Extended Abstract

Medium-Term Effects of the Nicaraguan CCT on Cognitive Functioning and Educational Attainment.

1. Introduction

Improving health and nutrition of young children is important not only for their immediate well-being, but also because it is believed to reduce poverty through improved cognitive development, health, educational achievements, and labor market opportunities (Strauss & Thomas 2008, Heckman 2006). Economic theories of human capital development rely on this postulated link and are part of the rationale for important programs in the US, such as Head Start, as well as in developing countries, such as Conditional Cash Transfer (CCT) programs.

Despite the spread of programs like CCTs to more than 30 countries world wide, there is limited evidence of the longer-run effects of early childhood health and nutrition interventions, especially on later cognitive functioning and children's learning in school (Hoddinott et al. 2008, Maluccio et al. 2009, Barham forthcoming). It is also not well understood how important is the exact timing of health and nutrition interventions. This is because it is unclear whether the benefits from interventions in the earliest years (i.e., before say age 3) continue (Pollitt et al. 1993) or fade out (Garces et al. 2002), and if interventions after age 3 can help reverse the effects of prior deficits (Walker 2007). The issue of fade-out is particularly pertinent in developing countries, where there are many competing health risks and a greater frequency of shocks, coupled with limited ability to smooth consumption.

This paper exploits the randomized design and timing of benefits of the Nicaraguan CCT program, the *Red de Protección Social* (*RPS*), to estimate the medium-term effects of being eligible for the intervention early in childhood (i.e., during the first 2 years of life) relative to being eligible later (after age 2), on various domains of cognitive fucntioning and academic achievement of these same children 11 years laters. The RPS provided 3 years of benefits to both the treatment and control group: benefits were provided to the treatment group from 2000-2003 and to the control group from 2003-2006. This difference in timing means that children of certain cohorts in the treatment localities were more intensively or solely exposed to the program (from 2000–2003) than similarly-aged children in the control localities, who received the program (from 2003–2006), and vice versa. Using recently collected data from 2010/2011 we use single difference models and kernal density graphs to examine the effect of RPS on the cognitive and academic achievement outcomes. The 2010/2011 data is a panel data set with the earlier rounds collected in 2000 (baseline), 2001, 2002, and 2004. We use the earlier rounds of data to control for baseline characteristics as well as to investigate possible mechanims, such a nutrition. Our data collection efforts paid close attention to reducing bais due to migration attrition, and we will investigate the possible effects on the analyses from not reducing attrition from migration.

Our results are still too preliminary to report.

The rest of this extended abstract gives a brief literature review and describes the RPS program, randomization and targeting.

2. Literature Review

To date, there is little evidence on the medium-term effects of CCTs, partly because the first large scale program only began in 1997. The evidence that does exist is from the Mexican program *Progresa/Oportunidades*. *Oportunidades* is an on-going program and medium-term analyses exploit the 18 month difference in length of exposure between treatment and control groups, as the control group became eligible for the program a year and a half after the treatment group. Results highlight that for rural youth the number of grades attained increased, but that longer exposure to the program had no differential effect on achievement tests, and had insignificant or even negative effects on the probability of working among 15–21 year olds (Behrman et al. 2005). In addition, while longer exposure to the program during early childhood is related to improved child behavior and greater child growth for children of non-educated mothers, it did not yield significant differences in cognitive or language skills (Fernald et al. 2009).

The lack of significant positive results of *Oportunidades* is surprising in light of the substantial short-term effects of the program. Two aspects of these medium-term analyses likely played a role in the findings, both of which we can address in our study. First, the differential exposure period, 18 months, may be too short. Second, there was substantial attrition between 1997 and 2003, mainly due to migration—approximately 40 percent for the 15–21 year old age group. Moreover, a number of pre-program characteristics are correlated with migration (Parker et al. 2008). Therefore, it is possible that the lack of significant findings in the medium-term evaluations of *Oportunidades*, for which they did not follow migrants, is the result of selection bias from migration.

The findings from this study are of interest beyond the literature on CCTs. In the US and other developed countries, there is growing interest in investing resources in disadvantaged children at an early stage in life. Drawing on a wide body of evidence from economics, psychology, and neuroscience, for example, Heckman (2006) argues that returns to such investments are much higher than those made later in life. However, the empirical base for these arguments is not as deep as is often presumed and evidence from developing countries that good health and nutrition of children under age 5 matters for later life outcomes such as cognitive functioning and income, which our study will examine, is scarce and mixed (Walker et. al., 2007). For example, a study in Jamaica which randomized 9–24 month olds to receive a nutritional supplement found a significant positive impact of the supplement on child development two years after the program, but no statistically significant effects when the children were ages 7 and 8 years old (Grantham-McGregor et al. 1997). In contrast, results from another supplementation program run by the Guatemalan Institute for Nutrition in Central America and Panama (INCAP) which randomized four villages into two groups, one which received a high energy and protein drink and the other a placebo sugar drink, found that children who were exposed to the intervention before age 3 experienced a quarter of a standard deviation increase in both reading comprehension and nonverbal cognitive tests when they were young adults (Maluccio et al. 2009).

In addition, while evidence on nutritional outcomes suggests it may be critical to intervene in the first 2 years of life, it is far less clear how sensitive cognitive outcomes are to improvements in the health and nutrition at different points in early childhood. Indeed, evidence from another CCT in Nicaragua shows positive impacts on cognitive development of children over 3 years old, while no significant results were found for those between 0 and 3 (Macours et al. 2008). Research results are also inconclusive as to whether interventions that help improve the health and nutrition of a child early on, such as before versus after age 2 or 3, will differentially affect outcomes later in life, perhaps due to the possibility of reversing the prior deficits (Walker et al. 2007). This potential reversal of deficits may underlie the mixed results observed regarding the long-term effects of nutrition and health interventions. The potential for catch-up is an important theme in current research on developed countries (Almond & Currie 2010). Evidence on this topic is crucial for policy makers to determine the cost-effectiveness of interventions targeted to different points in the child's life and the randomized design of our study and the timing of the interventions allow our study to rigorously address this gap in the literature.

3. The RPS Program

The objective of *RPS* was to reduce both current and future poverty by providing cash transfers conditional on health and education behaviors. On average, the transfers were approximately 18 percent of pre-program expenditures and delivered every other month. Transfers were paid to the female caregiver in the beneficiary household, referred to as the *titular,* and came with a strong social marketing message that the money was intended to be used for improved nutrition as well as health and educational investment in children. Separate amounts were transferred for, and different conditions applied to, the health and education components of the program.

The health conditionality included 1) bringing children to scheduled preventive health care appointments and 2) the *titular* attending bimonthly health information workshops. Health services at the scheduled visits included growth monitoring, vaccination, iron supplementation and provision of anti-parasite medicine. The supply of health care was increased to ensure the program could meet the increased demands for health care without reducing quality. In particular, *RPS* contracted and trained private health providers (Regalia & Castro, 2007) and beneficiaries were required to use those providers for fulfillment of the conditions and all services were free of charge. Providers visited program areas on scheduled dates and delivered services in existing health facilities, community centers, or private homes.

Receipt of the separate education transfer was contingent on all children in the household aged 7–13 who had not yet completed 4th grade enrolling in school and attending at least 85 percent of the time. While the education component relied on the existing education infrastructure (primary schools) in the communities, a small supply-side transfer was included for each child to provide schools with funds for school materials, and to incentivize teachers. Teachers were required to report enrollment and attendance using specific *RPS* designed forms for verification of the conditionalities.

When the control group was phased-in there was a change in program design and between 2003 and 2006 young teenagers of beneficiary households (age 12–14), as well as the *titular*, were required to attend information sessions focused on reproductive health and contraception. Further, contraceptive methods were made available to beneficiaries through the health care

providers. Given the experimental design, this change in conditionalities implies a random variation in exposure to reproductive health and contraception information and access.
The program was implemented by the Government of Nicaragua with technical assistance and financial support from the Inter-American Development Bank (IADB) and benefited more than 30,000

Program Targeting, Take-Up, and the Evaluation Design of RPS
The original randomized treatment and control evaluation design targeted the *RPS* interventions in 42 localities in 6 rural municipalities in central and northern Nicaragua. First, municipalities were chosen that were relatively worse off in terms of health and education indicators. Second, 42 out of 59 localities where selected based on a poverty index constructed using information from the 1995 National Population and Housing Census. Last, household targeting based on a census of the eligible localities in May 2000, led to 4 percent of households being deemed ineligible for the program (Maluccio 2009).

To rigorously evaluate the program, the 42 targeted localities were randomized into equally sized treatment and control groups at a public lottery. The randomization was stratified by poverty to ensure a similar poverty index between the two experimental areas. The 21 treatment localities became eligible for the program after the census in mid 2000 and they were eligible to receive 3 years worth of cash transfers. After the 3 years of transfers to the treatment localities were completed, the 21 control localities were phased-in, starting in mid 2003. They also received 3 years worth of cash transfers. Past analysis on the program has shown that there was very little contamination of the control group (Maluccio & Flores, 2005). Program take-up across treatment and control localities was approximately 85 percent. As with many randomized experiments, for ethical reasons the control group eventually received the program. Therefore, to enhance the evaluation of the longer-term effects of the program, prior to the control group becoming eligible, 21 additional localities in neighboring municipalities with similar levels of poverty were selected in 2002 to serve as a quasi-experimental comparison group. A random sample of households from these localities was then interviewed in the 2002 and 2004 follow-up surveys and also in our 2010 follow-up survey.