Heterogeneous Spillovers from SCTs: Evidence from Lesotho

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with

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Introduction

- Impacts of SCTs on the treated are well documented
  - Impact of cash transfer programs in Sub-Saharan Africa, Davis et al. (2012)
  - Using PORGRESA's RCT data, Gertler (2004) measures impacts on child health outcomes, Schultz (2004), Skoufias et al. (2001)
  - Handa and Davis (2006) review of 6 CCTs in Latin America and the Caribbean
- Measuring impacts on *ineligible households*
  - Experimental Methods: Increased consumption of ineligibles in same villages in Mexico's PROGRESA (Angelucci and De Giorgi, 2009)
  - Simulations and GE techniques: Thome et al. (2013) using Kenya's CT-OVC, Filipski et al. (2015) Lesotho CGP

Motivation and Contribution

- We use experimental data to evaluate impacts of Lesotho CGP transfers on
  - Eligible Households in Treatment clusters, and
  - **Ineligible Households** in Treatment clusters
  - measure **intensity of treatment** on treated (ITT) eligible

Motivation and Contribution

- We use experimental data to evaluate impacts of Lesotho CGP transfers on
  - Eligible Households in Treatment clusters, and
  - **Ineligible Households** in Treatment clusters
  - measure **intensity of treatment** on treated (ITT) eligible
- Other main findings:
  - **Heterogeneity of treatment** effect across
    - Income Sources
    - Income Distribution (Quantile Treatment Effects (QTE))
- We compare **experimental** results with **simulation** results from Filipski et al. (2015)
- Both simulation and experimental results find **real economic growth**
  - income **multipliers** within treated eligibles
  - **Spillovers** on treated ineligibles

Outline

- Lesotho Child Grants Programme
  - RCT Experimental Data
  - Baseline Summary Statistics
- Methodology
  - Difference-in-difference
  - Quantile Treatment Effects
- Results
- Comparing experimental results with simulations

Data: Lesotho's Child Grants Programme

- **Cash transfers** given to poor households with children
- In 5 districts reaching almost 50,000 children
- 48 electoral divisions as treatment and control clusters
- ***Baseline*** collected in ***2011***, ***follow up*** in ***2013***
- Data on both **eligible** and **ineligible** households
- Final panel consists of **2,150 hhs** and **10,456 individuals**
- Existing research with Lesotho CGP Data
  - Taylor, Thome & Filipski (2013)
  - Daidone *et al.* (2014)
  - Dewbre *et al.* (2015)
  - Filipski *et al.* (2015)

Data: CGP Experimental Design

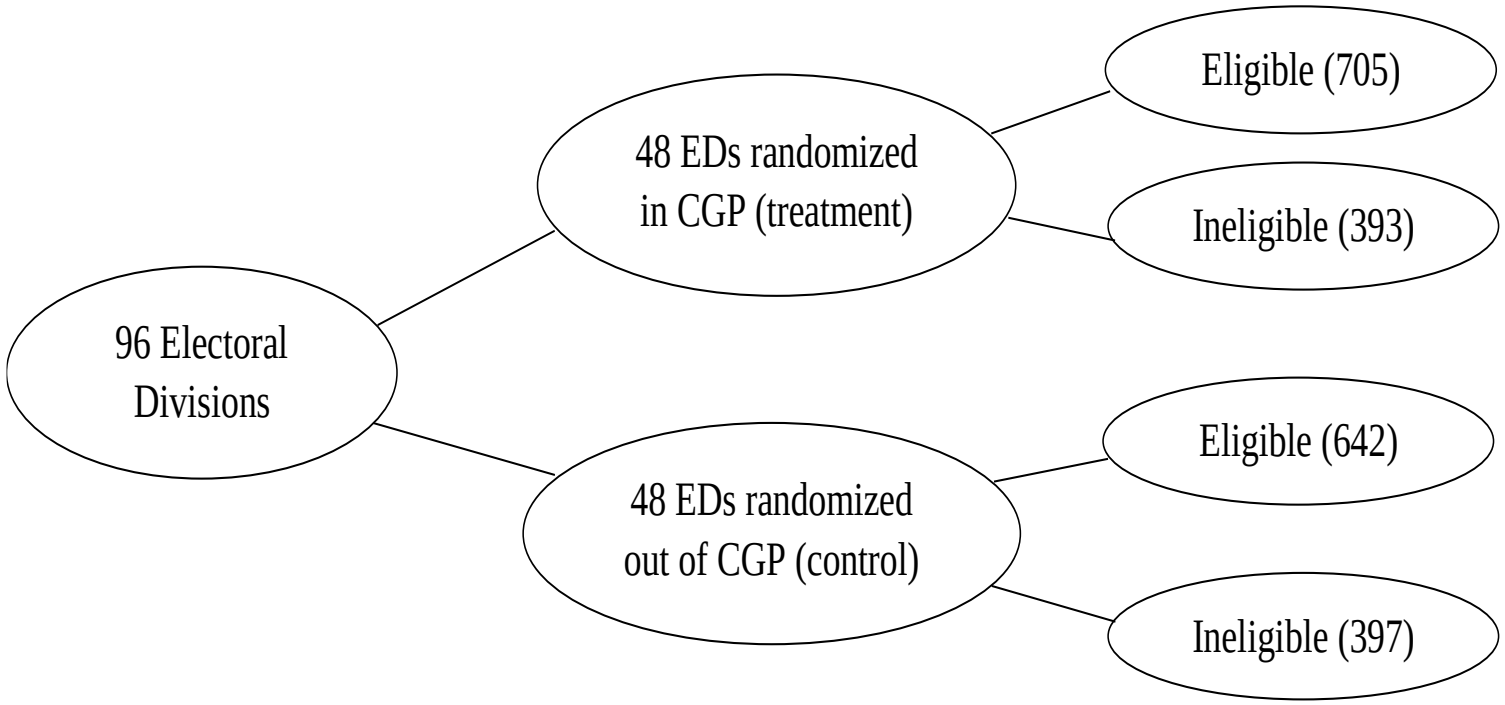

Figure 1: Lesotho CGP Experimental Design

Numbers in parenthesis give the sample size in each group in each round of survey.

- In our estimation, households with **both baseline and follow-up** data are only included
- **Reduction** in ineligible sample in 2013 due to budgetary constraints
- **Sampling weights** and **cluster-eligibility ratio** included in specifications to control for sampling bias

Data: CGP Experimental Design (contd.)

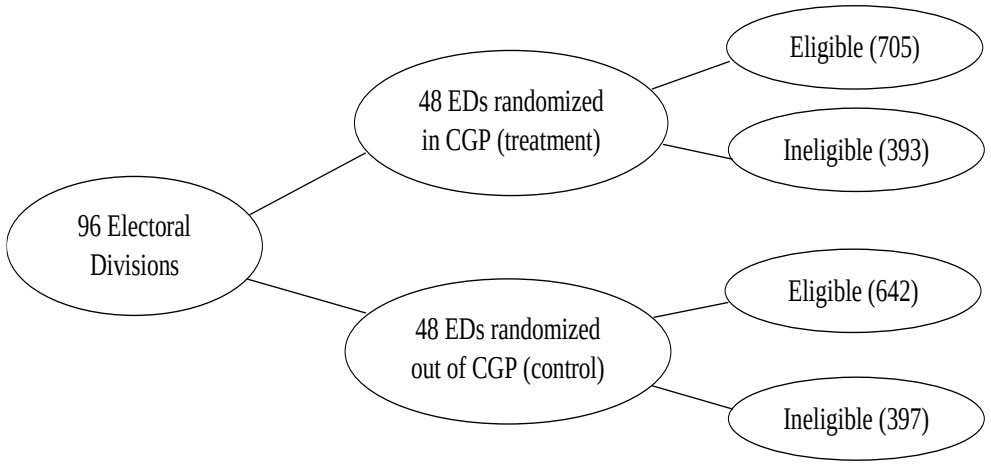

Figure 1: Lesotho CGP Experimental Design
Numbers in parenthesis give the sample size in each group in each round of survey.

Table 1: Distribution of Eligible Households in Treated Clusters by CGP Transfer Amount

CGP Monthly Transfer	Number of Children	% of Total Eligible Households
120 LSL ($12)	1-2	51.2
200 LSL ($20)	3-4	38.8
250 LSL ($25)	5+	10.0

- All **eligible households** started getting **LSL 120** after baseline data collection in 2011
  - payments made quarterly
- Later payments were indexed by **number of resident children**
- **Average transfer** level **LSL 164 ($16.4)** approx.

Baseline Summary Statistics

Table 2: Summary Statistics of Baseline Household Characteristics of Each Group

Summary Statistics	Eligible Group			Ineligible Group		
	Control	Treatment	*Diff*	Control	Treatment	*Diff*
Normalized Asset Index	100	103.3	-3.3	149.6	140	9.6
Normalized Social Network Index	100	101.3	-1.3	120.9	110.5	10.4
Household Size	5.5	5.8	-0.3**	5.1	5.3	-0.2
Land Owned (Acres)	1.2	1.4	-0.2**	1.4	1.9	-0.5***
Total Livestock Units (TLU)	0.8	1.0	-0.2**	1.8	2.2	-0.4*
Average Education of members (0-17 years)	3.3	3.2	0.1	3.1	3.1	0.0
Average Education of members (18-59 years)	5.9	5.7	0.2	6.3	6.4	-0.1
Proportion of Female Headed Households	0.5	0.5	0.0	0.4	0.3	0.1
Age of Household Head	51.9	52.0	-0.1	55.6	57.4	-1.8

*Significant- * at 10%, ** at 5%, *** at 1% respectively*

- **Asset Index:**
  - agricultural tools, house characteristics, access to electricity etc.
- **Social Network Index:**
  - giving and receiving food, labor, ag and non-ag inputs

*Both indexes were constructed using principal component analysis

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- Most baseline variables are **not significantly different** between control and treatment groups
- **Some significant differences** in variables: *HH Size, Land Owned and TLU*

A Naïve Diff-in-Diff Comparison of Household Incomes

Table 3: Monthly Income of Household Groups (in LSL)

Survey Round	Treated Clusters		Control Clusters	
	Eligible	Ineligible	Eligible	Ineligible
2013 (Follow-up)	905.4	792.8	555.4	932.9
2011 (Baseline)	406.8	661	444.5	732.5
Difference between 2013 and 2011	498.6***	131.8**	110.9***	200.4***
	(0.000)	(0.025)	(0.001)	(0.004)
Difference-in-difference	387.7***	-68.7		
	(0.000)	(0.450)		

p-values in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

- **Household Incomes increased** across all groups from baseline (2011) to follow-up (2013)
- **Difference-in-difference** (DiD) shows **significant increase** for **eligible hhs.**
- **Naïve DiD** could be misleading
- **Regression-based approach** for evaluating Treatment Impacts

Empirical Strategy: Treatment Effect on Treated Clusters

- Start with estimating impacts on **treated local economies**:

$$(1) \qquad D_{ijt} = \alpha + \beta T_j + \rho Y_t + \theta\left(T_j Y_t\right) + \epsilon_{ijt}$$

D_{ijt}: Income of household i in cluster j and year t

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

Y_t: Year dummy, 1 for follow − on and 0 for baseline

ϵ_{ijt}: Idiosyncratic error term

Disaggregating Treatment Effect and ITT

- **Disaggregating** the impacts on **treated eligible** and **treated ineligible** households:

$$(1) \qquad D_{ijt} = \alpha + \beta T_j + \rho Y_t + \theta(T_j Y_t) + \epsilon_{ijt}$$

$$\boldsymbol{\theta = \gamma + \xi E_i}$$

E_i: Eligibility Dummy, 1 if household is eligible, 0 otherwise

$$\mathbf{(2)} \qquad D_{ijt} = \alpha + \beta T_j + \rho Y_t + \boldsymbol{\gamma}(T_j Y_t) + \boldsymbol{\xi} T_j Y_t E_i + \epsilon_{ijt}$$

- Introducing **intensity of treatment** on treated (ITT) eligible households:

$$\mathbf{(3)} \qquad D_{ijt} = \alpha + \beta T_j + \rho Y_t + \boldsymbol{\gamma}(T_j Y_t) + \boldsymbol{\xi} T_j Y_t E_i + \boldsymbol{\delta} T_j Y_t E_i CGP_{i,t} + \epsilon_{ijt}$$

$\boldsymbol{\gamma}$ measures **impact on ineligible** and $(\boldsymbol{\gamma} + \boldsymbol{\xi})$ **on eligible** in $(\mathbf{2})$

$(\boldsymbol{\gamma} + \boldsymbol{\xi} + \boldsymbol{\delta} * \boldsymbol{CGP_{i,t}})$ estimates the **ITT on eligible** households in $(\mathbf{3})$ at different level of CGP transfers

Results: Impacts on Eligible and Ineligible Households

Table 6: Econometric Results from Estimation of Equation (2)

Parameter Estimates	(3) Nominal Income	(4) Real Income	(5) Nominal Income	(6) Real Income	(7) Nominal Income	(8) Real Income
*T*Y (γ)*	143.5**	116.1**	120.1*	97.25*	143.5**	116.2**
	(67.49)	(54.63)	(63.10)	(51.08)	(67.46)	(54.61)
T (β)	-85.70**	-69.38**	-85.38**	-69.12**	-85.46**	-69.18**
	(34.49)	(27.92)	(34.53)	(27.96)	(34.50)	(27.93)
Y (ρ)	943.1***	763.4***	940.5***	761.3***	941.2***	761.9***
	(97.38)	(78.83)	(97.49)	(78.92)	(97.40)	(78.85)
*T*Y*E (ξ)*	165.6***	134.1***			-177.3	-143.5
	(60.49)	(48.97)			(120.5)	(97.56)
*T*Y*E*CGP (δ)*			1.225***	0.992***	2.079***	1.683***
			(0.306)	(0.248)	(0.588)	(0.476)
Constant	-358.4***	-290.1***	-355.8***	-288.0***	-352.6***	-285.5***
	(99.59)	(80.62)	(99.59)	(80.62)	(99.57)	(80.60)
N	3893	3893	3893	3893	3893	3893
R-squared	0.106	0.106	0.108	0.108	0.109	0.109
Eligible with 120LSL			267.1***	216.3***	215.7***	174.7***
Eligible with 200LSL			365.1***	295.7***	382.0***	309.3***
Eligible with 250LSL			426.4***	345.3***	486.0***	393.5***
Eligible with 164LSL (average transfer)	309.1***	250.2***	321.0***	259.9***	307.2***	248.7***
Impact on Ineligible	143.5**	116.1**	120.1*	97.3*	143.5**	116.2**

Cluster robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

- All specifications **control** for *baseline household characteristics, district fixed effects, cluster eligibility ratio*
- Specification on (7) and (8) is **our preferred specification** with ITT
- **Significant income spillovers** to both **eligible** and **ineligible** household groups

Results- Heterogeneity of Impact across Income Sources

Table 7: DD Impact of CGP on Eligible and Ineligible Households from Equation (2), by Income Source with Real Income as Dependent Variable

CGP Impacts on Real (Inflation-adjusted Income)	Income from Livestock	Income from Wage Work	Income from Other Sources
Impact on Ineligible households (θ)	48.6***	18.73	-121.6
	(0.007)	(0.745)	(0.298)
Impact on Eligible households at LSL 120 ($\gamma + \xi + \delta \cdot 120$)	-0.6	-9.1	112.8
	(0.958)	(0.866)	(0.192)
Impact on Eligible households at Mean ($\gamma + \xi + \delta \cdot 164$)	-0.3	13.8	198.3**
	(0.975)	(0.788)	(0.012)
Impact on Eligible households at LSL 200 ($\gamma + \xi + \delta \cdot 200$)	-0.1	32.7	268.6***
	(0.992)	(0.531)	(0.002)
Impact on Eligible households at LSL 250 ($\gamma + \xi + \delta \cdot 250$)	0.2	58.9	365.9***
	(0.989)	(0.300)	(0.001)
N	2487	1430	882

p-values in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

- Impact on **ineligible** households are through **Livestock Income**
- Impact on **eligible** households through **Self-employment** and **crop** income

Measuring Quantile Treatment Effects: Test for Rank Similarity

- Assumption of **rank invariance** and **rank similarity** is required for **identification** (Dong and Shen, 2015; Frandsen and Lefgren, 2015)
- We use **regression-based test** of Frandsen and Lefgren (2015)

Method

Construct **sample ranks**

$$\widehat{U}_{ijt} = (1 - T_j)\widehat{F}_0(D_{ijt}) + T_j\widehat{F}_1(D_{ijt})$$

Estimate the following equation

$$\widehat{U}_{ijt} = \alpha_0 + \alpha_1 T_j + X_i'\Gamma + T_j X_i'\Theta$$

$\mathrm{H}_0: \Theta = \mathbf{0}$ Rank similarity holds

$\mathrm{H}_\mathrm{A}: \Theta \neq \mathbf{0}$ Rank similarity assumption fails

- **Rank Similarity** assumption holds for **eligible** households
- **Failure** indicates that, at the least, include those covariates in QTE estimation

Results- Heterogeneity of Impact across Income Distribution

Table 8: Quantile Treatment Effects on the Treated Eligible and Ineligible Households

Dependent Variable: Real Income	*Quantile = 0.25*		*Quantile = 0.50*		*Quantile = 0.75*	
*T*Y (γ)*	-15.11	-16.83	77.39*	76.10*	159.4**	159.6**
	(24.16)	(22.72)	(43.45)	(45.84)	(68.80)	(65.52)
T (β)	-8.452	-8.030	-27.25	-25.62	-74.41*	-74.62**
	(13.87)	(13.05)	(24.95)	(26.32)	(39.51)	(37.62)
Y (ρ)	136.9***	137.8***	561.1***	565.8***	930.6***	930.5***
	(45.79)	(43.06)	(82.36)	(86.88)	(130.4)	(124.2)
*T*Y*E (ξ)*	156.8***	316.0***	-213.8**	168.1***	-324.2**	140.6**
	(48.32)	(20.61)	(86.92)	(41.58)	(137.6)	(59.43)
*T*Y*E*CGP (δ)*	0.998***		2.317***		2.481***	
	(0.261)		(0.470)		(0.744)	
Constant	-73.39	-75.61*	-232.3***	-243.9***	-262.0**	-261.8**
	(46.34)	(43.57)	(83.34)	(87.91)	(132.0)	(125.6)
N	3893	3893	3893	3893	3893	3893
R-squared	-	-	-	-	-	-
Eligible with 120LSL	261.5***		141.6***		132.9*	
Eligible with 200LSL	341.3***		327.0***		331.4***	
Eligible with 250LSL	391.2***		442.8***		455.5***	
Eligible with 164LSL (average transfer)	305.3***	316.0***	243.3***	244.2***	241.8***	300.2***
Impact on Ineligible	0	0	77.39*	76.10*	159.4**	159.6**

Cluster robust standard errors in parentheses
* p < 0.10, ** p < 0.05, *** p < 0.01

- At **lower transfer levels**, **highest** impacts on households in **bottom** quantile
- Assuming rank invariance, **no spillover** effect on **bottom quantile ineligible** households
- These results are **robust** to including **non-linear effect** of CGP on household income

Comparing Simulations and Experiments

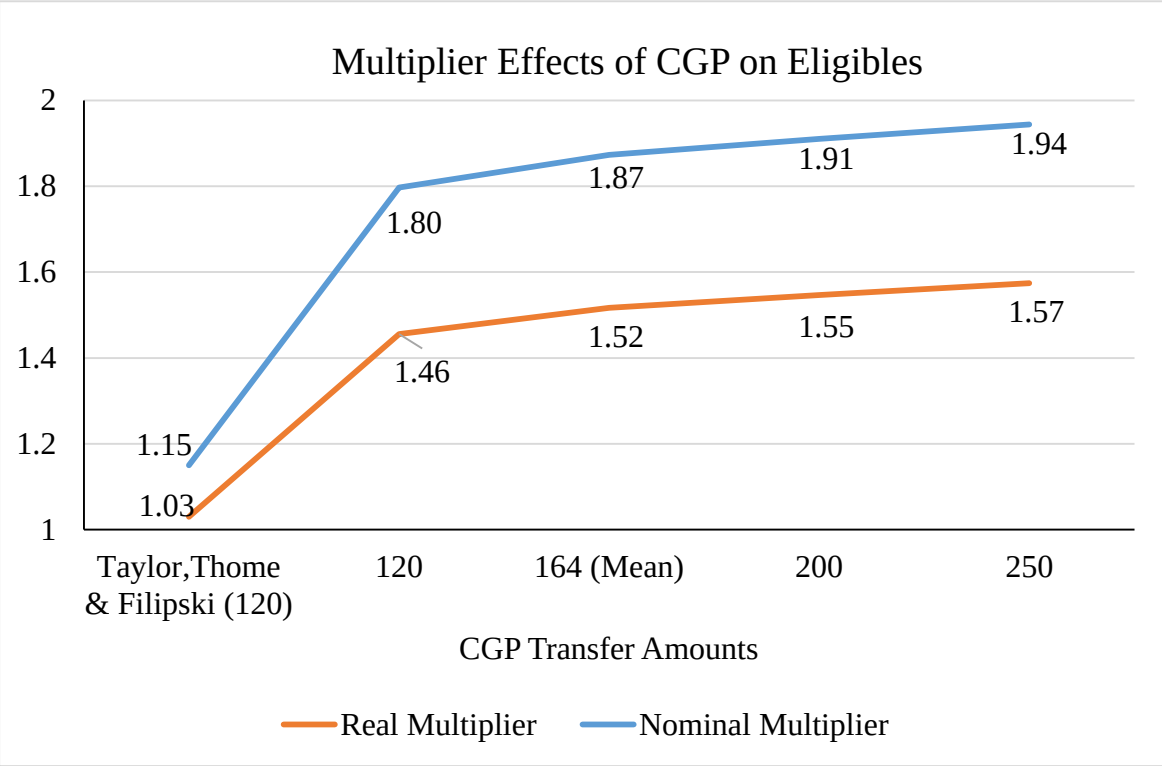

Table 10. Local Economy Multipliers Compared

Estimation	Real Multiplier	Nominal Multiplier
Experimental results using baseline and follow-up data	1.86 (1.81, 1.91)	2.20 (2.14,2.26)
LEWIE simulation results using baseline data*	1.53 (1.43,1.62)	2.21 (2.07,2.39)

* Source: Filipski et al. (2015)

- **Experimental** results indicate **impact** on **eligible** households higher than found by **simulations**
- **Real multiplier** from *experimental* data **bigger** than that from *simulations*
- Our **nominal multiplier** with tighter confidence interval

Conclusions

- We find **significant impact of CGP** on a **treated local economy**, which we disaggregate into impacts on eligible and ineligible households

- Our regression results are **robust to alternative specifications** and sample restricted to only eligible households

- Impacts are **heterogeneous** by **income source** and **income distribution**
  - QTE results show that for **lowest transfer level**, bottom quantile households benefit most
- Our results **confirm the spillovers** found by Taylor, Thome and Filipski (2013) and Filipski et al. (2015)

- These results are **key** for **understanding SCTs** from **policy perspective** beyond usual impact evaluation literature

Thank you

¿ Questions ?