual o impacto da tributação e dos gastos publicos sociais na distribuição de renda do Brasil? Observando os dois lados da moeda," in *Progressividade da Tributação e Desoneração da Folha de Pagamentos Elementos para Reflexão*, edited by Jose Aparecido Carlos Ribeiro, Alvaro Luchiezi Jr., and Sergio Eduardo Arbulu Mendonça (Brasilia: IPEA).

Slemrod, Joel. 1992. "Taxation and Inequality: A Time-Exposure Perspective," in *Tax Policy and the Economy*, vol. 6, edited by James M. Poterba (MIT Press).

Suits, Daniel B. 1977. "Measure of Tax Progressivity." *American Economic Review* 67, no. 4, pp. 747–52.

Tax Foundation, Inc. 1960. "Allocation of the Tax Burden by Income Class." Project Note No. 45, May.

———. 1967. *Tax Burdens and Benefits from Government Expenditures by Income Class, 1961 and 1965* (New York: Tax Foundation, Inc.).

Urzua, Carlos M., ed. 2012. *Fiscal Inclusive Development: Microsimulation Models for Latin America* (Mexico: IDRC-PNUD-ITESM).

van de Walle, Dominique. 1992. "The Distribution of the Benefits from Social Services in Indonesia, 1978–87." Policy Research Working Paper 871 (Washington: World Bank, Country Economics Department).

———. 1998. "Assessing the Welfare Impacts of Public Spending." *World Development* 26 (March), pp. 365–79.

———. 2004. "Testing Vietnam's Public Safety Net." *Journal of Comparative Economics* 32, no. 4, pp. 661–79.

van de Walle, Dominique, and Kimberly Nead, eds. 1995. *Public Spending and the Poor: Theory and Evidence* (published for the World Bank by John Hopkins University Press).

World Bank. 2000/2001. *World Development Report 2000/2001: Attacking Poverty* (published for the World Bank by Oxford University Press).

———. 2006. *Country Policy and Institutional Assessments*, Operations Policy and Country Services (http://siteresources.worldbank.org/IDA/Resources/CPIA2006Questionnaire.pdf).

———. 2009. *The World Bank's Country Policy and Institutional Assessment, An Evaluation* (http://siteresources.worldbank.org/EXTCPIA/Resources/cpia_full.pdf).

———. 2011. "CPIA Public Sector Management and Institutions Cluster Average" (http://data.worldbank.org/indicator/IQ.CPA.PUBS.XQ).

Younger, Stephen D. 2018. "Ghana and Tanzania: The Impact of Reforming Energy Subsidies, Cash Transfers, and Taxes on Inequality and Poverty," chap. 16 in *Commitment to Equity Handbook: Estimating the Impact of Fiscal Policy on Inequality and Poverty*, edited by Nora Lustig (Brookings Institution Press and CEQ Institute, Tulane University). Free online version available at www.commitmentoequity.org.

Younger, Stephen D., and Artsvi Khachatryan. 2017 "Fiscal Incidence in Armenia," in *The Distributional Impact of Taxes and Transfers. Evidence from Eight Low- and Middle-Income Countries*, edited by Gabriela Inchauste and Nora Lustig (Washington: World Bank).

Younger, Stephen D., Flora Myamba, and Kenneth Mdadila. 2016. "Fiscal Incidence in Tanzania." *African Development Review* 28, no. 3, pp. 264–76 (doi:10.1111/1467-8268.12204).

Younger, Stephen D., Eric Osei-Assibey, and Felix Oppong. 2017. "Fiscal Incidence in Ghana." *Review of Development Economics,* January 11 (doi:10.1111/rode.12299).

Younger, Stephen D., David Sahn, Stephen Haggblade, and Paul Dorosh. 1999. "Tax Incidence in Madagascar: An Analysis Using Household Data." *World Bank Economic Review* 13, no. 2, pp. 303–31.