

POVERTY AND SHARED PROSPERITY 2022

Chapter 6 Annex

6A Additional Material on the Marginal Value of Public Funds

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Annex 6A

Additional Material on the Marginal Value of Public Funds

Comparison of marginal value of public funds to other measures of policy value

Aside from the marginal value of public funds (MVPF), several other frameworks are used to measure the welfare impacts of spending on a particular policy. At a high level, all frameworks involve comparing the benefits of a policy to its cost, and thus require estimating many of the same objects as the MVPF framework. However, as discussed in the following paragraphs, by not imposing how a government finances a policy, the MVPF framework is arguably more general and, therefore, of more use to policy makers who have a range of tools to finance expenditures. This annex discusses two approaches commonly used for welfare analysis and compares them to the MVPF approach: the marginal cost of public funds approach and the marginal excess burden approach.

A common approach in welfare analysis is to measure the benefits of a policy and compare these benefits to the cost of raising revenue to pay for the policy via distortionary taxation. This approach, the *marginal cost of public funds* (MCPF), captures the fiscal cost of distortionary taxation. For example, if revenues were raised by raising income taxes on top earners, those earners may respond by reducing their labor supply, which, in turn, reduces tax revenue. The MCPF captures the budgetary cost of this reduction in labor supply (that is, it captures the fiscal externality of raising taxes on top earners). Thus, implicitly, the MCPF approach assumes that spending on the given policy is financed through distortionary taxation. In contrast, the MVPF approach does not impose this assumption. The MVPF framework allows policy makers to consider alternative financing options, such as reducing spending on an alternative policy or increasing borrowing (and, in turn, reducing spending on some policy in the future). Thus, the MVPF framework allows policy makers to explore more options to close the government budget. Furthermore, as Kleven and Kreiner (2006) note, the MCPF approach suffers from another criticism: because of the multitude of different taxes, there is no single marginal cost of public funds. For example, the government can raise revenue by increasing taxes on top earners, or by increasing corporate tax rates, or by increasing taxes on the middle class. These alternative tax reforms will have different distortionary costs and thus imply different values for the marginal cost of public funds.

Another approach is to estimate the *marginal excess burden* (MEB) of a policy. The MEB is typically used to evaluate changes to tax and transfer programs and is defined as the welfare impact of conducting the reform while simultaneously imposing individual-specific, lump-sum taxes (or transfers) so that each individual is no better or worse off from the reform (Auerbach and Hines 2002). Thus, loosely speaking, the MEB approach assumes that the policy is paid for by individual-specific, lump-sum taxes, whereas the MVPF framework allows for more flexibility in financing a policy. Moreover, the MEB approach is based on an unrealistic thought experiment in which a government can implement individual-specific, lump-sum taxation (Finkelstein and

Hendren 2020), which makes the MEB approach less suitable for policy makers trying to make feasible fiscal trade-offs.

Finally, it is worthwhile to compare the MVPF framework with *cost-effectiveness analysis* (CEA). CEA, although different from welfare analysis, is closely related in that it measures the impact of a given policy or program on a particular outcome (typically a short- to medium-term outcome), per dollar spent. For example, Dhaliwal et al. (2012) conduct CEA for several programs that seek to increase student attendance; they evaluate these programs on the basis of additional years of schooling generated per US\$100 spent. The benefit of such an approach is that it requires fewer data and fewer assumptions; that is, focusing on a shorter-term outcome means one does not have to extrapolate the short-term impacts of a policy into long-term impacts (for example, one does not need to translate gains in years of schooling into gains in lifetime earnings). Moreover, such analysis will typically not require estimating the impacts of a program on future government revenue. However, such an approach does have a significant drawback: “Cost-effectiveness analysis by itself does not provide enough information for a policymaker to make an investment decision” (Dhaliwal et al. 2012, 3). This drawback arises for three reasons. First, CEA does not allow policy makers to compare policies across different sectors that have impacts on entirely different outcome variables. Second, CEA typically focuses on just one outcome variable, whereas policies can affect many different outcomes. Finally, CEA typically does not require estimating possible fiscal externalities of a policy or program; however, these externalities are necessary inputs for understanding the welfare impacts of a policy. Nevertheless, “CEA does provide a very useful starting point for researchers and policymakers to collaborate in assessing the efficacy of the different programs and their relevance to the particular situation” (Dhaliwal et al. 2012, 3). Thus, CEA should be viewed as a complement, as opposed to a substitute, to the MVPF framework, especially in low-information environments.

Calculating the MVPF of targeted cash transfers

Targeted cash transfers will lead to an increase in the short-run income and consumption of beneficiary households. The size of this consumption gain will depend on the size of the grant, the economic context, and the design features of the transfer program. For example, the review by Bastagli, Hagen-Zanker, and Sturge (2016) of evidence of the impacts of cash transfers shows that beneficiary households sometimes invest or save part of their transfer, leading to increased consumption in future years. These findings indicate the presence of liquidity constraints facing households that cash transfers help them overcome. However, Bastagli, Hagen-Zanker, and Sturge (2016) note that the size and types of investments depend on design features: lump-sum transfers, compared with smaller, regular transfers, generate investments in bulkier items (for example, larger livestock); and predictable and reliable transfers enhance beneficiaries’ creditworthiness and risk-management capacity. Conversely, if transfer programs are means-tested with somewhat salient eligibility criteria, some beneficiary households may reduce their formal sector incomes in order to qualify or remain eligible for the grant. Gerard, Naritomi, and Silva (2021) observed this phenomenon in Brazil, and Bergolo and Cruces (2021) saw it in Uruguay. This reduction in earnings will partially offset gains in short-run consumption for these households.

The calculations presented here use estimates from Kondylis and Loeser (2021) on the net impact on consumption.¹ These estimates consider the different ways by which cash transfers can increase or reduce the income, and therefore the consumption, of a household; however, estimates are available only for the first three years after transfers are received. The authors find that, for every US\$1.00 transferred, the consumption of beneficiary households increases by US\$0.36 in the first year of receiving the grant, by US\$0.77 in the second year, and by US\$0.32 in the third year. These estimates suggest a short-run growth effect of providing cash transfers such that every dollar of a temporary unconditional cash transfer would increase beneficiary households’ discounted consumption by US\$1.38.² However, an effect of zero short-run growth is also within the estimated range of impacts in Kondylis and Loeser (2021). For this reason MVPF

estimates are also calculated under the assumption that beneficiaries' consumption increases by US\$1.00 for every US\$1.00 transferred.

Furthermore, evidence suggests that targeted cash transfers lead to increased investments in children's health and education (Bastagli, Hagen-Zanker, and Sturge 2016). Thus, in the long run, earnings of children in beneficiary households may also increase; however, few authors investigate the impacts on children's future earnings, in part because such evaluations need to occur several decades after the disbursement of grants.³ Fortunately, a rigorous evidence base explores impacts on short-term outcomes such as enrollment and nutrition outcomes, and some evidence exists on medium-term outcomes such as completed years of schooling. Gains in children's lifetime earnings can be calculated from these changes in short-term outcomes using previously estimated relationships between these outcomes and future earnings.⁴ Although context and transfer design almost certainly matter, back-of-the-envelope estimates from a few studies suggest that using a range of 0.25–0.50 additional year of schooling for a US\$1,000 (2015 US dollars) transfer is reasonable. Using estimates from Montenegro and Patrinos (2021), table 6A.1 illustrates the associated gains in discounted lifetime earnings for a hypothetical low-income setting

TABLE 6A.1
MVPF estimates for stylized cash transfer example

Impact on years of schooling	Benefits			Costs to government				MVPF
	SR consumption beneficiaries (2015 US\$)	SR consumption, nonbeneficiaries (2015 US\$)	Lifetime earnings, beneficiary children (2015 US\$)	Transfer amount (2015 US\$)	Program costs (2015 US\$)	SR tax revenue (2015 US\$)	LR tax revenue (2015 US\$)	
Low-income setting								
0.25	1,000	0	113	1,000	180	-30	-3	0.97
0.25	1,000	179	113	1,000	180	-35	-3	1.10
0.25	1,380	0	113	1,000	180	-41	-3	1.30
0.25	1,380	179	113	1,000	180	-47	-3	1.50
0.50	1,000	0	228	1,000	180	-30	-7	1.10
0.50	1,000	179	228	1,000	180	-35	-7	1.20
0.50	1,380	0	228	1,000	180	-41	-7	1.40
0.50	1,380	179	228	1,000	180	-47	-7	1.60
Middle-income setting								
0.25	1,000	0	652	1,000	180	-75	-49	1.60
0.25	1,000	179	652	1,000	180	-88	-49	1.80
0.25	1,380	0	652	1,000	180	-104	-49	2.00
0.25	1,380	179	652	1,000	180	-117	-49	2.20
0.50	1,000	0	1,306	1,000	180	-75	-98	2.30
0.50	1,000	179	1,306	1,000	180	-88	-98	2.50
0.50	1,380	0	1,306	1,000	180	-104	-98	2.70
0.50	1,380	179	1,306	1,000	180	-117	-98	3.00

Source: World Bank.

Note: Children are assumed to be age 12 at the time of the cash transfer, and in the absence of the transfer, and to complete 9 years of schooling in the low-income setting and 10 years in the middle-income setting (equal average mandatory years of schooling in low- and middle-income countries, respectively; see World Bank Data). Children are assumed to earn an average annual income across their working life (ages 15–65 in the low-income setting and 16–65 in the middle-income setting) of US\$745 and US\$5,284 in the low-income setting and middle-income setting, respectively (equal to the average gross national income per capita in each setting; see World Bank Data). "SR consumption beneficiaries" reflects the gain in (discounted) short-run consumption for a given beneficiary household, while "SR consumption nonbeneficiaries" reflects the gain in consumption for nonbeneficiary households when a US\$1,000 grant is given to one beneficiary household. "Lifetime earnings" reflects the (discounted) gain in lifetime earnings a beneficiary child experiences; these gains are estimated using Mincer regressions from Montenegro and Patrinos (2021) combined with the assumption that growth in real wages is 0 percent. "SR tax revenue" and "LR tax revenue" reflect the discounted gains in short-run and long-run consumption tax revenue (respectively); each beneficiary household generates under the assumptions that the consumption tax rate is 15 percent and that 20 percent (50 percent) of consumption occurs in the formal sector for the low-income setting (middle-income setting). All values are discounted back using an annual 5 percent discount rate.

and a hypothetical middle-income setting, and shows how these estimates vary with the gain in completed years of schooling.

The impact of transfers on nonbeneficiaries is less studied and likely context dependent. Nonbeneficiary households may be affected by cash transfers through a number of channels. For example, cash transfers may change the prices of local goods through demand effects. Filmer et al. (2021) estimate consumption declines for nonbeneficiary households due to an increase in the prices of perishable goods. In other settings, however, the impacts of cash transfers on prices are negligible or modest (for example, Attanasio and Pastorino 2020; Cunha, De Giorgi, and Jayachandran 2018; Egger et al., forthcoming). Evidence also exists that nonbeneficiary households may experience higher labor market earnings through multiplier effects. Recent evidence from Egger et al. (forthcoming) and Gerard, Naritomi, and Silva (2021), for example, finds positive impacts of Give Directly grants in rural Kenya and Bolsa Familia grants in Brazil, respectively, on nonbeneficiaries' labor market earnings.

Another potential source of impact on nonbeneficiaries is through increased transfers from beneficiaries to nonbeneficiaries. Quantifying these impacts is difficult, however. One needs to know how many nonbeneficiary households are affected per beneficiary household, to what extent their consumption increases, and for what duration. Estimates from Egger et al. (forthcoming) suggest that, for every beneficiary household receiving US\$1,871, a nonbeneficiary household experiences an increase of US\$334 in annualized consumption. Assuming this impact on nonbeneficiaries is temporary, a back-of-the-envelope calculation suggests that, for each US\$1,000 cash transfer, consumption of nonbeneficiaries increases by US\$179. This estimate may be on the larger side given the slack production capacity in the local economy in rural Kenya at the time of the Give Directly grants: the gains for nonbeneficiaries came largely from higher wages rather than increased labor supply (Egger et al., forthcoming). For this reason, in the stylized example, MVPFs are estimated under two alternative assumptions: (1) a (likely) conservative assumption that the impact on nonbeneficiaries' consumption is 0; and (2) an assumption using the results from Egger et al. (forthcoming) that the impact on nonbeneficiaries is equivalent to US\$179 per US\$1,000 grant.

The net cost of the cash transfer program is equal to total transfers paid, plus additional program costs (for example, costs associated with identifying eligible households, disbursement costs, and the like), plus any fiscal externalities associated with the transfers. For program costs, estimates from Kondylis and Loeser (2021) are used; they find that each US\$1.00 of transfer is associated with US\$0.18 of program costs. Based on this estimate, the program costs associated with a US\$1,000 unconditional cash transfer (UCT) are US\$180; equivalently, the direct cost of a US\$1,000 UCT is US\$1,180.

It is assumed that the fiscal externalities come from gains in short- and long-run consumption tax revenue given the results of chapter 5, which show that the deciles being targeted for transfers in low- and middle-income countries pay negligible amounts of personal income tax. Consistent with Bachas, Jensen, and Gadenne (2022), the assumption is that households in the low-income setting have a formal budget share of 20 percent (that is, they spend 20 percent of their budget in formal markets), whereas households in the middle-income setting have a formal budget share of 50 percent. Furthermore, the analysis assumes a consumption tax rate of 15 percent and that the government faces a 5 percent discount rate.⁵ On the basis of these assumptions, table 6A.1 reports the gain in short-run tax revenue that results from the increase in short-run consumption of both beneficiary and nonbeneficiary households, and the gain in (discounted) long-run tax revenue that results from the increase in lifetime earnings of beneficiary children. These fiscal externalities are a lower bound to the extent that improvements in labor market outcomes, as well as physical health, lead to gains in income tax revenues or to reductions in public assistance.

The last column of table 6A.1 calculates the MVPF for the stylized cash transfer example. For the hypothetical low-income setting, the MVPF lies between 0.97 and 1.60; for the hypothetical middle-income setting, the MVPF lies between 1.60 and 3.00. The higher MVPF in the middle-income setting, in part, reflects the higher tax capacity of middle-income countries relative to low-income countries.

Calculating the gains in schooling from cash-transfer programs

Parker and Vogl (2021) explore the long-term impacts of the conditional cash transfer (CCT) program Progresa. Using their estimates, a back-of-the-envelope calculation can be conducted for gains in years of schooling for a US\$1,000 (in 2015 US dollars) cash transfer. Parker and Vogl (2021) find an increase of about one year of schooling across boys and girls exposed to Progresa during 1997–2000. According to figure 1 from the authors’ paper, approximately 1.275 million households received grants over this period; total transfers paid during this time frame equaled about 23.2 billion Mexican pesos (in 2010 Mexican pesos). Using an exchange rate of 0.0792 in 2010 between the Mexican peso and the US dollar, and using the conversion of US\$1.00 in 2010 as equal to US\$1.09 in 2015 (via the consumer price index inflation calculator), this funding total amounts to a transfer per household of approximately US\$1,571 (2015). Assuming a US\$1,000 (2015) transfer has 1,000/1,571 the impact on schooling as a US\$1,571 (2015) transfer, this amounts to a gain in schooling of 0.64 year for a US\$1,000 (2015) transfer. Of course, Progresa is a CCT program, not a UCT program. Baird et al. (2013) find that CCTs increase the odds of a child being enrolled in school by 41 percent and UCTs increase the odds by 23 percent. Using these relative magnitudes on enrollment for CCTs versus UCTs, the estimate is an increase of $0.642 \times 23/41 = 0.36$ years of schooling for a US\$1,000 (2015) UCT.

Similarly, using CEA conducted by the Abdul Latif Jameel Poverty Action Lab (see Bhula, Mahoney, and Murphy 2020), these authors find that a UCT in Malawi led to a 0.02 gain in years of education per US\$100 (2011) spent, where expenditures include both transfer payments and other program costs; alternatively, they find the same UCT led to a 0.06 gain in years of education per US\$100 (2011) spent, where expenditures exclude transfer payments. These numbers can be used to back out gains in years of education per US\$100 (2011) of transfer payments. Per US\$100 (2011 US dollars) of transfer payments, years of schooling rose by an estimated 0.03 year. Using a linear scaling factor, this translates into a 0.3 year gain in schooling per US\$1,000 (2011) in transfers. Translating this into 2015 US dollars (using the conversion that US\$1.00 in 2011 is equal to US\$1.05 in 2015), the estimate is a 0.29 gain in years of schooling for a US\$1,000 (2015) transfer (because $0.3 \times \frac{1}{1.05} = 0.29$).

Calculating the gains in lifetime earnings from gains in years of schooling

Montenegro and Patrinos (2021) estimate the following Mincer regression:

$$\log(w_{it}) = \alpha + \beta_1 S_i + \beta_2 (age_{it} - S_i - 6) + \beta_3 (age_{it} - S_i - 6)^2 + \mu_i$$

where w_{it} denotes earnings of individual i in year t , S_i denotes years of education that individual i has completed, and age_{it} denotes the individual’s age in period t (so that $age_{it} - S_i - 6$ denotes experience in the labor force). β_1 captures the direct return to an additional year of schooling. In their sample, Montenegro and Patrinos (2021) estimate an average value across all countries and periods of about 0.01, implying one more year of schooling is associated with 10 percent higher earnings each year, all else being equal. However, this additional year of schooling is not without cost. Implicitly, it is assumed that an additional year of schooling comes at the cost of delayed entry into the labor force, leading to forgone wages for that year along with less labor market experience each year going forward.

Using data from Montenegro and Patrinos (2021), average values of β_1 , β_2 , β_3 across all low-income countries in their sample and all middle-income countries (lower-middle and upper-middle) in their sample (for the latest survey year in each country) are calculated. This calculation gives $\{\beta_1, \beta_2, \beta_3\} = \{0.104, 0.048, -0.00057\}$ for low-income settings and $\{\beta_1, \beta_2, \beta_3\} = \{0.094, 0.034, -0.00044\}$ for middle-income settings. In the low-income setting, α is chosen such that average

earnings across the working life (assumed 15–65 years, because 9 years of schooling at baseline is assumed) are US\$745 (average, gross national income per capita in low-income countries, in 2015 US dollars). In the middle-income setting, α is chosen such that average earnings across the working life (16–65 years, because 10 years of schooling at baseline is assumed) are US\$5,284 (average, gross national income per capita in low-income countries, in 2015 US dollars).

Assuming a growth rate in real wages of 0 percent, a social discount rate of 5 percent, and a retirement age of 65, discounted lifetime earnings for a given level of schooling, S , is calculated as follows:

$$\sum_{t=S+6}^{65} 0.95^{(t-age_{pol})} \exp(\alpha + \beta_1 S + \beta_2 (t - S - 6) + \beta_3 (t - S - 6)^2)$$

where age_{pol} is the age of the child at the time the policy was implemented. The gain in lifetime earnings associated with a given policy can then be calculated as the difference in discounted lifetime earnings evaluated at schooling levels obtained under the policy less discounted lifetime earnings evaluated at schooling levels obtained without the policy.

Notes

1. Their paper reviews the evidence for 17 randomized controlled trials of temporary unconditional cash transfer programs implemented in 14 developing economies.
2. Assuming households face an annual social discount rate of 0.95, and considering a temporary unconditional cash transfer of US\$1,000, beneficiary households' discounted consumption increases by US\$1,380 ($0.36 + 0.77 \times 0.95 + 0.32 \times 0.95^2 = 1.38$).
3. One exception is Araujo and Macours (2021) who find that greater exposure to the Progresá grants led to statistically significant and large gains in earnings of beneficiary children 20 years later. These results stand in contrast to evaluations of medium-term effects, which tend to find limited impacts on employment and earnings 10 or so years after the disbursement of transfers (Molina-Millan et al. 2020), highlighting the importance of waiting a suitable time before estimating long-term impacts on earnings.
4. This assumes that the causal impact on the intermediate outcome observed in the cross-sectional data is the same as the long-run outcome that would be observed over time.
5. That is, the government can borrow against future revenues at a 5 percent interest rate.

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