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Measuring the distributional impact of taxation and public spending: The practice of fiscal incidence analysis*

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Abstract

Taxation and public spending are key policy levers the state has in its power to change the distribution of income. One of the most commonly used methods to measure the distributional impact of a country's taxes and public spending is fiscal incidence analysis. Rooted in the field of Public Finance, 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. Standard fiscal incidence analysis just looks 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." Although the theory is quite straightforward, its application can be fraught with complications. The salient ones are discussed here. While ignoring behavioral responses and general equilibrium effects is a limitation of the accounting approach, the effects calculated with this method are considered a reasonable approximation of the short-run welfare impact. Fiscal incidence analysis, however, can be designed to include behavioral responses as well as general equilibrium and inter-temporal effects. This article focuses on the implementation of fiscal incidence analysis using the accounting approach.

Keywords: fiscal incidence, taxation, social spending, transfers, pensions, progressivity, distributional effects, inequality, poverty, marginal contribution, effectiveness, valuing in-kind transfers.

JEL Classification: D31, H22, I32, I38.

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Introduction

Taxation and public spending are key policy levers the state has in its power to change the distribution of income determined both by market forces and institutions, and the prevailing distribution of wealth and property.[3] Two key indicators of society's commitment to equalizing opportunities and reducing poverty and social exclusion are the share of total income devoted to social spending and how equalizing and pro-poor this spending is.[4] While measuring the level of taxation and spending (in absolute terms or as a share of GDP) is straightforward, determining their impact on inequality and poverty is more complex.

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.[5]

Fiscal incidence analysis can be used to assess the redistributive impact of a fiscal system as a whole or changes of specific fiscal instruments (e.g., eliminating tax exemptions or raising the VAT rate). In particular, fiscal incidence analysis is used to address the following questions: Who bears the burden of taxation and who receives the benefits of public spending? How much income redistribution is being accomplished through taxation and public spending? What is the impact of taxation and public spending on poverty and the poor? How equalizing are specific taxes and government welfare programs? How progressive are spending on education and health? How effective are taxes and government spending in reducing inequality and poverty? Who are the losers and winners of tax and welfare programs reforms? Real time analysis of the winners and losers, in fact, plays an important

[3] See, for example, Atkinson (2015), Barr (2012), Bourguignon and Pereira da Silva (2003), Musgrave (1959), Lindert (1994, 2004) and Piketty (2014). Government activity affects the distribution of income and wealth through a variety of channels: public spending, taxation, borrowing, macroeconomic policy, foreign policy, competition policy, regulatory activities, ownership or control of business enterprises, and norms and institutions.

[4] Barr (2012) and Lindert (2004).

[5] Among taxes, typical ones that appear in fiscal incidence analysis are personal income tax, payroll taxes, corporate taxes (however, they are not always included), other direct taxes such as property taxes, VAT, sales taxes and excise taxes. On the spending side, cash and near-cash transfers, education, health, and housing spending, and consumption subsidies.

role in shaping the policy debate, for example, in France,[6] the United Kingdom,[7] and the United States.[8]

The tax incidence literature includes a long list of studies going back to the middle of the XXth century—mainly on the US tax system--starting with the pioneer work of Musgrave et al. (1951) and Musgrave (1959), and the Tax Foundation (1960); and, subsequently, by Musgrave, Case, and Leonard (1974), Pechman and Okner (1974), and Musgrave and Musgrave (1976). On the expenditure side, early studies on its incidence can be found in Peacock (1954), Gillespie (1965), and the Tax Foundation (1967).[9] To this early work one should add, for example, Urrutia and de Sandoval (1976), Meerman, (1979) and Selowsky (1979) who analyzed the incidence of public spending in Colombia, Malaysia, and Colombia, respectively.[10]

From a policy viewpoint, net fiscal incidence (that is, taxes net of transfers) is the relevant measure that government authorities need to use in judging the fiscal system as a whole or particular policies. Focusing on one side of the ledger of fiscal accounts can be seriously misleading. For instance, taxes may well be progressive (and equalizing) but, if the poor pay taxes and the amount they receive in transfers is not large enough to more than compensate for the taxes they pay, a progressive fiscal

[6] In France, this type of analysis takes place at the Institut des Politiques Publiques (IPP) of the Paris School of Economics. In its website, the institute states: "IPP researchers are particularly concerned with household taxation, issues around local public finance, corporate taxation, poverty reduction, policies targeting families, wealth taxation and inheritance, and more generally the architecture of our tax and transfer system. The purpose is to assess the impact of reforms which have already been implemented or are simply being considered, from the standpoint of their efficiency as well as of their redistributive impact." https://www.ipp.eu/en/topics/tax-and-social-system/

[7] In the United Kingdom, the leading organization is the Institute for Fiscal Studies (IFS). In its website, the IFS states: "Since its foundation in the 1960s, the IFS has studied the design of the UK's tax and benefit system, and the effects it has on individuals and companies. This continues to be a core part of the Institute's work. We monitor and analyse policy developments and proposals on an ongoing basis and use this work to make important contributions to public debates. Each year in the run up to the Budget we publish our own Green Budget, which addresses the challenges facing the Chancellor, and we publish analysis of policy changes immediately following the Budget and fiscal statements. More recently we have also began supporting the analysis of tax policy in developing countries, including via our TaxDev initiative."
https://www.ifs.org.uk/research_areas/116?year_published[start]=&year_published[end]=&page=1&

[8] In the United States, the leading organization is the Urban-Brookings Tax Policy Center (TPC). In its website, the TPC states: "The Urban-Brookings Tax Policy Center (TPC) aims to provide independent analyses of current and longer-term tax issues and to communicate its analyses to the public and to policymakers in a timely and accessible manner. The Center combines top national experts in tax, expenditure, budget policy, and microsimulation modeling to concentrate on four overarching areas of tax policy that are critical to future debate. TPC is a joint venture of the Urban Institute and Brookings Institution. The Center is made up of nationally recognized experts in tax, budget, and social policy who have served at the highest levels of government. TPC provides timely, accessible analysis and facts about tax policy to policymakers, journalists, citizens, and researchers. To read the full collection of research or find out about news and events, visit the Center's website at: http://www.taxpolicycenter.org/"

[9] 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.

[10] For a description, applications and limitations of standard incidence analysis as well as of those which include behavioral responses and general equilibrium effects, see the items marked with an "*" in the References section. The readings mentioned in the references section and in the above paragraph are neither meant to be an exhaustive list nor represent the history of thought in fiscal incidence analysis. The list is meant to give the reader a sample of references to early work on fiscal incidence analysis as well as of its evolution.

system may worsen poverty.[11] An increase in value added taxes (VAT) may be rejected on equity grounds as being regressive, but it actually may be desirable if the resulting revenues are used to finance cash transfers to the poor or primary-school services in poor neighborhoods. Expanding social protection benefits such as pensions to low income groups may help combat old-age poverty. However, if this expansion needs to be financed with higher consumption taxes, a significant portion of the poor who are not eligible for pension benefits could be left worse off (at least, in the present).[12]

The simplest version of fiscal incidence analysis just looks 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." This approach takes private income as given and allocates taxes and public spending to individuals and families in different economic circumstances according to certain assumptions. Available fiscal incidence studies that use the accounting approach, however, are not a mechanically applied accounting exercise. They analyze the incidence of taxes by their assumed economic rather than statutory incidence (i.e., where a tax is proximately levied). The economic incidence, strictly speaking, depends on the elasticity of demand and supply of factors and goods, and the ensuing general equilibrium effects. In essence, the accounting approach implicitly assumes zero (completely inelastic) demand price and labor supply elasticities which may not be far-fetched assumptions for analyzing effects in the short-run. Under these assumptions, individual income taxes and contributions (both by employee and employer) are borne by labor in the form of lower wages, taxes on incomes from capital are borne by the owners, and indirect taxes (on both final goods and inputs, using input-output tables for the latter) are fully shifted forward to consumers in the form of higher prices.

On the transfers side, fiscal incidence studies assume that transfers do not induce individuals to work less than in the absence of transfers: that is, labor supply is assumed to be perfectly inelastic to an increase in non-work income (i.e., studies assume zero non-work income elasticity in labor supply). In addition, fiscal incidence studies-- especially those for low- and middle-income countries-- often take into account the lower incidence associated with consumption of own-production (quite common, especially in rural areas in developing countries), informality and other forms of tax evasion due to corruption or poor enforcement schemes. While ignoring behavioral responses and general

[11] See the results in Lustig (2018b) and Figure 4 above.

[12] For recent studies which look at both the tax (both direct and indirect) and spending side (both cash and in-kind transfers), see, for example, Alam, Inchauste, and Serajuddin (2017); Aristy-Escuder et al. (2018); Arunatilake, Inchauste, and Lustig (2017); Beneke, Lustig, and Oliva (2018); Bucheli et al. (2014); Cabrera, Lustig, and Morán (2015); Cancho and Bordarenko (2017); Enami (2018a); Higgins and Lustig (2016); Higgins and others (2016); Higgins and Pereira (2014); Hill and others (2017) ; Inchauste and Lustig (2017) ; Inchauste and others (2017) ; Jaramillo (2014); Jellema, Wai-Poi, and Afkar (2017) ; Jellema and others (2018); Jouini and others (2018); Lopez-Calva and others (2017) ; Lustig (2015, 2016, 2018a, 2018b); Lustig, Pessino, and Scott (2014); Martínez et al. (2018); Paz-Arauco et al. (2014); Rossignolo (2018); Scott (2014); Younger and Khachatryan (2017); Younger, Myamba, and Mdadila (2016); Younger, Osei-Assibey, and Oppong (2017); Younger (2018). Also, see the CEQ Working Paper series available at www.commitmentoequity.org. In these studies, the reader will find examples of how the purchasing power of the poor may be lowered by fiscal policy even if the combined effect of taxes, transfers, and subsidies is equalizing.

equilibrium effects is a limitation of the accounting approach, the effects calculated with this method are considered a reasonable approximation of the short-run welfare impact.[13]

Fiscal incidence analysis, however, can be designed to include behavioral responses and general equilibrium effects. It can be point-in-time or lifetime fiscal incidence analysis. That is, the analysis can assess a current system or estimate the potential or actual effects of particular reforms taking into consideration the lifetime earnings profiles. The analysis can assess the average incidence of a tax or benefit or it can assess the incidence on the margin. For example, although the average incidence of primary education spending in a low-income country may show that the main beneficiaries are from urban areas, expanding this spending could benefit the rural (poorer) population making the marginal incidence more progressive than the average.[14]

This article focuses on the implementation of fiscal incidence analysis using the accounting approach which is the most commonly used framework in practice. In particular, the article presents fiscal incidence's conceptual components and assumptions, discusses the data requirements and their challenges, and describes the main indicators and their properties illustrating with examples.

Fiscal Incidence Analysis in Practice: Allocating Taxes and Transfers to Households

Constructing the Core Income Concepts: The Bedrock of Fiscal Incidence Analysis

As mentioned above, in the accounting approach there are no behavioral responses, no general equilibrium effects and no dynamic effects associated with tax and transfers policy. In other words, the counterfactual income in the presence of a tax (transfer) is simply the prefiscal income minus (plus) the tax (transfer). Once the allocation judgments have been made, who bears the burden (receives the benefit) of a tax (transfer) in the accounting framework is altogether straightforward. Thus, the building block of fiscal incidence analysis is the construction of "income concepts." That is, starting from a prefiscal income concept or market income (mainly, income from labour and capital and private transfers), each new income concept is constructed by adding the relevant transfers and subsidies and subtracting taxes to the previous income concept. For example, to obtain the concept of disposable income, one needs to subtract direct personal income taxes and add cash transfers to market income; consumable income is generated by subtracting indirect (consumption) taxes and adding subsidies to disposable income; and, final income is obtained by adding government spending

[13] 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).

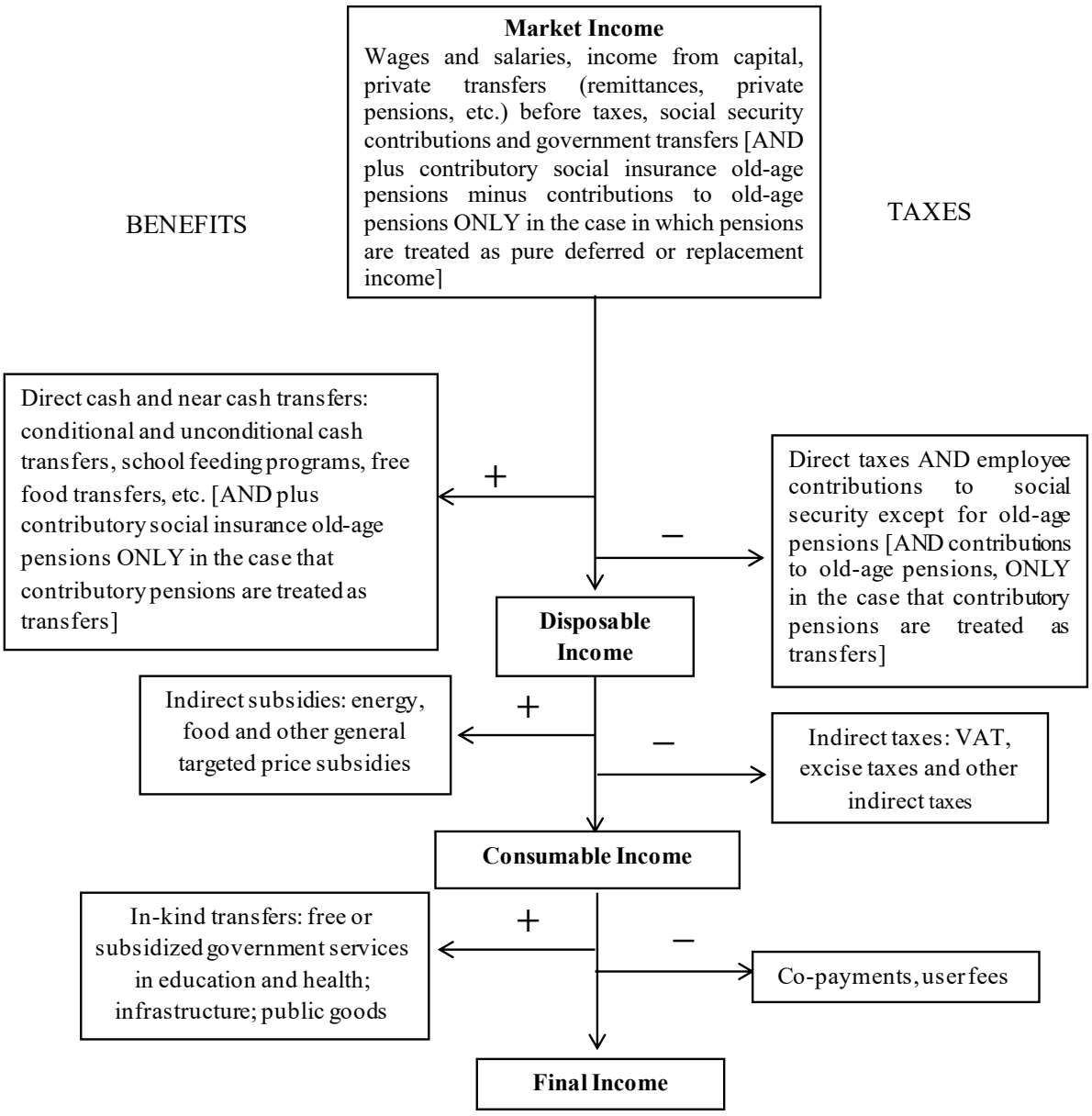
[14] For examples of fiscal incidence analysis in a partial equilibrium context see Coady (2006); Gertler and Glewwe (1990); Gertler and van der Gaag (1990); van de Walle (1998 and 2003); and, Younger and others (1999). Devarajan and Hossein (1998) carry out fiscal incidence analysis in a general equilibrium framework. Fiscal incidence analysis in an intertemporal setting for the United States can be found in Fullerton and Rogers (1991) and Slemrod (1992). An application of the marginal incidence analysis is presented in Younger (2003) and van de Walle (2003), for example.

on education and health to consumable income.[15] A schematic presentation of this process can be seen in Figure 1.[16] Recall that in the accounting approach no claim is made that the original or market income equals the true counterfactual income in the absence of taxes and transfers. It is a first-order approximation.

[15] In other words, let's define the before taxes and transfers income of unit h as I_h (i.e., a household's per capita income) and net taxes of type i as T_i. Let's define the "allocator" of tax i to unit h as S_{ih} (or the share of net tax i borne by unit h). Then, post-tax income of unit h can be defined as: $Y_h = I_h - \sum_i T_i S_{ih}$.

[16] The income concepts are named using the terminology in Lustig (2018a).

Figure 1: Construction of Income Concepts



Source: Lustig and Higgins (2018), Figure 1-1.

Not all the fiscal incidence studies construct the four income concepts shown in Figure 1.[17] For instance, EUROMOD at the University of Essex presents results for European Union member countries up to disposable income only.[18] So does the OECD Income Distribution Database for members of the organization. In contrast, the Commitment to Equity (CEQ) Institute at Tulane University presents results for a considerable number of low-and middle-income countries for all four income concepts.[19] Disposable income or consumption (per capita or equivalized) is the standard welfare indicator used to measure poverty and inequality in international databases,[20] official statistics, and the bulk of poverty and inequality research. However, actual consumption of goods and services will be different if, for example, consumption taxes on food are exempt in one country (or period) but pay VAT in another country (or period) even if disposable income is identical. Hence the importance of the concept of consumable income as an indicator of household welfare.[21] Similarly, if in one country households have access to free publicly provided education and health services while in another country they don't, welfare levels will be different. Hence the importance of the concept of final income as an indicator of welfare.[22]

Data Requirements and Data Challenges

Identifying who bears the burden of taxes and who benefits from government spending, or who the winners and losers of particular fiscal reforms are, requires the use of household-level data. Fiscal incidence studies use microdata from household surveys combined with budget data from fiscal accounts and other administrative registries. The data requirements for a fiscal incidence analysis includes three main ingredients: a recent household survey (possible options: expenditure-income, expenditure, employment, Living Standard Measurement Surveys, and so on) representative at the

[17] Some studies do not attempt to calculate the income concepts and focus on the incidence of specific fiscal instruments. For example, see LATAX--a multi-country flexible tax micro-simulation model--, housed in the Institute of Fiscal Studies. (Abramovsky, Laura and David Phillips, 2015). (http://www.ifs.org.uk/uploads/publications/software/LATAX/LATAX%20Manual.pdf). LIS (the Luxembourg Income Study) presents indicators for market and disposable income only.), http://www.lisdatacenter.org/our-data/lws-database/

[18] For more details, see https://www.euromod.ac.uk/.

[19] See http://www.commitmentoequity.org/. "Final income" in CEQ studies, however, does not include the incidence of infrastructure spending or spending on other public goods (broadly defined). The CEQ definition of *final income* is similar to the concept of *adjusted disposable* income proposed by the Canberra Group Handbook (CGH) on Household Income Statistics except for a crucial difference: the latter does not subtract net indirect taxes from disposable income (United Nations Economic Commission for Europe, 2011).

20 See, for example, the following international databases: CEPALSTAT (UN Economic Commission for Latin America and the Caribbean), http://estadisticas.cepal.org/cepalstat/WEB_CEPALSTAT/Portada.asp; IDD (Income Distribution Database/OECD), http://www.oecd.org/social/income-distribution-database.htm; LIS/LWS (Luxembourg Income Study), http://www.lisdatacenter.org/our-data/lws-database/; PovcalNet (World Development Indicators, World Bank), http://iresearch.worldbank.org/PovcalNet/povOnDemand.aspx; SEDLAC (Socio-Economic Database for Latin America and the Caribbean/CEDLAS at Universidad Nacional de La Plata and World Bank), http://sedlac.econo.unlp.edu.ar/; WIID (World Income Inequality Database/UNU-WIDER), https://www.wider.unu.edu/project/wiid-world-income-inequality-database.

[21] See discussion in Higgins and Lustig (2016), Lustig (2018a), and Lustig (forthcoming).

[22] For this reason, the international convention concerning how to measure welfare proposed by the Canberra Group acknowledges the need to broaden the conceptual definition of household income to add benefits in kind such as publicly provided education and healthcare services. See, for example, (United Nations Economic Commission for Europe, 2011).

national level; a detailed description of the characteristics of each tax and spending item to be included in the analysis: and, audited or confirmed budget and administrative data for the survey year.

If the fiscal incidence analysis is to take into account the indirect effect of certain taxes or subsidies that are used as key inputs in the production of final goods (for example, duties on oil imports; or, fuel, electricity, and transportation subsidies), one would also need either a recent input-output table, a Social Accounting Matrix (SAM), or a Supply and Use Table (SUT). The incidence of indirect taxes (subsidies) with or without these indirect effects can be significantly different especially if the taxed (or subsidized) product is a pervasive input in production. When such is the case (as with electricity or fuel), consumable income calculated with the indirect effects can be quite different than if such effects are assumed away.

Although the process of calculating the core income concepts seems utterly simple, in practice it is very complex even in the basic accounting approach. There are data challenges and conceptual challenges. First, especially in low-income countries, the data is frequently absent, incomplete, and/or quite difficult to obtain. Although advanced countries (and most middle-income countries) collect household surveys periodically, that is not the case in low-income countries.[23] A second problem is that, with exceptions, household surveys collect data on either income or consumption.[24] Lack of data on consumption patterns, implies that the incidence of consumption taxes and subsidies cannot be calculated, unless one resorts to "borrow" information on consumption patterns from a similar country and/or use econometric techniques to predict consumption based on income. Even if surveys exist, in many countries governments still restrict the access to the microdata, a factor that limits the ability of independent researchers to carry an analysis of their own. Data limitations, moreover, affect not only the microdata. Especially (but not only) in low-income countries, total taxes collected by federal, state, and local governments and actual spending on education by level, for instance, may be impossible to obtain.

In addition, the empirical analysis is made more complicated because of inconsistencies between information obtained from microdata such as household surveys and that found in macrodata such as government budgets, administrative registries (e.g., tax returns), and National Accounts. Two typical problems that arise are, for example, that the number of beneficiaries of a particular welfare program according to the household survey may differ substantially from the number recorded in administratitive registries. A second and serious limitation of household survey data is the

[23] According to Lustig (forthcoming): "The data in the World Bank's PovcalNet presently cover 153 countries of which 34, as of July 2013, are classified as High Income (Atkinson, 2016). However, lack of data is still a problem. In the Middle East and North Africa (MENA) region, where there are 19 countries, only around half are covered by PovcalNet. Furthermore, according to World Bank (2016) the largest possible set of countries on which at least two comparable data points are available between the years of 2008 and 2013 was 83 countries. This set covered 75% of the world's population but fewer than half of the world's countries; population coverage was 94% in the East Asia and Pacific region but only 23% in Sub-Saharan Africa."

[24] A common practice in the absence of income data in household surveys is to assume that total consumption is equal to total disposable income and work backwards to generate the concept of market income by subtracting transfers and adding taxes. For details, see Higgins and Lustig (2018).

undercoverage and underreporting of top incomes.[25] In part (but not only) due to the "missing rich" problem, for most countries in the world, totals for household income and consumption from surveys do not match the equivalent totals from National Accounts.[26] To make matters worse, frequently discrepancies are not limited to levels of different types of household economic resources but extend to their changes over time.[27]

Given these discrepancies between survey-based income and consumption data and National Accounts, which totals should one use in fiscal incidence analysis? Both approaches have been followed in the literature. Fiscal incidence exercises in WID.World, for example, scale up survey totals to match National Accounts (and tax records and budgetary data) and produce Distributional National Accounts (DINA).[28] However, scaling-up is not done mechanically (e.g., raising all incomes by the same proportion) but takes into account the fact that there is much more income missing at the top of the distribution, and researchers apply a combination of parametric and nonparametric methods to correct for the "missing rich."[29]

At the other end of the spectrum, the fiscal incidence exercises in the CEQ Institute Data Center on Fiscal Redistribution use the scale of the economy observed in the household surveys and scale-down administrative totals to keep proportions similar to those observed in National Accounts (for example, the totals for the various fiscal components are scaled-down so that their ratio to consumption or disposable income—where the latter is obtained from the survey--is to the equivalent ratio in administrative data).[30] Why would one prefer to scale variables down to the size of the economy found in household surveys? Primarily, because this is the data used in the calculation of income (consumption) poverty in all the most widely use databases on poverty. With upwardly adjusted data (and unless all the adjustment takes place at the top of the distribution), there would be significant differences in the poverty estimates shown in the fiscal incidence exercises and those found in the standard international databases and official statistics. However, if the goal is to show how National Account aggregates are distributed among households such as in the DINA project mentioned above, then survey totals will need to be scaled-up.

Economic Incidence Versus Statutory Incidence

Statutory incidence refers to the rate of taxation established by law and where the tax is proximately levied. For example, in statutory terms, an excise tax might be collected from consumers. However, as formally shown by Harberger (1962) many decades ago, the actual burden in welfare terms—that is, the economic incidence-- of a tax may be quite different from who mails the check to the tax authorities. In the case of an excise tax, the economic burden may fall entirely on the consumer,

[25] For an overview on this matter, see, for example, Lustig (2018c).
[26] As shown in Bourguignon (2015), these differences can be very large.
[27] Deaton (2005).
[28] For details, see Alvaredo and others (2017).
[29] These details are discussed in Alvaredo and others (2017) and summarized in Lustig (2018c).
[30] For details, see Higgins and Lustig (2018).

entirely on the producer, or on both, depending on demand (or supply) elasticities.[31] In partial equilibrium analysis (and in competitive economies where markets clear), if demand is completely inelastic (or supply perfectly elastic), consumers will bear the entire burden of an excise tax: the price of the good at the cash register will increase exactly in the amount of the tax. If, on the other hand, demand is perfectly elastic (or supply completely inelastic), producers will: the prices on the shelf will not change but the price that producers receive will be reduced exactly in the amount of the tax. Beyond these two limiting cases, the fundamental principle is that taxes tend to be borne by the more inelastic consumers (or, more generally, demanders) or producers (or, more generally, suppliers). In the case of payroll taxes, for instance, the more inelastic labor supply versus labor demand is, the more is the employer able to transfer the burden of employer's payroll taxes to workers in the form of lower wages: i.e., the burden is shifted backward to workers. Likewise, the burden of a tax on inputs (such as a gasoline tax on retailers) will be borne by the consumer in the form of higher prices the more inelastic his/her demand for the taxed good is vis-à-vis the supply elasticity.

In sum, the economic incidence depends on the elasticity of demand and/or supply of a factor or a good: the burden of taxes is borne by those who cannot easily adjust to the change in price induced by the tax. The economic incidence of taxes will also be affected by how revenues are used. In a general equilibrium analysis (which is necessary when taxes impact large parts of the economy), the economic incidence is also sensitive to a large number of elasticities. In open economies, the extent of factor mobility will affect on whom the burden of taxes fall. Finally, in a dynamic context, the long run economic incidence will ultimately depend on how taxes affect capital accumulation and marginal productivities of factors of production.

As mentioned in the introduction, the accounting approach (that is, studies based on the judgmental allocation of tax burdens across the income distribution) can be thought off as implicitly assuming i) completely inelastic demand functions so that the economic incidence of taxes on goods and services falls entirely on consumers: that is, the tax burden is shifted forward to consumers in full in the form of higher prices; and, ii) completely inelastic labor supply functions so that payroll taxes are fully shifted backward to workers in the form of lower wages.

In addition, the actual incidence of taxes may differ from the statutory incidence because of tax avoidance and tax evasion. Especially in developing countries, a significant portion of economic activity may take place outside of the formal market (e.g., salaried workers, self-employed, or property owners who do not pay direct taxes or contributions to social security due to the state's inability to enforce the law) or outside the market altogether (e.g., own production of consumption goods such as small farmers or peasants cultivating corn, wheat, or other staples to feed their families). Due to limited state capacity or corruption, tax collection and the distribution of benefits (whether in cash or in-kind) may operate very differently from the letter of the law.

[31] For an analysis of the economic incidence of taxes, see, for example, Atkinson and Stiglitz (2015), Chetty, Looney and Kroft (2009), Kotlikoff and Summers (1987) and Salanie (2011).

In the case of transfers, the actual incidence can differ from the statutory rules because beneficiaries may choose to work less (thus, incomes after the transfer may not be equal to previous earnings plus the transfer) or of imperfect take up of welfare programs. In the accounting framework it is assumed that individuals do not change their labor market behavior as a result of receiving a government transfer.

As indicated above, in spite of its limitations, the accounting approach is considered a reasonable first-order approximation and it is the most frequently used in practice. For example, when evaluating tax reform proposals, the United States Congressional Budget Office assumes that the personal income tax is fully borne by households, payroll taxes are fully borne by workers (both, the employer and employee's share), excise taxes are fully borne by buyers and corporate income tax is fully borne by the owners of capital (Salanie, 2011).

Robustness Checks and Validation

The information on direct and indirect taxes, transfers (in cash and in-kind), and subsidies, however, is often not collected in household surveys or they are collected with error. To cope with the lack of information or its inaccuracy, researchers have proposed a number of methods that rely on statistical inference, data from external sources, and common sense.[32] Because the process of allocating taxes and transfers relies on assumptions (judgment calls) that one cannot truly test using standard statistical testing methods, it is recommended to carry out robustness checks to assess the sensitivity of results. For example, one may want to change assumptions on tax evasion, informality, the size of the nonmarket economy, and/or program take-up rates. Each fiscal incidence exercise needs to be subject to thorough micro and macro validation processes.[33] Whenever it is not possible to determine whether one source of information is more credible than another (e.g., there is a discrepancy in number of beneficiaries of a program between surveys and administrative registries but there is no way to tell which one is accurate), the fiscal incidence exercise should be carried out for both to obtain a range rather than produce a single number.

Old-Age Contributory Pensions: Deferred Income or Government Transfer?

Among the salient conceptual challenges is whether social insurance contributory pensions should be considered as deferred or replacement income (and, thus, counted as part of prefiscal income) or a government transfer. In the incidence analysis literature, one can find both approaches: in some cases contributory pensions are considered deferred or replacement income[34] while in others--especially in systems with a large subsidized component--they are considered a pure government transfer.[35] In the former case, contributions during active years are treated as a form of mandatory saving and, thus,

[32] For details, see Higgins and Lustig (2018).
[33] See, for example, the recommendations in EUROMOD (2017), pp. 20-22.
[34] Alvaredo and others (2015); Breceda, Rigolini and Saavedra (2008); Immervoll and others (2009).
[35] Goñi, López, and Servén (2011); Immervol and others (2009); Lindert, Skoufias and Shapiro (2006); Silveira and others (2011).

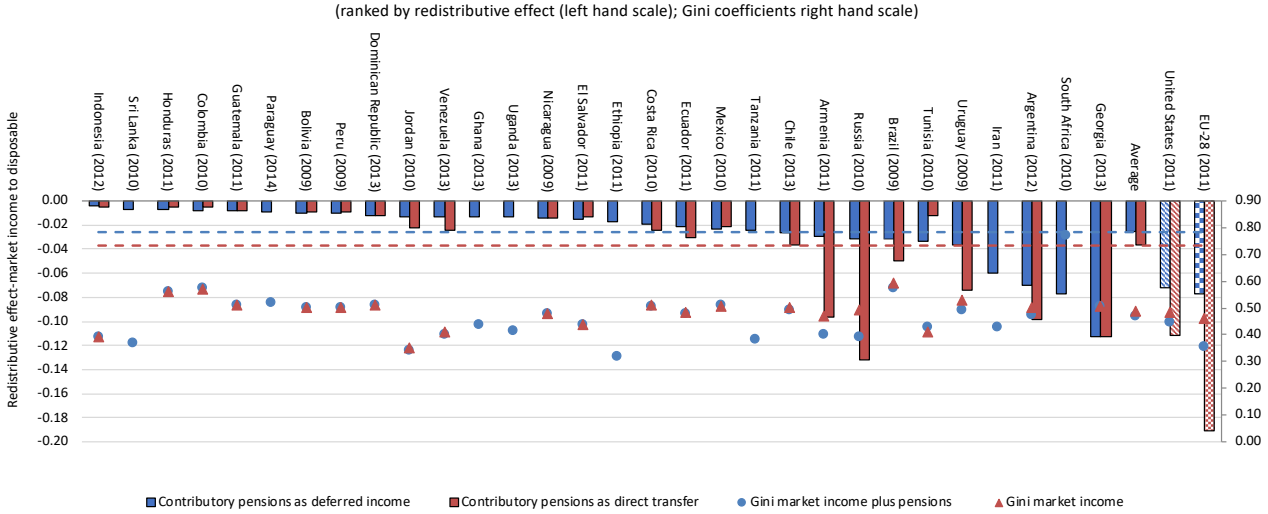
subtracted from the prefiscal income concept to avoid double counting and the income from pensions are treated as part of prefiscal income: that is added to earnings, income from capital, and private transfers. When pensions are considered a government transfer, contributions are treated as any other direct tax and the income from pensions is added to other government transfers to obtain total transfers. See Figure 1.

The true situation, however, is likely to be in between the two cases for many individuals. Since contributions to the system during working years can count as "mandatory saving," whether an individual receives a transfer depends on the size of the replacement income and her life expectancy. However, to identify how much is a pure transfer (or tax) and how much is replacement income with cross-section household surveys is very difficult.

Although the question whether a particular benefit is deferred income or a transfer also pertains to other components of public spending such as contributory health spending, disability benefits, and unemployment compensation, the assumption made about pensions significantly affects the order of magnitude of fiscal redistribution, especially in countries with a high proportion of retirees and generous contributory pensions. In Figure 2, one can observe that the redistributive effect with pensions as transfers is much higher (double or triple in some cases) for the European Union, Russia, Armenia, the United States, Uruguay, and Argentina, for example. Why? In populations with a large proportion of retirees, if pensions are treated as a government transfer prefiscal or market income will be zero or close to zero for a large number of individuals. The fiscally-induced inequality and poverty reduction then will be very large because the system will feature many of what one could call "false poor."[36]

[36] 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 so treating pensions as a transfer makes sense. However, the government's role could be just that of a "piggy bank"[36] forcing individuals to save during their working years to ensure an income stream during retirement. Reflecting this role, many countries place Social Security in a separate budget, protected from the politics governing other public expenditures.

Figure 2: Redistributive Effect Under Pensions as Deferred Income and Pensions as Government Transfer



Note: the redistributive effect is calculated as the difference between the Gini coefficient for disposable income minus the Gini coefficient for market income plus pensions (pensions as deferred income scenario) or minus the Gini coefficient for market income (pensions as transfer scenario).
Source: Lustig (2018b), Figure 10-8 based on country studies in CEQ Data Center on Fiscal Redistribution http://www.commitmentoequity.org/datacenter. For EU (28 countries) own calculation based on EUROMOD version G3.0.

To make the point of the "false poor" 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 pre-fisc destitute poor during retirement. This does not make sense.

Although any government tax or transfer might generate behavioral changes[37], social security is special in the sense that it is a lifelong contract between a working individual and society. Although a 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 commanding an even larger share of income. Since in the accounting approach behavioral responses are not modelled, the alternative is to present results for both scenarios –pensions as pure deferred or

[37] Bosch and Campos-Vázquez (2014); Camacho, Conover and Hoyos (2014); Garganta and Gasparini, (2015).

replacement income and pensions as pure government transfer—and treat the results as a lower and upper bound of the redistributive impact of the state.[38]

The Challenge of Valuing Transfers In-Kind

Another conceptual challenge of importance is which method should be used for allocating benefits from public spending on government services such as education and healthcare. In the literature, three approaches have been suggested: to value these services at the production cost to the government, at the opportunity cost in the private sector, or by the households' willingness to pay.[39] A basic definition utilised for the unit cost of providing a service is total government spending on a particular service divided by the number of users of that service. While this method has notable shortcomings (for example, there is no account for differences in quality of the service), it amounts to asking a valid question: How much would the income of a household have to be increased if it had to pay for the free or subsidized public service at the full cost to the government?

Moreover, if the goal is to produce distributional national accounts—that is, to take the totals in government budgets and distribute them among households--combining the information of unitary production cost with the usage of the service appears to be a sensible option. If the goal is to determine how much these services are "worth" to households, however, valuing services at production costs is not an appropriate method. Methods that estimate the willingness to pay are better suited. In sum, rather than choosing one method above others, researchers should use different methods depending on the question asked.[40]

Limitations of Standard Fiscal Incidence Analysis

Ideally, fiscal incidence analysis should cover all the taxes and all the components of public spending. In practice, however, it usually includes only a portion of a government's budget.[41] The difficulties are particularly strong when dealing with revenue and public spending items that are not easy to "assign" to households as is the case with revenues stemming from taxing state-owned companies (quite significant in countries where natural resources are directly exploited by the state, for example) and

[38] It is important to note that contributory pensions can exert an equalizing effect or an unequalizing one. Lustig (2018b), for instance, shows that in Bolivia, Colombia, El Salvador, Honduras, Mexico, Nicaragua, and Tunisia, contributory pensions are unequalizing.

[39] Aaron and McGuire (1970) were among the first to set out the principle that a rationed, publicly provided good (or service) should be evaluated at the individual's own valuation of the good rather than through some ad hoc assumption. On the available methods and their shortcomings see, for example, Bastagli (2015); Brennan (1976); Cornes (1995); Demery (2003); and, van de Walle (1998).

[40] A variant of the production cost approach bypasses focuses only on whether a service is used or not. Lionel Demery describes it as follows: "For each service, households are assigned an "accessi-bility dummy" taking the value of unity for those that used the service, and zero for those that did not…. The distribution of this dummy across income groups provides a measure of the equity of service provision." (Demery, 2003, p. 45).

[41] For instance, the fiscal incidence studies for thirty countries reported in the CEQ Institute's Data Center, on average, cover about 50 percent of the government revenues and spending. http://www.commitmentoequity.org/datacenter .

spending on genuine public goods such as defense.[42] If the excluded components are not distributional or poverty-neutral, then the full redistributive impact of the state--even within the confines of the accounting framework--may be quite different from those obtained from a fiscal incidence analysis that only partially covers taxes and transfers.

To the above, one must add the shortcomings of assuming away behavioral responses, general equilibrium effects, spillovers, and intertemporal redistribution. In some contexts, however, behavioral responses can be quite significant so results based on first-order approximation must be taken with great caution.[43] For instance, a beneficiary of a means-tested transfer may decide to work less than otherwise to avoid losing his eligibility; if schools offer free lunches, parents may decide to send their children to school to take advantage of them; access to local health clinics may induce parents to be more mindful of their children's health.[44]

In essence, these effects can alter the counterfactual income (i.e., the income *without* taxes and transfers) and, thus, modify not only the size but also the sign of the estimated fiscal redistribution. 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.[45] 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.[46]

Key Indicators in Fiscal Incidence Analysis

As stated in the introduction, the typical questions that fiscal incidence analysis is meant to address include: Who bears the burden of taxation and who receives the benefits of public spending? How much income redistribution? What is the impact of taxation and public spending on poverty and the poor? How equalizing are specific taxes and components of public spending? How progressive are spending on education and health? How effective are taxes and government spending in reducing inequality and poverty? Who are the losers and winners of tax and welfare programs reforms? Here I shall discuss the indicators for the first four. The effectiveness indicators are discussed in detail in Enami (2018) and Lustig and Higgins (2018).

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[42] The Distributional National Accounts (DINA) in the database WID. World of the Paris School of Economics apportions all components of the government budgets assuming that the benefits from public spending on pure public goods such as defense and infrastructure spending are proportional to the prefiscal distribution of income.
[43] Ravallion and Chen (2015).
[44] Bourguignon and Pereira da Silva (2003).
[45] For partial equilibrium analysis, see, for example, Coady (2006); Harberger (1962); Gertler and Glewwe (1990); Gertler and van der Gaag (1990); McClure (1970); Mieszkowsky (1967); Musgrave (1959); Rolph (1954); van de Walle (1998 and 2003); and, Younger and others (1999). An example of fiscal incidence analysis in general equilibrium framework is the article by Devarajan and Hossein (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.
[46] See, for example, the fiscal incidence analysis in an intertemporal setting for the United States by Fullerton and Rogers (1991) and Slemrod (1992).

Regarding assessing the winners and losers of fiscal reforms, all the nonanonymous indicators described below are useful to assess this. As a reminder to readers, some of the key indicators are anonymous while others are nonanonymous. Anonymous indicators are those which rank individuals (using household per capita or equivalized income) by the variable of interest (that is, by market income, disposable income, consumable income, and final income). Nonanonymous indicators are calculated with individuals ranked by the prefiscal income, and this ranking is kept fixed throughout the incidence analysis. The latter can be viewed as indicators of "fiscal mobility" induced by the combined effect of taxes and transfers where mobility does not refer to changes over time but to "before-after" (fiscal policy) situations.

Also, it is important to note that all the indicators discussed in this section can be calculated for any type of fiscal incidence exercises, and not just for the accounting approach. As long as one can generate results at the household level (or, if not at the household level, at least for grouped data by fractiles or bins), the indicators can be calculated for the more elaborate fiscal incidence analyses that include behavioral responses, and general equilibrium and intertemporal effects.

Finally, although the typical fiscal incidence exercise focuses primarily on the impact on the personal distribution of income, one may also 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. In the literature, there are examples of fiscal incidence analysis by the sociodemographic categories.[47] Fiscal incidence analysis by gender is one of the most challenging.[48]

Who Bears the Burden of Taxation and Who Receives the Benefits of Public Spending?

The most common indicator used in fiscal incidence analysis since its inception consists in presenting the information of taxes paid and benefits received by decile, quintile, or income categories. This is a nonanonymous indicator. That is, households are ranked by prefiscal income. A typical fiscal incidence table looks as Table 1 which shows results for Brazil by prefiscal income decile and the grand total at the bottom:

Table 1: Fiscal Incidence by Component: Brazil (2009)
Panel A: Absolute Incidence (in reais)

[47] For an analysis by urban-rural population see, for example, Cabrera, Lustig and Moran (2015). For an analysis by ethnicity and race see, for example, Lustig (2017). For fiscal incidence analysis by gender see the Further Readings section in this article.
[48] See Greenspun and Lustig (2018).

	Distribution of prefiscal income	Taxes	Transfers	Education	Health
1	13,081,969,567	-2948373988	10,421,337,948	25,140,139,803	8,962,060,295
2	29,813,431,543	-5229994493	8,481,237,822	22,385,815,538	9,468,199,385
3	45,844,250,445	-7711304871	7,229,517,809	21,631,928,109	10,045,337,871
4	62,865,228,643	-10746049330	6,980,073,476	21,065,715,763	10,217,543,692
5	82,855,122,780	-14532187216	8,220,231,177	19,175,597,836	9,968,867,505
6	107,627,764,805	-19095182907	7,296,601,164	18,502,749,799	10,017,548,391
7	140,405,251,414	-24767853744	7,555,971,413	16,754,722,212	9,407,380,882
8	189,900,201,546	-35094164551	8,404,069,442	15,096,909,627	7,739,770,634
9	281,694,143,183	-55327392595	8,200,982,452	12,848,954,793	5,175,694,597
10	782,007,064,983	-190239623650	16,395,055,536	10,635,658,533	3,004,012,636
Total	$1,736,094,428,908	-$365,692,127,346	$89,185,078,240	$183,238,192,014	$84,006,415,889

Panel B: relative incidence (each component as a % of prefiscal income)

	Distribution of prefiscal income	Taxes	Transfers	Education	Health
1	13,081,969,567	-23%	80%	192%	69%
2	29,813,431,543	-18%	28%	75%	32%
3	45,844,250,445	-17%	16%	47%	22%
4	62,865,228,643	-17%	11%	34%	16%
5	82,855,122,780	-18%	10%	23%	12%
6	107,627,764,805	-18%	7%	17%	9%
7	140,405,251,414	-18%	5%	12%	7%
8	189,900,201,546	-18%	4%	8%	4%
9	281,694,143,183	-20%	3%	5%	2%
10	782,007,064,983	-24%	2%	1%	0%
Total	$ 1,736,094,428,908	-21%	5%	11%	5%

Source: 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. DOI: 10.1177/1091142113501714

On the first column of Panel A, Table 1 shows total income before taxes and transfers. The subsequent columns show, respectively, total taxes paid, total cash transfers received and total transfers in-kind received in education and health (measured at average cost to government). Panel b shows the incidence of each fiscal intervention with respect to prefiscal income. In this table, it is easy to observe the difference between absolute and relative progressivity. Let's look at, for example, taxes. Panel a shows that taxes are progressive in absolute terms: taxes paid increase with income (since deciles have identical number of individuals, it suffices to look at the total by decile to determine this). However, in panel b one observes that the poorest decile pays a higher proportion of taxes (23 percent with

respect to its prefiscal income) than all the other deciles except the top one. Thus, taxes are regressive in relative terms except at the top end.

Now let's look at transfers. Transfers are everywhere progressive in relative terms: the proportion of transfers received with respect to prefiscal income declines with income. However, transfers are not progressive everywhere in absolute terms. To see this, for example, note that even though the richest decile receives only 2 percent in transfers, the amount the top decile receives in absolute terms is 57 percent higher than the bottom decile's.

With this information on hand one can calculate a variety of indicators such as the ratio of each component of fiscal policy vis-à-vis prefiscal income, concentration shares (e.g., the distribution of each fiscal instrument across fractiles or income groups), and the relative share adjustment defined for each income group as the share of actual income divided by the share of income under the assumption that government taxation-cum-expenditures do not affect the distribution of income.[49]

The concentration shares are commonly used to illustrate who bears the burden of taxes or receives the benefit of transfers. Based on the data shown for Brazil in Table 1, for example, 52% of collected taxes are paid by the richest decile while the poorest decile pays only 0.8% of the total. Clearly, the burden of taxes falls disproportionately on the richest echelon. However, as shown in Panel b, the relative incidence of taxes is not progressive everywhere: the bottom decile pays a higher share of its prefiscal income than every other decile than the top. Hence, there is room to make the tax system more progressive by, for instance, reducing the taxes that must be paid by the poorest decile and raising them for the second richest (i.e., the ninth) decile.

How Much Income Redistribution Is Being Accomplished?

To measure the extent of income redistribution one can calculate any of the conventional inequality measures for each income concept and subtract one from the other to measure the sign and extent of redistribution.[50] For example, subtracting a typical indicator such as the Gini coefficient for market from the Gini coefficient for disposable income shows how much redistribution is achieved by direct transfers and taxes (see Figure 2 above, for an example), while the analogous calculation with disposable and consumable income Gini coefficients shows how much redistribution is achieved by indirect subsidies and taxes. Comparing market and final income Gini coefficients shows how redistributive the fiscal system is when considering all the analyzed instruments at once.

By definition, all standard inequality measures are anonymous. In other words, one does not know (actually, more strongly, one does not care) whether, for example, the poorest person using the

[49] See Baum (1987) and Ruggeri (2003), p. 27.
[50] For a description of typical inequality indicators and their properties see, for example, Atkinson and Bourguignon (2000 and 2015a), Cowell (2009), Duclos and Araar (2006), and Jenkins and van Kerm (2009). In addition to the standard measures of inequality, one can also calculate the impact of fiscal policy on inequality of opportunity measures in the sense proposed by Roemer (1998); see also Barros and others (2009) and Ferreira and Gignoux (2011).

disposable income scale is the same as the poorest person using the market income scale. However, an important desirable characteristic of fiscal systems is that they do not result in arbitrary switching of individuals' positions in the income scale. That is, unless there are reasons that justify the switch, the poorest person should not jump ahead of the second poorest person according to market income because of the impact of taxes and transfers.[51]

In the literature, switches are called reranking and the extent to which these switches are absent is called horizontal equity.[52] Reranking refers to the phenomenon when 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 net taxes, but B is poorer than A after net taxes. The definition of horizontal equity postulates that the prefiscal policy income ranking should be preserved. In other words, if individual A was poorer than individual B in the prefiscal situation, individual A should continue to be poorer than individual B in the postfiscal one. Reranking is interpreted as a measure of fiscally-induced horizontal inequality. The more reranking there is, the more horizontal inequity. An indicator of the extent of reranking—that is, of horizontal inequity--is the Atkinson-Plotnick index. [53] By definition, the latter is a nonanonymous indicator.

Reranking has also powerful implications when assessing the contribution of a specific tax or transfer or combinations of them. In particular, reranking can potentially destroy the conventional public finance dictum that: "…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."[54]

To illustrate, let's think of a hypothetical case in which following this dictum causes 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. Under such circumstances, any anonymous inequality indicator would show that the fiscal system's impact was exactly nil. Although such an extreme situation is not likely to ever occur in real life, actual fiscal systems show quite a bit of reranking.[55] Thus, in order to determine whether a particular change on a tax or a transfer is equalizing or not, one must resort to an empirical calculation since relying on the characteristics of such the tax or transfer (whether its size or progressivity) to predict the impact of changing them, can yield the wrong results.

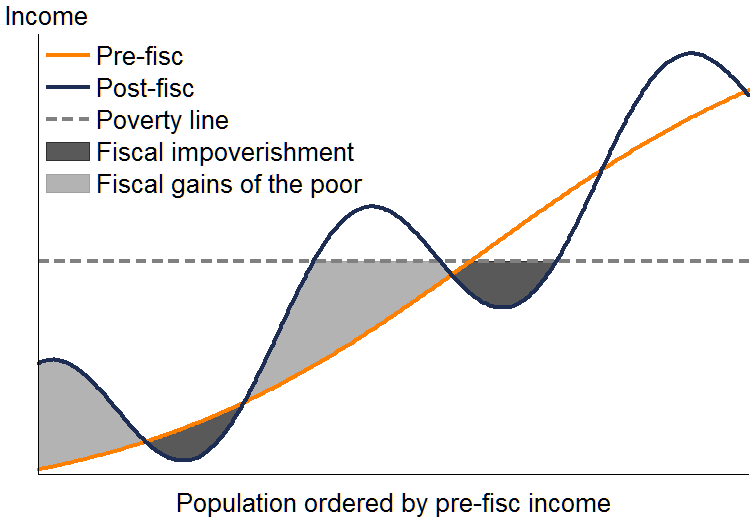
[51] "Justifiable reasons" for a swap may include, for example, that poorest person suffers a chronic illness with much higher medical expenses than the second poorest person.
[52] See, for example, Duclos and Araar (2006), p. 141. Reranking, however, is one measure of horizontal inequity. The so-called classical measures of horizontal inequity focus on whether equals are treated as equals by the fiscal system. Duclos and Araar discuss both in their Chapter 8. Also see Atkinson (1980).
[53] For a formal definition of the Atkinson-Plotnick indicator and how to calculate it see, for example, Duclos and Araar (2006), p. 145.
[54] Clements and others (2015, p.57).
[55] See, for example, the country cases in Inchauste and Lustig (2017).

What Is the Impact of Taxation and Public Spending on Poverty and the Poor?

Just as with inequality, one can assess the impact of the fiscal system by tracing out the change in poverty across income concepts[56] with any of the standard poverty measures such as the headcount ratio, the poverty gap ratio, the squared poverty gap, and so on, and with international and national poverty lines.[57] It is advisable to carry out dominance tests to assess whether poverty is unambiguously lower in one income distribution (e.g., disposable income compared with market income) than another for a range of poverty lines and broad class of poverty measures.[58]

Poverty indicators are anonymous by definition. As a result, poverty comparisons are silent about whether prefiscal poor (nonpoor) individuals were made poorer (poor) by the net effect of taxation and public spending. Even if a tax and transfer system unambiguously reduces poverty (and inequality), it has been shown that the system can make a portion of the poor poorer and some of the non-poor poor.[59] To quantify this phenomenon one can use the newly developed indicator of fiscal impoverishment.[60] Figure 3 presents a (hypothetical) graphic representation of fiscal impoverishment and fiscal gains to the poor.

Figure 3: Fiscal Impoverishment and Fiscal Gains to the Poor



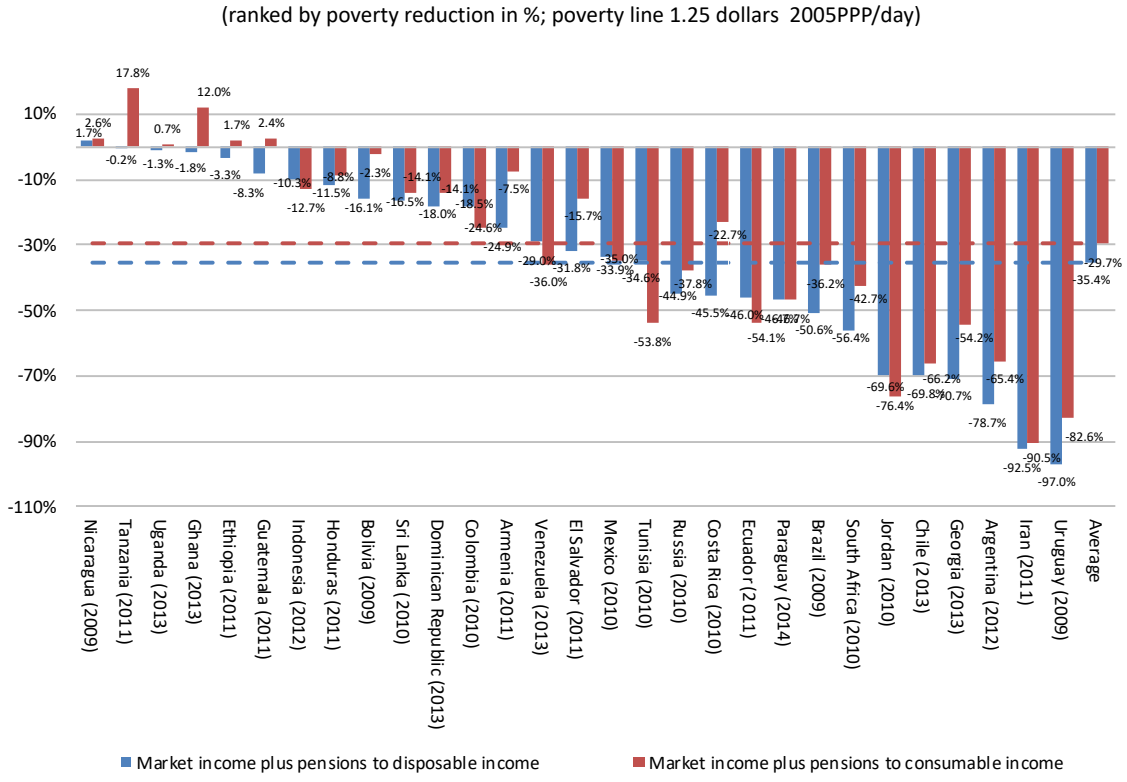
Source: Higgins and Lustig (2016), Figure 1.

[56] Because poverty lines are not calculated taking into account the access to free public services in education and health, the poverty indicators should not be calculated using the final income concept.
[57] For available poverty measures and their properties see, for example, Duclos and Araar (2006) and Haughton and Khandker (2009).
[58] Atkinson (1987); Foster and Shorrocks, (1988).
[59] Higgins and Lustig (2016).
[60] Derived in Higgins and Lustig (2016). As shown by these authors, the fiscally-induced change in the poverty gap ratio can be exactly decomposed into the sum of fiscal impoverishment and fiscal gains to the poor.

It is important to stress that fiscal systems may be equalizing but poverty increasing.[61] How can that be? A simple example will help illustrate. Assume that net taxes are progressive and equalizing but that everybody is a net payer, including the poor. In such a world, fiscal policy would have reduced inequality but increased income poverty. Figure 4 illustrates how in some countries net indirect taxes increase poverty: the headcount ratio for consumable income is higher than for market income.

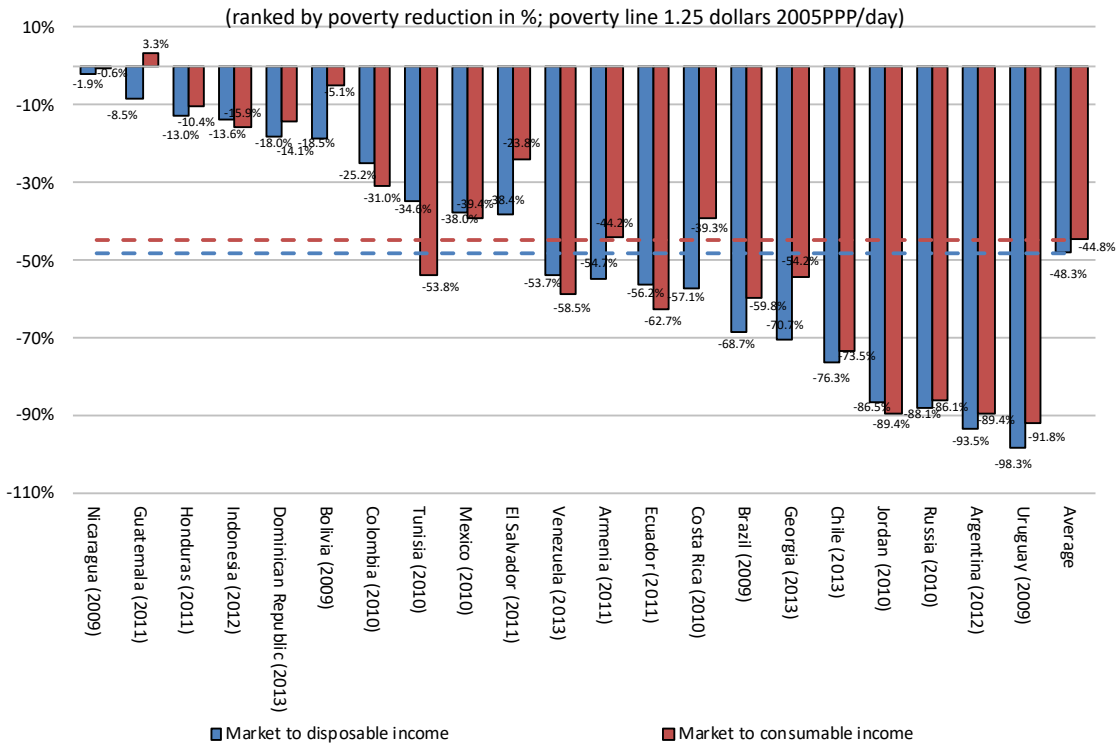
Figure 4: Fiscal Policy and Poverty Reduction

Panel A: contributory pensions as deferred income



Panel B: contributory pensions as transfers

[61] See Lustig (2018b) for examples of countries where this happens.



Note: The vertical axis is the percentage change of the headcount ratio for disposable income and prefiscal income (blue bar) and for consumable income and prefiscal income (red bar). The number in parenthesis is the year of the survey.
Source: Lustig (2018b), Figure 10-9.

How Equalizing Are Specific Taxes and Components of Public Spending?

A fundamental question in the policy discussion is whether a particular fiscal intervention (or a particular combination of them) is equalizing or unequalizing. Traditionally, in the incidence literature this has been measured using typical indicators of progressivity such as concentration shares or summary indicators such as the Kakwani or the Reynolds-Smolensky indexes.[62]

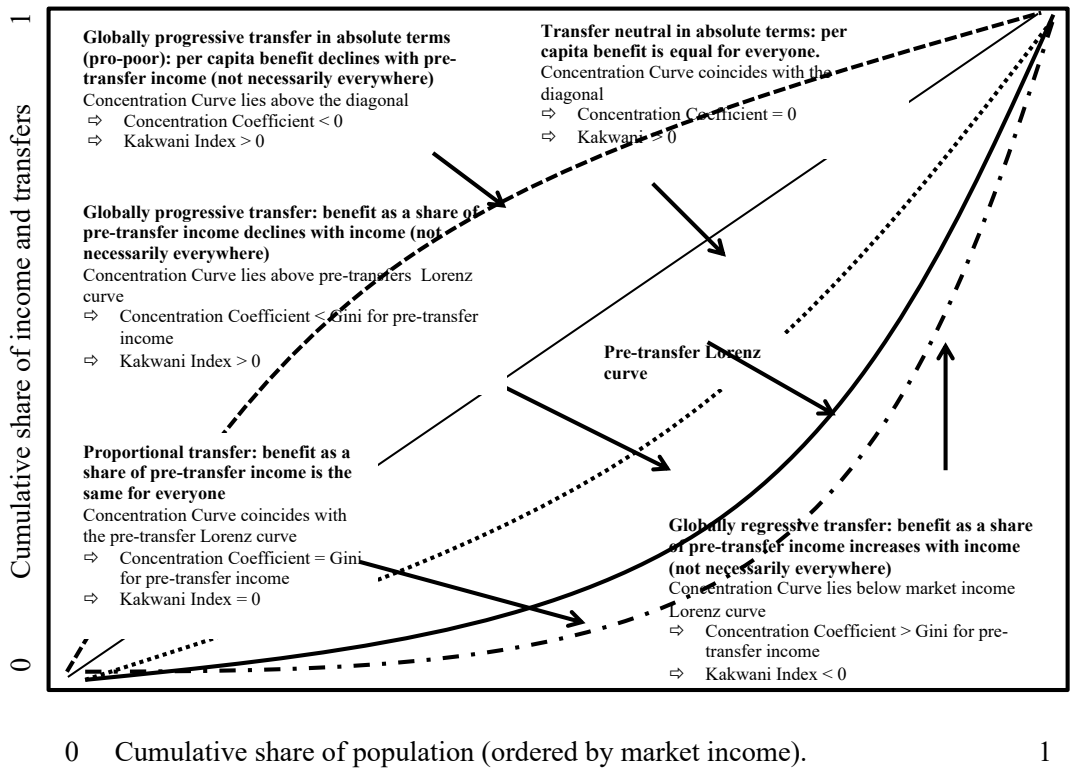
Kakwani (1977) was among the first to propose a measure of tax progressivity based on "disproportionality," that is, by the extent to which a tax distribution was not proportional to the distribution of pretax income. If the Kakwani index is positive (negative), the tax or the transfer in question is progressive (regressive). The Kakwani index for taxes is defined as the difference between the concentration coefficient of the tax and the Gini for prefiscal income. For transfers, it is defined as the difference between the Gini for market income and the concentration coefficient of the transfer. The concentration coefficient (also known as quasi-Gini) is calculated in a similar way as the Gini coefficient but it differs from the latter in that the households are always ranked by the income *before*

[62] See, for example, Kakwani (1977). For definitions of these indexes see, for example, Duclos and Araar (2006) and Enami, Lustig, and Aranda (2018).

taxes and transfers (prefiscal income). The concentration curves show the distribution of a tax or a transfer with households ranked by prefiscal income. Figure 5 illustrates graphically in the case of transfers. Whenever the concentration curve for transfers lies above (below) the Lorenz curve of pre-transfer income, the Kakwani index will be positive (negative) and, thus, the transfer is progressive (regressive).

The Reynolds-Smolensky index is defined as the difference between the Gini coefficient of prefiscal income and the concentration coefficient of the postfiscal income (income after a particular tax or transfer or all taxes and transfers combined, for example). If the difference is positive (negative), the tax or the transfer in question is progressive (regressive). Under no reranking, the Reynolds-Smolensky index is identical to the redistributive effect (RE)—that is, the change in inequality between pre-tax and post-tax income distribution measured in Gini points.[63]Thus, in the absence of reranking, whenever the post-tax or post-transfer income Lorenz curve lies above (below) the prefiscal income Lorenz curve, the tax or transfer is progressive (regressive).

Figure 5: Progressivity of Transfers: A Diagrammatic Representation



[63] This result can be generalized to a wide range of inequality measures of the S-Gini family. See also Lambert (2001) and Duclos and Araar (2007).

However, in a world with more than one fiscal intervention, it is no longer the case that a progressive (regressive) tax or transfer will be equalizing (unequalizing) by definition. In fact, it could be exactly the opposite. To my knowledge, the first author to note this counterintuitive result was Lambert (1985, 2001). Lambert shows that whether a particular tax or transfer (or any combination of them) exert an equalizing or unequalizing force depends not only on the characteristic of the fiscal instrument of interest but also on those of the rest of the fiscal system.[64] Put simply, Lambert's conundrum is the consequence of path dependency: a particular tax can be regressive vis-à-vis market (prefiscal) income but progressive vis-à-vis the income that would prevail if all the other fiscal interventions were already in place.[65] It is important to note that counterintuitive results can occur in the absence of reranking. If there is reranking, then one cannot be sure what the effect will be even in the case of a single fiscal instrument.[66]

To illustrate the point made by Lambert, let's look again at the example for Brazil in Table 1. Taxes are not progressive. In fact, the poorest decile pays (relatively) more in taxes than everybody else except the richest decile. However, if one calculates the incidence of taxes with respect to prefiscal income PLUS transfers, the tax system becomes globally progressive. That is, the (relative) incidence increases (or remains the same) as income from 13% for the bottom decile to 24% for the richest one.

How should one calculate the contribution (i.e., the sign and order of magnitude) of a specific tax or transfer on the redistributive effect (i.e., the difference between inequality indicators for selected income concepts)? In the literature, one often encounters that the contribution is calculated sequentially. That is, as the difference between inequality indicators with fiscal interventions ordered in a path according to their institutional design.[67] For example, if direct transfers are subject to taxation, the sequential contribution of personal income taxes is the difference between market income plus transfers and market income plus transfers and minus personal income taxes. Given path dependency, however, the result (in particular, the sign of the contribution) obtained by the sequential method can be wrong. It is important to note that the path dependency of fiscal interventions is independent of whether we can identify the institutional path accurately. For example, whether direct transfers are subject to taxation or not, the contribution of direct taxes to the redistributive effect can be equalizing or unequalizing (this is precisely the implication of Lambert's conundrum).

A sensible alternative is to use what in the statistical literature is known as the *marginal contribution*. In the context of fiscal incidence analysis, the marginal contribution of a tax (or transfer) is calculated by taking the difference between the inequality indicator *without* the tax (or transfer) and *with* it.[68] For

[64] See Lambert (2001, p. 277-278). 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 (Chapter 2 in this Handbook).
[65] See the discussion on path dependency in chapter 7 of Duclos and Araar (2006, p. 387-406).
[66] For the effects of reranking, see Enami (2018).
[67] OECD (2011) used this method, for example.
[68] The *marginal contribution* should not be confused with the *marginal incidence*, the latter being the incidence of a small change in spending. The *marginal contribution* is <u>not</u> a derivative. 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

example, 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). If the difference is positive (negative), then direct taxes are equalizing (unequalizing). [69]

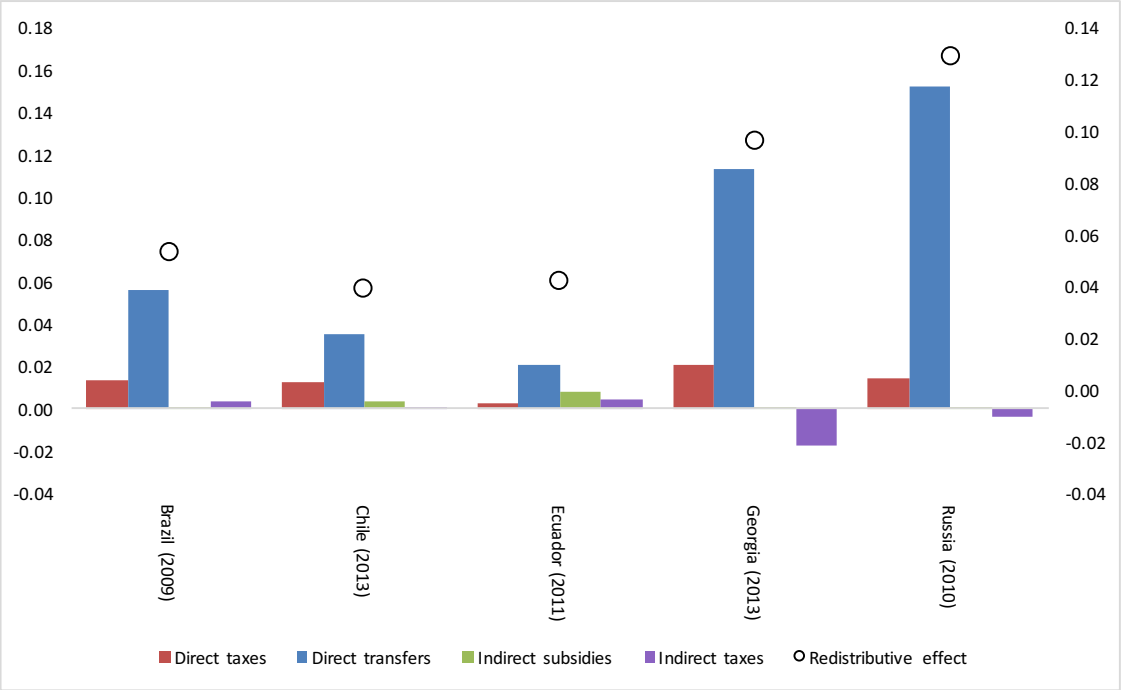
The marginal contribution has a straightforward policy interpretation because it is equivalent to asking the question: what would inequality be if the system did not have a particular tax (or transfer) or if a tax (or transfer) was modified? Would inequality be higher, the same or lower with the tax (or transfer) than without it?[70] As an example, Figure 6 presents the marginal contributions of direct and indirect taxes, direct transfers, and indirect subsidies for a sample of countries. As can be observed, direct taxes and direct transfers are always equalizing but indirect taxes are almost neutral (very slightly equalizing) in some cases (Brazil, Chile, and Ecuador) and unequalizing in others (Georgia and Russia, in this case).

contributions will not equal the total change in inequality either. An approach that has been suggested to calculate the contribution of each intervention in 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.

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

[70] 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 question 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.

Figure 6: Marginal Contributions



Note: The number in parenthesis is the year of the survey.
Source: CEQ Data Center on Fiscal Redistribution http://www.commitmentoequity.org/datacenter. Based on Brazil (Higgins and Pereira, 2014); Chile (Martinez-Aguilar and Ortiz-Juarez, 2018); Ecuador (Llerena and others, 2015); Georgia (Cancho and Bondarenko, 2017); Russia (Lopez-Calva and others, 2017).

The *marginal contribution* should not be confused with the *marginal incidence*, the latter being the incidence of a small change in spending. The *marginal contribution* is not a derivative. Note that, because of path dependency, adding up the marginal contributions of each intervention will not be equal to the total change in inequality. That is its main limitation. Path dependency would require to measure the total average contribution by considering all the possible paths. An approach that has been suggested to calculate the contribution of each intervention in a way that they add up to the total change in inequality, is to use the Shapley value (used in game theory, for instance) Interpreting the meaning of a Shapley value for policy purposes is, however, intractable. [71]

Some Final Thoughts

This article summarized the main conceptual components and assumptions, data requirements and indicators utilized in fiscal incidence analysis based on the accounting approach.[72] One key limitation of the accounting approach is that it ignores behavioral responses as well as general equilibrium and

[71] For an analysis of the Shapley value and its properties see, for example, Shorrocks (2013).
[72] The reader should remember that the discussion of indicators is relevant for fiscal incidence analysis in broad terms and not just the accounting approach.

dynamic effects. Among the latter, importantly, the analysis is silent regarding the effects that the fiscal system has on macroeconomic stability and economic growth. A country may appear to do quite well on the equity front by devoting a significant portion of its income to spending on safety nets for the poor and on education and health. However, if this spending is financed by distorsionary taxation, inflation, and/or unsustainable public debt, the end result may be disastrous for the poor.

A second limitation of fiscal incidence analysis as we know it, is that benefits from government services are valued at average government cost. This assumption ignores quality issues and whether consumers' valuations of the benefits actually correspond to what it costs governments to produce the services. A third limitation of fiscal incidence analysis is that households are treated as unitary: that is, the analysis assumes that taxes (benefits) paid (received) by the household are equally distributed among the members of the household. Within-household distributional issues are ignored. In spite of all its limitations, standard fiscal incidence analysis is –for the time being—the best approximation to assess the distributional impact of the current fiscal system and the potential effects of reforms.

While a summary of stylized facts is beyond the scope of this article, for an historical analysis of the progressivity of fiscal systems, the interested reader may want to consult Lindert (2004 and 2017). The references mentioned throughout this article also include numerous cases of fiscal incidence analyses for both advanced, middle-income and developing countries. Plenty of results are summarized in the data bases on fiscal redistribution housed in the CEQ Data Center on Fiscal Redistribution, EUROMOD, IDD, LIS and WID.World to name some of the leading sources.

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