Long-term Impacts of Poverty Programs: A Local-economy Cost-benefit Analysis of Lesotho's Child Grants Programme

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Abstract

This study quantifies the long-run impacts of Social Cash Transfers (SCTs) and carries out the first ever (to our knowledge) long-run cost-benefit analysis of a SCT program. The impacts of SCTs include socio-economic and productive outcomes in beneficiary households as well as the economic spillovers that result from linkages between beneficiaries and non-beneficiaries within local economies. Using data from the PtoP impact evaluation of Lesotho's Child Grants Program (CGP), we parameterize a cost-benefit model and estimate costs and benefits for both beneficiary and non-beneficiary households. The long-run benefits accruing to beneficiary households include the transfers themselves, plus a future stream of returns from human, physical and social capital formation stimulated by the program. These income gains, in turn, generate income multipliers in treated economies. We use unique panel data from Lesotho to model capital formation within treated households, together with the effect of this capital on household income. Then we link the cost-benefit model for CGP beneficiaries with a local economy-wide impact evaluation (LEWIE) model. We find that the discounted future stream of benefits from the CGP substantially exceed the program's costs in the village clusters initially included in the program. The CGP produces 42.11 million Lesotho loti (LSL) in discounted benefits over a ten-year period, compared to a total discounted program cost of 22.38 million LSL.

Keywords: Long-run, SCTs, Lesotho, CGP, capital formation, cost-benefit analysis

JEL codes: *O12, C21, D61*

A diversity of studies provide insights into the impacts of social cash transfers (SCTs) on social and economic outcomes in the short term.[1] These impacts include socio-economic and productive outcomes in beneficiary households as well as the economic spillovers that result from linkages between beneficiaries and non-beneficiaries within local economies. However, no study to our knowledge has attempted to compare the costs and benefits of SCT programs in the long run.

The costs of SCT programs are straightforward; they include the transfers themselves as well as the costs of delivering them to beneficiaries. The benefits are less clear, and they are considerably more complex. Experimental methods have documented impacts of SCTs on a wide range of social and productive outcomes in the short run. What do these short-run impacts imply with regard to the welfare of beneficiaries in the long run? What are the potential long-run spillovers of SCTs? If one combines short and long-run, direct and spillover impacts, do SCTs pass the cost-benefit test? The goal of this study is to take a step towards answering these questions. Researchers have paid remarkably little attention to the economic returns from SCTs and other interventions in the short or long run.

Governments and donors have made it clear that they want to know whether and to what extent the benefits of SCTs, many of which (like children's schooling) are long-term, exceed the costs. Without long-term data collection, it is not possible to identify long-term impacts using experimental methods. However, it is possible to estimate these impacts indirectly, using econometric and simulation methods.

This study takes a first step towards identifying the long-run impacts of SCTs and carrying out a long-term cost-benefit analysis of a SCT program. We begin by presenting a simple framework for thinking about the long-run costs and benefits of SCTs. Using data from the impact evaluation of Lesotho's Child Grants Program (CGP), we parameterize the cost-benefit model and estimate costs and benefits for beneficiary households. Then we link the

[1] A summary of the PtoP evaluation can be found at the UN-FAO's From Protection to Production website: http://www.fao.org/docrep/018/i2968e/i2968e05.pdf.)

cost-benefit model for beneficiaries with a local economy-wide impact evaluation (LEWIE) model to derive an estimate of the long-term, local economy-wide costs and benefits of the program.

Our analysis finds that the CGP causes an increase in human and physical capital accumulation that increases income by an additional 26% in beneficiary households and 1% in non-beneficiary households in the treated clusters. This, together with the income spillovers it creates, results in 42.11 million LSL in discounted real income benefits over a ten-year period, compared with a total discounted cost of 22.38 million LSL using a discount rate of 10%. In other words, each maloti invested in the CGP creates 1.88 maloti of total economic benefits in the long run.

1 The Lesotho Child Grant Programme

The CGP is an unconditional social cash transfer programme targeting poor households with children. The programme was launched in 2009, and after a series of expansions reached ten community councils spread across five districts (Berea, Leribe, Mafeteng, Maseru and Qacha's Nek) and approximately 20,000 households (50,000 children) at the end of 2013. The transfer was initially LSL 120 (USD 12) per month irrespective of the number of children. In April 2013 the amount was indexed to the number of resident children: 1-2 children: LSL 360 (USD 36); 3-4 children: LSL 600 (USD 60); 5+ children: LSL 750 (USD 75). The programme is run by the Ministry of Social Development, with financial support from the European Commission and technical support from UNICEF-Lesotho. Further details on the programme and the targeting procedure can be found in OPM (2014a).

The impact evaluation of the CGP involved a community randomized longitudinal design. The baseline household survey was carried out in June-August 2011, with a follow-up with the same households in June-August 2013. The evaluation covers ten community councils comprising 96 Electoral Divisions which were split equally into treatment and control arms through public lottery events. Eligible households in 48 EDs were randomly selected to receive the CGP in 2011 (after baseline collection) while eligible households in the 48 remaining EDs were randomly selected to enroll after follow-up data collection. Both eligible households and non-eligible households

were surveyed. The final study sample comprises a panel of 2,150 households and 10,456 panel individuals. Over 60 percent of the households are poor and eligible for the CGP while the remainder are non-eligible. Details on the sample and attrition are found in OPM (2014) and Daidone, et al (2014).

2 Cost-benefit Analyses of SCTs

Cost-benefit analysis entails summing up the future stream of discounted benefits from a project and comparing it with project costs. The well-known formula for calculating the discounted net benefits of a project, relative to the baseline without the project, is:

$$NPV = \sum_{t=0}^{T} \left(\frac{Y_t^p - Y_t^{np} - I_t}{(1+r)^t} \right)$$

Where Y_t^p (Y_t^{np}) denote benefits with (without) the project, *r* is the discount rate, and I_t is the project cost in year t.

The potential benefits of SCTs are complex, encompassing income gains to beneficiary households, income spillovers to non-beneficiary households, as well as other impacts to which it is difficult to assign economic values (e.g., optimism about the future and happiness). We focus only on the economic benefits, specifically, income. Although income is a subset of all potential benefits, it is the component that lends itself to cost-benefit analysis.

SCTs have an immediate impact on income in beneficiary households; beneficiaries' income increases initially by the amount of the transfer. Experimental evaluations conducted as part of the PtoP project reveal that cash transfers may also stimulate production activities in beneficiary households, for example, by loosening liquidity and other constraints on production. LEWIE evaluations reveal that transfers also create significant income spillovers to non-beneficiaries.

Other potential income effects that take longer to materialize. A key goal of all SCT programs is to improve the health and nutritional status of the household as well as children's schooling. Experimental analyses document significant impacts on these human capital outcomes. Improved health and nutrition can make people more productive in the short run. Increased school attendance does not increase income in the short-run, and it may reduce income by shifting children's time from production activities to schooling. In the longer run, however, human capital studies show that higher schooling makes people more productive, raising incomes. Few researchers have examined long-term income effects of schooling in an impact-evaluation study. The main exceptions of which we are aware is Duflo's (2000) study of impacts of school construction on children's education and later earnings in Indonesia.

Lagged impacts of SCTs on income in beneficiary households, like short-run impacts, potentially create income spillovers in local economies. These indirect benefits must be appropriately discounted, because they occur in the future.

Figure 1 illustrates the potential short- and longer-run impacts of SCTs on household incomes and how they nest within a cost-benefit analysis of SCT programs. Arrow ***a*** represents the SCT's direct impact on beneficiary households' income. Loop ***b*** is the income multiplier *within* the beneficiary household, which can result from a loosening of production constraints, as in Sadoulet, de Janvry, and Davis (2001). Short-run income spillovers to non-beneficiaries are depicted by arrow ***c***. The impact on household human capital (arrow ***d***) generates future income ***e*** as well as future income spillovers to non-beneficiaries ***f***. All of these benefits enter into the above cost-benefit equation. The cost-benefit analysis is carried out by comparing the discounted stream of total benefits in the local economy with discounted SCT program costs.

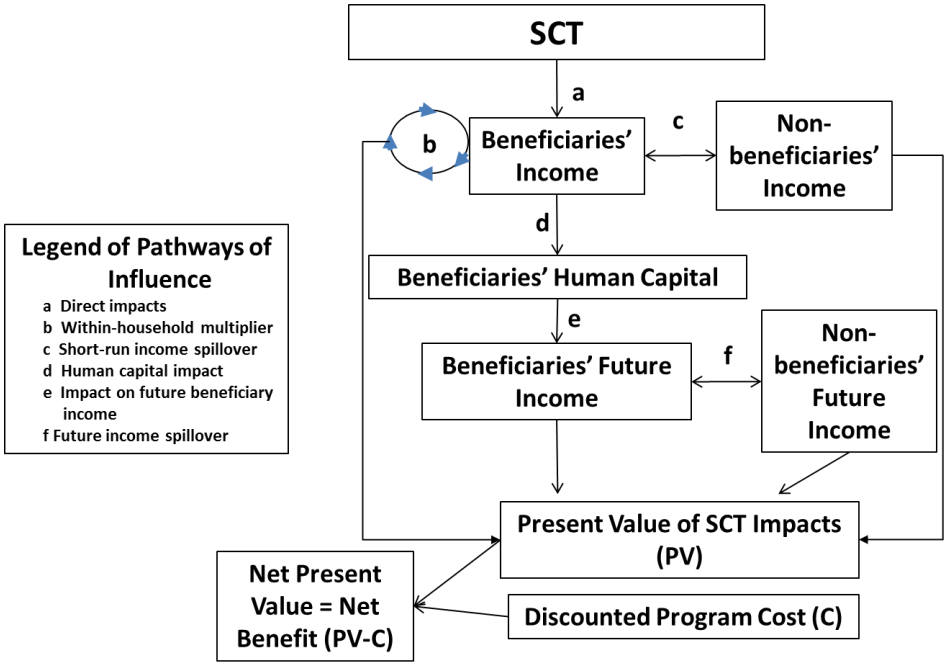

Figure 1. Framework for Local Economy Cost-benefit Analysis of SCTs

A critical difference between the methods proposed in this study and conventional cost-benefit analysis is that we include the local economy-wide benefits of the project, including spillovers to non-beneficiaries. Y_t^p is the output from a local economy-wide impact simulation model. To compute it, the direct impacts attributable to the SCT have to be run through a LEWIE model, as in Taylor and Filipski (2014).

As with most programs, present and future SCT program costs are known *ex ante* with a fair amount of certainty. Some benefits, on the other hand, are uncertain, and as we have seen they can assume a variety of forms. It is particularly difficult to know how a project will affect future incomes; the time frame of impact evaluation studies (typically 1-2 years) does not permit experimental estimation of these impacts.

We combine econometric and programming methods to estimate the short- and long-term benefits of SCTs using data from the baseline and follow-on surveys to evaluate Lesotho's CGP. Our strategy has five components.

First, we model the impacts of human, physical, and social capital on household income using an approach proposed

by Taylor and Yúnez-Naude (2000) and inspired by Mincer (1958). The results show that human, physical, and social capital all significantly predict household income. Controlling for these assets, CGP payments have a large and significant positive impact on treated-households income that exceeds the amount transferred to eligible households, consistent with the findings of Gupta et al. (2015).

Second, we evaluate the impact of the CGP on human, physical and social capital variables in the beneficiary households as well as spillovers in the non-beneficiary households, using a difference-in-differences (DiD) approach. This methodology is similar to the one used by Daidone et al. (2014) to evaluate the average treatment effects of CGP transfers on several key household characteristics and by Gupta et al. (2015) to estimate income spillovers from the CGP. This analysis demonstrates that the CGP had significant and positive impacts on schooling, health, and physical capital asset holdings in CGP-eligible households. However, we are not able to identify impacts on social capital formation or large asset-spillover effects on ineligible households over the timeframe of this evaluation.

Third, we use the findings from the income and asset models to estimate the impacts of the CGP on income in the eligible households, including impacts via human and physical capital formation. We find that the indirect impacts, via asset formation, significantly augment the effects of the CGP on eligible household income.

Fourth, we use the LEWIE model for Lesotho (Filipski et al., 2015; Taylor and Filipski, 2014) to simulate the income-spillover effects created by income increases in beneficiary households, including asset effects. The LEWIE simulations reveal a total income multiplier of 1.53 (Filipski et al., 2015); that is, each maloti of income gain to an eligible household, in the form of the CGP transfer or the transfer's impacts on household assets, increases total income in the treated clusters by 1.53 maloti.

The fifth and final step in our analysis is to use conventional cost-benefit (CB) methods to calculate the present value of the future flow of benefits, direct and indirect, from the CGP, and compare these to CGP program costs. We find that the discounted future stream of benefits from the CGP substantially exceed the program's costs in the village clusters that were treated in the first round of the program. Using a discount rate of 10%, the ratio of

discounted benefits to discounted costs over ten years is 1.88, indicating that each maloti invested in the CGP creates 1.88 maloti of benefits. The CGP produces 42.11 million in discounted benefits over a ten-year period, compared to a total discounted cost of 22.38 million.

The main objective of CGP is to improve the living standards of the poor and vulnerable households, reduce malnutrition, improve health status, and increase school enrolment. Past studies have documented positive impacts on these social outcomes, consistent with our findings of positive CGP impacts on human capital assets. This study adds a new dimension to the impact evaluation of social cash transfers; to our knowledge, it is the first to estimate and compare the total discounted benefits and costs of a social cash transfer program. The impacts of the CGP on asset formation and spillovers substantially increase the program's future flow of economic benefits, for eligible as well as for ineligible households.

3 Impacts of Human, Physical, and Social Capital on Household Income

Methods to estimate the impact of human capital on earnings, inspired by Mincer's (1958) seminal work, are well developed. Taylor and Yúnez-Naude (2000) adapted this approach to estimate the effects of human, physical, and migration capital on household incomes in rural Mexico. We expand this approach to consider two other forms of capital that might influence income and, in turn, might be influenced by the CGP: family health and social networks. We argue that CGP transfers impact a household's physical, human, and social capital holdings, which in turn may create a future stream of income returns to the household. Higher endowments of human capital in terms of better health outcomes and higher average schooling create a source of higher future incomes. In this sense, human capital plays a role similar to that of other productive assets. Social networking within rural communities could also impact household incomes, by enabling households to share risk and buffer themselves from adverse income shocks and encouraging investment. Households might mutually experience higher income gains with access to well-knit social networks in their communities.

We begin by estimating the impacts of human, physical, and social capital assets on household incomes, as well as

the impacts of CGP transfers *given* household assets. In the next section we show how CGP transfers impact households' human, physical, and social capital accumulation.

The following model can be thought of as an income production function, in which household income is a function of average education of household members, household health captured by the number of members fit to work, physical assets, and access to social networks.

We consider the following income model:

$$(1) \qquad y_{it} = \alpha + Z_{i,t}\Lambda + \rho Y_t + \gamma X_{i,t} + u_{it}$$

The variables in this equation are defined as follows:

y_{it}: Household i's income in time t

$Z_{i,t}$: Vector of household i's human, physcial and social capital endowment in time t

Y_t: Year dummy, 1 for Follow $-$ up and 0 for baseline

$X_{i,t}$: Vector of household characteristics for which we control

u_{it} is the idiosyncratic error term

The capital variables ($Z_{i,t}$) include three types of capital: human, physical, and social. The human capital variables include enrollments in schools in different grades, average years of schooling and the number of members fit to work within the household (a proxy measure of health due to lack of anthropometric data or any other better measure). To measure physical capital, we use a physical asset index that we constructed using a principal component analysis on ownership of agricultural assets, livestock units and the characteristics of housing units. Similarly, to construct a social network index, we use information on household's social participation within their village, again using component analysis. In particular, we consider a household's participation in receiving and giving food, labor and other agricultural and non-agricultural inputs within the village community. Appendix A1 is

a summary table of the key variables with single and double differences in both eligible and ineligible households. The other household controls ($X_{i,t}$) include landholdings and the age of the household head.

The set of coefficients Λ are the primary focus of this stage of our analysis, because they represent the economic returns to human, physical, and social capital holdings that may be influenced by the CGP. Table 1 reports the ordinary least squares (OLS) estimates of this regression equation. Columns (1)-(4) correspond to four different income variables: monthly income, real monthly income (deflated using Laspeyeres CPI), log of monthly income, and log of real monthly income, all measured in LSL. Columns (3) and (4), our preferred specification, correspond to a household version of the conventional Mincer model, in which the dependent variable is the log of monthly income.

Table 1. *Regression Output of Income on Human, Physical and Social Capital Indexes*

	(1) Monthly Income	(2) Real Monthly Income	(3) Log of Monthly Income	(4) Log Real Monthly Income
Avg. education (0-17)	9.056*	7.33*	0.0251**	0.0533**
	(4.786)	(3.874)	(0.0102)	(0.0249)
Avg. education (18-59)	8.708*	7.048*	0.0425***	0.051**
	(5.165)	(4.181)	(0.0096)	(0.0253)
Family members fit to work	34.56***	27.97***	0.0962***	0.2375***
	(10.173)	(8.235)	(0.0214)	(0.0468)
Physical Asset Index	0.859***	0.695***	0.00118***	0.00313***
	(0.127)	(0.103)	(0.000219)	(0.00054)
Social Network Index	0.182*	0.1475	0.000736***	0.0029***
	(0.1021)	(0.077)	(0.000219)	(0.00053)
Yearly Dummy	261.9***	212.04***	0.8698***	1.826***
	(26.21)	(21.22)	(0.0657)	(0.182)
N	3932	3932	2979	3932
R^2	0.11	0.11	0.19	0.16

Standard errors in parentheses
Controlled for Land Owned, Household Head Age, Household Weights
* p<0.10, ** p<0.05, *** p<0.010

We find positive and significant economic returns from all of the capital assets: household schooling, measured as the average years of education of household members in the 0-17 and 18-59 age groups; the number of family members fit to work; the physical asset index; and the social network index. In the Mincer equation for monthly income (Column 3), household income increases by 2.5% for a 1-year increase in average education of members aged 0-17, by 4.2% for a 1-year increase in average education of 18-59 year olds, and by 9.2% for a 1-person increase in household members fit to work.[2] The physical capital index and social network index contribute about 0.1% and 0.07%, respectively, to monthly income.

This analysis assumes that the returns to assets are similar in eligible and ineligible households in both treatment and control clusters. As a robustness check, to test for differences in returns between household groups, we repeated the estimation of equation (1) including interactions of variables of interest with CGP eligibility. Similarly, to test for differences in returns after treatment, we also included an interaction of eligibility and treatment with the year dummy variable. The results of these tests (not shown) failed to reject the null hypothesis that the returns to assets are the same in eligible and ineligible households. In other words, it appears that human, physical and social capital have similar effects on incomes in eligible and ineligible households, and these impacts do not change with CGP transfers.

4 The Impacts of the CGP on Beneficiary Household's Human, Physical and Social Capital

Having demonstrated that human, physical, and social capital significantly and positively affect household income, the next step in our analysis is to test whether the CGP significantly impacts capital formation in in the treated village clusters.

The specification that we use to measure the DiD impact of CGP cash transfers on capital formation in the eligible households and the spillover effects on ineligible households is given by equation 2:

[2] In the Mincer semi-log specification, the estimated parameters represent the percentage effect on the dependent variable of a 1-unit increase in the corresponding right-hand variable.

$$(2) \qquad D_{it} = \alpha + \beta T_i + \rho Y_t + \eta E_i + \theta(T_i * Y_t) + \xi(T_i * Y_t * E_i) + \delta * CGP_{i,t} + \gamma X_{i,t} + \epsilon_{it}$$

…where the newly introduced variables are defined as follows:

D_{it}: Impact variable that we are interested in

T_i: Treatment dummy equal to 1 if household is in a treatment cluster, 0 otherwise

E_i: Eligibilty dummy, 1 for eligibles and 0 for ineligibles

$CGP_{i,t}$: Amount of CGP transfer for household i in time period t

ϵ_{it} is the idiosyncratic error term

We use the above specification to evaluate the impact of CGP transfers on capital formation of the eligible and ineligible households in the treatment clusters, using the same capital variables as in the income analysis. This framework is similar to the DiD estimation used to evaluate the impact of the CGP on incomes in Lesotho by Gupta et al. (2015). We have an additional eligibility dummy in equation (2) which allows for heterogeneity in initial values of our capital variables based on eligibility. In this formulation, the double interaction term θ captures the average spillover effect of the CGP on the variables of human, social and physical capital in the treated clusters. It represents the DiD-estimated impact of the CGP on ineligible households within the treated clusters. The triple interaction parameter, ξ, captures the average effect of the CGP on eligible (treated) households, controlling for the amount of transfer received by a treated household.

Tables 2 and 3 give the estimation results for human, social and physical capital using the specification in equation (2). Also, we find the impacts for beneficiary households in treated clusters and look for any spillovers in the non-beneficiary households in those clusters. Columns (1)-(4) in Table 2 present the results for school enrollment, in

particular, the proportion of household members within an age group that are enrolled in school. Dependent variables in columns (1) and (2) in Table 1 are the proportion of children within the age group of 6-17 enrolled in grades 1-3 and 4-6, respectively. In columns (3) and (4), the dependent variables are the proportions of household members in the 6-59 age group that are enrolled in grades 7-12 and in college or above, respectively. The last two columns correspond to average years of schooling for members in the 0-17 and 18-59 age groups, respectively. We find that the CGP's impact is different between these age groups.

Table 2. *CGP Impacts on Education variables*

	(1) Prop. of children enrolled in grades 1-3 in age group 6-17	(2) Prop. of children enrolled in grades 4-6 in age group 6-17	(3) Prop. of members enrolled in grades 7-12 in age group 6-59	(4) Prop. of members enrolled in college and above in age group of 6-59	(5) Average Education of members 0-17	(6) Average Education of members 18-59
CGP transfer amount	-0.000854*	-0.00343***	-0.000864***	0.0000431	-0.00621***	-0.000698
	(0.000459)	(0.000614)	(0.000245)	(0.0000597)	(0.00193)	(0.00187)
Treatment dummy	-0.0379	-0.0664**	0.0119	-0.00499	-0.0611	-0.0515
	(0.0301)	(0.0332)	(0.0174)	(0.00370)	(0.125)	(0.167)
Yearly Dummy	-0.0320	-0.0172	0.0526***	0.00408	0.424***	0.158**
	(0.0237)	(0.0244)	(0.0102)	(0.00405)	(0.0749)	(0.0750)
Eligibility Dummy	0.0997***	0.0549	-0.00893	-0.00798	0.614***	-0.161
	(0.0313)	(0.0412)	(0.0195)	(0.00594)	(0.174)	(0.179)
Treatment*Year	0.0245	-0.000937	0.00224	0.000148	-0.00728	0.280*
	(0.0372)	(0.0484)	(0.0217)	(0.00759)	(0.176)	(0.155)
Treatment*Year*Eligibility	0.129	0.596***	0.122**	-0.00414	1.036**	-0.168
	(0.0881)	(0.117)	(0.0495)	(0.0113)	(0.411)	(0.356)
Impact on Ineligibles	*0.0245*	*-0.000937*	*0.00224*	*0.000148*	*-0.00728*	*0.280**
Impact on Eligibles	*0.129*	*0.596****	*0.122***	*-0.00414*	*1.036***	*-0.168*
N	4253	4253	4253	4253	4253	3932
Mean of column variable	0.51	0.7	0.39	0.01	3.41	6.11

Standard errors in parentheses
Controlled for Household Size, Land Owned, Household Head Age, Cluster Eligibility Ratio
* p<0.10, ** p<0.05, *** p<0.010

The CGP significantly impacts most of the education variables except enrollment in grades 1-3 in the 6-17 year age

group and at the college level or above. The program has significant positive impacts on enrollment in grades 4-6 and 7-12. For treated households, enrollment in grades 4-6 for the 6-17 year age group increases by about 60%, and enrollment in grades 7-12 increases by 12.2%. The CGP increases the average education of members in the 0-17 age group significantly by 1 grade level; however, not surprisingly, it does not affect the average education of members older than 18 years. These findings demonstrate that the CGP has boosted school enrollment and average schooling in the treated households.

For the ineligible households in the treated clusters, we find no evidence of significant spillover impacts of the CGP on school enrollment except for some positive spillover on average education of household members within the 18-59 age group. It is likely that the two-year period covered by the data is too short to identify social spillovers to non-beneficiaries on variables related to human capital formation.

Table 3 reports the impacts of CGP transfers on the number of members fit to work within the beneficiary households, physical assets, and social networks within the treated village clusters. We use the variable "number of members fit to work" as a proxy for household health, given the lack of anthropometric data and other health variables of interest. The idea here is that if CGP affects health outcomes within the beneficiary households, this will be reflected by an increase in the number of household members fit to work.

In column (1), we find that treated beneficiary households experience a significant increase in the total number of members fit to work, after controlling for other confounding factors (including household size). CGP transfers also significantly increase the physical asset index of beneficiary households, by 62 points. The magnitude of this impact is large given that the mean asset index for this household group is about 114. We are unable to identify a significant CGP influence on the social network index, even though the sign is positive. Again, a two-year time period might not be long enough to precisely identify increases in community-level networks for eligible or ineligible households in the treated clusters. We do not find evidence of significant spillover effects on ineligible households for any of these variables. The impact on asset accumulation in ineligible households in the treated clusters is positive and

large but not significant.

Table 3. *CGP Impacts on Physical and Social Capital Indexes*

	(1) Number of members fit to work	(2) Physical Asset Index	(3) Social Network Index
CGP transfer amount	-0.00971***	-0.328***	-0.0172
	(0.000863)	(0.0961)	(0.117)
Treatment dummy	-0.0467	4.056	-5.373
	(0.0488)	(6.225)	(11.82)
Yearly Dummy	0.0167	3.063	-9.417
	(0.0423)	(4.620)	(10.47)
Eligibility Dummy	-0.421***	-62.71***	-16.43*
	(0.0521)	(7.793)	(9.911)
Treatment*Year	-0.0891	1.857	13.93
	(0.0677)	(8.596)	(16.37)
Treatment*Year*Eligibility	1.669***	61.93***	6.026
	(0.157)	(16.78)	(21.37)
Impact on Ineligibles	*-0.0891*	*1.857*	*13.93*
Impact on Eligibles	*1.669****	*61.93****	*6.026*
N	4253	4253	4253
Mean of column variable	2.19	135.16	105.49

Standard errors in parentheses
Controlled for Household Size, Land Owned, Household Head Age, Cluster Eligibility Ratio
* p<0.10, ** p<0.05, *** p<0.010

In summary, the baseline and follow-up data from the Lesotho CGP evaluation enable us to experimentally estimate the impact of the transfers on human, physical and social capital variables using our capital formation specification in equation (1). We find that CGP transfers have significantly positive impacts on school enrollments in grades 4-6 and 7-12 within the eligible households in treated clusters. Also, the average education within the 0-17 year age group in the treated households rises significantly. Similarly, we find considerable impacts of CGP on physical capital formation. However, we are not able to identify socio-economic spillovers to ineligible households in the treated clusters. We argue that two years is not enough of a time period to find spillovers on human capital variables like enrollment in schools or other health spillovers. Findings from Gupta et al. (2015) suggest that there are significant income spillovers for the non-beneficiary households in the treated clusters, but our analysis does not

find evidence that this translates into higher asset holdings in the non-beneficiary households over the two-year timeframe. Similarly, we do not find significant impacts on social networks for eligible or ineligible households.

Using the capital formation analysis in this section, we predict the long-run impacts of CGP transfers on incomes of beneficiary households. We find the impact of CGP transfers on beneficiary households' future incomes via human, physical and social capital formation in Section 2. We then use the results from the income model to estimate the CGP's long-run impacts on household incomes—including income spillovers within the treated clusters—using LEWIE simulations.

5 Experimental Inputs for Long-run Spillovers

We used the estimated impacts of the CGP on human, physical, and social capital (Tables 2 and 3) together with the income regression results (Table 1) to obtain predicted increases in income due to the CGP. Table 4 presents these impacts. The top panel of Table 4 show the percentage effect of human, physical and social capital variables on monthly nominal income, obtained from column (3) of Table 1. The absolute effects of the CGP on the human, physical and social capital variables are the average treatment effect on the treated obtained from tables 2 and 3. We only consider the ones that are significant; the non-significant impacts are ignored.

The bottom panel of Table 4 presents the capital accumulation impact on monthly nominal incomes for eligible and ineligible households. The capital accumulation impact is measured by combining the impact that the CGP has on the capital variables and the impact of the capital variables on income. The accumulated impact of capital on nominal monthly income is the sum of the impacts of education, health, physical assets and social networks. Since, there are no significant impacts of social networks for either eligibles or ineligibles, we ignore it in the analysis. The respective capital accumulation impact is obtained by combining the CGP's impacts on the capital variables (absolute effect) and the capital variables' impact on income above baseline (percentage effect). The total sum of the capital effects give the capital accumulation impact on incomes of eligibles and ineligibles.

For each LSL transferred to a beneficiary household, the total income of beneficiary households rises by an

additional 26% due to the capital accumulation effect. There is also a 1% spillover in income accruing to non-beneficiary households. These numbers demonstrate the importance of the indirect income impacts of the CGP in beneficiary households, *before local income and production spillovers are taken into account*. These indirect income impacts are the inputs into our simulations of local-economy spillovers and total economic impacts of the CGP in Lesotho.

We use the LEWIE model in Filipski, et al. (2015) to simulate the long-run spillover effects of predicted changes in total income, including from human and physical capital formation in the beneficiary households caused by the CGP. The LEWIE simulations reveal that 1-maloti income increase in CGP-eligible households increases real income in the treated cluster by 1.53 maloti. An experimental estimate (Gupta, et al., 2015) finds a higher CGP income multiplier—on the order of 2.84. In our cost-benefit calculations below we use the lower, simulated multiplier, both because it is more conservative and also because the experimentally-estimated multiplier is likely to include asset accumulation effects. The multiplier obtained from the experimental paper is larger in magnitude than the simulated multiplier because the simulated multiplier fails to capture the impact of capital accumulation from baseline data. However, since we are experimentally capturing the impact of human, physical and social capital on long-term incomes in this analysis, using the income multiplier from experimental results would overestimate the benefits by double counting the accumulation of assets.

Table 4. *Long-term Predicted Impacts of the CGP on Household Incomes*

Income Determinants and CGP Impacts	Monthly Nominal LSL	Average Education of members 0-17	Average Education of members 18-59	Number of members fit to work	Physical Asset Index
Percentage Effect of…					
Avg. education (0-17)	0.0251				
Avg. education (18-59)	0.0425				
Family members fit to work	0.0962				
Physical Asset Index	0.00118				
Social Network Index*	0.000736				
Absolute Effect of…					
Impact on Eligibles		1.036		1.669	61.93
Impact on Ineligibles			*0.28*		
Total Income Impact Calculation					
Base Income of Eligible	211.45				

Capital Accumulation Impact	54.9	5.50		33.95	15.45
Percentage Impact on Eligible Household Incomes	***26%***				
Base Income of Ineligible	490.37				
Capital Accumulation Impact	6.014		6.014		
Percentage Impact on Ineligible Household Incomes	***1%***				

* Social Network Index is not significantly affected by the CGP treatment and thus omitted from the benefit calculation
** Inputs for LEWIE simulations of long-term impacts of CGP transfers

6 Benefit-cost Analysis of Lesotho's CGP using LEWIE Model

Our cost-benefit analysis of Lesotho's CGP consists of adding up the discounted future stream of total local-economy benefits (to beneficiaries and non-beneficiaries) over a time horizon of 10 years, then comparing these benefits to the discounted stream of project costs. The discounted stream of benefits is the present value (PV) of local-economy benefits from the SCT. The discounted stream of program costs over this period (C) is the total amount transferred in the base year continuing on over the 10-year period, appropriately discounted. We subtract C from PV to obtain the net present value of the CGP (NPV).

The results appear in Table 5. All numbers in the table are millions of maloti. This analysis assumes an annual discount rate of 10%, with no changes in CGP transfers (in nominal terms) over the 10-year time horizon of the analysis.

Column A is the amount transferred to eligible households for the 10-year period which is assumed to be the same amount every year, LSL 3.31 million. The next column B is the discounted CGP programme cost, discounted at an annual discount rate of 10%. Columns C and D are the indirect benefits accrued to the eligible and ineligible households respectively taking into account the benefits in income from human, physical and social capital. Values in columns C and D are obtained by multiplying column A with 0.26 and 0.01 respectively, the percentage impacts from Table 4. Columns E and F are the discounted benefits excluding and including spillovers respectively, again using the 10% annual discount rate. The last column is the discounted net benefit.

Table 5. *Long-term Cost-Benefit Analysis of CGP using LEWIE model*

t	*A* Amount Transferred to Eligible Household (= CGP Program Cost)	*B* Discounted CGP Program Cost $(A/(1+i)^{(t-1)})$	*C* Indirect Impacts in Eligible Households	*D* Indirect Impacts in Ineligible Households	*E* Discounted Benefits Excluding Spillovers (A+C+D)/(1 +i)(t-1))	*F* Discounted Benefits Including Spillovers (E* 1.53)	*G* Discounted Net Benefit (G - C)
1	3.31	3.31			3.31	5.07	1.75
2	3.31	3.01	0.86	0.03	3.82	5.85	2.84
3	3.31	2.74	0.86	0.03	3.47	5.32	2.58
4	3.31	2.49	0.86	0.03	3.16	4.83	2.35
5	3.31	2.26	0.86	0.03	2.87	4.39	2.13
6	3.31	2.06	0.86	0.03	2.61	3.99	1.94
7	3.31	1.87	0.86	0.03	2.37	3.63	1.76
8	3.31	1.70	0.86	0.03	2.16	3.30	1.60
9	3.31	1.54	0.86	0.03	1.96	3.00	1.46
10	3.31	1.40	0.86	0.03	1.78	2.73	1.32
Total	**33.11**	**22.38**	**7.75**	**0.30**	**27.52**	**42.11**	**19.74**
Ratio of Discounted Benefits to Discounted Costs (42.11/22.38)							**1.88**

The PV of benefits from the CGP is 42.11 million LSL. It exceeds the PV of program costs, which is 22.38 million LSL. The ratio of total discounted benefits to costs is 1.88. In other words, each maloti invested in the CGP results in an income gain of 1.88 maloti in the treated clusters. Over the 10-year period, the CGP produces an excess of benefits over costs equal to 19.74 million LSL.

7 Conclusions

This study identifies the long-run economic benefits of Lesotho's Child Grants Program and compares these benefits to program costs. Benefits include the transfers, themselves; the impact of transfers on future income, via the formation of human, physical, and social capital in beneficiary households; plus the spillover effects of income gains within treated village clusters.

Using data from the impact evaluation of Lesotho's CGP, we find that human, physical and social capital significantly predict household incomes. The CGP has significant and positive impacts on human, physical and

social capital formation in the beneficiary households. The capital formation within these households contributes to the long-run incomes by increasing income in the eligible households by 26% and in ineligible households by 1%. Adding conservative estimates of local multiplier effects of increases in eligible-household incomes, Lesotho's CGP produces discounted benefits that significantly exceed program costs over a 10-year time horizon. Using a discount factor of 10%, we find that the CGP produces 42.11 million in discounted benefits over a ten-year period, compared to a total discounted program cost of 22.38. Thus, each maloti invested in the program generates a 1.88-maloti increase in income in the CGP-treated village clusters.

This analysis substantially expands upon conventional impact evaluations, which focus on short-term social and economic outcomes and offer little insight into the costs and benefits of SCT programs. The main objective of SCT programs is to achieve social outcomes, including improvements in beneficiaries' schooling, nutrition, productive capacity, and social networks. We find compelling evidence that Lesotho's CGP achieves these objectives, and that improvements in these outcomes, in turn, produce future income gains that substantially increase the benefits of SCT programs. In addition, market linkages within project areas transmit impacts from eligible to ineligible households, generating local income multipliers that further increase benefits. Studies that ignore the indirect income effects of SCT programs via capital formation and local spillovers can dramatically understate benefits, which in the case of Lesotho's CGP appear to substantially exceed program costs.

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Table A1: Summary Statistics with differences and differences-in-differences of key household variables in Eligible and Ineligible Households

Summary Statistics of key variables	Eligible Households							Ineligible Households						
	Treatment			Control				Treatment			Control			
	2011	*2013*	*Diff*	*2011*	*2013*	*Diff*	Diff-in-Diff	*2011*	*2013*	*Diff*	*2011*	*2013*	*Diff*	Diff-in-Diff
Avg. Education in Household	3.94	4.26	0.32***	4.06	4.43	0.36***	-0.04	4.61	4.83	0.22	4.68	4.89	0.21	0.01
Education of Head of HH	3.98	4.53	0.55***	4.18	4.73	0.55***	0.0009	3.99	4.57	0.58**	4.42	4.87	0.45*	0.13
Avg. Edu of age group 18-59	5.7	5.95	0.25*	5.89	6.1	0.21	0.04	6.4	6.71	0.31	6.32	6.41	0.09	0.22
Avg. Edu of age group 0-17	3.15	3.68	0.53***	3.31	3.87	0.56***	0.03	3.14	3.42	0.28	3.04	3.4	0.36	0.08
# of members without schooling	1.56	1.4	-1.15**	1.38	1.27	-0.11	-0.04	1.21	1.08	-0.13	1.11	0.97	-0.14*	0.01
# of members enrolled in 1-3	1.19	1.2	0.01	1.12	1.11	-0.01	0.02	0.95	0.87	-0.08	0.94	0.84	-0.1	0.02
# of members enrolled in 4-6	1.51	1.61	0.1	1.49	1.49	0	0.1	1.26	1.24	-0.02	1.25	1.28	0.03	-0.05
# of members enrolled in 7-12	1.58	1.78	0.2**	1.53	1.77	0.24***	-0.04	1.81	1.95	0.14	1.72	1.86	0.14	0
# of members enrolled in > college	0.01	0.03	0.02**	0.02	0.03	0.01	0.01	0.08	0.06	-0.02	0.08	0.08	0	-0.02
# members not fit to work	3.69	3.82	0.13	3.5	3.54	0.04	0.09	3.01	3.04	-0.03	2.78	2.84	0.06	-0.03
# members fit to work	2.16	2.23	0.07	2.04	2.14	0.1	-0.03	2.31	2.19	-0.12	2.31	2.21	-0.1	-0.02
# members in 6-12 with perm job	0.003	0.012	0.009**	0.011	0.011	0	0.009	0.02	0.018	-0.002	0.012	0.032	0.02*	-0.02
# members in 13-17 with perm job	0.01	0.008	-0.002	0.009	0.012	0.003	-0.005	0.028	0.028	0	0.025	0.02	-0.005	0.005
# members in 18-59 with perm job	0	0.005	0.005*	0.003	0.003	0	0.005	0.003	0.005	0.002	0.005	0.002	-0.003	0.005
# members in 6-12 with temp job	0.02	0.04	0.02**	0.022	0.023	0.001	0.019	0.005	0.018	0.013*	0.022	0.032	0.01	0.003
# members in 13-17 with temp job	0.018	0.041	0.022**	0.015	0.025	0.01	0.012	0.015	0.013	-0.002	0.019	0.017	-0.002	0
# members in 18-59 with temp job	0.01	0.009	-0.001	0.011	0.006	-0.005	0.004	0.003	0.013	0.01	0.013	0.02	-0.007	0.003
# members in 6-12 with occ job	0.146	0.089	-0.06***	0.138	0.113	-0.025	-0.032	0.081	0.051	-0.03*	0.037	0.062	0.025	-0.06**
# members in 13-17 with occ job	0.156	0.097	-0.06***	0.162	0.107	-0.056***	-0.003	0.079	0.053	-0.025	0.067	0.045	-0.022	-0.003
# members in 18-59 with occ job	0.067	0.056	-0.001	0.079	0.062	-0.017	0.006	0.025	0.02	-0.005	0.047	0.047	0	-0.005
# mem working on own household	2.27	2.68	0.41***	2.07	2.38	0.31***	0.1	2.37	2.41	-0.04	2.17	2.32	0.15	-0.11
# mem working on own ag & liv	2.2	2.64	0.44***	2.02	2.34	0.32***	0.12	2.31	2.37	-0.06	2.11	2.26	0.15	-0.09
# mem working outside household	1.01	0.86	-0.15***	0.94	0.92	-0.026	-0.13*	0.76	0.63	-0.13**	0.76	0.72	-0.04	-0.08